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Research Article

Two-In-Blend and Senior High School Learners' Performance in Organismal Biology

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Abstract: Low performance in science, coupled with disengagement among today's learners, has been persistently observed. Considering this generation's characteristics, this study combined two types of blended learning: blended cycle and flipped classroom as a strategy. This research study, utilizing a quasi-experimental pretest-posttest design, was participated in by 32 Grade 12 students at a public Senior High School for the academic year 2022-2023, and determined the performance in Organismal Biology. The experimental and the control groups were determined through match pairing. The study lasted for 6 weeks, including the pre-experimental stage, the experimental stage, and the post-experimental stage. Analysis of the results shows that both groups had an increased achievement after the intervention. Noticeably, a significant difference existed in the posttest scores of the experimental group that was exposed to two types of blended learning. This means that the students exposed to the blended cycle and flipped classroom had achieved better than those who were taught using the conventional method. Blended learning, therefore, was a way to maximize learning opportunities.

Keywords: blended cycle; blended learning; flipped classroom; Organismal Biology

1. Introduction

Blended learning has gained significant attention both before and after the pandemic, with many educators applying blended strategies often without consciously recognizing it. This approach promotes active learning and student engagement by integrating interactive online activities with face-to-face discussions (Sarkar et al., 2021). Studies have consistently shown that blended learning can lead to improved academic performance and student satisfaction across disciplines such as sociology, programming, and medicine (Ololube, 2014; Deperlioglu & Kose, 2013; Wang et al., 2022). True to its definition, blended learning combines technology, self-paced learning, and teacher-led instruction, making it particularly relevant for today's generation of learners. Shah and Barkas (2018) emphasize that e-learning platforms and online resources provide students with flexible opportunities to access content anytime and anywhere, thereby maximizing learning opportunities.

Despite these promising outcomes, student performance in science has persistently remained low. The Department of Education reported that the national mean percentage score (MPS) for Grade 10 Science in school year 2017-2018 was only 31.26, with Region VI recording 31.13. At Oton National High School, the Grade 10 Science MPS was slightly higher at 36.81, but still below satisfactory levels. Insights from a Learning Action Cell session in May 2020 further revealed that Science teachers in Grades 11 and 12 observed recurring challenges, including students' low motivation, frequent use of mobile phones during class, and reduced engagement due to predictable, lecture-heavy activities. Given that science is a content-rich subject requiring sustained focus and retention, these issues indicate a serious gap between instructional delivery and learner needs.

The problem becomes more pronounced when considering the learning characteristics of today's generation. Scholars note that both millennials and centennials are technologically skilled, self-confident, and adept at multitasking, but also heavily engaged with digital gaming and social media (Gilbert, 2011). Martínez-Estrella et al. (2023) similarly describe current learners as tech-savvy, while Vizcaya-Moreno and Pérez-Cañaveras (2020) highlight their preference for interactive, technology-driven learning environments such as online tutorials,

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videos, and virtual tools. These findings underscore the mismatch between traditional, lecture-centered instruction and the digital inclinations of modern learners.

While Hill et al. (2017) established that blended learning, by combining in-class and online methods, enhances student performance and engagement, little is known about its effectiveness in addressing persistent challenges in Science education at the secondary level. Specifically, there is limited research exploring how blended learning strategies may help improve students' motivation, focus, and academic performance in science, particularly in contexts where achievement scores remain alarmingly low. This study, therefore, aims to address this gap by examining the potential of blended learning as a means to enhance Science learning outcomes and align instructional delivery with the learning preferences of today's digital generation.

2. Materials and Methods

The research was conducted among 32 officially enrolled Grade 12 STEM learners from two heterogeneous sections during the academic year 2022-2023. Using a matched-subject design, students were paired based on their first-semester performance in General Biology 1, resulting in 16 matched pairs whose performances were analyzed. One group was randomly assigned to the experimental condition through a toss-coin method, while the other served as the control. The experimental group received instruction through a two-in-blend approach, which combined blended cycle and flipped discussion, integrating teacher-led instruction, offline video materials, Google Classroom, Mentimeter, collaborative tasks, and self-paced learning. In contrast, the control group was taught using conventional methods, primarily lecture and classroom activities without technology integration or self-paced components.

