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Teacher and Student Perception of Blended Learning in Chemistry Curriculum Implementation in Public Secondary Schools in Obio/Akpor Local Government Area

***Nduudee, J.N., & Enebeli, E.**
Department of Chemistry, Ignatius Ajuru University of Education, Port Harcourt, Nigeria
Department of Curriculum and Instruction, Federal College of Education (Technical) Omoku, Rivers State, Nigeria

***Corresponding author email:** joywereneeduu@gmail.com

Abstract
This study looked at Chemistry Education curriculum implementation and integrated learning in public secondary schools in Obio-Akpor Local Government Area, Rivers State. This study used a descriptive survey design as its research methodology. The study formulated two hypotheses and three research questions. 18116 Chemistry students and 189 Chemistry teachers from all of the public secondary schools in the study area made up the study's population. With the use of multi-stage sampling approaches, 301 students and 90 Chemistry professors made up the sample size. Questionnaires served as the data collection tool. The instrument's 0.88 reliability coefficient served as validation. The t-test was utilised for the hypotheses, and mean and standard deviation were employed for the analysis of the research questions. Every experiment was run at the significance level of 0.05. The study's conclusions showed that both educators and pupils in the public secondary schools in the study region possess the skills needed to use the blended learning approach to Chemistry Education curricula. Subsequent research revealed that inadequate internet access, unstable electrical supply, and expensive data plans are the main obstacles impeding the successful use of blended learning in Chemistry education. Making internet facilities available was one of the recommendations provided for the successful integration of blended learning as an instructional design in the Chemistry Education programme.

Keywords: Blended learning, Chemistry, Curriculum, Implementation, Learning, Schools

Introduction

New possibilities in education have emerged as a direct result of the exponential development of technology in the modern period. According to numerous research, kids prefer and benefit more from new educational models when compared to more conventional methods (Bernard et al., 2017). Blended learning is one of the latest and most well-liked approaches to education. When the benefits of online learning environments, brought about by the tremendous advancements in information and communication technology (ICT), failed to materialise, educational policymakers and practitioners devised blended learning as a solution (Seraji et al., 2019). Blended learning is characterised by the integration of several delivery methods, instructional models, and learning styles within a dynamic and purposeful learning environment. To maximise the utilisation of available resources and enhance student learning outcomes while simultaneously tackling significant institutional concerns, blended learning courses integrate online and classroom learning activities (Nugraheni et al., 2021). According to Graham (2006), referenced in Nugraheni et al. (2021), blended learning occurs when online and in-person methods and tools are organically combined. In a nutshell, blended learning is the practice of integrating online educational content delivery with the greatest aspects

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of traditional classroom interaction and live instruction to facilitate student-to-student differentiation, facilitate reflective thinking, and personalise learning for a wide range of learners.

According to Thorne (2003) blended learning is a way of teaching and learning that showcases the potential to merge online lessons that make use of cutting-edge technology with more conventional classroom methods that emphasise student engagement and hands-on experience. Regarding Thorne's concept in a broader context, According to Bersin (2014), blended learning is an audience-specific approach that combines different forms of training "media," such as activities, events, and technologies, to provide a successful training programme. Blended learning, according to Watson (2008), is a paradigm that combines traditional classroom instruction with online resources to improve student engagement, broaden their knowledge base, and take advantage of new developments in ICT. In addition, blended learning was defined by Graham (2006) as combining traditional classroom instruction with online resources. According to Nugraheni et al. (2020), blended learning essentially combines online and in-person learning. Scholars frequently use terms such as "personalised learning," "differentiated instruction," "hybrid learning," "technology-mediated instruction," "web-enhanced instruction," and "mixed-mode instruction" to describe blended learning. The four blended learning models described by Staker and Horn (2012) are the rotation, flex, self-blend, and enriched-virtual models.

