# Implementation Strategies and Possible Obstacles to blended learning Design for Statistics Courses.

Dorcas Modupe OKEWOLE[1], Ayobami Fadilat GBOYEGA[1] and Peter OHUE[2]
[1]Department of Mathematics and Statistics, Redeemer's University, Ede, Osun State, Nigeria
[2]Department of Statistics, University of Ibadan
okewoled@run.edu.ng

## Abstract

*Technological advancement and growth has brought about introduction of various methodological dynamics in teaching and learning. A very notable approach in this regard is blended learning, otherwise known as hybrid learning. Although the implementation appears easy in some climes, a purposeful, goal oriented implementation comes with challenges that limit the use and harnessing of its potentials, particularly for statistics courses. In this study, we present a review of blended learning models alongside obstacles to appropriate and successful implementation in statistics course delivery. The study includes a survey of ideas and experiences of statistics lecturers at the university level on challenges and obstacles to blended learning. 75% of the respondents identified with the obstacles listed as affecting blended learning while 87.5% indicated for statistics courses in particular that methods and theories discussed online have to be repeated during in-person classroom lectures. In developing countries, having to repeat classes could be a major setback to any learning process due to challenges with lecturers' workload. A regression analysis of the blended learning implementation on obstacles to blended learning (general obstacles and obstacles in statistics courses) was carried out. Results suggested that both general obstacles and obstacles in statistics courses significantly influence effective implementation of blended learning design by the respondents (P= 0.000). Specifically, obstacles to blended learning design for statistics courses had a negative effect on the implementation. The literal implication of this result is that, increase in the awareness of the obstacles to blended learning design for statistics courses leads to lower implementation level. In other words, those that mostly agreed that statistics courses have peculiar difficulty in teaching through blended learning designs had low implementation of the design. It indirectly implies that the stated obstacles have been affecting implementation of the design. Attention of stakeholders is drawn to the important issues discussed, so that the benefits of blended learning approach can be maximized for statistics courses.*

Keywords: Statistical Literacy, Learning Design, Web-Based Instructions, Lecturers' Experiences, Statistical Obstacles.

## Introduction

Developments in education all over the world now involve the use of blended learning models more frequently since the beginning of COVID-19 pandemic. Blended learning can be viewed as a learning approach that integrates the advantages of online learning into physical environments (Seraji, 2019). It has been described as a method of teaching that integrates technology and digital media with traditional instructor-led classroom activities, giving students more flexibility to customize their learning experiences. It became more obvious in recent times that traditional classroom contacts no longer suffice for learning. There are instances when online and self-paced learning would bring about richer and better acquisition of knowledge, probably due to distance between student and instructor, time discrepancies, the need for more individual learning schedule by students, among others.

Statistics courses are not left out of the need for blended learning methods, more importantly since users are all over professional and research disciplines. In other words, blended learning methods are veritable tools for both regular university and college students as well as users of statistics across various disciplines. According to Bailey et al (2013), "In highly personalized environments, blended and online learning will be central strategies that benefit all students".

In this paper, the interest is on the blended learning for statistics courses, considering the challenges and implementation strategies. A survey was carried out among statistics lecturers. The focus of the survey was on the challenges facing lecturers in the implementation of blended learning for statistics courses. The results are discussed with relevant recommendations for more effective implementations.

**Common Blended Learning Models**

Since the incorporation of blended learning into educational systems, several specifications of this approach have been in practice, varying by content, scale, technology, learning space, e.t.c. The most common of these models are discussed as follows.

1. Station Rotation Blended Learning: It is a system that allows students to rotate through stations on a fixed schedule, which involve at least one online station.
2. Lab Rotation Blended Learning: This system of blended learning involves rotation of students through stations on a fixed schedule in a dedicated computer lab of flexible scheduling arrangements with teachers. The peculiarity is the use of the school computer labs in new ways
3. Remote Blended Learning (otherwise known as Enriched Virtual Learning): In this learning model, the students complete online coursework while only meeting with the teacher intermittently or as the need arises. The difference between this blended learning model and the flipped classroom model is in the frequency of the face-to-face component of the learning schedule. In a remote blended learning model, students wouldn't see, work with or learn from a teacher on a daily basis face-to-face, but would in a flipped classroom setting.
4. Flex Blended Learning: The major component of this model is the online learning, while it directs students to offline activities at times. The learning modalities allow students to make individual arrangements for the learning process. The teachers are available for face-to-face support which is flexible and adaptive, depending on the needs. It involves activities such as small group instruction, group projects, and individual tutoring. The special feature of flex blended learning model is in its versatility to meet the needs of different formal and informal learning processes.
5. The 'Flipped Classroom' Blended Learning: The flipped classroom learning design is one in which contents are introduced to students at home while they practice working through it at school under the guidance of the teacher and/or support of peers.
6. Individual Rotation Blended Learning: This learning design allows students to follow individual schedule set by a teacher or software algorithm for rotating through stations. It is more flexible and personalized than other rotation schedules in the sense that students do not necessarily have to rotate to every station but only to those activities on their playlists.