The study employed a researcher-made 40-item pretest–posttest summative test covering competencies in plant and animal reproduction, nutrition, gas exchange, chemical and nervous control, immune systems, and sensory and motor mechanisms, as outlined in the Department of Education's curriculum guide for Organismal Biology. The test was validated by school administrators and master teachers, pilot-tested among Grade 12 STEM learners in the previous school year, and subjected to reliability analysis using the Kuder Richardson 20 (KR-20), yielding a coefficient of 0.73, indicating acceptable reliability. Test items were distributed across cognitive domains: 15 remembering, 14 comprehension, 6 analysis, and 5 application questions. Classroom observations were also conducted by selected Science teachers using an observation guide to ensure fidelity in the implementation of both blended and conventional lesson plans.

After the intervention period, both groups were given the posttest under the same conditions. The results were statistically analyzed to compare the academic performance of students exposed to the blended learning intervention and those taught through conventional methods.

In conducting this action research, the researcher obtained approval from the school administration and the Department of Education Division Office. Students and their parents were informed of the study's purpose, procedures, and schedule, with proper orientation conducted prior to implementation. Parents were notified of the need for gadget use and provided with formal letters detailing the benefits for their children. All permissions, receipts, and financial reports were properly documented. Participants' scores and responses were recorded, documented, and kept confidential.

The results and findings were reported with accuracy and integrity, and shared with students, parents, teachers, and administrators. Student participants were formally recognized during card day and awarded certificates of recognition, together with their parents, for their cooperation in the study.

3. Results

This section presents the results of the study on the effectiveness of the two-in-blend approach in enhancing learners' performance in Organismal Biology. The data include the pretest and posttest mean scores of the blended and conventional groups, as well as the statistical analysis comparing their performance before and after the intervention.

3.1. Level of Performance in Organismal Biology before and after the Exposure to Two-in-Blend

This part of the study presents the performance of learners in Organismal Biology before and after being exposed to the two-in-blend approach. The section compares the pretest and posttest mean scores of the blended group to assess the improvement in their performance

following the intervention.

The data in table 1 shows the pretest and posttest mean scores of the learners exposed to two-in-blend. The blended group's performance prior to the exposure to the intervention was satisfactory. Blended obtained (M = 17, SD = 3.32). After them exposing to the intervention, blended group had an increased in performance as indicated by (M = 33, SD = 4.42). After the exposure to blended learning, the performance was outstanding. The two-in-blend group was exposed to the two common types of blended learning, the blended cycle and the flipped classroom. These two types of blended learning have helped cater in learning to take place. It means the experimental group that was exposed to the intervention had better performed. It is evident that the scores of the blended group increased after the intervention.

Table 1. Performance in Organismal Biology prior and after the exposure to two-in-blend.

Two-in-Blend	n	Mean	SD	Description
Pretest	16	16.62	3.32	Satisfactory
Posttest	16	32.75	4.42	Outstanding

The findings reveal that the two-in-blend approach significantly enhanced the learners' performance in Organismal Biology. The marked increase in mean scores from the pretest (M = 16.62) to the posttest (M = 32.75) demonstrates that the blended learning strategies, specifically the blended cycle and flipped classroom, were effective in improving understanding and engagement. This improvement indicates that integrating technology-driven and interactive instructional methods can foster deeper learning and better academic outcomes.

3.2. Level of Performance in Organismal Biology of the Two-in-Blend and Conventional Group After the Intervention

This part of the study presents the performance of learners in Organismal Biology of the two-in-blend and conventional group. The section compares the posttest mean scores of the blended group and the conventional group.

