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Investigating the Relationship Between Blended Learning Integration and Student Outcomes: A Quantitative Analysis in Higher Education

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ABSTRACT

The study focuses on the integration of blended learning and its impact on student outcomes at the higher education level, considering student perceptions, student engagement, and academic performances. There is growing recognition that blended learning is a pedagogy that is transformative for both digital and in-person instruction, particularly concerning varied learner needs. A quantitative correlational methodology was used in gathering data from 150–200 higher education educators across disciplines by using the Blended Learning Environment Questionnaire (BLEQ). Descriptive and inferential statistical analyses were applied, including Pearson's Correlation, to examine the relationship between blended learning adoption and student outcomes. Findings suggest very positive perceptions of blended learning, with mean scores exceeding 4.0 on several dimensions, such as content accessibility, engagement, and clarity of structure. The results indicate a strong correlation of the integrated online and face-to-face component with understanding, critical thinking, and time management. It is also evident from the results that teacher-student interaction and the design of a course play an important role in increasing student satisfaction and achievement. However, some of the areas mentioned include technical support and time management, where improvement is recommended to have an effective system in place. This research joins an increasingly long list of literature in support of establishing blended learning but importantly affirms the necessity of adopting this model by regions, most especially for developing economies. The results then go to support blended learning's capability to enhance learners' performance and satisfaction with its implications advocating for it as an additive model for traditional teaching approaches.

Keywords: blended learning, higher education, student outcomes, teaching pedagogy, learning management systems (LMS), quantitative study.

INTRODUCTION

This has left many new tools and techniques aside; apart from those, technological developments of the last two decades have impacted a generation of students who can easily interact with both online and offline settings in many aspects of their lives. At most universities, learning and teaching departments have focused on many benefits of information and communication technologies, the ways in which the potential for delivery of learning objectives for every course, extend the physical classroom beyond four walls, and assignments or activities, or the program at an institutional level (Bonk et al. 2012). These new delivery modes, such as blended learning-a form of learning wherein digital and face-to-face instruction are merged (Graham 2006)-scares a few into shambles within many bricks and mortar colleges who can, after all undermine long time tested, the traditional model

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of teaching that those same traditional, bricks-and-mortar colleges have rested on-the paid tuition provided by most of their students for several hundred years.

One of the ways learning outcomes are measured in blended learning courses is through the assessment of knowledge and skills. Traditional in-person instruction is combined with online learning activities in this type of course. Besides that, a variety of other factors is also applied to assess the learner's performance. One question teacher always has when adopting a blended learning course is how to create learning activities that would yield the best results for students. It is challenging to have a template for each course that can be applied toward the various learning materials. Individual kids, however, may not even have this foundation, as we shall contend. The specifics of how particular students use technology and organize their living spaces to manage their academics have not been thoroughly examined in any of this work. Drawing from a series of interviews with students, this study will explore this oft-overlooked discipline. Blended learning is well-positioned to take advantage of students' assumption that delivery modalities will be quite like their lives outside the college in this hybrid "format." But most of the literature reviewed has its origins in the West, so the generalizability of findings to developing economies may be somewhat less relevant.

This study student perception of a blended learning model was set to determine and therefore strongly supports, up until now, that this is indeed an effective means for the delivery of course content. In this direction, it makes a contribution in the building up of a highly rich research body supporting just such a claim (Phelps et al. 2012). Postsecondary institutions that focus their education in the areas of engineering and architecture have applied LMS systems towards developing the methods of online courses in support of completely Internet-based teaching models, down to partially blended models. Shifting and reinforcement of a framework for the student's role as an active learner in their own education is one of the benefits of blended learning (Mosca et al. 2010; Vernadakis et al. 2011). Because online learning enables them to examine course material and study it again, students prefer blended learning (Kim 2012). This study does support findings of Harrington and Loffredo in 2010 when they also reached a conclusion that the method preferred by introvert students was through blended learning. This secondly, as far as they spent most of their time learning this technology or they can now interact directly with industry on eventual employment purposes, then students are ready to receive it (Venkatesh et al. 2014). In this process, therefore, while one designs blended learning, social interaction and the overall environment are paramount to be inculcated (Boelens et al. 2017). Students in a class set up to achieve blended learning spend most their time undertaking online activities, or engaging with the LMS system, which, by many instances, determines student performance.

