

# Rivers

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*Ashok Kumar Bora  
Kasturi Borkotoki*

## **Introduction**

A river system is an integral part of the earth surface and is subject to alterations since long history. Rivers found in different environments show different forms and they have their significant impact on any region. The dynamic form of a river influences its riverine landscape which helps explain the past and the present form of the river. The Brahmaputra and the Barak are the two important river systems of Assam (Figure 6.1) and these rivers drain an area of 5,80,000 sq km and 78,000 sq km, respectively. The Brahmaputra being the largest river of North-East India flows through the heart of the state of Assam by receiving numerous north and south bank tributaries. It serves as a lifeline to the people of Assam. The Barak river, on the other hand, lies to the south of the Barail range and drains the southern part of Assam forming the second largest river in North-East India.

## **Brahmaputra river system**

The mighty river Brahmaputra is an antecedent, trans-boundary river and it traverses over diverse environments of the territories of China, Bhutan, India and Bangladesh having different topographic characteristics. Originating at an altitude of 5,300 m just south of lake Konggyu Tso ( $82^{\circ}10'$  E,  $30^{\circ}30'$  N) about 63 km south-east of the Manasarowar lake in Tibet, it flows for a total distance of 2,906 km from its source to the mouth in the Bay of Bengal. In Tibet, the river flows through steep slopes of young folded Himalayas and traverses parallel to the

## Chapter - 6

### Assessment of Morphometric Characteristics and LULC Pattern of the Leko Watershed, North East India

Dhanjit Deka and Hemanta Kumar Medhi

#### Abstract

A watershed is a most suitable geomorphologic unit for organization of all kinds of human activities and natural processes continuing within it. Knowledge of watershed characteristics becomes an important pre requisite to evaluate the watershed hydrology. The amount of water reaching a stream system is dependent on the morphometry of the watershed, total precipitation, losses due to evapotranspiration and absorption by soil and vegetation. Evaluation of morphometric parameters requires preparation of drainage map, contour map, ordering of streams, measurement of catchment area, perimeter, relative relief, relief ratio, length of streams, drainage density, drainage frequency, bifurcation ratio, texture ratio which further helps in understanding the watershed environment. Similarly, Land use change due to natural causes as well as human interferences is a common phenomenon almost each and every watershed of the Northeast India. The changes that have taken place in the watersheds due to human activities have been accelerated in last few years. Such changes have been identified as the cause of many environmental problems in the region. For this, accurate monitoring and management of land use/ land cover is very much necessary. The present study involves the Remote Sensing and Geographic Information System (GIS) analysis technique to evaluate the morphometric analysis of Leko watershed as well as the monitor the changing pattern of Land Use/Land Cover of the said watershed.

**Keywords:** Watershed, morphometry, environment, LULC change, GIS, Remote sensing

#### Introduction

A watershed is a most suitable geomorphologic unit for organization of all kinds of human activities and natural processes continuing within it. Knowledge of watershed characteristics become an important prerequisite to evaluate the hydrological behaviors of the river and its tributaries [1]. The

# पूर्वोत्तर की जनजातियाँ और उनका लोकजीवन

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इस पुस्तक के सर्वाधिकार सुरक्षित हैं। प्रकाशक या लेखक की लिखित अनुमति के बिना इसके किसी भी अंश को, फोटोकॉपी एवं रिकार्डिंग सहित इलेक्ट्रॉनिक अथवा मशीनी, किसी भी माध्यम से अथवा ज्ञान के संग्रहण एवं पुनर्लिखित प्रणाली द्वारा, किसी भी रूप में, पुनरुत्पादित अथवा संचारित-प्रसारित नहीं किया जा सकता।

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## पूर्वोत्तर की निराली पहचान : असम की नामधरीया संस्कृति

पूजा शर्मा

प्रकृति की रमणीय गोद में बसा पूर्वोत्तर विशाल भारतवर्ष का एक अभिन्न अंग है जो असम, अरुणाचल प्रदेश, मेघालय, मणिपुर, मिज़ोरम, नागालैंड, त्रिपुरा और सिक्किम—इन आठ प्रदेशों का समुच्चय है। नाना जाति-उपजातियों की मिलन-भूमि कहलाने वाला यह पूर्वोत्तर भारतवर्ष के मूल भू-भाग से दूर पर स्थित होते हुए भी प्राचीनकाल से ही सांस्कृतिक दृष्टि से सम्बद्ध रहा है। पुण्यभूमि भारतवर्ष की मूल सार्वभौमिक संस्कृति की अविरल धारा के प्रवाह से यह पूर्वोत्तर सदा प्रेरित-प्रभावित रहा है। 'सात बहनें और एक भाई' के रूप में प्रसिद्ध इस पूर्वोत्तर भारत के उक्त आठों प्रान्तों के निराले एवं वैचित्रपूर्ण समुच्चय में असम प्रदेश का अपना प्रमुख एवं विशिष्ट स्थान है।