The data in table 2 shows the posttest mean scores of the learners exposed to the two-in-blend and those with the conventional group. The two-in-blend group exhibited mean score (M =32.75, SD =4.42) which is described as outstanding. While the conventional group obtained a mean score (M =26.44, SD = 4.24), which is satisfactory. The standard deviations of the two groups indicate that the posttest scores of the learners exposed to blended learning and conventional learning vary.

This descriptive data shows that there is a higher mean among the blended group compared to the conventional group after the intervention. The blended group was the group exposed to the two types of blended learning the blended cycle, and the flipped classroom. There was an effect on the increased in achievement among the two-in- blend group. The increased scores implied that blended learning can be an effective approach in maximizing students learning and participation. This can be considered as a new way to engage learners and to see self-paced learning with minimal teacher discussion can be a potential and can bring teaching in a new perspective.

Table 2. Two-in-blend and conventional group's performance in Organismal Biology after the intervention.

Group	n	Mean	SD	Description
Blended	16	32.75	4.42	Outstanding
Conventional	16	26.44	4.24	Very Satisfactory

This demonstrates that the integration of the blended cycle and flipped classroom significantly enhanced learners' understanding, engagement, and achievement. The results suggest that blended learning strategies can serve as a powerful tool to promote active and self-paced learning, reduce dependence on direct teacher instruction, and introduce a more flexible and interactive approach to teaching science concepts.

3.3. Difference between Two-In-Blend and Conventional Groups' Performance in Organismal Biology after the Intervention

This section presents the comparison of the posttest performance between the two-in-blend and conventional groups in Organismal Biology after the intervention. It aims to

determine whether the two-in-blend approach produced a significant improvement in learners' achievement compared to the traditional method of instruction.

Table 3 shows the significant difference between the posttest mean scores of two-in-blend and conventional group. There is a significant difference between the posttest mean scores of the two groups, respectively. This is indicated by t (30) = 4.122, p= .000 < .001. The null hypothesis that there is no significant difference between the posttest mean scores of two groups is rejected.

The table further shows that the difference of 6.31 in the means of the posttest scores of the Blended Group and the Conventional Group was significant at 0.05 alpha level. This means that the scores of the two groups after the intervention vary significantly. It implies that the teaching method employed among the experimental group (Blended Group) had an effect in the increased achievement in Organismal Biology. During the intervention, the experimental group was exposed to a two-in-blend approach combining common types of blended learning tailored to diverse learner needs. This method integrated digital platforms, videos, and interactive tools, supporting visual learning which has been shown to enhance retention compared to purely verbal or textual input (Staneviciene & Žekienė, 2025). Each lesson incorporated varied blended strategies to sustain student engagement and challenge.

Blended learning aligned well with millennials' learning preferences, which include technology use, group collaboration, personalized instruction, and small "bite-sized" information (Lamimi et al., 2024). The strategies employed such as self-paced learning, use of search engines for microlearning, cooperative activities via Mentimeter, and teacher-guided discussions, catered to different learning styles while deepening content understanding. Overall, the two-in-blend approach maximized learners' experience by integrating technology, collaboration, and teacher support

Table 3. Difference in the posttest scores of two-in-blend and conventional group.

Group	n	df	Mean	Mean difference	t-value	p-value	95% confidence interval of the difference	
blended	16		31.75				lower	upper
		30		6.31	*4.12	.000		
conventional	16		26.44				3.18	9.44

This finding confirms that learners exposed to the two-in-blend approach performed significantly better than those taught through the conventional method. Therefore, the use of blended learning strategies, combining digital resources and interactive classroom instruction, proved to be an effective pedagogical approach in enhancing students' academic achievement and engagement in Organismal Biology.

3.4. Difference in the Level of Performance of the Two-in-Blend Group in Organismal Biology Before and After the Intervention

This section presents the comparison of the pretest and posttest performance of the two-in-blend before and after the intervention. It aims to determine whether the two-in-blend approach produced a significant improvement in learners' achievement after the intervention.