   Some other models are: Project-Based Blended Learning; Self-Directed Blended Learning; Inside-Out Blended Learning; Outside-In Blended Learning; Supplemental Blended Learning; Mastery-Based Blended learning.

**Challenges with Blended Learning**

Various issues have been identified in literature as constituting setbacks to the effective implementation of blended learning in educational programs, for example Boelens, De Wever &

Voet (2017), Alvarez (2020), Crawford & Jenkins (2017). The challenges are summarized as follows:

1. Little or lack of understanding of blended learning concepts
2. Difficult to execute in classroom environment due to the absence of institutional policies on the use of blended learning
3. Lack of training/knowledge (e.g., technophobia)
4. Poor confidence to engage in blended learning approach
5. Limited access to computer laboratories
6. Students tend not to participate in online discussion boards, specifically if it is not a requirement
7. Social presence in virtual classroom is largely underdeveloped
8. Difficulty for teachers to encourage students' engagement in online participation
9. Web-based instructions are time-consuming
10. Web-based instructions are more rigorous in teaching-learning preparations
11. Not all faculty members are inclined towards blended-based instructions
12. Lack of technological capabilities of some faculty members

Some of the highlighted challenges become more pronounced in the teaching and learning of statistical theories, methods, and models due to the mathematical inclination and peculiarities. Preparations as well as teaching-learning of web-based instructions require a lot more time as a result of the mathematical content. Experiences have shown that functions, models, statistics, formulae, e.t.c., have to been explained repeatedly while switching from online classes to face-to-face, mostly among undergraduate students. Consequently, implementation strategies for the blended learning approaches in statistics courses should be carefully and efficiently designed for harnessing its benefits optimally towards improved statistical literacy.

## Implementation Strategies for Blended Learning in Statistics Courses

There are many ways to apply blended learning, but the best strategy is always determined by the situation. The first step is always choosing a learning management system that is appropriate for the type of learners, the course material, and the learning environment. Always using adaptable blended strategies is the best option. A learning community is essential, and this cannot be emphasized enough. Flipped classroom models can be employed in a classroom context before moving to digital assessment to get feedback. Using group projects with participants divided into break-out rooms is another strategy. Using modern technologies is a wonderful idea for older learners like college and university students. Due to this, students can benefit from both traditional and online learning.

By outlining the objectives and learning goals at the start of each class with a view to evaluating the learning outcomes in relation to expectations, instructors, teachers, and mentors are expected to redefine their roles in the learning environment. It is important to select a blended learning model to go with the chosen teaching approach. Also, it's critical to create a classroom setting that values innovation, curiosity, and excitement, and in the end, an accurate assessment of the students and the learning environment. In the implementation of statistics, the goals and objectives have to be designed to accommodate proper understanding of the theories, models and equations.

## Methodology

*Research Design*

An online survey was carried out among statistics lecturers in Nigerian universities. There were only 23 responses. The items in the instrument are:

1. General information such as age; sex; highest educational qualification; whether or not the respondent understands blended learning; whether or not the respondent makes use of blended learning.
2. General obstacles to blended learning listed in the section on "challenges with Blended Learning", as well as obstacles that are peculiar to statistics courses, referred to as statistics obstacles. The items included in statistics obstacles are:
   (i) Statistics courses are particularly difficult to implement on blended learning designs because of the equations, functions and distributions requiring derivations and proofs.
   (ii) Students find it difficult to understand statistical theories and methods during online class
   (iii) Most often, statistical methods and theories discussed online have to be repeated during in-person classroom lectures.

Items on general obstacles, statistics obstacles and blended learning implementation have 5-point Likert scale.

*Analysis Method*

The study adopts the use of average scores on challenges of blended learning by each respondent computed for general obstacles, statistics obstacles and blended learning implementation (labeled as "implementation"). We also computed average scores on each item in the general obstacles and statistics obstacles and presented it in a chart (figure 1).

**Results and Discussion**

*Descriptive Analysis*

Almost all the respondents (95.7%) indicated that they understood the concept of blended learning while 65.2% stated that they make use of blended learning in teaching students. The highest qualification of the respondents is mostly between MSc (56.5%) and PhD (39.1%) and was not associated with whether or not they make use of blended learning.