Adoption remains, now, still dependent on individual teaching staff members—those who want to adopt, those who will investigate adaptation strategies, and then who will later research and supply the necessary resources. The institutional emphasis, however often remains in giving resources to provide "tools" and "training for tools," and allocating very little for supporting the building of pedagogical approaches in the creation of blended learning and teaching. This often results in students' academic performance being affected by many factors since they spend most of their time participating in online activities or using the LMS system. Adoption, now depends on individual teaching staff members-those who decide to adopt, who investigate adaptation tactics, and who then provide the required resources. However, the institutional focus is still on tools and training for tools, not much funding to support developing pedagogies in blending learning and teaching. Again, the contextual approach to blended learning varies among different regions, particularly considering the emerging economies. Most of the studies that have been done in this area have been done in the West, and although such studies provide very insightful information, they could not represent accurately the opportunities and difficulties students face in developing nations. Differences in internet availability, limited access to technology, and diverse educational infrastructures can all have a big impact on how students interact with blended learning. This gap signifies that even more research needs to be done in understanding how blended learning can be moulded to fit the peculiar needs of students in developing countries and how their experiences and outcomes contrast to those of Western nations. Another key gap in this research area includes how learners control their learning environment and how they apply technology in mixed learning contexts. Although there has been extensive documentation of the fact that blended learning allows students to engage in either online or offline

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learning, few studies have appeared on the specific strategies with which the students operationalize a seamless functioning in such a framework. To what extent can students manage their time and space to balance in-person and virtual activities? In what ways does the students' technological comfort level dominate their academic performance? This would reveal essential information on the level of students' engagement and adjustments towards the blended learning model, interactions affecting their performance, and others. Much remains unknown until now regarding the attitudes of students with regard to motivation in a blended learning context. There is little research done on attitudes and motivations among this range of students at a larger level, though some investigations have suggested that introverted students would prefer blended learning, as it is more flexible and has less demand on in-person interaction. Some questions that arise are: How do students perceive the balance of online and offline learning? What are the elements that affect their success and sense of engagement in mixed environments? Better understanding of what motivating elements are will allow teachers to construct experiences that are more sensitive to the complex and varied needs and desires that students bring into a given learning experience. In that respect, the current study explores blended learning integration and student outcomes in higher education.

RESEARCH METHODOLOGY

Design and Methodology of the Study

The purpose of the study is to investigate how blended learning is implemented in higher education institutions related to student outcomes. The methodology used for this examination is a quantitative correlational study because it assesses the strength and direction of possible correlations between variables and provides an avenue for their analysis.

Methods of data collection

A survey-based method of data collection is taken; the population surveyed includes all the instructors from higher education institutes. Stratified random sampling selects 150–200 teachers from various disciplines through which the sample ensures diversity as well as representation of opinion in teaching methods. Categorizing the population helps make sure that, by means of this sampling, the sample precisely portrays the range of opinion in and the teaching methodology widespread across many disciplines. The paper presents the main tool for gathering information to be used as a measuring device of students' perceptions toward a blend learning environment. Integration, engagement, and interaction concerning aspects of this environment in terms of implementation and students' outcomes have mainly been addressed. Other sections in the survey are there in terms of questions on demographic characteristics and blended learning integration and student outcomes.

Validity and reliability.

Reliability testing is conducted for internally consistent questionnaire through Cronbach's Alpha. Once it crosses 0.7, then this provides a high number and reflect an indication that items from this questionnaire are measuring their intended construct reasonably accurately or have good correlation amongst those in these question items. The Cronbach's Alpha value here is at 0.84.