ध्यातव्य है कि भारतवर्ष के विशाल फलक पर लगभग तेरहवीं शती से सत्रहवीं शती तक परिव्याप्त अखिल भारतीय भक्ति-आन्दोलन मध्यकालीन धर्म-अध्यात्म-साधना के इतिहास की अन्यतम उल्लेखनीय घटना है। साम्य, मैत्री, दया, करुणा, प्रेम, अहिंसा, सह-अस्तित्व, विश्वात्मबोध एवं लोक-तांत्रिक मूल्यों पर आधारित इस उदात्त भक्ति-आन्दोलन की प्रबल धारा से यह असम भूमि भी आलीड़ित एवं आन्दोलित हुई जिसके कर्णधारों में परम विष्णु-भक्त महापुरुष श्रीमन्त शंकरदेव (ई. 1449—ई. 1568) का नाम बड़े आदर एवं सम्मान के साथ लिया जाता है। प्रसिद्ध धर्म-उपदेशक, क्रांतिकारी समाज-सुधारक एवं प्रतिभाशाली जाति-निर्माता के रूप में श्रीमन्त शंकरदेव ने अपने बहुआयामी व्यक्तित्व और सशक्त नेतृत्व-शक्ति के बल पर 15वीं-16वीं शती के नव-वैष्णव आन्दोलन (Neo-Vaishnavite Movement) का असम में सूत्रपात किया। इसके अंतर्गत

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## Classification of soil types from GPR B Scans using deep learning techniques

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Abstract

Document Sections

- I. Introduction
- II. GPR Data
- III. Methodology
- IV. Results
- V. Conclusion

**Abstract:** Traditional methods for classification of soil types are time consuming, invasive and expensive. A non-invasive method like ground penetrating radar (GPR) provides a suitable way to classify soil types based on its electromagnetic properties. Deep learning algorithms have proven to be an effective tool for features extraction of GPR data. A deep convolutional neural network (CNN) model for automatic classification of soil types is proposed. A synthetic dataset is created using gprMax and used to train and validate the proposed CNN model. The proposed model shows good performance in classifying 7 different soil types from GPR B-Scan images. Upon testing the model on new and unseen data, its accuracy is found to be 97%.

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**Abstract:** Several parameters of a gas sensing chamber influence the overall response of the system. These parameters are related to the dimensions of the chamber and the placements of the sensors inside it. In this work, a gas sensing system with two similar gas sensors along with two well designed orifice plates was designed, and simulated utilizing Finite Element Method. Various models of gas chamber with fixed boundary conditions were simulated to optimize the sensing system. The simulation was performed in three different ways and for eighteen unique arrangements. The angle between the gas sensors with z-axis was varied to calculate the optimised angle of the sensors inside the chamber. The optimised distance between the gas sensors and the optimised dimensions of the orifice plates were also calculated. The optimised model was fabricated and tested for different leaf samples.

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**Abstract:** This paper documents the prediction of two important quality attributes of tea liquor viz. briskness and brightness using process parameters of fermentation room of tea factory. Different machine learning techniques are implemented for this work. Temperature and relative humidity are two important parameters of the fermentation room. These data are collected from the tea factory by the developed instrument during factory hours. Corresponding tea samples are also collected and tea quality is evaluated by tea tasters. This tea quality is a numeric value called overall liquor rating which is a function of different tea quality attributes like briskness, body, brightness etc. This work is an attempt to predict briskness and brightness from the collected factory data by implementing different machine learning techniques viz. k- Nearest Neighbor, decision tree and random forest. Average accuracy, f1-score and recall are found more than 95% for k-Nearest Neighbour, decision tree and random forest in training and validation for both the attributes.

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Nairit Barkataki ; Pranjal Borah ; Utpal Sarma ; Banty Tiru | All Authors

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Abstract

**Abstract:** This study presents the design a 400 MHz CPW-fed bow-tie slot antenna backed by a cavity. The application of UWB signal sources in ground penetrating radar (GPR) is widely recognised. The antennas are first modelled and simulated, and then tested using a VNA. The antenna has a high gain and very good (F/B) ratio. The antenna exhibits resonance at 401 MHz and 421 MHz and has a measured bandwidth of 47.5%. It has a realised gain of 6.68 dB at 400 MHz.

