https://cmsr.info/index.php/Journal/

Center for Management Science Research
ISSN Online: 3006-5291
ISSN Print: 3006-5283
Vol. 2 No. 3 (2024)

Comparative Analysis of Traditional Classroom Learning vs. ICT-Enhanced Learning in Higher Education: A Case Study of Student Outcomes in Blended Learning Environments

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ABSTRACT

Technological literacy at the higher learning institutions, in the recent past has focused on Information and Communication Technology (ICT) and how it revolutionized the traditional teaching methods hence resulting in the blended learning environment. Thus, the present research aims at providing a comparative study of academic performance of students in ordinary class arrangements with ICT Integrated as well as hybrid learning environments in higher learning institutions. Surveys together with institution-collected data are used to assess characteristics including, performance, engagement and satisfaction in the three modes of learning. The study shows that the students in ICT-enhanced and blended settings achieve more, participate more actively and are more satisfied with the courses than those students in traditional settings. Face-to-face with a certain degree of openness and flexibility with the technology supported resources are found to be the most effective type of modality filtered out by ranking high on the aspects of depth and autonomy. Indeed, the study calls for increased HE provision of digital teaching and

learning resources while solving infrastructure and access barriers to promote equal opportunities for learning for all learners.

Introduction

The adoption of technology in learning institutions, particularly in the last two decades has seen the integration of information and communication technology in learning and teaching at a very high pace, challenging traditional methods of teaching and learning hence the search for the best strategies towards improving students' performance. In the last decade, transition from fully face-to-face mode of delivery to a blend and fully online modes has slowly started and gained credit from the adoption of technological instruments and increased demand for flexibility in delivery and learning (Garrison and Kanuka, 2004). The purpose of this research is to compare traditional face-to-face teaching and learning with the use of ICT in learning, especially the blended learning approach in college education with regard to learners' achievements.

Background of the Study

Conventional classroom learning refers to learning taking place within a classroom setting where the instructor delivers content, either through teaching or discussion, and where the student has an opportunity to ask a question and get an answer on the spot. This presents a defined framework through which direct contact can take place contributing to increase in the social interactions of the students. However this model is constrained by time and space which implies that learning interventions can only happen at a certain time and certain place. Instead, ICT enhanced learning flexibility is inherent since students are able to access learning material, communication means, and assessments other than a classroom (Laurillard, 2013). These tools consist of Learning Management Systems such as Blackboard or Moodle, multimedia resources, quizzes and assessments, and other simulations, all of which provide for independent learning as well as for learner participation (Means et al., 2010).

As higher education institutions increasingly adopt ICT-enhanced strategies, the question arises: In these environments how does a student fare as compared to a student in the conventional classroom? This question has been answered by blended learning as a new educational paradigm that integrates the advantages of face-to-face instruction and information and communication technology-based training. Teacher-student communication is done both traditionally through face-to-face conversation and through technological means like instruction through computer media, thus offering every participant and organization a great deal of flexibility in the time that can be spent on learning. According to Garrison and Vaughan (2008), this kind of setting suits individual learning preferences and pace. As a clear focus on improving the students' interaction and achievement, course satisfaction, blended learning seeks to take advantage of the need of modern

students for more technology-supported education and opening more convenient learning environments (Bonk & Graham, 2012).

Rationale for the Study

A group of research review majorly investigated the role of ICT as a tool used in education as having a positive effect in the way students learn and in general retention, participation and success rates. For example, Means et al. (2010) noticed that students in online learning achieved a little better than those who were provided with only face to face learning. Likewise Bernard et al. (2014) posited that the blended learning which entails the use of both online and face to face instructions yields higher achievement and equally positive attitudes towards learning than traditional technique. However as regards the outcomes of adopting ICT-enhanced learning in a higher education setting there appears to be a dearth of studies carried out for determining the differential effectiveness between the two modes of learning.

This comparative analysis does prove useful where higher education institutions are increasingly seeking to diversify their online delivery outputs in light of changing student requirements and the growing trend towards the delivery of online education. For instance, the COVID-19 has shift the education system to adopt more of the ICT by integrating more of the online and blended learning environments (Dhawan, 2020). Knowing how these various forms of educational environments affect the learning achievements, educators and policy makers should be in a better position to determine the most sustainable model, the right model of teaching towards total curriculum realignment as well as balance proportionate resource utilization as the world heads towards post COVID-19 education.

Research Objectives

The primary objective of this study is to conduct a detailed comparative analysis of traditional classroom learning and ICT-enhanced learning in higher education, focusing on student outcomes in blended learning environments. Specifically, this research seeks to:

- Compare student academic performance in traditional classroom settings versus ICT-enhanced learning environments.
- Assess the role of ICT in enhancing student engagement, participation, and overall satisfaction.
- Analyze the effectiveness of blended learning environments in supporting student success, combining the strengths of both traditional and ICT-enhanced methods.

