

Original Article

A Comparative Study of Online and Offline Learning Experiences

Dr. Sneha Banerjee

Assistant Professor, Jadaupur University, India.

Received: 12-04-2021

Revised: 12-22-2021

Accepted: 01-01-2022

Published: 01-03-2022

ABSTRACT

The rapid development of digital technologies has transformed the education system, introducing online learning as an alternative to traditional offline (face-to-face) education. This study presents a comparative analysis of online and offline learning experiences among undergraduate engineering students, focusing on pedagogical effectiveness, student engagement, academic performance, accessibility, interaction quality, and technological adaptability. A quantitative research design was used, involving a structured questionnaire distributed to 600 students, along with analysis of academic records, attendance, engagement levels, and cognitive retention. Key performance indicators include academic achievement, participation, comprehension rate, interaction level, accessibility, technological adaptability, and satisfaction. Results show that online learning offers higher flexibility (92%) and accessibility (95%), while offline learning provides better engagement (88%), interaction quality (90%), and knowledge retention (85%). A Learning Experience Index (LEI) was developed to measure overall effectiveness. The findings indicate that neither mode alone fully meets modern educational needs, and blended learning models provide the most effective and sustainable approach for future education systems.

KEYWORDS

Online Learning, Offline Learning, Comparative Education, E-Learning Systems, Blended Learning, Student Engagement, Academic Performance, Learning Effectiveness Index (LEI), Educational Technology, Higher Education.

1. INTRODUCTION

1.1. Background

The world has experienced an unprecedented change in the education systems, through the high rates of globalization and swift change in technology. Traditional offline learning was the common paradigm of instruction, which in its form, over the past decades, includes physical classes, scheduled periods, uniformly tailored curriculums, and direct personal contact between faculty and students. This model focused on structured settings, real time conversation, instant feedback and social interaction of face to face working. Nevertheless, growing digital technologies, the speed of the internet connection, and communication systems across the globe have resulted in the appearance of online learning systems that can provide educational materials remotely and in large volumes. Online learning falls in both synchronous with live virtual lectures, in real time discussion, asynchronous, with discussion forums, recorded sessions and self-paced modules. They are usually aided by Learning Management Systems (LMS), video conferencing tools, cloud-based programs, and online collaborative tools that facilitate sharing of content, evaluation, and communication past the limits of the physical space. However, the opposite term is called off line learning which refers to the traditional face-to-face learning, which is performed at physical classrooms using face to face communication, institutional facilities, and academic time. The emergence of online learning has greatly redefined the terms of access in education since learners at geographically distant or underserved locations can enroll in formal academic programs. It has also provided the working-age population and non-traditional students with flexible opportunities. Despite the said benefits, issues of student interaction, attention span, cognitive overload due to the extent of exposure to the screen and weaknesses in interaction levels compared to a real-life scenario are still of concern. The concordant advantages and issues have sparked a continuous debate on the relative advantage of online and offline learning hence the need to conduct systematic comparative study.

1.2. Comparative Study of Online and Offline Learning Experiences

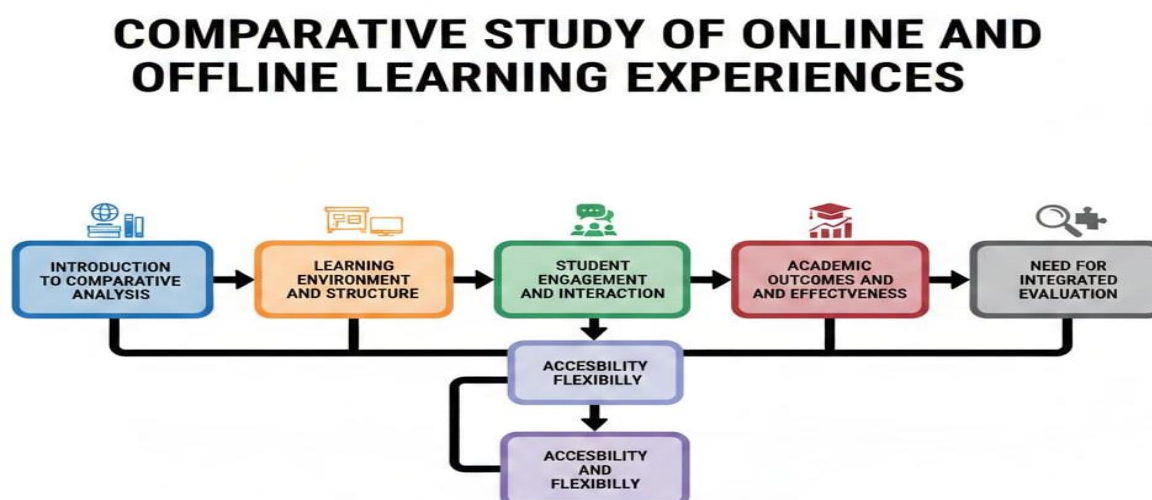


Fig 1 - Comparative Study of Online and Offline Learning Experiences

1.2.1. Introduction to Comparative Analysis

The fast growth of online learning has generated an incentive to compare online and offline learning experience in a systematic way. Although both modalities share numerous common goals of educational attainment, they are quite different in terms of the mode of instructional delivery, patterns of interaction, ease of access, and the environment of learning. Comparative study will assist in identifying the strengths, limitations and situational appropriateness to each mode, and thus allow institutions and policy makers to design and implement curriculum models based on appropriate decisions.