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- III. Results
- IV. Conclusion

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## Artificial Neural Network based automatic classification of target shapes from GPR data

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Nairit Barkataki; Anirban Bhattacharjee; Sharmistha Mazumdar; Banty Tiru; Utpal Sarma All Authors

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Abstract

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**Abstract:** Identifying and classifying buried artefacts remains a major scientific and technological problem. Shape recognition will aid investigators in classifying buried items and narrowing down areas of interest. An artificial neural network (ANN) model for automated object shape classification using GPR data is developed in this paper. A synthetic dataset is developed using finite difference time domain (FDTD) simulation and utilised to train and evaluate the proposed ANN model. The model performs well in identifying three shapes of cylindrical, rectangular, and triangular objects.

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## Estimation of soil moisture from GPR data using artificial neural networks

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Abstract

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**Abstract:** Soil moisture estimation is essential for understanding the water cycle and its impact on weather and climate. GPR based soil moisture estimation is non-invasive in nature and provides quicker results as compared to standard laboratory approaches. Deep learning algorithms have been shown to be an effective method for extracting characteristics from GPR data. To assess soil moisture, this paper offers a deep artificial neural network (ANN) model. The data set was created using finite-difference-time-domain (FDTD) simulation and is used to train and validate the ANN model. The suggested model predicts soil moisture from GPR A-Scans well, with  $R^2 = 0.998$  and mean average percentage error (MAPE) of 1.23.

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# Aluminium Plate Surface Defect Detection and Classification based on Piezoelectric Transducers

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**Abstract**

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**Abstract:** This paper investigates a detection technique for monitoring the structural health of an Aluminium plate. Inspection of aluminium metal plate surface enables ease of product maintenance and provides warnings to prevent any catastrophic failure. The proposed diagnostic technique enables the detection of surface defects in aluminium metal plates based on piezoelectric transducers. Firstly, the natural frequency response for the plates was obtained using the Finite Element Method (FEM) of simulation. The natural frequency for each defective plate was compared which shows different frequencies for the different defective plates. Secondly, a piezoelectric actuator was used to produce periodic excitation to the aluminium plate, the mechanical impact response is sensed using a piezoelectric sensor. Finally, the sensor responses were used to classify the defects using the K-nearest neighbours (KNN) classification algorithm which yielded an accuracy of 91.75%.

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# Context-Based Clustering of Assamese Words using N-gram Model



M. P. Bhuyan, S. K. Sarma, and P. Sarma

**Abstract** The popularity of mobile devices and the availability of the Internet increase the use of various online platforms for chatting and communicating with others. Due to the use of such platforms, the use of local languages is also increasing because everyone feels comfortable with his/her mother tongue. In this research work, clustering of Assamese words is done by using N-gram models. This clustering is context-based and preserves the contextual information of the words. This Assamese word clustering will help in the development of the Assamese language in Parts of Speech tagging, spell checker, word prediction, etc. In this research work, word clusters are designed using bigram, trigram, and quadrigram models. Words that appear in a particular context are stored in the same list of clusters. A corpus of size almost 600K words is used to design the Assamese word clusters. A similarity score is calculated between two words to keep them in the same cluster. The accuracy of the clustering system is around 60%, and 733 different clusters are extracted with a maximum of 15 words in a cluster.

**Keywords** N-gram · Word cluster · Bigram · Trigram · Quadrigram · Assamese words · Contextual information

## 1 Introduction

Assamese is an officially recognized language mostly spoken in the north-east part of India [1]. Assamese is the first language of Assam, and also it is the official language of Assam, and Assam is an Indian state situated in the north-east region

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of the country. More than 15 million speakers are found in the Assamese language [1]. But, the Assamese language digitization work is not well enough. The clustering of words in the Assamese language is not done till now which is important and useful for other tasks like spell checker design, word sense disambiguation, etc. Word cluster will help to generate suggestions for wrongly typed words, and also it can generate suggestions for the real-word errors, because detection of real-word error is a challenging task, as the word cluster keeps the contextual information of the words, so the clusters help us for generating the suggestions for the real-word errors. Part-of-speech (POS) of the unknown words can also be determined by using the word cluster of the word and the POS of the cluster words. Besides, the Assamese is a suffix rich language, and one root word can form more than 100 forms, and the language is having some matras which change the meaning of the words if the matras are changed. So, this word clustering research work will help the users to correct their sentences in semantic order. Besides, the word clustering can help in machine translation by suggesting the appropriate words and for the search engine; query expansion would be performed by using the cluster of the various words of the query. From the present discussion, it has been cleared that the word cluster will play a vital role in the future development of the Assamese language in the digital world.