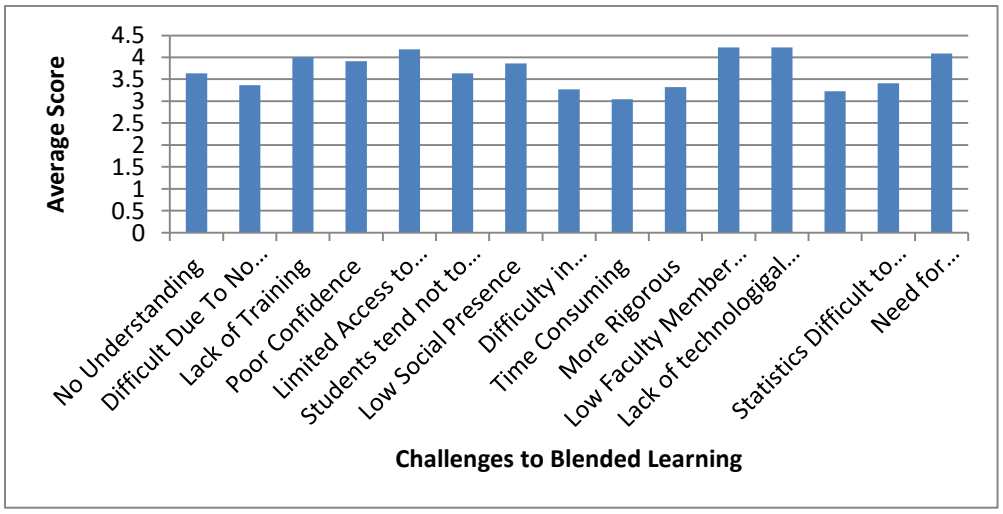


Figure 1: Average Scores on Challenges to Blended Learning

The challenges to blended learning with scores above four in the 5-point Likert Scale in the survey were (Figure 1):

1. Limited access to computer laboratories poses a challenge to the implementation of blended learning design.
2. Not all faculty members are inclined towards blended-based instructions.
3. Lack of technological capabilities of some faculty members poses a challenge to the implementation of blended learning designs.
4. Most often, statistical methods and theories discussed online have to be repeated during in-person classroom lectures.

*Hypothesis*

The hypothesis in this study is given as:

H1: Statistical obstacles and General obstacles affect implementation of blended learning models by the university lecturers involved in the study.
The model on implementation of blended learning by the statistics lecturers was significant (Table 1) with 58.8% explained variation by statistical obstacles and general obstacles. In other words, effective implementation of blended learning for statistics courses require detailed attention on the obstacles.

Table 1: Analysis of Variance for the Regression on Blended learning Implementation in Statistics Courses

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| | Regression | 12.781 | 2 | 6.391 | 16.015 | .000 |
| | Residual | 7.582 | 19 | .399 | | |
| | Total | 20.364 | 21 | | | |

As presented in Table 2, both general obstacles and statistics obstacles were significant in explaining the variation in blended learning implementation. Statistics obstacle had a negative impact on implementation. It is imperative for statistics lecturers to develop the blended learning scheme in a way that would circumvent the statistics obstacles.

Table 2: Coefficients in the Regression on Blended Learning implementation for Statistics Courses

| | | Unstandardized Coefficients | | | | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|
| Model | | B | Std. Error | t | Sig. | Tolerance | VIF |
| 1 | (Constant) | .439 | 1.065 | .413 | .685 | | |
| | General_Obstacles | 1.432 | .284 | 5.040 | .000 | .907 | 1.181 |
| | Stat_Obstacles | -.711 | .178 | -3.986 | .001 | .907 | 1.181 |

## Conclusion

The focus of this study was on issues surrounding effective implementation of blended learning models for statistics courses. Most prominent challenges were identified as those that concern technological infrastructure and knowledge availability among lecturers as well as having to repeat statistical methods and theories already discussed online. In developing countries, having to repeat classes could be a major setback to any learning process, because a lecturer in most cases share the limited time of each week among many courses. A statistics lecturer should carefully design lectures in such a way that would enhance the benefits of blended learning rather than allowing the obstacles to impede successful implementation. Stakeholders (lecturers, institutional management/leaders) should pay attention to the implementation of blended learning for statistics courses so that statistical literacy would be better, wider and stronger.

## References


Alvarez, Jr., A. (2020). Learning from the problems and challenges in blended learning: Basis for faculty development and program enhancement. Asian Journal of Distance Education, 15(2), 112-132. https://doi.org/10.5281/zenodo.4292631

Bailey, J., Schneider C., and Ark T. V. (2013). Navigating The Digital Shift: Implementation Strategies for Blended and Online Learning. Digital Learning Now. http://www.digitallearningnow.com/dln-smart-series/.

Boelens, R., De Wever, B., & Voet, M. (2017). Four key challenges to the design of blended learning: A systematic literature review. Educational Research Review, 22(4), 1-18. doi:https://doi.org/10.1016/j.edurev.2017.06.001.

Crawford, R., & Jenkins, L. (2017). Blended learning and team teaching: Adapting pedagogy in response to the changing digital tertiary environment. Australasian Journal of Educational Technology, 33(2). DOI: https://dx.doi.org/10.14742/ajet.2924

Seraji F., Attaran M., Azizi S. A., (2019). Lended Learning Researches in Iran: Several Fundamental Criticisms. Digital Education Review 36(4): 190-207. DOI:10.1344/der.2019.36.190-206.

Teachthought. 12 Types of Blended Learning. Accessed at https://www.teachthought.com/learning/12-types-of-blended-learning/ 04 October, 2022