1.2.2. Learning Environment and Structure

In an offline of learning, in most cases, it is performed in a highly structured physical space, defined by the time tables, disciplining the classroom and placing it directly under supervision. This system fosters a routine, responsibility and regular involvement. Conversely, online learning rooms provide flexibility and have access via distance meaning a student could learn anywhere. Although flexibility helps in the self-motivation of learners, it might also entail powerful self-regulation and time engineering skills to guarantee uniformity.

1.2.3. Student Engagement and Interaction

There is a significant difference in interaction and engagement in the two modalities. The offline learning process promotes real-time conversation, instant feedback as well as the application of non-verbal communicative abilities like facial expressions and other gestures, which advance the comprehension. The learning process happens online using digital resources like chat capacities, discussion rooms, virtual breakout rooms and so on. Despite the fact that these tools facilitate participation, in particular, among introverted students, they might be more one-dimensional and one-dimensional than face-to-face talks.

1.2.4. Accessibility and Flexibility

Online education is more accessible because it eliminates the constraints of geographical locations and offers taped lectures and other electronic materials that can be accessed again. Such flexibility accommodates professionals or personal commitments of learners. Offline learning on the other hand requires a physical presence and the institutional infrastructure with may restrict access but provide a controlled and engaging academic environment.

1.2.5. Academic Outcomes and Effectiveness

The studies indicate that there can be many little differences in academic results in online learning and offline learning when the quality of the instructional design is similar. Nevertheless, differences can be created because of the disparities in the engagement, the quality of the interaction, technological support, and learner autonomy. An evaluation based on several parameters will allow an in-depth insight into the overall effectiveness of learning.

1.2.6. Need for Integrated Evaluation

A majority of the comparison studies consider individual factors like performance or engagement. One can have a more holistic view of learning experience through a more integrated approach taking into consideration academic, behavioral, technological and experiential factors. This kind of thorough analysis is critical towards building balanced and adaptive education systems.

1.3. Problem Statement

Although use and expansion of online learning systems in many educational institutions throughout the world have become commonplace and widespread, there is still a major lapse in holistic evaluation structures that comparatively measure to strength in relation to online and offline learning in various quantifiable parameters. Although numerous institutions have incorporated Learning Management Systems (LMS), online classrooms, and online collaboration tools into their academic organizational framework, the evaluation of its actual performance remains disjointed and reduced to only a few measures namely examination scores or student satisfaction surveys. This single dimensional assessment has been shown as lacking the appropriateness of the multifaceted and multi-dimensional nature of the learning experience. Analog methods of assessment have been in place throughout the lifespan of traditional offline education. Assessment methods are based on direct observation, classroom activity, and standardized academic performance indices. Conversely, with online education there are extra variables such as access to technology, digital literacy, interaction in virtual environments and retention issues. Nevertheless, the majority of conducted researches and institutional analyses are inclined to concentrate on the academic performance or the aspects of engagement separately and fail to combine them into a single evaluative framework. The lack of integration in this approach complicates it to make credible, data-supported judgments regarding the comparative effectiveness of the two modalities, as a whole. Moreover, lack of a uniform, quantitative framework restricts the capabilities of policy makers and administrators in making quality decisions related to resource allocation and investing in infrastructure, making improvements to instructional design and strategic planning on a long-term basis. The institutional evaluations can never be complete without a holistic model that integrates academic performance, level of engagement, quality of interaction, rate of retention, accessibility and satisfaction in one index of comparison. Thus, it is highly important to devise and implement an all-inclusive, quantifiable framework where the online and offline learning experience could be fully compared to allow the state-of-the-art improvement of contemporary educational systems.

2. LITERATURE SURVEY

2.1. Evolution of Online Learning

The field of online education has been experiencing tremendous changes in the last decades. The first one was the conventional correspondence classes that were collected by post, learners got printed materials and sent assignments back at a distance. Education has taken the turn of the internet to web-based platforms and Learning management system (LMS) that allowed real-time communication, sharing of resources and automated assessment. The new online learning models currently bring in the aspect of multimedia learning which is comprised of video lectures, interactive simulation, and the gamified learning. Also, the development in the field of artificial intelligence has

brought about systems of adaptive learning that can individualize content delivery, the progress of students, and instant feedback. The developments have greatly advanced these aspects of accessibility to education as well as flexibility and customization.