Pereira et al. [2] had given a method for word clustering in English. They used the distribution of the words in a particular context, and the grouping of the words were done by their participation in particular grammatical relations among the other words. They represented the words by the relative frequency distribution of the contexts where the words appeared and to measure the similarity for clustering relative entropy of the distributions were used. Ismail and Rahman [3] had designed Bangla word clusters using the bigram, trigram language models. They were able to design around 456 clusters using the Bangla corpus of size 251,897,33 words consisting of 512,391 unique words, and the maximum cluster size was 12. A probability-based similarity measuring technique was used to group the words based on the context in which the words appeared. To check the similarity of two words, they tried to find the left bigram and right bigram of each of the two words and found the common words appearing in the context of these two words. Finally, by trial and error method, they had fixed threshold value for clustering. Two words are assigned to the same cluster if their similarity is greater than or equal to the threshold value. They evaluated their method with the help of five users, and these five users were asked to scale the clusters with numeric grading ranging from 5 to 1. In the grading system, the value 5 was for the highest similarity, and 1 was for the lowest similarity, and on average, the cluster rating 5 was assigned to 425.2 clusters which were around 93% of the total clusters. Besides, there were no clusters assigned the rating value 0. The rest of the paper is organized as follows.

Section 2 describes the related works in word clustering in other languages and the present development status of the Assamese language, Sect. 3 has focused on the proposed method for word clustering, Sect. 4 analyzes the results obtained in the experiment, and finally, Sect. 5 concludes the present research work and proposes the future work for the betterment and application of the present research work.

## 2 Related Works

Hunsa et al. [4] have proposed a framework for word clustering using a higher-order N-gram language model in Bangla. They have implemented a system that can generate different word clusters. In the higher-order N-gram model, they have used bigram, trigram, 4-gram, 5-gram, and 6-gram model for word clustering. The model was able to give an accuracy of around 89%. Similarly, Saha et al. [5] have used the trigram, 4-gram, and 5-gram model for Bangla word clustering. They have used a Bangla corpus of size around 1 lakh words. They have calculated the similarity measure among the words and assign the clusters using some threshold value. The trigram, 4-gram, and 5-gram models were able to form 2215, 3327, 5730 clusters, respectively. They have obtained accuracy for strong similarity 88%, 91%, and 93% for trigram, 4-gram, and 5-gram models, respectively. From their experiment, it is cleared that higher-order N-grams show the better result in clustering than the lower-order N-gram models. Mori et al. [6] have described a class-based N-gram model. They have used a greedy search method for clustering. They were able to design the clusters for English and Japanese with low perplexity.

Goldberg [7] has proposed a method for clustering of the words for part-of-speech tagging. He has designed the clusters based on the behaviors of a tagger instead of using the distributional similarity. His clusters' accuracy was comparable with the traditional distributional clustering. He has used combined features to improve cluster accuracy. He has shown his method for English, French, German, and Italian language. Testing was done for both in-domain and out-domain text data.

Brown et al. [8] proposed a class-based N-gram model for natural language processing. They have introduced the problem of prediction of words by observing the previous word. They have used the statistical models and frequency of co-occurrence of a word with other words to assign a particular class. They were able to cluster the words either by syntactically or semantically depending on the behavior of the statistical rules.

Lin and Wu [9] presented a simple distributed version of the  $K$ -means algorithm for the clustering of phrases that worked as features for the discriminative classifier. For the evaluation of their method, they have applied the clusters for named entity recognition and query classification. In both cases, they have found improvement in comparison with the other techniques.

Wohiduzzaman et al. [10] designed a recommendation system for the Bangla news article. They did the clustering of the news articles; they have used anaphora resolution for better keyword frequency. They have calculated tf-idf and cosine similarity to make the recommendation. They have designed a tagging model by which they were able to tag six different tags. On the other hand, Ritu et al. [11] have measured the performance of the various word embedding techniques in Bangla by checking the various word clusters formed by the models like word2vec in tensor flow, FastText, and word2vec in Gensim. They had found the Skip Gram and FastText model showing better results in their dataset. Umi et al. [12] have designed a method for stemming Bangla words by using N-gram models. They have used context-based

similarity to identify the root words. They have implemented the 6-gram model and are able to achieve an accuracy of 40.18%.