Table 4 shows the significant difference between the pretest and posttest mean scores of the two-in-blend group. The result reveals that there is a significant difference between the pretest and posttest mean scores of the Blended Group. This is indicated by t (15) = 14.58, p= 0.000 < .05.

The table further shows that the difference of 16.13 in the means of the pretest posttest scores of the Blended Group was significant at 0.05 alpha level. The two types of blended learning contributed in the positive perceived outcome of the intervention.

Table 4. Difference in the pretest-posttest scores of the two-in-blend group.

Blended group	n	df	Mean	Mean difference	t-value	p-value	95% confidence interval of the difference	
blended	16		16.13				lower	upper
		15		16.13	*14.58	.000		
conventional	16		32.75				18.67	13.58

This suggests that the two-in-blend approach had a substantial positive effect on students' learning outcomes. The findings confirm that exposure to blended learning strategies, combining traditional instruction with technology-based activities, enhanced students' under-standing, engagement, and mastery of concepts in Organismal Biology.

4. Discussion

The implementation of blended learning, which integrates both teacher-initiated and student-initiated instructional approaches, together with the use of technology-based tools, online learning platforms, and cooperative learning strategies, has been found to enhance students' academic performance and engagement in Organismal Biology. This finding aligns with Vetrivel et al. (2024), who emphasized that combining face-to-face instruction with online components fosters a dynamic and interactive learning environment that enhances both student engagement and academic outcomes.

The improvement in the performance levels of students in the blended learning group, compared to those in the conventional learning group, highlights the effectiveness of this instructional approach. The incorporation of two common types of blended learning, the flipped classroom and the blended cycle, further contributed to this effectiveness. Langat (2025) supports this observation, asserting that the use of blended learning models and flipped classrooms promotes active learning and critical thinking, thereby deepening students' understanding of course content. Similarly, Kannan et al. (2020) found a positive correlation between student engagement in blended learning activities and their academic performance in an undergraduate engineering physics course. Engagement, as a key indicator of active learning, has consistently been linked to higher academic achievement compared to traditional lecture-based methods (Nuangchalerm & Kanphukiew, 2024; Yousif et al., 2024).

The significant differences in the pretest and posttest scores of the blended learning group further demonstrate that this approach facilitates more effective learning than conventional methods. The integration of technology not only enhanced students' engagement but also encouraged independent learning by allowing learners to progress at their own pace. Younas et al. (2025) reported that students felt more motivated and in control of their learning when they could determine the time, place, and pace of their studies. Similarly, Ghanbari-Ghazijahani (2025) and Bai (2022) found that digital integration in blended learning enables personalized learning experiences through access to diverse resources and collaborative tools, catering to individual learning styles and promoting knowledge sharing.

Blended learning has also been shown to significantly enhance student engagement. For example, Sahni (2019) reported that students enrolled in a business course utilizing a Learning Management System exhibited higher levels of engagement in both online and in-class activities compared to those in traditional classroom settings. Consistent with this, Bekele et al. (2025) found that blended learning significantly improved the learning engagement levels of teacher education students at Jimma College of Teachers' Education.

Taken together, these findings emphasize that blended learning is a powerful pedagogical approach that promotes active participation, critical thinking, and self-directed learning. By integrating technology, flexibility, and interactive strategies into the learning process, blended learning creates an inclusive and adaptive educational environment that enhances student engagement and achievement. As supported by Robert et al. (2020), classrooms that integrate flexible layouts and appropriate technological tools are better positioned to facilitate active learning, an essential factor in improving student performance, particularly in the sciences.

This pedagogical approach bridges the gap between traditional and modern instructional practices, aligning with the evolving needs of 21st-century learners. Therefore, educators and institutions are encouraged to adopt and continuously refine blended learning models to maximize student engagement and achievement.