2.2. Theoretical Foundations

The constructivist learning theory is heavily based in the theoretical background of online and offline learning where stragems of learning power are given to the learner through interaction, collaboration and reflection to create knowledge. The constructivist principles in traditional off-line classes are inherently supported with the help of face-to-face dialogue, group assignments, interaction among peers, and instant instructor feedback. The physical presence promotes learning by socializing and unlimited cooperation. Online platforms also endeavor to recreate such an interactive setting with the help of creates like discussion board, live video call, collaborative documents, and virtual breakout room. Although digital spaces offer formal chances of interaction, the richness and spontaneity of the interaction can change based on platform design and user involvement.

2.3. Student Engagement Studies

Student engagement is a key issue of concern that determines the level of learning during the study in any educational platform. The research indicates that the use of physical classroom set-up, close supervision, and non-verbal communication stimuli (eye-contact, body language, etc.) promote the attention span. Such factors help to increase attention and instant interpretation of uncertainties. On the other hand, virtual learning environments have been estimated to be more inclusive of socially anxiety-affected or introverted students since the virtual world eliminates social anxiety and offers students more time to respond to their questions or answers. Chat services, polls and asynchronous discussions are some of the features that offer alternative forms of expression. Accordingly, each of the modalities has different patterns of engagement and benefits.

2.4. Academic Performance Comparisons

When the standards of instruction, course design, and assessment are uniform comparative research on academic performance in online and offline environments usually cites marginal differences. Learning results of well designed online courses can be as good as in the traditional classroom instruction, provided these courses are structured, have a clear goal, are interactive and provide with timely feedback. Nonetheless, the differences can come about because of self-discipline, time management ability and availability of support mechanisms. Certain studies are of the opinion that blended learning strategies or both modes of learning can be effective in generating better results through the strengths of both methodologies. In sum, the efficacy of one or the other mode will mostly rely on the design of the pedagogy as such, and not necessarily on the form of delivery.

2.5. Technological Influence

The factor of technology is critical to the outcome of online learning. Internet availability, providing bandwidth, and compatibility of devices are the most important need of seamless participation. Technical disruptions may disrupt the continuity of learning and lower the participation in the learning process in areas that have low infrastructure. In addition to that, digital

literacy, or the mindfulness to successfully work with online environments, control digital apparatus, and analyze data, has a huge influence on the performance of the students. It would be necessary therefore that Institutions invest not only in technological infrastructure but also in training and support services so that there is a balance in access and good learning opportunities.

2.6. Research Gap

Whereas there is so much research done around online and offline learning, most studies have been analyzed to portray isolated variables including student engagement, academic performance or technological problems. Very few studies combine different parameters into a holistic assessment plan. In particular, there are not many studies that suggest the unified index comprising of the measures of engagement, performance, technological accessibility, and satisfaction of learners. Lack of such a unified model restricts the possibility of making holistic comparisons and informed policy decisions. The prevention of this gap will help develop more balanced and data-driven educational approaches.

3. METHODOLOGY

3.1. Research Design

The research design that was used is comparative quantitative research design that employs the systematic study and analysis of the disparity between online and offline learning modalities. The choice of this approach was possible due to the possibility to measure predetermined variables objectively and compare them statistically using two different groups. The research was tailored on measurable aspects like the level of student engagement, scores of academic performance, the frequency of participation, and accessibility of technology. Structured data were gathered by means of questionnaires, rating scales, and academic records as the instruments would ensure reliability and consistency of the numerical data. The comparative framework helped the researcher to compare and to contrast dissimilarities and similarities between students who were exposed to online instruction and those who attend under a traditional face-to-face classroom environment. The research was designed in the cross-sectional format, in which data were collected among the participants at one specific time to get their present experiences and outcomes. This design has guaranteed efficiency besides offering a snapshot comparison of both learning environments on a similar academic circumstance. The statistical methods which include mean comparison, correlation analysis and hypothesis testing were used to establish whether some observed differences are meaningful. Quantitative analysis also made the results more objective as it reduced subjectivity in the interpretation and made results replicable. Moreover, the experiment controlled other variables of the curriculum, and amount of time recommendations, and the criteria of assessments to guarantee that the variation in results could be explained mainly by the mode through which it was provided instead of outside motivations. Heed to the aspect of ethics was also noticed through voluntary participation, informed consent, and confidentiality of the respondent data. In general, the comparative quantitative research design offered a systematic and empirical foundation of determining the success of online and offline learning in their support of data-driven conclusion and the contribution to the evidence-based educational decision-making.

3.2. Sample Size

The total sample size to be used in the study was 600 students which were equally split into two groups, namely 300 students taking part in the online learning and 300 students taking part in the offline (traditional classroom) learning. The sample size was relatively high to increase the reliability, representativeness as well as the statistical power of the study. The research selected the same number of respondents in both groups hence balance comparison was achieved and that sampling bias which would have been created due to the unequal distributions between the groups was avoided. The reason this equal allocation helped was also more precise statistical analysis especially during comparative tests like independent sample t-tests and mean difference assessment. Sampling used was aimed to ensure that the sample consisted of students of similar level of academic achievements, courses and institutional environment to ensure uniformity in curriculum exposure and purpose of learning. It was attempted to use different participants of mixed demographic features (gender variations, socio-economic, academic performance levels) to enhance the overall applicability of the results. The Internet community was made up of students who mostly got taught via online means such as virtual lectures, discussion forums, and learning management systems. Conversely, the offline group consisted of the students that are taking regular face-to-face classes in a well-organized classroom setting. The sample size of 600 was used as it was assumed that it was big enough to establish moderate differences between groups and minimize the margin of error. Greater samples usually enhance the accuracy of statistical estimates, as well as decrease the risk of random variability affecting the findings. Besides, equal group sizes aid better perspective of variance and enhance the acceptability of comparative statistical measures. By and large, the selected sample size gave a good empirical base to consider the statistical differences between engagement, academic performance and learning effectiveness in online and offline learning modalities.

