

**ABSTRACT**

*All around the world, the entire educational system has failed during the COVID-19 shutdown period, from primary to tertiary levels. The internet's technology for education has become crucial for future economic growth, since a nation's progress can be facilitated by a high level of education. The traditional learning approach has been replaced by a variety of online learning strategies, including remote learning, online learning, web-based learning, and e-learning. Web-based learning is now an important area of focus in educational studies which strengthens critical thinking, increases productivity and provides personalized learning. Unlike classroom learning, using web-based technologies or tools in a learning process offers unparalleled flexibility and allows students to study at their own pace. This paper illustrates the three types of web-based learning: Synchronous, Asynchronous and Blended Mode. Using a qualitative method to collect the data via a questionnaire survey randomly from online learners from different age groups, we compared these three modes based on four factors – flexibility, learning potential, cost and effectiveness. The survey involved 500 students and faculties from schools and colleges in Madurai. The study aims to identify the characteristics of a web based learning mode that supports students' learning needs. We have used statistical methods to check the difference between expected value and observed value. The results show that the students overwhelmingly agreed that the Blended web-based learning mode, which includes an interactive and self-paced learning, is highly preferred because of its high flexibility and the availability of online materials, while a teacher can speed up the learning process or provide more challenging resources as needed. This paper addresses the enhancements which can be done to the various forms of web-based learning that may be made to fully take advantage of the fresh ideas that has been received from the learners and educators. This paper concludes how each method could be integrated with edutainment to achieve a more productive outcome and how they can be implemented to effectively get benefitted of the new strategies.*

**Keywords:** *Web based learning, Web based learning tools, Synchronous, Asynchronous and Blended Mode, Edutainment.*

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## **I. Introduction**

In the past ten years, India's educational system has undergone significant change. How learners participate in the educational content has changed as a result of the introduction of blended learning, online courses, and experiential learning. In layman's terms, web-based training or computer-based training takes place online or over the internet. This type of training, also known as eLearning, has become increasingly well-liked in recent years as a result of the quick development of information and communications technology. Although web-based learning offers benefits, it shouldn't always be considered the preferred option because obstacles (such insufficient equipment) can readily hinder student learning. Because of this, technology must be used properly and not just because it is new and readily available or because students and teachers have specific expectations for this method of course delivery[1]. Both teachers and students seem to focus most of their attention on online courses. For instance, at least 104 presentations at the 2005 meeting of the Association for Medical Education in Europe covered a range of topics related to online education (WBL) [2]. Web-based training provides learners with the flexibility and convenience to access course content regardless of time or location because the training materials are maintained online. Such contemporary training programs also function on any device, browser, and operating system. Static methods of delivering instruction include learning portals, hyperlinked pages, screen cam tutorials, streaming audio and video, and live Web broadcasts. Threaded discussions, chats, and desktop video conferencing are examples of interactive methods. To establish an efficient e-learning program, an organization should adhere to three basic criteria. They are, a range of media should be used, the experience should be mobile-friendly and social features should be implemented. WBT is

thus one of the most practical, economical, and adaptable training methodologies accessible, especially for big, global corporations.

## II. Objectives

- To identify the characteristics of web-based learning modes
- To examine which web-based mode is the best
- To analyze the strategies to enhance web-based learning
- To discuss how edutainment can be integrated with web-based learning modes

## III. Overview

Web-based training offers unmatched flexibility by enabling employees to learn whenever and wherever they want. WBT can be delivered as self-paced learning, instructor-led virtual training, or a hybrid of the two through a blended learning environment. Based on how each sort of web-based training involves learning, there are three primary categories: Synchronous, Asynchronous, and Blended Web-Based Modes.

### A. *Synchronous Web-Based Mode*

Synchronous type of training is instructor-led and requires in-person interaction between the instructor and students, which most closely resembles conventional face-to-face learning. Synchronous training allows for the simultaneous delivery of instruction to one or more individuals in different places. Students can have a deeper sense of connection to their peers and teacher through synchronous online entire class meetings and well-structured small group meetings, which can also help them stay interested in the course's activities [3]. Webinars, online discussions, conference calls, and online tutoring are a few examples.