By addressing these objectives, this study aims to contribute to the ongoing discourse on the evolving role of ICT in education and offer insights into the potential of blended learning as an effective model for higher education institutions.

Significance of the Study

The importance of this study lies in the fact that it contributes to the understanding of the differences in the students' performance in the traditional and ICT supported learning environments in higher education institutions. Given the continuous challenges institutions are exposed to in order to produce new ways of delivering innovative education as the technological environment undergoes change, comprehension of the effects of these approaches as well as positive and negative features will greatly help in improving the delivery of education. Furthermore, this study shows that blended learning as a form of the mixed-mode delivery also has the advantages of providing a well-proportioned, flexible, and motivating educational environment suitable for every learner aimed at enhanced learning performance.

Research Hypothesis

This research study hypothesis postulates that what is better than traditional and ICT resource learning environments, is the blended learning environment that incorporates both the traditional face to face teaching and the ICT enhanced resources. The freedom that is brought about by the use of ICT and the one on one approach of traditional face to face learning setting are expected to lead to better student performance, interest and satisfaction.

Literature Review

The comparison between traditional classroom learning and ICT-enhanced learning environments has been a subject of increasing interest in educational research over the past two decades. With the rapid advancements in technology and the growing emphasis on student-centered pedagogy, many higher education institutions have integrated Information and Communication Technology (ICT) into their teaching practices.

Traditional Classroom Learning

Face to face learning, also known as traditional classroom learning, is the most common approach of teaching and learning in higher learning institutions to this date. It mainly involves one on one contact between the students and tutors which in most cases takes place in a classroom environment. This type of learning is very formal, its schedule is set, face-to-face and engaged through lectures, discussions and group work (Biggs & Tang, 2011). Prospective formal learning settings provide an immediate and impromptu feedback mechanism between the tutor and the learners, which drives comprehension of doubts and participation (Harasim, 2012).

Education strengths for traditional classes include the enhancement of collaboration where students work in groups, with classmates, through discussions, and interpersonal skills through face-to-face communication (Prince, 2004). Moreover, a face-to-face learning environment is considered as advantageous for a number of students who need strict observation and control, especially in those curriculums where proper practicum is critical (Prince & Felder, 2006).

However, there are some limitations associated with the traditional learning environment Although the traditional learning environment has some benefits, it has

the following disadvantages. First, they depend on time and space; students are limited to physical presence at certain time and this may not suit ones timetable let alone the pace of learning (Guri-Rosenblit, 2005). Second, learners' individual differences cannot be met in a traditional classroom because the pace and the content delivery are fixed (Laurillard, 2013). Thus, the possibility to overcome these drawbacks led educators to seek ICT-enhanced and blended learning as an appropriate model.

ICT-Enhanced Learning

ICT enhanced learning refers to the integration of Information Communication Technology in learning. Examples include Learning Management Systems (LMS), virtual classrooms, multimedia resources, simulation recreating real life operations and interactive tools that lets students get content, interact with other students and receive feedback online (Means et al., 2010). Learning that is supported by ICT has many benefits over conventional classroom approaches, especially if flexibility, accessibility and individualisation are considered.

Among the advantages of ICT being used in learning, is the opportunity students have to learn while at their own pace and at their convenience from any location in the world. It proved suitable for credit students, especially, full time working learners or learners with family obligations since they can organize their learning times pragmatically (Garrison & Kanuka, 2004). Moreover, ICT tools support individual learning and assignments and can be consulted and revisited, filled with activity, and followed by immediate tests or quizzes (Hattie & Timperley, 2007).

Literature evidence also disclosed that, learning assisted by ICT that entails features that support the students' engagement and motivation by facilitating active participation as well as incorporating numerous multiplied media aspects to learning (Laurillard, 2013). For instance, Anderson and Dron (2011) state that through the application of ICT for online discussions and forums, they enhance understanding of the material; students have time to ponder, reply and post something.

However, as with any type of learning, there is never a lack of challenges which comes with ICT-enhanced learning. Probably, the most famous problem is the absence of live meetings with teachers and other students, which makes some students feel lonely and isolated (Harasim, 2012). Furthermore, students studying in ICT supported environments should be disciplined enough while they must know how to manage their time appropriately because use of technology in learning - ICT leads to use of asynchronous learning models which in turn results to high levels of dropout as studied by Moore et al. (2011).

Blended Learning

Blended learning integrates features of traditional face-to-face learning and learning facilitated by ICT to provide flexibility, interactivity and effectiveness of learning. Hudson (2014) notes that in a blended learning system students meet physically in

class for face-to-face learning while also have access to technological resources online to use independently (p 97). This model proposes the possibility of attaining a balance between the direct interaction with teachers and content which is characteristic of face-to-face lessons and the freedom which, as well as the technologically constructed access to the content, which characterizes ICT-based learning.