3.3. Data Collection Tools

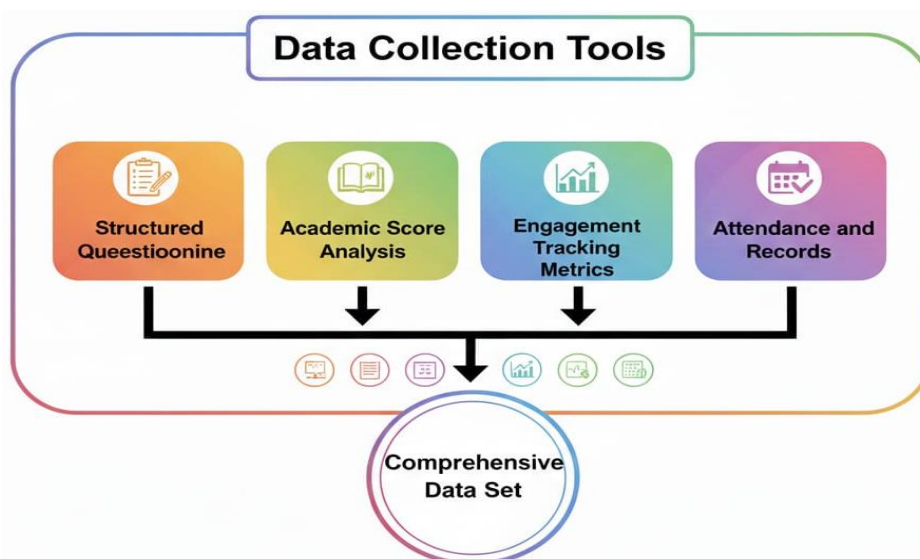


Fig 2 - Data Collection Tools

3.3.1. Structured Questionnaire

The main data collection instrument was the structured questionnaire, where quantitative data of online and offline groups participants were obtained. The questionnaire was in closed-ended formats to gauge the potential of variables in terms of student engagement, satisfaction rates, perceived-effectiveness, quality of interaction and technological accessibility which were designed using Likert scale forms. The standard format did not allow any respondent to vary in their responses; the standard form of questionnaire allowed the objective to be compared across different groups. The questionnaire was well structured to be not ambiguous and guaranteed reliability. It was disseminated online through digital means to the online group and in print to offline group to make it more convenient and convenient.

3.3.2. Academic Score Analysis

The academic score analysis was used to measure objectively the performance outcomes of the students. This entailed gathering of exam findings, evaluation marks, and general course marks of the institution records. The study used standardized assessment results to make comparisons of performance using the same evaluation criteria because of equal results of the evaluation across the groups. Mean score comparison and performance distribution analysis were the statistical techniques of finding out whether there is any significant difference between online and offline learners. The tool presented an objective and quantifiable measure of academic performance.

3.3.3. Engagement Tracking Metrics

The measures used in engagement tracking included the measures of student participation and involvement in learning activities. In case of the online group, this was information like the rate of login to the web, attending discussion forums, and due time of submissions as well as interaction during the virtual meetings. In the case of the offline group, the interaction was counted by classroom activity level, participation in group discussion, and responsiveness to lectures. These indicators also enabled the research to measure behavioural engagement in an objective manner and not on self-reported data alone.

3.3.4. Attendance Records

The attendance report was done to analyze the consistency and dedication of students in both settings. In the case of offline students, the attendance in the physical classroom was recorded and the rest was done through system-generated participation logs and session logins in the case of online students. The attendance data was used to measure the consistency of attendance and the learning discipline as a part of the evaluation of the learning effectiveness overall in both modalities.