Pros:

- Allows structured learning
- Provides direct information
- Offers increased interaction

Cons:

- Students with low studying pace may be held back
- Lack of flexibility

### ***B. Asynchronous Web-Based Mode***

The absolute reverse of synchronous training is asynchronous training. The training materials are available online, and students can use them whenever it is convenient for them. Asynchronous learning provides maximum flexibility because all of the course material is accessible online, allowing students to take it at their own pace and comfort. Online training that is conducted asynchronously lacks real-time guidance. A new, widely used learning model for distant learners can be built on asynchronous interaction [4]. Online tutorials, pre-recorded webinars, and video tutorials are a few instances of asynchronous training.

Pros:

- Highly flexible, as learners can study at their own pace
- More practical type of learning
- More affordable

Cons:

- Limited guidance and communication
- Requires self-discipline

### ***C. Blended Web-Based Mode***

Asynchronous and synchronous aspects are combined in blended learning. It involves in-person learning or online real-time interactions between a student and the instructor. Additionally, some of the training can be completed at one's own pace and according to one's schedule.

Pros:

- Increased accessibility and flexibility
- Instant communication
- Efficient student assessment

Cons:

- High cost
- Overload for instructors

Each web-based learning method has benefits and drawbacks of its own. When a learner is not entirely focused on themselves to learn, web-based learning would become unproductive. Therefore,

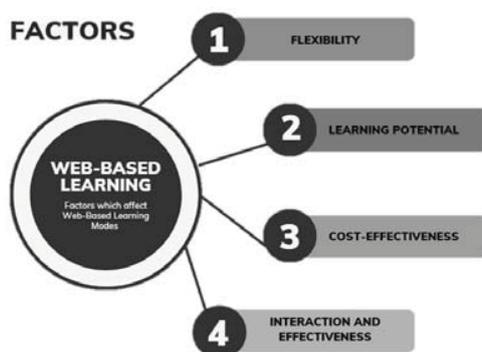
it must be ensured that the student is focused on the teaching and should advance. Therefore, choosing a mode that is best suited for e-learning is essential.

#### IV. Materials and Methods

We used a qualitative approach to get the data by randomly selecting online students from various age groups to complete a questionnaire survey, and we evaluated these three modes based on four criteria: flexibility, learning potential, cost, and effectiveness. About 500 students and faculty members from schools and institutions in Madurai participated in the survey. The goal of the study is to analyze the aspects of a web-based learning environment that meets students' learning requirements. To examine the discrepancy between the expected value and the observed value, we applied statistical techniques.

#### V. Analysis

The respondent in the survey had to specify which web-based learning method they preferred for studying. The individual must also decide why they favor that mode. Four criteria are listed as the basis for their decision to use that particular mode. These factors include how flexible the mode is, how much learning potential is obtained, the cost involved and the effectiveness in interaction in that particular mode. So, each respondent would have chosen their preferred mode and the reason behind their choice. This information is gathered from students and faculty members and is presented as tabular data.



The tabular data gathered indicates that the majority of respondents chose blended mode. The table also makes the following deductions. First of all, it has been discovered that those who have chosen synchronous mode have done so mostly because of its potential for learning given that it involves face-to-face interaction. Second, the main reason why individuals chose asynchronous mode was its increased flexibility. Thirdly,

the criteria for blended mode are selected in accordance with the individual. It can be observed that blended mode largely fits all four requirements. Therefore, the web-based learning mode that is best suited for e-learning is the blended one. The results indicated that perception, self-efficacy, and interaction among students have a strong correlation with outcomes. [5].