Bhuyan and Sarma [13] have proposed a model for the automatic formation of Assamese words and their termination. Besides, they proposed the correction mechanism for the words containing errors. They did experiments and calculated the sentence probability using the N-gram models. They concluded that the bigram and trigram models are sufficient for such work in the Assamese language. Bhuyan and Sarma [14] designed an N-gram model which could predict the word during the formation, and also their model was able to generate the next words after a given word in Assamese. This method was a fast text generation technique in the Assamese, and also they calculated the keystrokes saving for different pre-configured and users' sentences, and a significant amount of improvement was found in their experiment. Bhuyan and Sarma [15] have given a statistical model for the correction and detection of spelling errors in the Assamese. Besides, they have considered a confusion set of 14 different Assamese characters whose pronunciations are the same, but their glyphs are not the same. They have tried to find the errors in words by using bigram and trigram models. Finally, they concluded that their model would help the school students to learn the correct spelling of the Assamese words with the help of computers. Bhuyan and Sarma [16] have designed a method using higher-order N-gram models for the prediction of the next word in sentences containing ambiguous words, and the model was able to improve the accuracy around 6% than the earlier model. Bhuyan and Sarma [17] have performed one experiment to know how the prediction list length effects on the accuracy of prediction of Assamese words, and they have found a variation of accuracy with length, and finally, they proposed prediction list length five or six as optimum length, depending on the size of the word predictor screen. Bhuyan et al. [18] have designed a method for information retrieval in the Assamese using WordNet and Assamese Wikipedia. The model was consisting of three modules, viz. structure query, query expansion using WordNet, and information extraction using Assamese Wikipedia. Rahman et al. [19] have designed a model which was able to utter the Assamese printed numerals to its corresponding utterance; the model was able to read up to four digits of Assamese numerals, and the numerals were pronounced by using Google speaker.

From the above literature survey, it is cleared that word clustering is necessary for the digital development of a language, and also the various works toward the development of the Assamese language are going on. In such a situation, the Assamese word clustering will speed up the digitization of the Assamese language by providing support from different aspects. The next section describes the methodology used for Assamese word clustering.

### 3 Proposed Method

A corpus of size around 600K words is used for this purpose. The corpus is containing text from literature, science, novel, newspaper, magazine, etc. From the corpus

bigram, trigram and quadrigram of each unique word are taken and stored in a separate list of bigram (left\_bigram and right\_bigram), trigram (left\_trigram and right\_trigram), and quadrigram (left\_quadrigram and right\_quadrigram) corpus. In other words, the bigram corpus for a word  $w_i$  all the occurrence of  $w_i x$  and  $y w_i$  are stored, and here,  $x$  is all words which appear after  $w_i$ ; similarly,  $y$  is all the words which appear before the word  $w_i$ . Using the same method, the trigram and quadrigram corpora are designed. Besides, these corpora also keep the records of the frequencies of occurrences of each bigram, trigram, and quadrigram pair. The similarity score between a pair of words  $w_i$  and  $w_j$  is calculated by using the following equations.

### 3.1 Similarity Score Calculation

The similarity score between the two words is calculated using the bigram, trigram, and quadrigram model which is described in the following subsections.

#### 3.1.1 Bigram Model

$\text{Left\_score}_{\text{bigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\text{Left\_score}_{\text{bigram}}(w_i, w_j) = \frac{\text{size of}(\text{Left\_bigram\_list}(w_i) \cap \text{Left\_bigram\_list}(w_j))}{\text{size of}(\text{Left\_bigram\_list}(w_i))} \quad (1)$$

$\text{Left\_score}_{\text{bigram}}(w_j, w_i)$  is the similarity between the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\text{Left\_score}_{\text{bigram}}(w_j, w_i) = \frac{\text{size of}(\text{Left\_bigram\_list}(w_i) \cap \text{Left\_bigram\_list}(w_j))}{\text{size of}(\text{Left\_bigram\_list}(w_j))} \quad (2)$$

$\text{Right\_score}_{\text{bigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\text{Right\_score}_{\text{bigram}}(w_i, w_j) = \frac{\text{size of}(\text{Right\_bigram\_list}(w_i) \cap \text{Right\_bigram\_list}(w_j))}{\text{size of}(\text{Right\_bigram\_list}(w_i))} \quad (3)$$

$\text{Right\_score}_{\text{bigram}}(w_j, w_i)$  is the similarity between the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\text{Right\_score}_{\text{bigram}}(w_j, w_i) = \frac{\text{size of}(\text{Right\_bigram\_list}(w_i) \cap \text{Right\_bigram\_list}(w_j))}{\text{size of}(\text{Right\_bigram\_list}(w_j))} \quad (4)$$

The overall similarity score in bigram model is given by:

$$\begin{aligned} \text{Score}_{\text{bigram}} = & \text{Left\_score}_{\text{bigram}}(w_i, w_j) + \text{Left\_score}_{\text{bigram}}(w_j, w_i) \\ & + \text{Right\_score}_{\text{bigram}}(w_i, w_j) + \text{Right\_score}_{\text{bigram}}(w_j, w_i) \end{aligned} \quad (5)$$

### 3.1.2 Trigram Model

$\text{Left\_score}_{\text{trigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\text{Left\_score}_{\text{trigram}}(w_i, w_j) = \frac{\text{size of}(\text{Left\_trigram\_list}(w_i) \cap \text{Left\_trigram\_list}(w_j))}{\text{size of}(\text{Left\_trigram\_list}(w_i))} \quad (6)$$