In addition to its many useful uses in biotechnology, environmental protection, and other fields, chemistry is a pure science with fundamental principles that underpin many other fields. In the first year of a Chemistry or Biochemistry degree programmes, as well as in senior high school, students are required to take General Chemistry. For secondary school chemistry students to acquire the necessary level of learning outcomes and specific competencies, along with other general competencies like communication and teamwork, a well-rounded education in the subject is essential, and this fact must be considered in any effective educational plan. Competencies "represent a dynamic combination of cognitive and metacognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values," and learning outcomes "are statements of what a learner is expected to know, understand, and be able to demonstrate after completion of a learning experience," as stated by the Tuning Educational Project. Students' performance may suffer if they start studying chemistry without a solid grasp of the subject's foundational ideas. The goal of teaching chemistry is to help students become better observers and manipulators of physical objects so that they can one day use this knowledge to find solutions to problems caused by the interplay of various substances and their properties under varying environmental conditions (Odo, 2013). This study aims to improve students' understanding of chemical bonding so that they can better grasp other topics in chemistry. Chemical bonding is important in chemistry and students often struggle with it (Nahum et al., 2018). To do this, it was necessary to establish instructional strategies that would improve the teaching and learning of chemical bonding. Consequently, this research looked at two methods of teaching chemical bonding that could lead to a deeper comprehension of the subject. Blended learning and expository tactics are the methods of instruction. There is a chance for higher-quality human contact in blended learning. Furthermore, it offers a combination of technological tools and interpersonal relationships that lead to a positive and encouraging educational environment (Holm, 2011). Blended learning has three main proponents in the academic community: better learning efficacy, more accessibility and convenience, and lower costs (Graham, 2006). Consequently, pupils must grasp the fundamental ideas taught in secondary school chemistry classes.

The development of blended learning in the twenty-first century has revolutionised education across the board, including chemistry. Shockingly, chemistry classes have not yet implemented integrated learning. According to a plethora of research, blended learning has the potential to be an effective strategy for raising the bar for chemical education. Blended learning, according to Olakanmi (2015), can help students conceptualise concepts like the rate of chemical reactions. According to Bernard et al. (2017), blended learning also has the potential to greatly improve students' outcomes. Despite the abundance of research on the topic, it is necessary to examine current trends in the use of blended learning in the chemical sciences. Research in the field of chemistry has recently been trending towards studying effective methods of learning and targeted curricula (Nugraheni et al., 2020). Concerning those findings, certain details still need filling in, such as the following: the journal, the study methods and issue, the education levels of the authors, the proportion of online and offline learning, the particular model of blended

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learning, and the technology employed in blended chemistry education. Blended learning is becoming more popular, and the trends in these areas can serve as useful resources for teachers, especially those teaching chemistry. To comprehend the application and trend of blended learning in chemistry, this study will expose the literature on blended learning-enabled chemical courses.

Teaching pupils about chemistry is important because it gives them the tools, they need to comprehend the universe. There has been a significant uptick in the push to find ways to improve classroom instruction by leveraging technological tools. Blended learning, which incorporates both online and traditional classroom training, is one strategy that has recently attracted a lot of interest. Potential benefits of blended learning include more student engagement, more learning flexibility, and access to more resources. Students can engage with instructional materials in a variety of ways, including through the use of films, simulations, and interactive exercises. In addition to meeting the unique needs of each student, it encourages active learning through group projects. The rise of ICT in the 21st century has made it imperative for educators to effectively incorporate these tools into the classroom to implement curricula. Inadequate instructional design, a bad learning environment, a lack of technology, and an improper integration of blended learning into students' subject training all contributed to its inadequacy in fostering the development of communicative abilities. Studying purely from textbooks, grammatical reference books, and dictionaries is no longer effective, unprofessional, or entertaining in this stage of developing international interaction and intercultural communication. Students' negative attitudes and inefficient technology use have also slowed the spread of blended learning.

Aim and Objectives

In light of these issues, this research will look at how public secondary schools in Obio-Akpor Local Government Area, Rivers State, use blended learning and how they teach chemistry. The study aims to accomplish the following in particular:

1. determine, among secondary school students in Obio/Akpor, the computer competency levels necessary for the effective application of the chemistry curriculum through the blended learning technique.
2. discover how the learning environment affects the execution of the chemistry curriculum in Obio/Akpor secondary schools through the use of the blended learning technique.
3. find out what problems secondary school pupils in Obio/Akpor are having with the blended learning approach to chemistry class.

In line with the objectives of the study, the following research questions were raised:

1. How much computer competency do secondary school students in Obio/Akpor need to successfully implement a blended learning chemistry curriculum?
2. How can the learning environment impact the implementation of the chemistry curriculum in Obio/Akpor secondary schools through the blended learning method?
3. What are the obstacles to teaching chemistry to secondary school pupils through a blended learning approach?