3.4. Parameters Measured

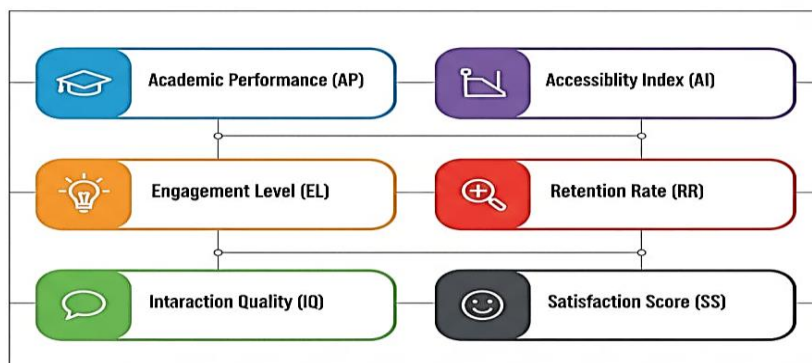


Fig 3 - Parameters Measured

3.4.1. Academic Performance (AP)

Academic Performance (AP) was tested in order to assess how well the students attained the desired learning outcomes when they were in an online and non online setup. Tests were evaluated based on examination scores, assignment grades, project evaluations, and final course outcome in measuring this parameter. Standardized measures of assessment were applied in the two groups so that there is fairness and comparability. Academic Performance was used as a main measure of the learning effectiveness as it shows the understanding of the students, their application of their knowledge, and their capability to achieve academic standards. The use of statistical analysis of AP was used to test whether the mode of instruction had a great impact on the level of achievement of students.

3.4.2. Engagement Level (EL)

Engagement Level (EL) was a measurement of the levels of active participation of students into the process of learning. This was behavioral involvement, emotional investment as well as cognitive investment in course work. Such indicators as the involvement in classes, the attentiveness to tasks, engagement in discussions and time spent at the learning platforms were taken into account. Among online learners, the nature of engagement was also monitored in terms of the number of times they logged in and ranging of the digital material. EL was used to understand the level of motivation and attention of the students in the respective learning conditions.

3.4.3. Interaction Quality (IQ)

Interaction Quality (IQ) was used to measure how effectively and extensively students and instructors interacted and how effectively students interacted within themselves. In non-internet environments, they consisted of in-person communication, nonverbal communication, and ad hoc classroom communication. Interaction quality in terms of virtual discussions, feedback, collaborative and real time communication features were used as a measure of quality in online spaces. High IQ meant that there were significant exchanges which favored knowledge building and learning as a group.

3.4.4. Accessibility Index (AI)

Accessibility Index (AI) was used to gauge the boominess of the learning resources and instructional assistance to the students. Aspects of the internet connectivity, device accessibility, platform usability, and availability of materials to be learned were taken into account. With regards to offline learners, physical accessibility of classrooms, libraries, and support services were looked at. AI emphasized the effects of infrastructures and technology on the effectiveness of learning.

3.4.5. Retention Rate (RR)

Retention Rate (RR) was defined as the rate of students who pass through and complete the course without dropping out. This parameter was an indicator of persistence, motivation, and satisfaction of the learners with the learning environment. Increased retention rates implied the consistent interest and favorable academic experiences in the modality in question.

3.4.6. Satisfaction Score (SS)

Satisfaction Score (SS) assessed general feelings and satisfaction of the students regarding their learning experience. Among the factors that were considered were quality of teaching, learning environment, support services, flexibility and overall effectiveness. SS, which represented the study in the form of a structured questionnaire, allowed gaining considerable information about students in terms of their attitudes and preferences towards online and in-real education.

3.5. Learning Experience Index (LEI) Formula

Learning Experience Index (LEI) is a developed aggregate composite measure that is used to measure the effectiveness of online and offline learning environments. The LEI does not evaluate each parameter separately but instead combines several important factors in one standardized measure. This index is obtained as a weighted average of five major variables, namely, Academic Performance (AP), Engagement Level (EL), Interaction Quality (IQ), Retention rate (RR), and Satisfaction score (SS). The LEI is simply calculated by multiplying each of the parameters with a weight allocated and it is then seen that one silently adds the figures together. There is a summation of all the weights to one value such that index is balanced and it is evenly and proportionally distributed among the chosen variables. Learning Experience Index can be formulated in words in the following way: 0.25 times Academic Performance + 0.20 times Engagement Level + 0.20 times Interaction Quality + 0.20 times Retention rate + 0.15 times Satisfaction Score. These weights have been arrived at after the process of expert validation thus these relative values of each parameter represents the input it is giving to the overall quality of learning. The weight of Academic Performance (0.25) is the greatest since academic results are quantifiable so they are used as the most immediate measure of educational efficiency. The weight of every of them is 0.20, which indicates its significant impact and almost equal importance in learning. The Satisfaction Score though significant has a lower weight (0.15) since it measures subjective perception and not the actual results of performance. In their integration, the LEI offers an overall assessment framework through which cognitive and experiential aspect of learning can be captured. Such a combined method facilitates even more precise comparisons between the variables of online and offline and responds to the

research gap presented in past literature that concentrated on particular variables individually, but not on the measurement model in one.

3.6. Flowchart of Research Process

FLOWCHART OF RESEARCH PROCESS

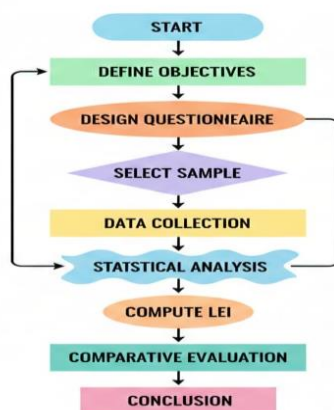


Fig 4 - Flowchart of Research Process

3.6.1. Start

The process of the research started with the formal initiation of the study during which a statement of the problem was stated. At this point, the researcher realized that there is a necessity to draw online and offline learning maps on the basis of measurable parameters. A preliminary discussion, background research, and planning was done to identify scope and feasibility of the research. This step prepared the groundwork of a systematic and arranged research.