$\text{Left\_score}_{\text{trigram}}(w_j, w_i)$  is the similarity between the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\text{Left\_score}_{\text{trigram}}(w_j, w_i) = \frac{\text{size of}(\text{Left\_trigram\_list}(w_i) \cap \text{Left\_trigram\_list}(w_j))}{\text{size of}(\text{Left\_trigram\_list}(w_j))} \quad (7)$$

$\text{Right\_score}_{\text{trigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\text{Right\_score}_{\text{trigram}}(w_i, w_j) = \frac{\text{size of}(\text{Right\_trigram\_list}(w_i) \cap \text{Right\_trigram\_list}(w_j))}{\text{size of}(\text{Right\_trigram\_list}(w_i))} \quad (8)$$

$\text{Right\_score}_{\text{trigram}}(w_j, w_i)$  is the similarity between the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\text{Right\_score}_{\text{trigram}}(w_j, w_i) = \frac{\text{size of}(\text{Right\_trigram\_list}(w_i) \cap \text{Right\_trigram\_list}(w_j))}{\text{size of}(\text{Right\_trigram\_list}(w_j))} \quad (9)$$

The overall similarity score in trigram model is given by:

$$\begin{aligned} \text{Score}_{\text{trigram}} = & \text{Left\_score}_{\text{trigram}}(w_i, w_j) + \text{Left\_score}_{\text{trigram}}(w_j, w_i) \\ & + \text{Right\_score}_{\text{trigram}}(w_i, w_j) + \text{Right\_score}_{\text{trigram}}(w_j, w_i) \end{aligned} \quad (10)$$

### 3.1.3 Quadrigram Model

$\text{Left\_score}_{\text{quadrigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\begin{aligned} & \text{Left\_score}_{\text{quadrigram}}(w_i, w_j) \\ &= \frac{\text{size of}(\text{Left\_quadrigram\_list}(w_i) \cap \text{Left\_quadrigram\_list}(w_j))}{\text{size of}(\text{Left\_quadrigram\_list}(w_i))} \end{aligned} \quad (11)$$

$\text{Left\_score}_{\text{quadrigram}}(w_j, w_i)$  of the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\begin{aligned} & \text{Left\_score}_{\text{quadrigram}}(w_j, w_i) \\ &= \frac{\text{size of}(\text{Left\_quadrigram\_list}(w_i) \cap \text{Left\_quadrigram\_list}(w_j))}{\text{size of}(\text{Left\_quadrigram\_list}(w_j))} \end{aligned} \quad (12)$$

$\text{Right\_score}_{\text{quadrigram}}(w_i, w_j)$  is the similarity between the first word  $w_i$  and the second word  $w_j$  which is given by:

$$\begin{aligned} & \text{Right\_score}_{\text{quadrigram}}(w_i, w_j) \\ &= \frac{\text{size of}(\text{Right\_quadrigram\_list}(w_i) \cap \text{Right\_quadrigram\_list}(w_j))}{\text{size of}(\text{Right\_quadrigram\_list}(w_i))} \end{aligned} \quad (13)$$

$\text{Right\_score}_{\text{quadrigram}}(w_j, w_i)$  is the similarity between the second word  $w_j$  and the first word  $w_i$  which is given by:

$$\begin{aligned} & \text{Right\_score}_{\text{quadrigram}}(w_j, w_i) \\ &= \frac{\text{size of}(\text{Right\_quadrigram\_list}(w_i) \cap \text{Right\_quadrigram\_list}(w_j))}{\text{size of}(\text{Right\_quadrigram\_list}(w_j))} \end{aligned} \quad (14)$$

The overall similarity score in quadrigram model is given by:

$$\begin{aligned} \text{Score}_{\text{quadrigram}} &= \text{Left\_score}_{\text{quadrigram}}(w_i, w_j) + \text{Left\_score}_{\text{quadrigram}}(w_j, w_i) \\ &+ \text{Right\_score}_{\text{quadrigram}}(w_i, w_j) + \text{Right\_score}_{\text{quadrigram}}(w_j, w_i) \end{aligned} \quad (15)$$

To get the overall final score, the scores obtained in the bigram, trigram, and quadrigram model are added which is given below:

$$\text{score}_{\text{overall}} = \text{score}_{\text{bigram}} + \text{score}_{\text{trigram}} + \text{score}_{\text{quadrigram}} \quad (16)$$