Hypotheses

H01: There is no significant difference in the mean ratings of students and teachers on the influence of computer competencies on the implementation of a Chemistry curriculum using the blended learning method

H02: There is no significant difference between the mean ratings of students and teachers on the influence of the learning environment on the implementation of Chemistry curriculum using the blended learning method**.**

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Methodology

This study used a descriptive survey design for its investigation. Researchers at Rivers State's Obio-Akpor Local Government Area conducted the study. A total of 18,116 secondary school pupils and 189 chemistry instructors from the Obio-Akpor LGA made up the study's population. Using multi-stage sampling approaches, 301 chemistry students and 90 Chemistry teachers made up the sample size. The research used a 15-item structured questionnaire

to gather data. The CSTOQ or Chemistry Students and Teachers Opinion Questionnaire was the name of the survey. To administer the survey, researchers used a modified 4-point Likert scale. Two measurement and evaluation specialists from Rivers State University and one expert from the Department of Chemistry Education at Ignatius Ajuru University of Education in Rumuolumeni, Port Harcourt, Rivers State, assessed the instrument's face and content validity. The reliability coefficient of the instrument was 0.88, indicating its validity. For the study questions, we utilised mean and standard deviation. For the hypotheses, we utilised a t-test. We used a significance level of 0.05 for all of our analyses. We accepted as acceptable any calculated mean greater than or equal to 2.50 and rejected any calculated mean less than 2.50 since a criterion value for decision-making is a mean of 2.50.

Results

Table 1: Mean respondents' rating on the levels of computer competencies required for effective implementation of Chemistry curriculum using blended learning method

S/N	Item	Students (n= 301)			Teachers (n= 90)		
		Mean	SD	Decision	Mean	SD	Decision
1.	Have skills in E-mail management and setup	3.56	1.54	High	3.88	1.75	High
2.	Competent in basic online information management	3.59	1.56	High	3.87	1.78	High
3.	Have skills for using real-time board	1.78	1.63	Low	2.45	1.57	Low
4.	Able to use smartphones	4.01	0.99	High	3.91	1.80	High
5.	Have online collaboration skills	3.45	1.47	High	3.89	1.78	High
	Grand mean	**2.92**	**1.43**		**3.06**	**1.73**	

Source: Researcher's field survey, 2023

From Table 1, analyzed data showed that Chemistry teachers and students can effectively perform five items of the five competencies required for effective implementation of the Chemistry curriculum using the blended learning method in public secondary schools in Obio/Akpor. However, further results indicated that teachers and students are not competent in using real-time boards (M=1.78) and (M=2.45).

Table 2: Mean respondents rating on the influence of the learning environment on the implementation of the Chemistry curriculum using the blended learning method.

S/N	Item	Students (n= 301)			Teachers (n=90)		
		Mean	SD	Decision	Mean	SD	Decision
6	Do you perceive your school's physical environment as not conducive to Chemistry lessons	3.20	0.42	Agree	3.88	0.92	Agree
7	If the school environment is conducive, it will improve your skills in chemistry lessons through blended learning.	3.40	0.70	Agree	3.05	0.97	Agree
8	Poor school environment affects your health condition	2.65	1.56	Agree	2.55	1.75	Agree
9	An inadequate learning environment makes you lose concentration.	3.00	0.67	Agree	3.04	0.80	Agree
10	Teachers with poor qualifications cannot effectively implement a chemistry curriculum	4.00	0.00	Agree	3.36	0.89	Agree
	Grand mean	**3.25**	**0.67**		**3.07**	**1.06**	

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Source: Researcher's field survey, 2023

Table 2's results highlight the importance of the classroom setting for secondary school students' successful completion of chemistry courses taught using blended learning strategies. When asked about the school's physical environment and its effect on chemistry education, both instructors and students agreed that it was helpful. The majority of respondents think that the blended learning approach will enhance chemistry education in a supportive setting. Blended learning may suffer if instructors lack the necessary qualifications to teach chemistry, a fact that the respondents also acknowledged with highly

Table 3: Mean respondents rating on the challenges facing the implementation of Chemistry curriculum using the blended learning method

S/N	Item	Students (n= 301)			Teachers (n=90)		
		Mean	SD	Decision	Mean	SD	Decision
11	Poor internet facilities may pose a challenge in the integration of blended learning in chemistry instruction	3.58	0.94	Agree	3.33	0.92	Agree
12	Epileptic electricity supply interrupts blended learning activities	3.00	0.89	Agree	3.25	0.91	Agree
13	Your house environment is not conducive and creates a distraction when integrating blended learning in Chemistry	2.89	0.90	Agree	2.80	1.32	Agree
14	The high cost of ICT facilities such as Android phones is a challenge to the use of the blended learning method	3.18	1.37.	Agree	3.13	1.49	Agree
15	You are comfortable with the high cost of data when engaging in blended learning.	3.01	0.71	Disagree	2.90	0.32	Disagree
	Grand mean	**3.13**	**1.12**		**3.08**	**0.99**	