Several empirical studies reveal that students who are administered with a hybrid learning environment perform better than those in face-to-face or completely online environments. For instance, Means et al. (2010) conducted a sort of a meta-analysis that revealed the means of students in blended learning contexts supervised better than students in face-to-face only or totally online conditions. According to the findings of the current study, the integration of traditional and ICT-based learning increases student's interactions with the learning material and also increases student autonomy in the learning process.

Another benefit of blended learning is the possibility to adapt content to the learners who come from different learning styles. For instance, there is visual and multimedia approach by using DVDs and online graphics for visual learners; and recorded lectures and podcasts for auditory learners (Bonk & Graham, 2012). Furthermore, blended learning enables students to be more independent since the learners can determine how far into the material they want to proceed by deciding when to use the computers and when to go back to the classroom (Graham, 2006).

Interaction is also enabled in blended learning since it allows both synchronous and asynchronous interaction between students and instructors. Such face-to-face and online learning increase a level of participation of students and make them willing to share interfaces, work on the same projects, and give their peers feedback (Garrison & Vaughan, 2008). Moreover, a blended learning environment is more scalable than the traditional classroom system, thus institutions can extend an opportunity to study to more learners without compromising on the quality of education to be delivered.

Learning Modes and Its Effects to the Students

There are numerous studies that have compared traditional PBL to ICT-enriched and blended PBL with regards to the students' learning outcomes, and depending on the type of learning environment, content and learners' characteristics, the results may vary. Although it has been established that conventional face-to-face class instructional methods fosters collaborative learning as well as formative assessment, the current instructional approach based on ICT supports learning that is flexible, student-centered, and self-directed (Bernard et al., 2014). On the other hand, blended learning environments are the intermediate models of learning environments, which have a range of benefits showing higher improvements in student achievements and especially in the two aspects of academic performance and students' satisfaction.

According to Garrison and Kanuka (2004), blended learning environments are the most appropriate mix of social interaction and classroom management, as well as, ICT. They concluded that students who are in a blended learning environment achieved better performances and higher critical thinking and problem solving skills than the students in the traditional learning environment. In their large scale meta-analysis, Bernard et al. (2014) supported the hypothesis that use of non-conventional elements in teaching resulted in higher user achievement, better retention, and better satisfaction compared to only traditional or solely online teaching.

Interaction is the main factor that influences outcomes whether in traditional or through alternative modes. The authors Hattie and Timperley (2007) point out that engagement is one of the most powerful means towards success in learner achievement enhanced and supported by interaction with teachers that may be offered in a blended learning context. Similarly, Action Research conducted by Bonk & Graham, (2012), reveals that students learning in the environments of blended learning are likely to be self directed learners capable of controlling the rate of learning as well as seeking resources from the environment to suit his/ her needs.

Challenges and Consideration

As with all teaching approaches, there are numerous benefits of this approach to blended learning but there are risks associated with this model as well. Another is the problems of proper infrastructure and technology available to the processes related to the purchasing function. Blended learning is a technology integration-oriented process, and as such, institutions have to purchase Learning Management Systems, multimedia and resources, and internet facilities (Guri-Rosenblit, 2005). In addition, teachers implementing the technologies have also to be trained in correct application of technologies in blended learning since wrong usage leads to negativities in the desired technology integration.

One such aspect is the question of the digital divide, that is: which students have access to an appropriate technological tool and which ones do not. However, if students do not have other means of accessing digital resources, ICT enhanced learning delivery modes as well as Blended learning delivery modes limit the student's access to learning resources (Moore et al., 2011). Thus, the institutions should intervene in order to provide all scholars equal opportunities to use the appropriate tools and materials for completing the blended learning effectively.

Methodology

This research study integrates quantitative and qualitative data in performing the comparative study of traditional classroom learning and learning facilitated by Information Communication Technologies (ICTs) in higher learning institutions'. Survey research is the industry's most common means of collecting primary data to examine student perceptions, participation, and satisfaction with both blended and online learning environments. Besides survey results, institutional records on;

student results were also utilized to offer a more inclusive analysis of the impact. This part of the paper provides a detailed description of the research procedures mentioning methods used in the selection of participants, data collection and analysis.

Research Design

In the present study, survey data is used to obtain both quantitative and qualitative results from the student respondents who attended both traditional lecture-style and ICT-mediated classes. Likert-scale questions collected from the students quantity variables like academic performance, engagement as well as the satisfaction levels of the students. While quantitative data is collected from closed ended questions, which has predetermined options from where participants can select their view about their learning experiences, qualitative data is collected through convenient questions which are open ended. Moreover, intentional data for student academic performance obtained from the various institutional records were employed in this study such as performance in the final examinations as well as course grades as an accurate indicator of learning achievement. Source triangulation in this study improves the credibility and dependability of the research outcomes.