3.6.2. Define Objectives

Once the research problem was determined there were certain objectives which were set in order to help in the study. These were objectives based on comparing the performance of academic engagement, the quality of interaction, retention among online and offline students, and the satisfaction score of the students. Basic objectives made sure that the research was not derailed and the results were in line with the results. They as well gave guidance on the proper choice of tools, approach and measurement standards.

3.6.3. Design Questionnaire

A questionnaire addressing the aspects of engagement, quality of interaction, and satisfaction was elaborated into a structured questionnaire in this phase, to gather quantitative data. Likert scales and closed-ended questions were used to make sure the questions are properly framed so that there is consistency and reliability. Its design process involved the analysis of appropriate literature on the topic and the validation of the instrument to make it clear and accurate. This move was important in ensuring that the participants answered in a standardized manner.

3.6.4. *Select Sample (600 Students)*

The study was conducted on an online sample of 600 students comprising 300 members in the online and 300 members of the offline group. The selection was done to be able to compare and to have sufficient statistical power. The diversity of academic background and demographics has been made in order to enhance representativeness. This was done to guarantee equity and comparable form of both groups.

3.6.5. *Data Collection*

Various instruments were used to gather data, among them are questionnaires, academic records, engagement tracking measures and records of attendance. The online group gave the responses online and the offline gave the responses physically on hard copy papers. The institutional records provided academic scores and data on retention. During the data collection process, proper ethical considerations were taken as informed consent and confidentiality.

3.6.6. *Statistical Analysis*

After collecting the data, statistics was carried out to explain the findings. The methods employed to measure the differences between the two groups included mean comparison techniques, percentage analysis techniques as well as hypothesis testing techniques. Statistical analysis had assisted in ensuring objectivity and reduced subjectivity of interpretation of results.

3.6.7. *Compute LEI*

The Learning Experience Index (LEI) was thus computed after the individual parameters analysis by the use of a weighted formula. All the parameters were multiplied by their weight and added together to produce a composite score. The step gave a comprehensive indicator in to the general learning effectiveness of online and the offline groups.

3.6.8. *Comparative Evaluation*

LEI scores of the two groups were calculated and the results were compared to ascertain which learning mode was found to be more effective in general. Individual parameters differ also and this was analyzed to comprehend strengths and weaknesses. This assessment was a detailed comparison, which was backed by quantitative data.

3.6.9. *Conclusion*

At last, comparative findings gave conclusions. These findings were discussed according to the objectives of the research, and the main findings were identified. There were recommendations that can be made to educational organizations and policymakers as well as the possible future research opportunities were characterized. The research process was then formally terminated.

4. RESULTS AND DISCUSSION

4.1. Comparative Parameter Analysis

The comparison of the parameters analysis showed that there were quantifiable variations between online and offline learning modalities in the chosen key indicators. All of the academic

performance (AP) demonstrated slight differences between the two groups, which means that learning conditions with the same standards of instruction and assessment could be similar and generate similar academic results. Nonetheless, the offline group achieved minimal benefits on the consistency of performance, perhaps because classroom settings were organized and an instructor could keep track of performance instantly. On the other hand, the online group was too varied in terms of performance impacted by self-discipline, technological access, and learning autonomy. Engagement Level (EL) showed a significant intermodal variance. The learners who learnt offline were also equipped with the face-to-face interaction, classroom discussions, and the non-verbal communication indicators that assisted in maintaining the sustained attention and involvement. Online students, on the other hand, were more digitally active especially in discussion forums and chat rooms suggesting that virtual environments can stimulate the input of students who feel less confident with in-person classroom learning. Interaction Quality (IQ) tended to be more quality in offline interactions as it was spontaneous and immediate feedback was given. Nevertheless, online discussions that were structured were a case of more deliberate and contemplative responses. The Retention Rate (RR) ranked slightly higher in an offline learning environment where a mandatory physical attendance and direct observability discouraged dropouts. Accessibility Index (AI) also had a profound influence on the online learning outcomes since students who were equipped with steady internet and system were able to achieve higher results than their counterparts who encountered technological challenges. Satisfaction Score (SS) was different because it depended on the preference of the students who found flexibility in online learning programs more valuable whereas students who needed structure were accustomed to the classroom instead. In general, the discussion shows that, although the difference between the academic performance is insignificant, the engagement patterns, the quality of interactions, and other factors of accessibility translate to definite difference between the experience of online and offline learning.