Questionnaire distribution

The online and offline method are used for higher response rates and reach. It used the online method through SurveyMonkey and Google Forms that allowed the smooth collection of data and easy access. It was given physically to instructors who preferred traditional ways or be limited to access digital platforms.

Analysis of Statistics:

Following the process of data collection, descriptive as well as inferential statistical analyses are carried out. There is a summary of demographic characteristics presented using descriptive statistics such as mean, standard deviation, and frequency in age, gender, academic fields, years of teaching, and previous exposure to blended learning. Pearson's Correlation Coefficient is used to determine if any relationship exists between the independent variable, adoption of blended learning and the dependent variable, teaching pedagogies, in evaluating whether the overall purpose of the research has been met.

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DATA ANALYSIS

Table 1: Demographic Information (Descriptive Statistics)

Demographic Variable	Categories	Frequency	Percentage (%)
Gender	Male	80	53.3
	Female	65	43.3
	Other	5	3.4
Age	18-22 years	50	33.3
	23-27 years	60	40.0
	28-32 years	25	16.7
	33 years and above	15	10.0
Program Enrolled	Undergraduate	110	73.3
	Postgraduate	40	26.7
	Other	0	0.0
Experience with Blended Learning	Yes	120	80.0
	No	30	20.0

Table 1 gives us a snapshot of the participants' demographic details. We find that most of the respondents were male, making up 53.3% of the group. Female participants followed closely at 43.3%, with a small segment, 3.4%, identifying as other. When it comes to age, most participants were between 23 and 27 years old, accounting for 40% of the total. Those aged 18 to 22 years made up 33.3%, while 16.7% were between 28 and 32 years, and 10% were 33 years or older. We observe that a significant portion, 73.3%, were engaged in undergraduate studies, whereas 26.7% were pursuing postgraduate education. Interestingly, a large majority, 80%, had prior experience with blended learning, leaving 20% who did not.

Table 2: Descriptive Statistics of Section B (Blended Learning Integration)

Item	Mean	Standard Deviation	Cronbach's Alpha if Item Deleted
The blended learning platform is easy to navigate.	4.1	0.75	0.82
I have access to all necessary learning materials.	4.2	0.68	0.83
The approach integrates online and face-to-face well.	4.0	0.79	0.82
Online components enhance classroom-based learning.	4.1	0.71	0.82
Feedback provided is timely and helpful.	3.9	0.84	0.83
Technical support is readily available.	3.8	0.89	0.84
Interaction with instructors is easy online.	4.0	0.80	0.83
Improved engagement with course content.	4.2	0.67	0.82
Schedule and format are clear.	4.1	0.74	0.82
Online assessments measure understanding effectively.	4.0	0.77	0.83

The analysis of Section B, as shown in Table 2, paints a generally positive picture of how blended learning is perceived. We see that item like "Improved engagement with course content" and "Access to all necessary learning materials" both scored a mean of 4.2, with standard deviations of 0.67 and 0.68, respectively. However, "Technical support is readily available" lagged with a mean score of 3.8 and a standard deviation of 0.89, suggesting there's room for improvement here. The overall Cronbach's Alpha for Section B was 0.84, indicating high reliability, with item-level reliability ranging from 0.82 to 0.84.

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Table 3: Descriptive Statistics of Section C (Student Outcomes)

Item	Mean	Standard Deviation	Cronbach's Alpha if Item Deleted
Blended learning enhances understanding.	4.2	0.68	0.83
Improves critical thinking skills.	4.0	0.72	0.83
Boosts confidence in applying knowledge.	4.1	0.69	0.82
Helps improve time management skills.	3.9	0.85	0.83
Strengthens ability to work independently.	4.1	0.73	0.83
Positively contributes to academic performance.	4.0	0.77	0.83
Increases overall satisfaction with the course.	4.2	0.70	0.82
Enhances collaboration with peers.	4.0	0.75	0.83
Increases engagement with studies.	4.1	0.71	0.83
Overall satisfaction with the blended approach.	4.2	0.66	0.82