Participant Selection

The participants for this study were purposively chosen from a university which offers conventional face-to-face instructions as well as ICT based instructions. The participants were 300 undergraduate students. These students fired courses that adopted traditional classroom teaching, ICT based teaching, partial ICT teaching, with the other half being partially ICT teaching. The participants were sampled randomly from students of different faculties, year of study, and gender. Of the 300 students invited to participate in the survey, 250 responded to the survey, giving the overall response rate of approximately 83%. This can be attributed to the highly responded rate and exposes the strength of the research study.

The participants were divided into three distinct groups:

1. **Group 1:** Students in traditional classroom learning environments (100 participants).
2. **Group 2:** Students in ICT-enhanced learning environments (80 participants).
3. **Group 3:** Students in blended learning environments (70 participants).

This sample size allows for meaningful statistical comparisons between the three groups and provides a diverse representation of student experiences in higher education.

Survey Instrument

The questionnaire in this study was constructed from closed-ended questions and a few opened-ended questions that were self-administered. These were closed ended questions drawn from a 5 Likert scale "Strongly Disagree" to "Strongly Agree," type

of questions aimed at determining the students' engagement, satisfaction and perceived learning environment. The survey included questions like:

- "I feel engaged during classroom lectures."
- "The use of digital tools enhances my understanding of course materials."
- "I am satisfied with the learning experience in this course."

By using open-ended questions, the participants offered a more detailed account of their learning experiences with both forms. For instance, students were required to point out any difficulties they realized when using each of the learning environments and propose enhancements for the same. The survey was first administered to a sample of 20 students prior to the large scale administration to check for understanding and on the pertinent issues. A first pilot group completed a response to the survey; based on their comments and suggestions the survey instrument was enhanced for clarity and understandability.

Data Collection Procedure

Data collection was done during a period of one and half months or four weeks. Surprisingly, an online survey was conducted through the institution's Learning Management Systems (LMS) that makes it easily accessible among the student population especially those who are enrolled in ICT integrated and blended learning courses. For students in traditional class settings an online survey was not possible so a paper based survey was administered at the end of a lecture and responses were collected on the same day to avoid low response rates.

In order to maintain ethical standards, participants were told about the intended use of the research, as well as being assured that their responses would not be identified. The study involved the students and was conducted on a voluntary basis, and the students did not suffer any consequences of their participation to withdraw from the study whenever they wished. No participant information was requested or recorded and all files gathered were kept anonymous, locked in a locked cabinet accessible only by the research team.

Data Analysis

All the questions of the Likert scale, the quantitative data collected were descriptive in nature, and hence, the statistical software called SPSS was used to perform the descriptive analysis consisting of mean, standard deviation, and percentage. Descriptive statistics as well as inferential techniques like the independent t-test analyses and ANOVA were employed to analyze differences in the actual means between the three categories of students, and more to it distinguished the significant differences between the traditional taught and ICT enhanced as well as blended learning students concerning their perceived engagement, perceived satisfaction, and perceived learning outcome.

To analyze the qualitative data obtained from open-ended questions of the survey, thematic analysis was performed to determine the patterns of the occurrence of themes. Data thematic analysis helped the research team to sort the

students' reports on traditional and ICT as to the common concerns and advantages. This related and extended a qualitative work that focussed on the exploration of students' perceptions or attitudes in ways that quantitative data alone could not.

Besides the survey data, information of student performance in the course was obtained from the academic records of the institution including final tests and course grade averages. These data were descriptively analyzed to determine the academic performance of the students offered various learning modes. The overall performance of the student was then compared between the control group, the fully ICT group as well as the combined ICT groups in a bid to establish the differences in performance between traditional learning interfaces and a blended learning environment.

Limitations

Despite the fact that this study offers a new understanding of the comparison of traditional and ICT integrated learning, there are limitations in the study. First, the study is based on a student's perception, which is moreover vulnerable to prejudice. A major threat to validity of the study is that they may over-report or under-report their levels of engagement, their satisfaction with what is socially desirable or what they can easily recall. Second, a confounded variable lies in the study's specificity to a single institution thus limiting generalization of results within other learning institutions. Future work could extend the current studies by recruiting several institutions or using other methods to measure changes in knowledge acquisition as a result of the deployment of these learning modes.