#### *A. Chi-Square Test*

A survey was conducted for 500 students to select the best learning mode. The chi-square test was used to further analyze the survey's data. The chi-square test (symbolized as  $\chi^2$ ) of independence determines whether there is a correlation between the two variables' categories. The chi-square test has the following crucial characteristics:

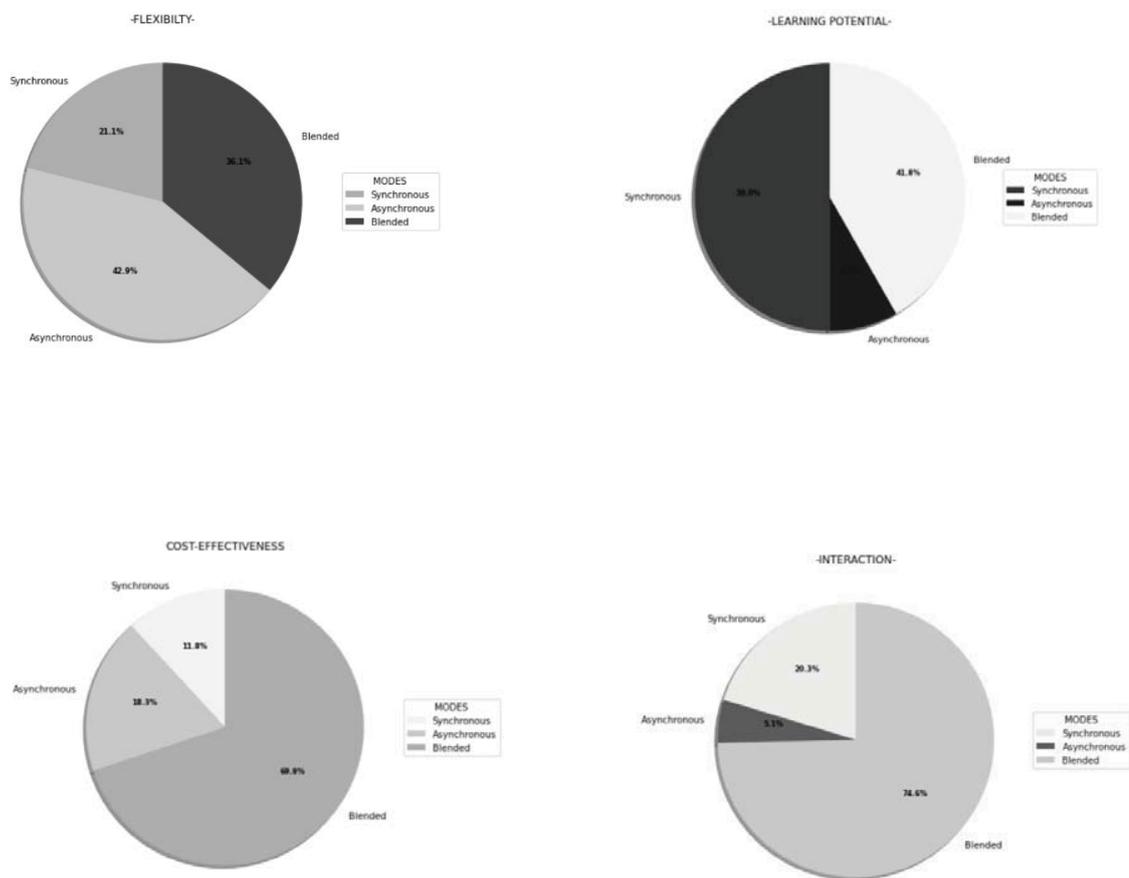
- The variance is equal to the degrees of freedom times two.
- The average distribution is equal to the number of degrees of freedom.
- When the degree of freedom rises, the chi-square distribution curve resembles the normal distribution.