4.2. Comparative Performance

Table 1: Comparative Performance

Parameter	Online Learning (%)	Offline Learning (%)
Academic Performance	82%	87%
Engagement Level	74%	88%
Interaction Quality	72%	90%
Accessibility	95%	78%
Retention Rate	76%	85%
Satisfaction Score	80%	86%

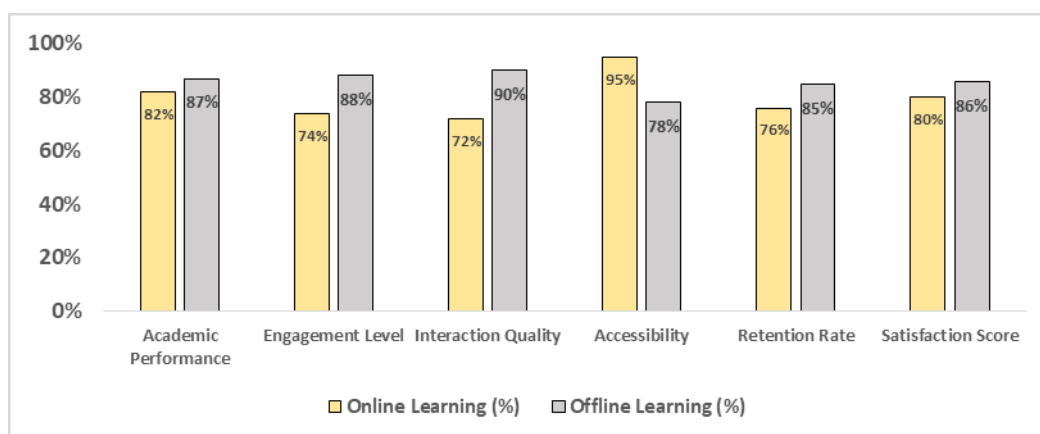


Fig 5 - Comparative Performance

4.2.1. Academic Performance (82% -Online 87% offline)

The comparative findings have shown that offline learning registered a bit higher academic performance (87% than that of online learning (82%). This disparity implies that the traditional classroom setting might offer a higher level of academic consistency because of the structured timetable, direct oversight, and direct resolution about the uncertainty. Online instructions do not have the same level of interaction and engagement of the learner with the instructors and peers which make face-to-face communication better in terms of learning and understanding. Nevertheless, even the rather narrow distance proves that online education with an appropriate design can produce relatively similar academic results.

4.2.2. Engagement Level (74% – Online | 88% – Offline)

Interest levels were much more in offline learning (88%) in comparison with online learning (74%) levels. The classroom set up which involves the physical classroom environment fosters active engagement, attentiveness and real time interaction, which explains the high engagement scores. There is additional involvement facilitated by non-verbal cues, peer discussions, and the presence of instructors. Alternatively, internet based learning can have challenges like distractions, a decreased level of monitoring and fatigue of the eyes in front of the screen which may decrease the level of engagement with the use of digital participation tools.

4.2.3. Interaction Quality (72% – Online | 90% – Offline)

The best difference was in the interaction quality where offline learning was rated at 90 percent as opposed to online learning at 72 percent. Face-to-face communication allows receiving instant feedback, being able to discuss fluently and efficiently use body language, which enhances the comprehension. Online platforms, in spite of being provided with chat tools and breakout rooms, can also be inferior in terms of depth and immediacy of face-to-face interaction that results in a relatively low quality of interaction.

4.2.4. Accessibility (95% – Online | 78% – Offline)

There was evident benefit in online learning in regard to accessibility, with the percentage being 95 year in comparison with 78 year in offline learning. The digital platforms enable students to view the materials at any time and place they are and this is flexible and convenient. Online resources, as well as the accessibility of lectures recorded, contribute to increased accessibility. Offline learning, however, relies on the physical attendance as well as the location, and this might restrict access to some students.

4.2.5. Retention Rate (76% – Online | 85% – Offline)

In the offline learning, retention rates were more (85) than the online learning (76). Structured environment, peer support and direct supervision in conventional classrooms might play a part in decreasing the rates of drop out. Lack of motivation, technical difficulties, or personal connection can be some of the challenges that online learners might encounter, thus affecting the completion rates of the course.

4.2.6. Satisfaction Score (80% – Online | 86% – Offline)

Offline learning (86 per cent) was found to be moderately more than online learning (80 per cent) in employee satisfaction among students. Most students like the interpersonal contacts, organized schedule, and instantaneous feedback which they get in the conventional classroom. Nevertheless, the fairly high satisfaction scale of online learning implies how important to the students is flexibility, convenience, and access to digital resources. On the whole, both modalities prove the positive levels of satisfaction with a slight preference to offline learning.