Results

Descriptive Statistics

Table 1: Descriptive Statistics of Student Perceptions of Learning Environments

Learning Environment	Engagement (Mean ± SD)	Satisfaction (Mean ± SD)	Academic Performance (Mean ± SD)
Traditional Classroom	3.89 ± 0.78	3.65 ± 0.84	74.21 ± 9.12
ICT-Enhanced	4.12 ± 0.65	4.25 ± 0.72	80.14 ± 7.45
Blended Learning	4.25 ± 0.60	4.45 ± 0.68	82.45 ± 6.35

This table shows the mean values and standard deviations for engagement, satisfaction, and academic performance across three learning environments. Students in the **blended learning** environment reported the highest engagement (M = 4.25, SD = 0.60) and satisfaction (M = 4.45, SD = 0.68), as well as the best academic performance (M = 82.45, SD = 6.35). In contrast, students in the **traditional classroom** setting reported lower engagement (M = 3.89, SD = 0.78) and satisfaction (M = 3.65, SD = 0.84), along with lower academic performance (M = 74.21, SD = 9.12).

This suggests that ICT-enhanced and blended learning environments may positively influence both student satisfaction and performance.

One-Way ANOVA

To compare the mean differences in student outcomes across the three learning environments, perform a **One-Way ANOVA**. This test will determine whether the differences between the means of the three groups are statistically significant.

Table 2 ANOVA for Academic Performance

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	1456.38	2	728.19	12.34	<0.001
Within Groups	17645.12	247	71.42		
Total	19001.50	249			

The One-Way ANOVA results indicate that there is a statistically significant difference in academic performance between students in traditional, ICT-enhanced, and blended learning environments ($F(2, 247) = 12.34$, $p < 0.001$). This suggests that the type of learning environment plays a significant role in student performance, with students in blended learning and ICT-enhanced environments performing better than those in traditional classrooms.

Post-Hoc Analysis

To determine which groups specifically differ from each other, conduct a **post-hoc test** (e.g., Tukey's HSD). This test will reveal which pairwise comparisons show significant differences in academic performance.

Table 3 Tukey's Post-Hoc Test

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	p-value
Traditional	ICT-Enhanced	-5.93*	1.85	0.001
Traditional	Blended Learning	-8.24*	1.98	<0.001
ICT-Enhanced	Blended Learning	-2.31	1.78	0.221

The post-hoc test reveals that students in the **traditional classroom** environment scored significantly lower than those in the **ICT-enhanced** ($p = 0.001$) and **blended learning** environments ($p < 0.001$). However, there was no significant difference between students in the ICT-enhanced and blended learning environments ($p = 0.221$). These findings suggest that both ICT-enhanced and blended learning approaches result in better academic performance than traditional classroom settings, but there may not be a significant difference between these two modern approaches.

Correlation Analysis

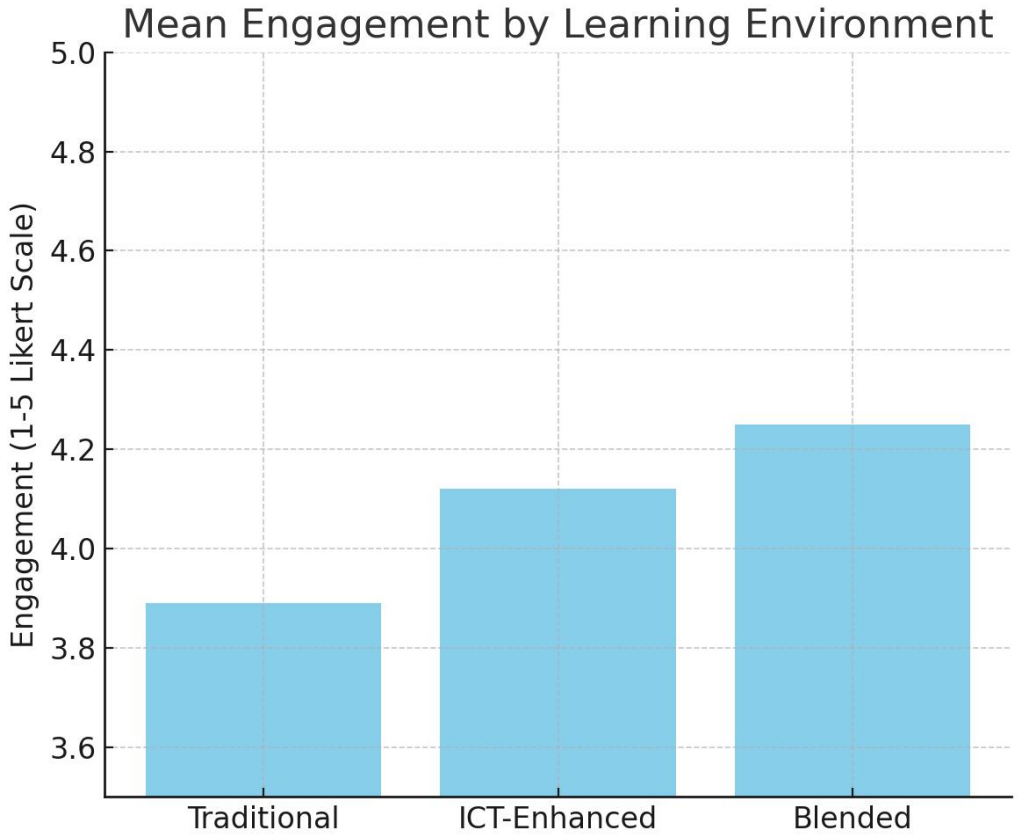
Perform a **Pearson correlation analysis** to determine the relationship between student engagement and academic performance.

