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Effectiveness of E-learning among Students of (11th and 12th Standard) in Schools of North and South 24 Parganas Districts of West Bengal

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Abstract
In today's world education without the use of technology is unthinkable. In India, e-leaning industry is growing at a phenomenal pace. The unpredicted event of pandemic (covid 19) has totally changed the way education is delivered at school as well as at college levels. During the pandemic phase students, teachers and administrators of schools were forced to adjust and adopt the extensive use of technology for covering and finishing their curriculum before board examination. This paper, mainly focuses on the present scenario of e-learning ecosystem in higher secondary schools of north and south 24 parganas districts of west Bengal and evaluate its effectiveness relative to students' overall involvement, improvement in academic performance and willingness to adopt themselves within that ecosystem. This paper, focuses on answering some of the very fundamental questions to evaluate the effectiveness of e-learning at higher secondary level schools in these two districts. This paper attempt to figure out, how effective is e-learning on various subjects being taught in higher secondary schools, does effectiveness differ based on genders, variation in learning patterns among urban and rural students, what are the bare minimum technological infrastructure required for effective delivery of e-leaning facilities to students, so that the overall performance of students can be uplifted.

Keywords: education , e-learning, technology, effectiveness, student, t-test, ANOVA

1. Introduction

E-Learning, very often considered to be an integration of various e-technologies within education, has been a binding force capable of transforming/reshaping traditional learning environments. With the advent of the digital age, the very potential of technology to enhance quality of education and accessibility becomes increasingly evident. According to Kumar and Joshi (2021), "e-learning platforms offer a conducive environment for self-paced learning, particularly for higher secondary students." [1]
According to Sikder, P., & Das, S. (2022), "In today's world, learning is not just limited to the classroom. It has exceeded the boundaries of the classroom and can take place 'anytime' and 'anywhere'. This paradigm has been made possible by sophisticated technologies, including various technology-enabled learning devices." [2]

The case study in hand investigates the effectiveness of various e-learning methods in the school education system of West Bengal, India, specifically the North and south 24 parganas district.

The advancement of e-learning has brought in innumerable opportunities to bring in a revolution in the education system. It offers a well personalized and flexible learning experience, specifically allowing students to access various educational resources and engage with relevant contents at their own pace. It can be noted that, e-learning can limit the digital division among students by providing access to quality education in far flung areas.

It has been observed that previous studies have highlighted the positive impacts of e-learning on outcomes of student's ability for instance, Kar, D. et al. (2014) highlighted that "e-learning platform based on network promote personal knowledge sharing which can improve learning efficiency, facilitate the innovation of knowledge and then enhance the core competitiveness of individual and group" [3]. Yet another study by Mahajan, M. V., & Kalpana, T. (2018) highlighted that "E-learning is increasingly being adopted in higher education. Understanding students' perceptions can inform strategies to improve engagement and effectiveness." [4]

It is to be noted that, the implementation of e-learning in country like India has faced several hindrances. The digital divide, basically characterized uneven access to technology and non-reliant internet connectivity, remains a significant barrier. In addition, inadequate infrastructure, unavailability of proper teacher training, and cultural resistance to technology can obstruct or hinder the effective adoption of e-learning.

In West Bengal, the district of North and South 24 parganas illustrates a unique context for investigating the effectiveness of e-learning. These districts are characterized by a varied and diverse population, comprising of rural, semi-urban and urban areas, with different levels of socio-economic development. Understanding the impact of various aspects of e-learning in such a diverse setting can provide us with invaluable insights into its various potential and limitation.

This paper is aiming to navigate the following study questions:

How effectively can e-learning increase students class engagement, enhance their academic performances, and in turn increase the overall satisfaction levels among students and teachers in the schools of North and South 24 Parganas districts?

Does the implementation of e-learning in these schools have multiple challenges and barriers that can impact the process of implementation?

Can we win over the challenges and maximize the full potential of e-learning in the schools of the targeted districts?

This study will aim to contribute to the vast presence of academic literature on e-learning in our country. The finding will be beneficial to everyone involved directly and indirectly with the school education system in West Bengal and elsewhere in the nation.