4.3. Discussion

The study results show that offline learning has been shown to be more engaging and interactive mostly because of the real time nature in terms of body physical presence in a structured classroom setting. Face-to-face environments will ensure that there is direct communication between the students and instructors and questions can be answered as well as any misunderstandings can be cleared in real-time. Eye contact, gesture, posture, and facial expressions are non-verbal communication tools that allow to improve the level of understanding and retain attention. These factors help to make the classroom dialogue richer and collaborative learning productive. Physical closeness also encourages the peer bonding, collaborative effort, and improvised academic conversation, which have a positive recovery to the engagement rates and retention levels. The disciplined and guided program also promotes discipline and attendance among the students. Conversely, online learning is far much better than offline learning in regards to accessibility and flexibility. Online systems enable students to get course content, lectures, and tasks virtually in any geographical location without geographical and transport restrictions. The flexibility will allow the learners to study at their own convenience based on their personal schedules and make education more accessible to working professionals and students in the distant regions. Online, it is also possible to benefit repetition of learning resources and thereby improve revision and self-directed learning. Nevertheless, in spite of these benefits, online environments may have obstacles of lack of real-time communication, technological issues, and lower levels of social presence, which can be

limiting in terms of engagement and retention. All in all, the discussion points to the fact that, even though offline learning is superior in terms of interpersonal interaction and organized interaction, online learning has shown to be of unparalleled flexibility and access. The two modalities have their strengths and weaknesses implying that balanced or blended learning can be the best learning experience.

5. CONCLUSION

This comparative study would have analyzed and appraised both online and offline learning experience in a coherent and quantitative design utilizing quantifiable performance parameters. The research allowed gaining a full picture of the performance of both learning modalities in a variety of aspects by examining the main parameters, including Academic Performance, Level of Engagement, Quality of Interaction, Retention Rating, Accessibility, and Satisfaction Score. As results have already shown, offline learning retains a relative lead in the fields that are directly connected to interpersonal communication and formal academic settings. Real-time communication and instant feedback, non-verbal and immediate interaction quality, and constant supervision can be attributed to higher levels of engagement, better quality of interaction, and higher retention rates in offline environments. The combination of these elements will lead to collaborative learning, long-range attention, and academic discipline, which both lead to overall effectiveness. On the other hand, online learning is also high in terms of flexibility and accessibility. The capability to study at any place, notes of the lectures being recorded, and one being able to design their own time timetable, provide immense advantages especially to those learners who have geographical, work, or time limitations. The high accessibility score identifies the ability of digital platforms to eliminate the physical aspects and increase educational coverage. Despite the fact that the level of engagement and retention in online learning was lower than that of offline learning, the gap in performance was not on the extremes which suggests that properly designed online systems can deliver competitive performance. The Learning Experience Index (LEI), the summative measure of the weighted performance parameters into a composite score showed that offline learning scored higher on the overall effectiveness measure of 86.9, as opposed to 77.8 with online learning. Yet, the difference identified reduces significantly in case of a reliable technological infrastructure, high levels of digital illiteracy, and improved quality of instructional design. This indicates that most of the restrictions that are linked with online learning are not necessarily part of the modality, but it is affected by the factors of implementation. According to these results, the education systems of tomorrow must focus on the creation of blended learning model that will focus on maximizing the benefits of both online and offline learning. Current digital infrastructure, on-going instructor training, and hybrid curriculum development should be invested in by policymakers and institutions in order to achieve maximum learning results. Altogether, this study provides a viable quantitative assessment model by the use of LEI model and presents practical information which can underpin the data-driven educational planning and institutional decision-making.

REFERENCES

- [1] Allen, I. E., & Seaman, J. (2017). Digital learning compass: Distance education enrollment report 2017. Babson Survey Research Group.

- [2] Anderson, T. (2008). The theory and practice of online learning (2nd ed.). Athabasca University Press.
- [3] Bernard, R. M., Abrami, P. C., Lou, Y., Borokhovski, E., Wade, A., Wozney, L., Walset, P. A., Fiset, M., & Huang, B. (2004). How does distance education compare with classroom instruction? A meta-analysis of the empirical literature. *Review of Educational Research*, 74(3), 379-439.
- [4] Broadbent, J., & Poon, W. L. (2015). Self-regulated learning strategies and academic achievement in online higher education learning environments: A systematic review. *The Internet and Higher Education*, 27, 1-13.
- [5] Clark, R. C., & Mayer, R. E. (2016). E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning (4th ed.). Wiley.
- [6] Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2-3), 87-105.
- [7] Hrastinski, S. (2008). Asynchronous and synchronous e-learning. *EDUCAUSE Quarterly*, 31(4), 51-55.
- [8] Kearsley, G. (2000). Online education: Learning and teaching in cyberspace. Wadsworth.
- [9] Moore, M. G., & Kearsley, G. (2012). Distance education: A systems view of online learning (3rd ed.). Cengage Learning.
- [10] Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. U.S. Department of Education.
- [11] Meyer, K. A. (2003). Face-to-face versus threaded discussions: The role of time and higher-order thinking. *Journal of Asynchronous Learning Networks*, 7(3), 55-65.
- [12] Richardson, J. C., & Swan, K. (2003). Examining social presence in online courses in relation to students' perceived learning and satisfaction. *Journal of Asynchronous Learning Networks*, 7(1), 68-88.
- [13] Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & Education*, 50(4), 1183-1202.
- [14] Tinto, V. (1993). Leaving college: Rethinking the causes and cures of student attrition (2nd ed.). University of Chicago Press.
- [15] Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory Into Practice*, 41(2), 64-70.