Table 4: Correlation Between Engagement and Academic Performance

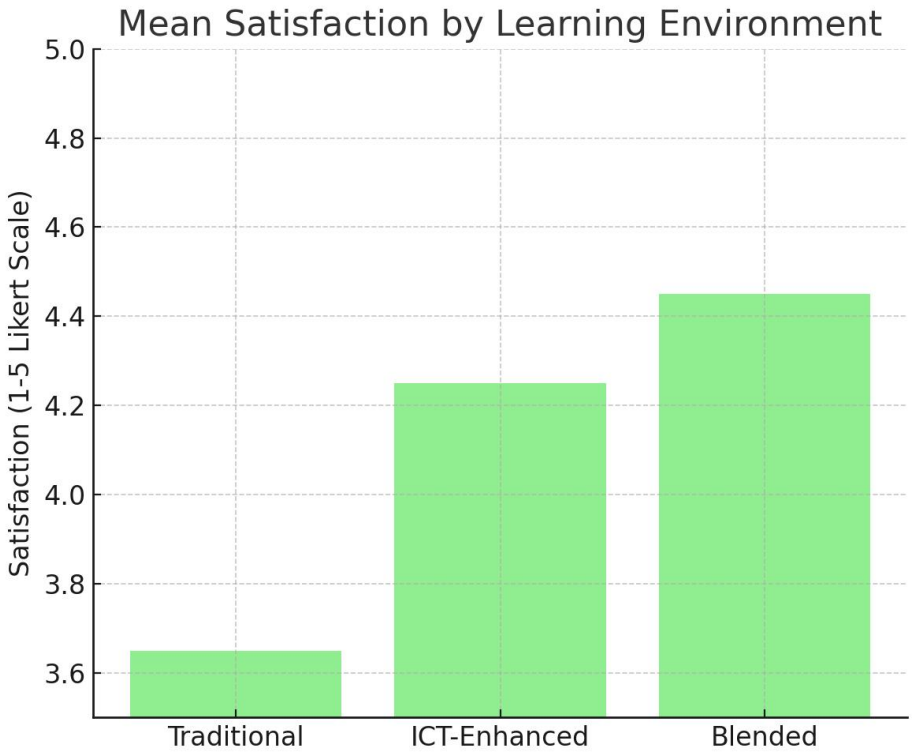
Variables	Engagement	Academic Performance
Engagement	1	0.482**
Academic Performance	0.482**	1

p < 0.01

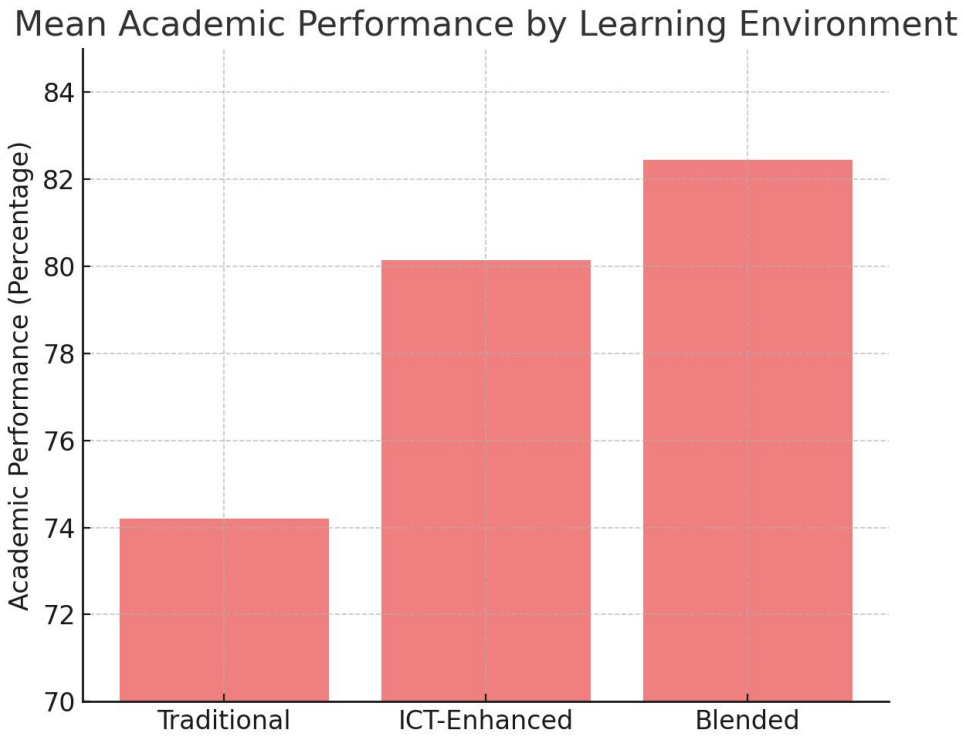
The Pearson correlation coefficient between **engagement** and **academic performance** is **r = 0.482**, indicating a moderate positive correlation that is statistically significant (p < 0.01). This suggests that higher levels of student engagement are associated with better academic performance. The positive relationship implies that when students are more engaged—whether in traditional or ICT-enhanced environments—they tend to perform better academically.