**Table I. Web-Based Learning**

	<b>Flexibility</b>	<b>Learning Potential</b>	<b>Cost-Effectiveness</b>	<b>Interaction and Effectiveness</b>	<b>Total</b>
<b>Synchronous Mode</b>	31 21.10%	61 50.00%	11 11.83%	28 20.29%	131
<b>Asynchronous Mode</b>	63 42.85%	10 8.20%	17 18.28%	7 5.07%	97
<b>Blended Mode</b>	53 36.05%	51 41.80%	65 69.89%	103 74.64%	272
<b>Total</b>	147 100%	122 100%	93 100%	138 100%	500

If the p-value for a Chi-square test is less than or equal to the designated significance threshold, there is enough data to conclude that the observed distribution differs from the expected distribution. In this case, we may say that there is a relationship between the provided category variables. Flexibility, Learning Potential, Cost, Interactivity, and Effectiveness were the four parameters examined.

$$X^2 = \sum z \frac{(Observed\ Value - Expected\ Value)^2}{Expected\ Value}$$



**Fig.1. Web-Based Learning Modes and factors affecting them**

### A. Kruskal Wallis H Test

We were able to get the conclusion that the blended learning mode was superior to the synchronous and asynchronous learning modes by using the chi-square test. To demonstrate that

the blended mode is the most effective, we divided an 80-student class into two separate groups of 40 students at random. Each group spent a total of 20 days using the blended learning technique. All of the students were requested to answer the same questions that had been given earlier at the end of the 20-day period. The Kruskal-Wallis test was performed to compare the results of both survey.

The medians of three or more independent groups are compared using the Kruskal-Wallis test to evaluate whether or not there is a statistically significant difference between them.

This test is the nonparametric equivalent of the one-way ANOVA and is typically used when the normality assumption is violated. The Kruskal-Wallis test does not assume normality in the data and is much less sensitive to outliers than the one-way ANOVA. To conduct a Kruskal-Wallis Test, we can simply enter the values into the Kruskal-Wallis Test calculator.

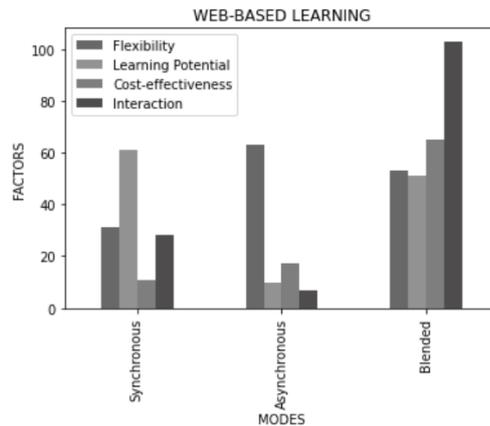
There was a significant difference between the median scores of the two groups. The outcomes were exactly as predicted. Both synchronous and asynchronous learning modes students claimed that the blended method was more efficient.

$$E_R = \frac{n+1}{2} \sigma^2 = \frac{n^2-1}{12} (1)$$

In (1),  $E_R$  represents the expected value of the rankings,  $\sigma$  represents rank variance and  $n$  represents the total sample size.

$$H = \frac{n-1}{n} \cdot \sum_{i=1}^k \frac{n_i \cdot (\bar{R}_i - E_R)^2}{\sigma^2} (2)$$

In (2),  $n$  represents total sample size,  $n_i$  represents the number of cases in group  $i$ ,  $\bar{R}_i$  represents mean rank sum in group  $i$ ,  $E_R$  represents expected value of the rankings and  $\sigma^2$  represents rank variance.



## VI. Discussions on Result

### A. *Enhancing Synchronous Web-Based Mode*

Due to the increased flexibility offered by online courses, many students prefer to enroll in them, particularly in light of the epidemic, when many may find themselves managing work, childcare, and course completion in ways they previously hadn't. However, the pandemic has also made it possible for synchronous elements to be really important for student learning, to meet the course's objectives, or just to enable students to interact with teachers and classmates more effectively. Many of the advantages of traditional training, such as quick feedback and direct group cooperation, are also offered via synchronous learning, while avoiding any of the disadvantages, such as the expense of on-site instructors. To make the most of synchronous learning opportunities, one must create a successful synchronous learning plan that enables them to make use of the numerous tools, approaches, and technologies that are presently available.