Source: Researcher's field survey, 2023

From Table 3, analyzed data indicated that respondents agree that there are challenges facing the implementation of the Chemistry curriculum using blended learning methods among secondary school students with an overall mean rating of (M=3.13) and (M=3.08). They also agreed that poor internet facilities posed a major challenge in the integration of blended learning in chemistry instruction (M=3.58) and (M=3.33). The respondents, however, disagreed that they are comfortable with the high cost of data when engaging in blended learning.

Table 4: Summary of t-test on the difference between the mean responses of students and teachers on the influence of computer competencies on the implementation of Chemistry curriculum using the blended learning method.

Status	N	Mean	Std.	Df	t-test	p-value	Decision
Teachers	90	3.08	0.79	389	0.053	0.658	NS
Students	301	2.93	0.88				

Key: NS-Not Significant

There is a statistically significant difference between the groups, as the t-test p-value (0.658) is higher than the 0.05 level of significance. There is insufficient evidence to reject the null hypothesis (H01) for the teachers, according to this. To rephrase, the data does not give strong evidence that students and teachers have significantly different

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opinions on the impact of computer proficiency on blended learning chemistry lessons. Therefore, the verdict is "NS," which means that there was no significant difference in the responses of students and teachers on the effect of computer competency.

Table 5: Summary of t-test on the difference between the mean ratings of students and teachers on the influence of learning environment on the implementation of Chemistry curriculum using the blended learning method.

Status	N	Mean	Std.	Df	t-test	p-value	Decision
Teachers	90	3.10	0.61	389	0.618	0.104	NS
Students	301	3.02	0.90				

Key: NS-Not Significant

For both groups, the t-test yielded a p-value of 0.104, which is higher than the 0.05 criterion of significance. Based on these results, it appears that neither the instructors nor the students have enough evidence to dismiss the null hypothesis (H02). To rephrase, the data does not strongly support the hypothesis that students and teachers have significantly different opinions on how the learning environment impacts chemical instruction and student performance in blended courses. The decision is "NS," which means that there was no statistically significant difference in the ratings of the learning environment's impact between students and teachers.

Discussion

According to Table 1, both teachers and students seem to possess competency in various computer skills required for effective blended learning implementation, such as email management, basic online information management, smartphone usage, and online collaboration skills. The mean ratings for these competencies are generally high. However, both groups lack competence in using real-time boards, as indicated by the low mean ratings. The findings suggest that while teachers and students are generally proficient in common computer skills, there is a gap in their ability to utilize real-time boards. Addressing this gap through training or providing access to appropriate technology could enhance their readiness for blended learning. The results from Table 4 indicate no significant difference between teachers' and students' perceptions of the impact of computer competencies on blended learning. This suggests alignment in their views regarding the importance of computer skills for effective implementation of the curriculum

The results from Table 2 highlight the importance of a conducive learning environment for the successful implementation of blended learning. Both teachers and students agree that a supportive physical environment positively influences chemistry education. Moreover, both groups acknowledge that poor qualifications of teachers could hinder effective implementation of the curriculum. Ensuring a conducive physical environment and providing support for teachers' professional development are crucial for the success of blended learning initiatives in chemistry education. The findings underscore the need for investment in infrastructure and teacher training to optimize the learning environment for blended learning. The results from Table 5 indicate that there is no significant difference between teachers' and students' perceptions of the influence of the learning environment on blended learning. This implies consensus between the two groups regarding the importance of a conducive learning environment for successful implementation.

Table 3 identifies various challenges faced in implementing blended learning, including poor internet facilities, electricity supply interruptions, and distractions in the home environment. While there is agreement on challenges like poor internet facilities, respondents disagree on whether they are comfortable with the high cost of data for engaging in blended learning. Addressing infrastructure challenges, such as improving internet connectivity and ensuring reliable electricity supply, is essential to overcoming barriers to blended learning implementation. Strategies to mitigate the financial burden of data costs could make blended learning more accessible and equitable for students. The findings underscore the importance of addressing technological, infrastructural, and environmental factors to facilitate the effective implementation of blended learning in chemistry education. Collaboration between

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stakeholders, including educators, policymakers, and technology providers, is essential to overcome challenges and maximize the benefits of blended learning in secondary school chemistry education in Obio/Akpor. LGA.