It has been observed that the simple addition of these three scores (Eq. 16) was not able to show satisfactory results; this is because of assigning the same priority to all



the three N-gram models. Moreover, the higher-order models are more sensitive than the lower-order model and have sparse counts; on the other hand, the lower-order models have robust count. So, a weighted combination of these three models is used, and the equation is given below:

$$\text{score}_{\text{FINAL}} = \lambda_1 \text{score}_{\text{bigram}} + \lambda_2 \text{score}_{\text{trigram}} + \lambda_3 \text{score}_{\text{quadrigram}} \quad (17)$$

By trial and error method, the values of  $\lambda_1$ ,  $\lambda_2$ , and  $\lambda_3$  are found as 0.20, 0.30, and 0.50 for this corpus. This weighted model also rescaled the score value in the range of 0–4 which was initially in the range of 0–12 according to Eq. (16). The higher-order models are given more importance as they have more contextual information and accuracy will also be higher in such cases. Assigning two words in the same cluster, the  $\text{score}_{\text{FINAL}}$  must be greater than a predefined threshold value and less than the maximum score value. Let us consider the following sentences and understand the clustering of the Assamese words with this example for the words  $w_i =$  প্রদূষণ (pollution) and  $w_j =$  বায়ুমণ্ডল (environment).

Sent<sub>1</sub> = আজিকালি নগৰত যান বাহনৰ ফলত **প্রদূষণ** বহুত বাঢ়িছে।

Sent<sub>2</sub> = **প্রদূষণ** পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ এক ভাবুকি।

Sent<sub>3</sub> = **নগৰত** যান বাহনৰ ফলত **বায়ুমণ্ডল** দূষিত হৈছে।

Sent<sub>4</sub> = **বায়ুমণ্ডল** বহুত দূষিত হোৱাৰ এটা প্ৰধান কাৰণ হ'ল যান বাহন।

Left\_bigram\_list of  $w_i$  is {ফলত}, Left\_bigram\_list of  $w_j$  is {ফলত}.

Right\_bigram\_list of  $w_i$  is {বহুত, পৃথিৱীৰ}, Right\_bigram\_list of  $w_j$  is {বহুত, দূষিত}.

Considering Eq. (1)

$$\text{Left\_score}_{\text{bigram}}(w_i, w_j) = \frac{\text{size of}(\text{Left\_bigram\_list}(w_i) \cap \text{Left\_bigram\_list}(w_j))}{\text{size of}(\text{Left\_bigram\_list}(w_i))}$$

$$\begin{aligned} \text{Left\_score}_{\text{bigram}}(\text{প্রদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{\text{ফলত}\} \cap \{\text{ফলত}\}) / \text{sizeof}(\{\text{ফলত}\}) \\ &= \text{sizeof}(\{\text{ফলত}\}) / \text{sizeof}(\{\text{ফলত}\}) \\ &= 1/1 \\ &= 1 \end{aligned}$$

Considering Eq. (2)

$$\text{Left\_score}_{\text{bigram}}(w_j, w_i) = \frac{\text{size of}(\text{Left\_bigram\_list}(w_i) \cap \text{Left\_bigram\_list}(w_j))}{\text{size of}(\text{Left\_bigram\_list}(w_j))}$$

$$\begin{aligned} \text{Left\_score}_{\text{bigram}}(\text{বায়ুমণ্ডল, প্রদূষণ}) &= \text{sizeof}(\{\text{ফলত}\} \cap \{\text{ফলত}\}) / \text{sizeof}(\{\text{ফলত}\}) \\ &= \text{sizeof}(\{\text{ফলত}\}) / \text{sizeof}(\{\text{ফলত}\}) \\ &= 1/1 \\ &= 1 \end{aligned}$$

Considering Eq. (3)

$$\text{Right\_score}_{\text{bigram}}(w_i, w_j) = \frac{\text{size of}(\text{Right\_bigram\_list}(w_i) \cap \text{Right\_bigram\_list}(w_j))}{\text{size of}(\text{Right\_bigram\_list}(w_i))}$$

$$\begin{aligned}
Right\_score_{bigram}(\text{প্ৰদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{ \text{বহুত, পৃথিৱীৰ} \} \cap \{ \text{বহুত, দূষিত} \}) / \text{sizeof}(\{ \text{বহুত, পৃথিৱীৰ} \}) \\
&= \text{sizeof}(\{ \text{বহুত} \}) / \text{sizeof}(\{ \text{বহুত, পৃথিৱীৰ} \}) \\
&= 1/2 \\
&= 0.5
\end{aligned}$$