5. Conclusions

The implementation of blended learning, which combines teacher-initiated and student-initiated instruction, the use of technology and online platforms, and cooperative learning strategies, has proven to be effective in enhancing students' academic achievement in Organismal Biology. This approach allows students to experience a balance between guided instruction and independent exploration, promoting both structure and autonomy in the learning process. By integrating traditional teaching methods with digital and collaborative

learning environments, blended learning creates a more dynamic and interactive classroom experience that fosters deeper understanding and engagement among students.

The results of the study revealed a notable increase in the performance levels of students who were exposed to blended learning compared to those who underwent conventional instruction. This improvement indicates the effectiveness of the approach in facilitating meaningful learning. The inclusion of the two most common types of blended learning, the flipped classroom and the blended cycle, further contributed to this positive outcome. These methods encourage active participation, critical thinking, and the practical application of knowledge, which are essential for mastering complex scientific concepts.

Moreover, the significant difference between the pretest and posttest scores of the blended learning group highlights its capacity to facilitate learning more effectively than traditional methods. The integration of technology in the learning process not only enhanced engagement but also encouraged independent and self-paced learning. Students were able to take greater control of their studies, revisiting materials and utilizing online resources according to their individual needs. This flexibility allowed learners to progress based on their readiness, which in turn strengthened their comprehension and retention of the subject matter.

Furthermore, the statistically significant improvement in the posttest scores of students under the blended learning approach supports the conclusion that this model has strong potential to enhance learners' performance, particularly in science-related disciplines. The combination of technology, teacher guidance, and collaborative learning provides an enriched educational experience that caters to different learning styles. Overall, these findings affirm that blended learning is an effective pedagogical strategy that not only improves academic per-formance but also cultivates essential skills such as independence, critical thinking, and active engagement among students.

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Informed Consent Statement: Student participants were informed of the details and the purpose of the research study. Proper orientation was done before the study. Parents of the respondents were given a letter and notified of the schedule of the class and were explained the benefits that their children get from the proposed research study. Furthermore, the use of gadgets was a necessity in the conduct of the study; parents were also informed. Formal letters were secured to all concerned individuals before the conduct of the study.

Conflicts of Interest: The author declares no conflict of interest.

References

Bai, X. (2022). Teaching design of English writing based on UMU. *Mathematical Problems in Engineering, 2022*, 9075380. https://doi.org/10.1155/2022/9075380

Bekele, A., Melese, W., & Sime, T. (2025). The effect of blended learning approach on students' learning engagement at Jimma Teachers' College, Ethiopia. *Discover Education, 4*, 327. https://doi.org/10.1007/s44217-025-00564-w.

Deperlioglu, O., & Kose, U. (2013). The effectiveness and experiences of blended learning approaches to computer programming education. *Computer Applications in Engineering Education, 21*(2), 328-342. https://doi.org/10.1002/cae.20476

Ghanbari-Ghazijahani, T. (2025). Future-forward education in engineering: Synergy of conventional and digital methods. *Global Journal of Engineering Education, 27*(1), 31-39.

Gilbert, J. (2011). The millennials: A new generation of employees, a new set of engagement policies. *Ivey Business Journal, 75*(5), 26-28.

Hill, T., Chidambaram, L., & Summers, J. D. (2016). Playing 'catch up' with blended learning: performance impacts of augmenting classroom instruction with online learning. *Behaviour & Information Technology, 36*(1), 54-62. https://doi.org/10.1080/0144929X.2016.1189964

Kannan, V., Kuromiya, H., Gouripeddi, S. P., Majumdar, R., Madathil Warriem, J., & Ogata, H. (2020). Flip & Pair – a strategy to augment a blended course with active-learning components: Effects on engagement and learning. *Smart Learning Environments, 7*, 34. https://doi.org/10.1186/s40561-020-00138-3

Lamimi, I., Alaoui, S., & Ouelfatmi, M. (2024) Bite-Sized Learning on TikTok: Exploring the Platform's Educational Value within the Framework of TAM (Technology Acceptance Theory). *Open Journal of Social Sciences, 12*, 228-245. DOI: 10.4236/jss.2024.124015.