According to Olakanmi (2015) and Bernard et al. (2017), blended learning has shown promise in improving students' understanding of complex chemistry concepts and enhancing their overall learning outcomes. The integration of online and traditional classroom methods offers students multiple avenues to engage with instructional materials, such as films, simulations, and interactive exercises. This variety of learning modalities fosters active learning and accommodates diverse learning styles, ultimately leading to better student engagement and comprehension. Furthermore, research trends indicate a growing interest in exploring the effectiveness of blended learning in chemistry education (Nugraheni et al., 2020), suggesting its increasing relevance and potential impact in the field. However, despite the potential benefits of blended learning, challenges exist in its effective implementation. The literature points out several factors that may hinder the success of blended learning initiatives, including inadequate instructional design, unfavourable learning environments, lack of access to technology, and improper integration of blended learning into the curriculum (Thorne, 2003; Bersin, 2014). Additionally, negative student attitudes and inefficient use of technology further impede the adoption of blended learning approaches. This contradictory perspective suggests that while blended learning holds promise for improving chemistry education, its effectiveness may be hindered by various practical and pedagogical challenges.

Conclusion

The purpose of this research was to analyse the efficacy of chemistry education curricula and blended learning strategies in public secondary schools in the Obio-Akpor Local Government Area of Rivers State. Research in Obio-Akpor Local Government Area, Rivers State, found that both students and teachers in public secondary schools there possess the knowledge and skills necessary to successfully execute a blended learning chemistry curriculum. The study did find that expensive data charges, unreliable electricity, and bad internet facilities were the biggest obstacles to using blended learning effectively in chemistry classes.

Recommendations

The study recommended the following:

1. For effective integration of blended learning as an instructional design in the Chemistry Education curriculum, internet facilities should be made available.
2. Constant electricity supply should be made available by the government to help generate power for computer equipment and gadgets.
3. The government through appropriate authority should enact a law that will regulate or reduce the high cost of data charges to consumers by service providers when using the internet. This is to enhance blended learning activities in Chemistry Education pedagogy.

References

Bernard, P., Bro P., & Migdał-Mikuli, A. (2017). Influence of blended learning on outcomes of students attending a general chemistry course: Summary of a five-year-long study. Chemistry Education Research and Practice, 18(4), 682-690. doi:10.1039/c7rp00040e

Bersin, J. (2014). *The blended learning book: Best practices, proven methodologies, and lessons learned.* Pfeiffer: San Francisco

Graham, C. R. (2006). Blended learning systems. *The handbook of blended learning: Global perspectives, local designs*, *1*, 3-21.

Holm, C. (2011). *Beyond the classroom: social virtual learning environments*.

Nahum, T., Mamlok-Naaman, R., Hofstein, A., & Kronik, L. (2018). A new "bottom-up" framework for teaching chemical bonding. *Journal of Chemical Education*, 85: 1680-1685

Nugraheni, A. R. E., Adita, A., & Srisawasdi, N. (2021). Blended Learning in Chemistry: A Systematic Review from 2010 to 2019. (2), 19-40.

Nugraheni, A.R.E., Adita, A., & Srisawasdi, N. (2020). *Blended learning supported chemistry course: A systematic review from 2010 to 2019*. In Proceedings of the 28th International Conference on Computers in Education (ICCE2020). *Asia-Pacific Society for Computers in Education, 202*, 23-27.

Odo, E. E. (2013). Integration of Ethnochemistry into Chemistry Curriculum in Nigeria: Option for Sustainable Development. In: Proceedings of the 54th Annual Conference of Science Teachers Association of Nigeria, pp. 260-267.

Olakanmi, E. E. (2015). The effects of a web-based computer simulation on students' conceptual understanding of rate of reaction and attitude towards chemistry. *Journal of Baltic Science Education*, *14*(5), 627-640.

Seraji, F., Attaran, M., & Azizi, S. M. (2019). Blended learning researches in Iran: several fundamental criticisms. *Digital Education Review*, (36), 190-206.

Staker, H., & Horn, M. B. (2012). Classifying K-12 blended learning. InnosightInstitute. 1-22. Retrieved from https://files.eric.ed.gov/fulltext/ED535180.pdf

Thorne, K. (2003). *Blended learning: how to integrate online & traditional learning*. Kogan Page Publishers.

Watson, J. (2008). Blended Learning: The Convergence of Online and Face-to-Face Education. Promising Practices in Online Learning. *North American Council for Online Learning*.