Mean Engagement by Learning Environment: This graph displays student engagement levels across traditional, ICT-enhanced, and blended learning environments.



Mean Satisfaction by Learning Environment: This graph shows student satisfaction with each type of learning environment.



Mean Academic Performance by Learning Environment: This graph compares the average academic performance of students in each learning setting

The results show that learning environment has the potential of influencing students' interaction, attitudes, and achievement. The studies presented in this paper

conclude that students achieve better performance in settings where there is ICT-enhanced or a blended learning environment as opposed to settings that make use of traditional classrooms. For instance, student learning in BCLE that was provided in the blended learning environment displayed higher level of learning engagement and satisfaction associated with higher levels of academic achievement. In addition, the differences highlighted through ANOVA and post hoc tests suggest that new media learning approaches improve student outcomes. The positive relationship between engagement and academic achievement underlines the need to enhance the level of students' engagement in all learning contexts to enhance the achievement of better learning results.

Discussion

The results of this study provide valuable insights into the comparative effectiveness of traditional classroom learning, ICT-enhanced learning, and blended learning environments in higher education.

Student Engagement

Another notable observation about this work is that students are more active in the ICT-enhanced and blended learning environments than in conventional face-to-face teaching conditions. Self-directed learning engagement self-assessed by students in the study was highest among the BL learners with a mean score of 4.25 (SD =.60) followed by those in ICT with a mean of 4.12 (SD = 0.65). On the other hand, the level of self-reported student engagement among learners in traditional classroom learning context was significantly lower (M = 3.89, SD = 0.78). Such findings correspond with pertinent literature in the field, which determine that the incorporation of ICT tools into the learning process enhances students' learning activities and gives them a possibility to interact with the material in a more active and flexible manner (Means et al., 2010).

The higher level of motivation could be discussed as the result of more designated multimedia use, possibilities of interactive simulations and online discussions within the framework of ICT enhanced and blended learning environments. For instance, Anderson and Dron (2011) argued that through using ICT students engage at a deeper level because of access to content which they can review several times, engage in a discussion with other students online and repeat the content as many times as they wish. It may also be supported by the ideas of Garrison and Kanuka (2004) who stated that a blended learning environment supports the concept of engagement due to face to face interaction with teachers and the use of convenient online materials that let students interact with the course more effectively.

The qualitative results furthermore suggest that the lower level of engagement can be attributed to the role of or at least linked to the more passive nature of traditional lectures where students are usually just asked to listen to the instructor. Prince (2004) pointed out that the traditional classroom environment

inhibits and does not support active learning and engagement as opposed to lectures, and it reduces the chances of critical thinking and problem solving by the students. This lack of active engagement may explain why students in this study indicated lower levels of engagement in the traditional settings:

Student Satisfaction

The results regarding student satisfaction are also aligned in the same way:, the students in the blended environment had the highest level of satisfaction mean score (M = 4.45, SD = 0.68), and ICT, the students in the second highest mean score (M = 4.25, SD = 0.72). The respondents who sit in a traditional classroom got the lowest satisfaction score (M = 3.65, SD = 0.84). All these results lead to the argument that the students normally desire more freedom/elasticity, class participation, and working independently, which are features of ICT and blended learning environments.

High satisfaction reported by students in blended learning can be attributed for this simple fact that the students get the best of both sides; face to face learning as well as online learning materials. From the perspective of Garrison and Vaughan (2008), the blended learning context enables students indeed to engage in purposeful face-to-face talk and at the same time leverage on online affordances. This combination is especially attractive to student audiences, who often care more about the interactional aspects of formal education but also prefer their learning pace and schedules to be determined by them, and who may need to study on their own time.

ICT enhanced Learning Environment also leads to higher satisfaction due to increased student control through technology medium. ICT helps students accommodate content according to their learning style, through videos, podcasts, and exercises, as noticed by Laurillard (2013). This is significantly preferred by students to other learning models since it creates a personalized learning environment.