Langat, A. K. (2025). Transition from analogue to digital technology: Examining teaching, learning, and assessment in higher education in Kenya. In *Advances in Educational Technologies and Instructional Design: Artificial Intelligence, Digital Learning, and Leadership* (pp. 89–118). IGI Global. DOI: 10.4018/979-8-3373-0025-2.ch004

Martínez-Estrella, E.-C., Samacá-Salamanca, E., Garcí-a-Rivero, A., & Cifuentes-Ambra, C. (2023). Generation Z in Chile, Colombia, México, and Panama: Interests and new digital consumption habits. Their use of Instagram and TikTok. *Profesional De La información, 32*(2). https://doi.org/10.3145/epi.2023.mar.18

Nuangchalerm, P., & Kanphukiew, S. (2024). Enhancing scientific problem-solving and learning achievement of lower secondary students through active learning management. *Jurnal Pendidikan IPA Indonesia, 13*(1), 172-181. DOI: 10.15294/jpii.v13i1.47672

Ololube, N. P. (2014). Blended learning methods in introduction to teaching and sociology of education courses at a university of education. In *Advancing technology and educational development through blended learning in emerging economies* (pp. 108–127). IGI Global. DOI: 10.4018/978-1-4666-4574-5.ch006

Robert, J., Ramsay, C., Ades, S. E., Keiler, K. C., & Palma, C. (2020). Active Learning Spaces: Matching Science Classrooms with Pedagogy. In *Active Learning in College Science: The Case for Evidence-Based Practice* (pp. 483-498). Springer International Publishing. https://doi.org/10.1007/978-3-030-33600-4_30

Sahni, J. (2019). Does blended learning enhance student engagement? Evidence from higher education. *Journal of E-learning and Higher Education, 201*, 121518. DOI: 10.5171/2019.121518

Shah R. K., & Barkas L. A. (2018). Analysing the impact of e-learning technology on students' engagement, attendance and performance. *Research in Learning Technology, 26*. https://doi.org/10.25304/rlt.v26.2070

Staneviciene, E., & Žekienė, G. (2025). The Use of Multimedia in the Teaching and Learning Process of Higher Education: A Systematic Review. *Sustainability, 17*(19), 8859. https://doi.org/10.3390/su17198859

Vetrivel, S. C., Arun, V. P., Maheswari, R., & Saravanan, T. P. (2024). Technology integration in online learning platforms: Blended learning gamification. In *Transdisciplinary Teaching and Technological Integration for Improved Learning: Case Studies and Practical Approaches* (pp. 219-247). IGI Global. DOI: 10.4018/979-8-3693-8217-2.ch011

Vizcaya-Moreno, M. F., & Pérez-Cañaveras, R. M. (2020). Social Media Used and Teaching Methods Preferred by Generation Z Students in the Nursing Clinical Learning Environment: A Cross-Sectional Research Study. *International journal of environmental research and public health, 17*(21), 8267. https://doi.org/10.3390/ijerph17218267

Wang, D., Zhou, J., Wu, Q., Sheng, G., Li, X., Lu, H., & Tian, J. (2022). Enhancement of Medical Students' Performance and Motivation in Pathophysiology Courses: Shifting From Traditional Instruction to Blended Learning. *Frontiers in public health, 9*, 813577. https://doi.org/10.3389/fpubh.2021.813577

Younas, M., El-Dakhs, D., & Jiang, Y. (2025). Younas, M., El-Dakhs, D., & Jiang, Y. (2025, August). Knowledge construction in blended learning and its impact on students' academic. *Frontiers in Education, 10*. https://doi.org/10.3389/feduc.2025.1626609

Yousif, M. R., Ameen, L. T., Jassim, B. M., & Majeed, B. H. (2024). The impact of two proposed strategies based on active learning on students' achievement at the computer and their social intelligence. *International Journal of Engineering Pedagogy, 14*(1), 39-49. https://doi.org/10.3991/ijep.v14i1.47085