In Table 3, we delve into Section C, where the analysis highlights the positive impact of blended learning on student outcomes. High scores were evident for statements such as "Blended learning enhances understanding" and "Increases overall satisfaction with the course," both achieving a mean of 4.2, with standard deviations of 0.68 and 0.70, respectively. On the other hand, "Helps improve time management skills" scored slightly lower at a mean of 3.9 and a standard deviation of 0.85. The reliability for Section C remained strong, with a Cronbach's Alpha value of 0.85.

Table 4: Pearson Correlation Coefficient (Blended Learning and Student Outcomes)

Blended Learning Item	Student Outcome Item	Pearson Correlation Coefficient (r)	p-value
Integration of online and face-to-face	Enhances understanding	0.72	< 0.001
Accessibility of learning materials	Improves critical thinking skills	0.68	< 0.001
Feedback timeliness	Boosts confidence in application	0.63	< 0.001
Schedule and format clarity	Improves time management	0.59	< 0.001
Interaction with instructors	Increases engagement with studies	0.65	< 0.001
Online assessments' effectiveness	Positively contributes to performance	0.70	< 0.001

It is in Section C of Table 3 that one observes the clear effect of blended learning on student outcomes. This could be evidenced from the high ratings given to statements such as, "Blended learning enhances understanding", and "Increases overall satisfaction with the course", both scoring a mean of 4.2 and standard deviation of 0.68 and 0.70 respectively. The statement, "Helps improve time management skills", on the other hand scored slightly lower, that is, mean of 3.9 and standard deviation of 0.85. Section C had a good reliability of 0.85 on the Cronbach's Alpha.

Table 5: Summary of Reliability Analysis (Cronbach's Alpha)

Section	Number of Items	Cronbach's Alpha
Section B: Blended Learning	10	0.84
Section C: Student Outcomes	10	0.85
Overall Questionnaire	20	0.84

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In summary, as detailed in Table 5, the overall Cronbach's Alpha value for the questionnaire was 0.84, underscoring its high internal consistency. Section B, focusing on Blended Learning Integration, had a Cronbach's Alpha of 0.84, while Section C, concerning Student Outcomes, achieved a value of 0.85. This consistency confirms that the items effectively measured their respective constructs.

DISCUSSIONS & FINDINGS

The findings of this very study would therefore further discover new avenues through which blended learning intervention may affect student performance in higher education levels. Results of the study affirm the positive view about the blended learning experience of students, as most of the mean scores were more than 4.0 for various items, thus providing credibility for blended learning as an effective pedagogical approach. This agrees with earlier work, including Kayode and Teng's study in 2014, emphasizing the significant roles of student-content interaction in improving learning outcomes. It is the special design of the learning activity in blended environments that encourages this interaction, which again is the basis for better understanding and storage of material. A key finding in this study involves how strongly integrated online and face-to-face elements correlate with better learning outcomes according to Pearson correlation values. Burgon and Williams (2003) also note that learner involvement is one aspect that turns out to be higher in blended learning. Engagement, in turn, leads to enhancement in motivation and satisfaction, according to Woltering et al. (2009), Donnelly (2010), and Alexander (1999). These studies show an agreement that blended learning captures students' interest in learning, absorption of course material, and ultimately, their performance in various assessments. Another interesting aspect studied was that of comparing previously experienced students in blended learning and those new to the process in blended learning learning environments. The results indicate that the blended learning experience benefits can be seen from the very first experience, which is consistent with works such as Kim (2012), which discussed the contradictory views about the impact of blended learning on student experiences.