On the other hand, the lower satisfaction levels reported by students who are enrolled for the traditional face-to-face class may be as a result of rigidity, constraints and inflexibility of face-to-face teaching and learning environments. For most years, the traditional learning environment can be characterized by a homogenization process in which students are expected to learn in the same rate and mode as others but with different technologies (Guri-Rosenblit, 2005). This lack of personalization and flexibility may well be the reason why students in traditional environments self-reported as being less satisfied in their learning experiences.

Academic Performance

The research findings of the present study reveal that academic performance of students significantly differs in traditional, ICT enhanced and blended learning environments. It was also noted that students in blended learning environments recorded higher academic performance (M = 82.45, SD = 6.35) than those in ICT

enhanced environments (M = 80.14, SD = 7.45) and those in traditional classrooms (M = 74.21, SD = 9.12). These results support earlier studies showing that blended learning is positively linked with better academic performance than both face-to-face and completely WEN environments (Bernard et al., 2014; Means et al., 2010).

Increased attainment levels are likely due to the integration of both FTF instruction, as well as technology-assisted instruction that allows for multiple attempts at learning-through-technology and feedback. In the view of Bonk and Graham (2012), the use of blended learning implies that students get a chance to in real time to communicate with the tutors while on the other hand they get to benefit from the increased flexibility and richness of web resources. This way the learning is more effective and students are enabled to apply what they have learnt in as many ways as you can think of.

The compared high results of the ICT-conditioned students may be attributed to the self-timing of ICT and flexible access to educational materials, skills, and feedback from online quizzes (Laurillard, 2013). Application of ICT tools like LMS or multimedia resources, Internet and computer-based activities involving input and output from the students offer students practice in strategizing the ways they can productively interact with content for meaning comprehension and memorable acquisition.

On the other hand, poor students' performance in traditional classrooms might have resulted from enhanced traditional lectures that do not allow much flexibility in the classroom and a passive learning interface. According to Garrison and Kanuka (2004), the traditional learning environments, for example, face-to-face classroom learning interrupts students from active involvement, which has adverse effects to their learning retention and application in real life. Furthermore, there is less flexibility of the 'time-space' frame of traditional classroom teaching which may contribute to students' lack of interest in the content due to times when they cannot attend a lecture or class discussion because of other responsibilities (Guri-Rosenblit, 2005).

Implications for Higher Education

The implication for higher education institutions as they advance in the innovation of ICT tools in their teaching learning endeavors is critical. About the mode, the study indicates that there is a general perception of blended learning environments as being superior to the other in terms of stimulating student learning satisfaction and achievement since they draw from the two forms of learning environment. It is believed that practices in blended learning contexts would add more flexibility, interactivity, and individualized approach that higher education institutions should incorporate more of in educating their students.

At the same time, the practice of organized blended learning is a complex process that requires critical time and financial resources for planning, creation of necessary infrastructure, and training of employees. According to Guri-Rosenblit

(2005), the issue of digital divide is still a real problem that higher education students face; certain students cannot afford to utilize ICTs to their full potential for improving their studying achievements. Blended learning requires students to have access to sufficient internet and digital technology devices and support to name but a few, institutions should strive to see that all students have these requirements.

Furthermore, the educators, the trainers, the teachers, and the facilitators need to be equipped with skills on how to incorporate ICT meaningfully into the learning process. According to Bonk and Graham (2012), while designing such courses, technology must be supported pedagogically along with providing professional development to instructors since the downside of using ICT tools outweighs the advantages if not done correctly. Teachers should be used and encouraged to try out many of the technologies and ways of teaching in order to identify the best ways of attaining students attention in order to teach them.

Limitations of the Study

However there are some limitations that need to be considered while reflecting upon the findings of this study. First of all, the study uses data that was made by students themselves, which is always questionable. The work also reveals the 'social desirability bias' as participants may over or under report their levels of engagement and satisfaction. It is also recommended that further research should adopt other forms of metrics of engagement, not only self-evaluation, structured learning analytics or observations in class.

Second, due to methodological reasons the study was conducted in only one higher education institution and therefore the results cannot be generalized for other contexts. The specifics of the given institution including the technological support of the classes, the body of students, and the approaches to the teaching method may also play the role. Future works are better to extend the research to more than one institution or alternatively, follow up studies are possible to track over time the effects of these environments on students outcomes.

Conclusion

In conclusion, this study demonstrates that ICT-enhanced and blended learning environments offer significant advantages over traditional classroom settings in terms of student engagement, satisfaction, and academic performance. Out of the identified models, blended learning is the most effective kind of learning with its benefits, including the opportunity to have fast face-to-face conversations and the presence of other forms of learning, including online and digital platforms. Nevertheless, for the effective utilization of these models, there is a need for institutional banking and financial resources for purchase and improvement of technologies, and related professional development for the teachers. This paper provides valuable insights into the key strategies effective for enhancing the learning environments in HEIs as universities and colleges evolve into digital classrooms.

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