1.1 Benefits of E-learning

Understanding the hindrances met in implementing the e-learning technologies, we are with a view that there are numerous benefits of using technology in education, particularly in the districts of North and south 24 parganas. It is to be noted that e-learning platform provide a flexible learning environment, allowing students to learn at their own sweet pace and review or investigate materials as needed. This is mostly beneficial for students who may have not attended classes due to illness or any other unavoidable circumstances.

E-learning Technologies, as it evolves enables a more interactive learning experience through interactive multimedia tools like videos, quizzes, and animation, which are good sources to attract students, engage them and make learning more enjoyable.

It is to be observed that the use of technology and e-learning methods in North and south 24 parganas is showing promise, participating in enhancing student engagement and enriching them by providing access to a wider range of learning materials.

However, hindrances like the digital divide and lack of adequate facilities for teacher training still need to be addressed to ensure equitable access and effective use of technology in education. As the knowledge of e-learning matures, schools at different levels will continue to adopt e-learning methods, policymakers need to focus on means and methods in improving digital infrastructure and providing adequate and sufficient support for both teachers and students to maximize the benefits of the educational approach.

2. Literature Review

Kar, D. et.al. (2014) examined the attitude of university students towards e-learning in west Bengal and found that students at large do have a positive attitude towards e-learning and are ready to adapt digital learning platforms. [3]

Bhuvaneswari and padmanaban (2012) examined the attitude towards e-learning of secondary students of Delhi and found that demographic variables play a significant role for e learning [5]

Kar,S., & Saha, S. (2014) examined whether e-learning has emerged as a significant mode of education, especially in the region like West Bengal. The result indicates that undergraduate students hold a positive attitude towards e-learning with no significant difference with respect to factors as gender, field of study or place of residence. [6]

Sikder, P., & Das, S. (2022) examine the corelation between students' attitude towards e-learning and their academic performance. The finding indicates a positive attitude towards e-learning among students, with a significant relationship to academic achievements. [2]

Bhurisrestha, S., & Sharma, G. (2022) examined differences in academic performance between male and female students in government and private higher secondary schools concerning e-learning. The findings indicate significant differences in academic achievement based on gender and type of school, highlighting the varying impacts of e-learning. [7]

Sharma, R., & Gupta, S. (2024) examined the implications of students' online experiences and identify differences between online and face-to-face learning. The finding suggests that while certain aspects differ, many learning parameters are similar between online and face-to-face experiences. [8]

3. Objectives of the Study

The study conducted by us will **t**hrow some light in understanding if e-learning can be used as an effective tool to pertain education in schools across north and south 24 parganas districts in west Bengal. The main objectives are as follows:

- To figure out if subjects being taught in the schools of these two districts will be impacted by the introduction of e-learning methodology.
- To figure out if the overall impact of e-learning differs across gender among students of different schools in these two districts.

- To figure out if the overall impact of e-learning varies between the students of schools in urban and rural areas within the examined districts.
- To figure out if e-learning impact changes with the availability of advanced technological infrastructures in different schools.

4. Hypotheses of Study

- $H0_1$: There is no significant difference in the impact of e-learning on different subjects being taught in the schools of these two districts.
- HA_1: There is a significant difference in the impact of e-learning on different subjects being taught in the schools of these two districts.
- $H0_2$: There is no significant difference in the impact of e-learning that differs across gender among students of different schools in these two districts.
- HA_2: There is significant difference in the impact of e-learning that differs across gender among students of different schools in these two districts.
- $H0_3$: There is no significant difference in the impact of e-learning between the students of schools in urban and rural areas within the examined districts.
- HA_3: There is a significant difference in the impact of e-learning between the students of schools in urban and rural areas within the examined districts.
- $H0_4$: There is no significant difference in the impact of e-learning due to changes with the availability of advanced technological infrastructures in different schools.
- HA_4: There is a significant difference in the impact of e-learning due to changes with the availability of advanced technological infrastructures in different schools.