The following strategies can be used to enhance web-based learning in synchronous mode. When planning the synchronous event/lesson/course, keep your main goal in mind. Integrate learning and group collaboration activities. Create a manual that students can use as a reference. Focus on learning actively. Include an accompanying visual presentation to the synchronous learning process. Provide a list of important websites, resources, and information about future assignments. To increase engagement, create tutorials or online situations. To facilitate a discussion, seek out volunteers. Encourage students to share their opinions. After the synchronous event, class, or course, make the presentation internet accessible.

The learner can ask questions of their instructor, participate in debates, and take a more active role in their own academic progress when the format is synchronous. These in-person interactions can improve learning and provide for a more enjoyable experience for the learner.

### ***B. Enhancing Asynchronous Web-Based Mode***

In the online learning environment, asynchronous strategies that provide students the opportunity to complete their coursework or participate in a conversation at different times are quite beneficial. The increased visibility of individual learning and thinking is a significant advantage. Instructors and teaching assistants can use the extra time to create insightful and focused feedback. When events don't go as expected, these methods also offer flexibility. Asynchronous learning activities are characterized by the absence of simultaneous student participation. Effective asynchronous activities foster a succession of conversations between teachers and students, unlike some tasks, such as watching recorded mini-lectures and taking online quizzes. This learning enables students to learn at their own pace and completely absorb the material before moving on, in addition to giving them the freedom to access information and schoolwork whenever it is most convenient for them.

The following strategies can be used to enhance web-based learning in asynchronous mode. Include a variety of eLearning activities such as video presentations, audio narratives, interactive scenarios, and text-based modules to not only offer variety to the course content but also to enhance learning. Motivate individuals by using stories and examples from the real world. Lend them a helping virtual hand and provide them with an alternative type of aid that takes care of their worries and responds to their important questions. Make bite-sized modules out of lengthy eLearning sessions. Foster group cooperation to offer peer-based help. Include tests or quizzes to monitor students' knowledge and development. They can assess their own development this way as well, which provides them the chance to modify poor learning habits and strengthen their areas of weakness. Use writing prompts to deepen overall understanding of the readings. Provide an online facilitator to oversee and direct the eLearning process. Feedback should be strategic and interactive. Create exercises that promote critical thinking in students. Be constant in email updates and/or communications. Strike a balance between being entertaining and being educational. The majority of highly effective asynchronous e-learning programmes provide enjoyable activities and amusing content, but learning should always be the main focus.

The main idea behind asynchronous learning is that during asynchronous online sessions, students can access their lessons at any time. In an asynchronous class, students can internalize material in a variety of ways, such as by devoting more time to challenging material and rushing through simpler ones. In asynchronous classes, where teachers are unable to personally evaluate

students' preparation, online interaction is essential. This form of instruction also requires a great deal of initiative and self-motivation, particularly if a student is having trouble with a particular subject.

### ***C. Enhancing Blended Web-Based Mode***

The "classroom-only" method is evolving, and distance and cost are no longer barriers to online instruction. Although most firms are not completely switching to online learning in favor of the traditional forms, blended learning is becoming the favored method. Companies are deciding on blended learning because they understand that traditional, non-interactive online or face-to-face training sessions no longer work to ensure that corporate learners have access to the skills and knowledge necessary to satisfy organizational goals. While each approach has pros and cons, blended learning outperforms other learning strategies by making instruction delivery efficient and goal-oriented from the start.

The following strategies can be used to enhance web-based learning in blended mode. Establish the course's interactivity by figuring out how much content will be completed online and how much in the classroom. The students can examine pre-recorded lectures in their free time by using a flipped classroom, and they can discuss and do assignments in class. Utilize videos in learning and instruction. Group Collaboration and Interaction is essential for a blended learning environment to succeed. It is crucial that students interact with one another as well as with the teacher. Place the learning process in the students' hands. Be deliberate when integrating in face-to-face and online learning. Provide tools and opportunities for collaboration. Make interactive elements like online games and quizzes. Assess participants in new ways. Vary the group work approaches. When it comes to project-based blended learning, responsive education, and other learning objectives, the correct technology can make a significant impact. Look for opportunities to use the mentioned technologies on a daily basis. All of these technologies and not just a single technology will be used to support students' learning.