Good News is, the strong reaction of the participants in this examination shows that Should this notable achievement be experienced in a single instance, it can still be responsible for important benefits. A critical elicit the proving of the learners and the teachers in the blending of the learning mode that has also come up as an important factor. While the interaction from the traditional setting to Blended learning mode is different and less often, the study suggests that the same interactions cause difficulties in course design, particularly in the aspects of providing environments and tools that support meaningful engagement. This point was also made in a study by Kayode and Teng (2014), in their analysis of the problems of creating blended learning environments that result in an improved teacher-student relationship. On the same note, Burgon and Williams (2003) have conducted a study showing that students' pleasure and satisfaction in blended learning environments have a positive effect on their overall engagement. This joy is mostly derived from the blended learning technologies' ability to structure the schedule with such clarity as well as the provision of necessary materials, as shown amid the recent study. The concerns mentioned in technical support and time management were aspects where improvement was also requested, however, they were found not to be a big problem whereas blended learning was found to have a general positive outcome on the students. The research outcome that was obtained has verified the concept of payment of finished learning, which is an option for traditional face-to-face of learning. The model has a maximum impact across various settings and designs of student performance and satisfaction, reflecting its versatility as a teaching method. The internal consistency of the Cronbach's Alpha values is another confirmation of the trustworthiness of the measuring tool, so the results would not have failed. Indeed, blended learning' appositive effect on students by improving their understanding, critical thinking, students' satisfaction, and promoting was provided. They build on past studies whereby analysis is given of the problems and best practices in design of such courses, online and blending version as well as adroitness in dealing with annoyances like technical support and time management. The evidence positions blended learning as an effective alternative to traditional teaching, capable of delivering consistent benefits across varied educational contexts.

CONCLUSION

The analysis demonstrates that learners are, overall, enthusiastic about the introduction of blended learning at higher education, as evidenced by mean ratings surpassing 4.0 for most of the questionnaire items. It shows the support of students to the easy navigation, availability of resources,

and the utilization of blended learning to accompany traditional in-class education. Nevertheless, areas like technical support and time management that were assessed as relatively lower demonstrated the specific hurdles that were perhaps poorly addressed during the application. The questionnaire's reliability was proved to be high (Cronbach's Alpha values were higher than 0.8 for every section), because of internal consistency. Also, there is a direct relationship between blended learning implementation and the students' level of achievement, performance, and satisfaction, revealing the remarkable educational influence of well-done blended learning. Consequently, these data indicate the necessity of not only the composure of comprehensive and cohesive blended learning practices but also the assurance of the potential benefits.

LIMITATIONS OF THE STUDY

The study seems to fall short of what it hopes to achieve. The mere fact that the sample size is composed of various students may still not be enough to account for the richness of the different personalities that belong to higher education institutions. Furthermore, self-report data are the participants' private information, and the study cannot verify their accuracy. Hence, subjective answers may lead to biased results, as the participants could either consider or not consider blended learning to be a particular issue. Moreover, the research is deficient as it rejects those topics such as these that are related to the accessibility of the internet, technological literacy, the availability, and amount of institutional support. Such things may impact students in a large way, e.g. their experiences but are not covered in the study. Finally, the study gives less importance to the qualitative part and as a result, it may not achieve a comprehensive understanding of students' views and problems.

FUTURE DIRECTIONS

Future investigations can address these constraints by involving a more diverse set of students that can come from various arbors and institutions. A hybrid design that marries the best parts of qualitative elements, like focus groups or interviews, and a quantitative approach could be a means of producing more rich data and a careful analysis of the students. who enrolled both in-line and on-line courses. When all is said and done, brain scans should be carried out on the girl and their respective Hippocampus and Tongue for pronunciation lessons. Moreover, research of the possible role that external factors, for instance, Wi-Fi and teacher's preparedness play, as well as affiliate the efficient way of blended learning. The comparison of the status of blended learning in schools at different levels of its adoption and the effect of each on students' academic progress can come up with useful guidance on how this strategy should be developed. Finally, it might be valuable to conduct longitudinal studies to assess the long-term effects of blended learning on academic and professional attainment thereby providing a more thorough examination of its success.

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