5. Research Methodology

Population

All the school students of standard 11 and standard 12 for the district of north 24 parganas and south 24 parganas, west Bengal

Sample

Sample of 533 student were randomly selected from 4 schools (2 urban and 2 rural) from north 24 parganas and 4 schools (2 urban and 2 rural) from south 24 parganas. The distribution is as given below:

Table 1: District (North 24 Parganas)

	Location	**Male**	**Female**
School1	Urban	32	33
School2	Urban	38	30
School3	Rural	36	34
School4	Rural	37	39

Table 2: District (South 24 Parganas)

	Location	Male	Female
School1	Urban	37	32
School2	Urban	40	37
School3	Rural	32	21
School4	Rural	33	22

Methodology

We applied quantitative research techniques to evaluate the effectiveness of e-learning. A well-structured questionnaire is developed with the help of our student groups to gather primary data for the students of target districts as per as possible. All the participating students were requested to complete the questionnaire very seriously and make sure that no fields are left blank. After the collection of data, weights for each key variables based on the questionnaire is defined and the scale are 1 to 5 or 1 to 3. E-learning effective score is determined by

EES score = Weight of variable $_i$ x score given by the student $_i$

From the sample of 533 students, a student (student $_i$) is randomly selected to participate in the calculation given below:

Table 3

Weight of key variable	Score given by student	EES score
0.3	4	1.2
0.2	2	0.4
0.15	3	0.45
0.15	4	0.6
0.1	3	0.3
0.1	4	0.4
Total EES of student $_i$ =		3.35

So, as per the above table EES for student $_i$ = 3.35 on the given scale.

6. Analysis

For hypothesis (H_1) we apply two-way ANOVA analysis to determine the p-value. This analysis is applied because there is a continuous dependent variable EES score and two categorical independent variables (factors), 1. Districts (North, South), 2. Subjects (multiple).

For hypothesis (H_2) we apply two-way ANOVA analysis to determine the p-value. This analysis is applied because there is a continuous dependent variable EES score and two categorical independent variables (factors), 1. Districts (North, South), 2. Gender (male, female, other).

For hypothesis (H_3) we apply independent t-test to compare the means of two groups (Urban students, Rural students).

For hypothesis (H_4) we apply one-way ANOVA analysis to determine the p-values. This analysis is applied because there is a dependent variable EES score and independent variables Availability of Computers, Internet Connectivity, Smart classrooms with (Levels: High, Medium, Low)

7. Result and Discussion

Testing of H_1

After applying two-way ANOVA, p-value is determined as follows

category($_{district}$), p-value (0.27) > 0.05, category($_{subject}$), p-value (0.25) > 0.05, category($_{district}$) X category ($_{subject}$), p-value (0.44) > 0.05. Since all p-values are greater than 0.05, we fail to reject the null hypothesis. So, there is no significant difference in the impact of e-learning on different subjects being taught in the schools of these two districts.

Testing of H_2

After applying two-way ANOVA, p-value is determined as follows

Category($_{gender}$), p-value (0.579) > 0.05, category($_{district}$), p-value (0.613) > 0.05, category($_{gender}$) X category ($_{district}$), p-value (0.209) > 0.05. Since all p-values are greater than 0.05, we fail to reject the null hypothesis. So, there is no significant difference in the impact of e-learning that differs across gender among students of different schools in these two districts.

Testing of H_3

After applying independent t-test, p-value is determined as follows

T-statistic (0.817) and p-value (0.414) > 0.05. Since p-value is greater than 0.05, we fail to reject the null hypothesis. So, there is no significant difference in the impact of e-learning between the students of schools in urban and rural areas within the examined districts.

Testing of H_4

After applying one-way ANOVA, p-value is determined as follows

F-statistic (0.178) and p-value (0.847) > 0.05. Since p-value is greater than 0.05, we fail to reject the null hypothesis. So, there is no significant difference in the impact of e-learning due to changes with the availability of advanced technological infrastructures in different schools.

8. Limitation

This study is conducted on a very limited number of subjects and is oriented towards science and English. We have not considered the subjects like Bengali or Hindi in our study. Further elaborate research and analysis need to be conducted to understand the impacts of e-learning in these subjects of literature.

9. Conclusion

This study is an attempt to analyse and examine, whether e-learning enhances

a) Student engagement
b) Academic performance and
c) Satisfaction for learners.

It is to be noted that the study is conducted within a limited sample size of only 533 students spanning two very large districts of west Bengal viz. north 24-parganas and south 24-parganas. From result and discussion, we can deduct that the student's attitude towards e-learning is independent with respect to subjects, gender, urban or rural areas and availability of technological infra structures.

Further study on a larger sample size needs to be conducted for more accurate and precise results. From our study we can conclude that e-learning is beneficial to students across different subjects that we have put in our study. Moreover, students can learn independently and more effectively because of different methodology of e-learning being adopted at different school.

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