### ***D. Edutainment***

E-Learning is the future of learning because it makes getting knowledge more enjoyable and convenient. Furthermore, it supports individuals in realizing their desire of receiving an education regardless of their age, occupation, or any other factor that would prevent them from finishing their education or from enrolling in further coursework.

Edutainment is a special combination of education and entertainment that spreads knowledge through a variety of interesting methods. It is a type of entertainment that aims to both entertain and educate. Edutainment often aims to educate its audience by incorporating lessons into a well-known type of entertainment, such as television shows, video games, multimedia tools, and so on. The major purpose of it is to create an inspiring learning environment for effective training. By establishing connections and fostering empathy through stories, one can arouse the learner's interest. A story-based eLearning course with characters helps to the learner can identify with will keep him interested the entire time.

Combining entertainment with education in blended mode doesn't reduce the value of eLearning; on the contrary, it encourages a warm, fun, and informal learning environment. When eLearning is entertainment-based, learners are highly engaged, which has the most positive impact on information retention.

### ***E. Web-Based Learning Tools***

An internet browser is used by users to connect to web-based software, also known as web-based applications, which is running on a server (a computer connected to the Internet).The main distinction between a simple website and browser-based software is that the latter offers desktop-style back-end capability via the front end of your web browser.The most important phases in creating an efficient educational website are to conduct a needs analysis, define goals and objectives, identify technological resources and requirements, and assess pre-existing software to see if it completely satisfies the demands[6].Through the Internet, web-based learning tools offer integrated environments of multiple technologies to serve various educator and learner demands[7].

One of the main advantages of browser-based applications is that, unlike desktop applications, you are not required to buy a large piece of software that you later install locally on your computer.Updates are also made to web-based applications. The following are some examples of Web-Based Apps.

**a) Kahoot:** Kahoot is a platform for game-based learning that enables you to make entertaining educational games. You can create quizzes on any subject and in any language, and you can include videos, diagrams, and images to personalize them.

**b) Edpuzzle:** We can make interactive video lessons with embedded audio notes, tests, and quizzes with Edpuzzle.Its analytics tool enables you to track how students are watching your videos and if they understand the content.

**c) Quizzizz:** With the help of the web-based assessment tool Quizzizz, you may give students quizzes on the social sciences, computer science, technical subjects, and the arts as a timed test or as homework with a deadline.

**d) Animoto:** Animoto is a digital tool that enables you to quickly and from any mobile device produce high-quality videos, motivating students and enhancing academic lessons. The user-friendly and practical Animoto interface enables educators to produce audiovisual content that responds to specific educational demands.

**e) Visme:** Anyone can create presentations, infographics, concept maps, timetables, reports, and more with the online design tool Visme. It has a range of features that both non-designers and designers enjoy using, such as free images and graphics, customizability possibilities, and a simple drag-and-drop editor.

Overall, it seems that both instructor and student attitudes and student learning performance were positively impacted by the WBLTs [8].

## VII. Conclusion

The results indicate that students overwhelmingly agreed that the blended web-based learning mode, which includes interactive and self-paced learning, is highly preferred because of its high degree of flexibility and the availability of online resources, while a teacher can help accelerate the learning process or provide more difficult resources as needed. This article discussed improvements that can be made to the various web-based learning models in order to effectively capitalize on the new suggestions that have been made by students and teachers. This paper finishes by discussing how each technique could be combined with educational entertainment to provide a more fruitful result and how they can be efficiently used to profit from the new strategies.

The instructor must be willing to modify their conception of effective instructional tactics in order to adopt these strategies. And there are definite advantages to revisiting the components of successful blended learning. These strategies have the potential to improve student results while also boosting accessibility and inclusivity, improving the student experience, and increasing involvement. Colleges and universities continue to adapt how they teach with digital tools and resources to offer an engaging, integrated blended learning experience for students when the immediate COVID-19 pandemic and the emergency transition to remote learning are over.

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