Considering Eq. (4)

$$Right\_score_{bigram}(w_j, w_i) = \frac{\text{size of}(\text{Right\_bigram\_list}(w_i) \cap \text{Right\_bigram\_list}(w_j))}{\text{size of}(\text{Right\_bigram\_list}(w_j))}$$

$$\begin{aligned}
Right\_score_{trigram}(\text{বায়ুমণ্ডল, প্ৰদূষণ}) &= \text{sizeof}(\{ \text{বহুত, পৃথিৱীৰ} \} \cap \{ \text{বহুত, দূষিত} \}) / \text{sizeof}(\{ \text{বহুত, দূষিত} \}) \\
&= \text{sizeof}(\{ \text{বহুত} \}) / \text{sizeof}(\{ \text{বহুত, দূষিত} \}) \\
&= 1/2 \\
&= 0.5
\end{aligned}$$

Considering Eq. (5)

$$\begin{aligned}
Score_{bigram} &= \text{Left\_score}_{bigram}(w_i, w_j) + \text{Left\_score}_{bigram}(w_j, w_i) \\
&\quad + \text{Right\_score}_{bigram}(w_i, w_j) + \text{Right\_score}_{bigram}(w_j, w_i)
\end{aligned}$$

$$Score_{bigram} = 1 + 1 + 0.5 + 0.5 = 3.$$

Left\_trigram\_list of  $w_i$  is { বাহনৰ ফলত }, Left\_trigram\_list of  $w_j$  is { বাহনৰ ফলত }.

Right\_trigram\_list of  $w_i$  is { বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ }, Right\_trigram\_list of  $w_j$  is { দূষিত হৈছে, বহুত দূষিত }.

Considering Eq. (6)

$$Left\_score_{trigram}(w_i, w_j) = \frac{\text{size of}(\text{Left\_trigram\_list}(w_i) \cap \text{Left\_trigram\_list}(w_j))}{\text{size of}(\text{Left\_trigram\_list}(w_i))}$$

$$\begin{aligned}
Left\_score_{trigram}(\text{প্ৰদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{ \text{বাহনৰ ফলত} \} \cap \{ \text{বাহনৰ ফলত} \}) / \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) \\
&= \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) / \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) \\
&= 1/1 \\
&= 1
\end{aligned}$$

Considering Eq. (7)

$$Left\_score_{trigram}(w_j, w_i) = \frac{\text{size of}(\text{Left\_trigram\_list}(w_i) \cap \text{Left\_trigram\_list}(w_j))}{\text{size of}(\text{Left\_trigram\_list}(w_j))}$$

$$\begin{aligned}
Left\_score_{trigram}(\text{বায়ুমণ্ডল, প্ৰদূষণ}) &= \text{sizeof}(\{ \text{বাহনৰ ফলত} \} \cap \{ \text{বাহনৰ ফলত} \}) / \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) \\
&= \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) / \text{sizeof}(\{ \text{বাহনৰ ফলত} \}) \\
&= 1/1 \\
&= 1
\end{aligned}$$

Considering Eq. (8)

$$\text{Right\_score}_{\text{trigram}}(w_i, w_j) = \frac{\text{size of}(\text{Right\_trigram\_list}(w_i) \cap \text{Right\_trigram\_list}(w_j))}{\text{size of}(\text{Right\_trigram\_list}(w_i))}$$

$$\begin{aligned} \text{Right\_score}_{\text{trigram}}(\text{প্রদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ}\} \cap \{\text{দূষিত হৈছে, বহুত দূষিত}\}) / \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ}\}) \\ &= \text{sizeof}(\{\Phi\}) / \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ}\}) \\ &= 0/2 \\ &= 0 \end{aligned}$$

Considering Eq. (9)

$$\text{Right\_score}_{\text{trigram}}(w_j, w_i) = \frac{\text{size of}(\text{Right\_trigram\_list}(w_i) \cap \text{Right\_trigram\_list}(w_j))}{\text{size of}(\text{Right\_trigram\_list}(w_j))}$$

$$\begin{aligned} \text{Right\_score}_{\text{trigram}}(\text{বায়ুমণ্ডল, প্রদূষণ}) &= \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ}\} \cap \{\text{দূষিত হৈছে, বহুত দূষিত}\}) / \text{sizeof}(\{\text{দূষিত হৈছে, বহুত দূষিত}\}) \\ &= \text{sizeof}(\{\Phi\}) / \text{sizeof}(\{\text{দূষিত হৈছে, বহুত দূষিত}\}) \\ &= 0/2 \\ &= 0 \end{aligned}$$

Considering Eq. (10)

$$\begin{aligned} \text{Score}_{\text{trigram}} &= \text{Left\_score}_{\text{trigram}}(w_i, w_j) + \text{Left\_score}_{\text{trigram}}(w_j, w_i) \\ &\quad + \text{Right\_score}_{\text{trigram}}(w_i, w_j) + \text{Right\_score}_{\text{trigram}}(w_j, w_i) \end{aligned}$$

$$\text{Score}_{\text{trigram}} = 1 + 1 + 0 + 0 = 2.$$

Left\_quadrigram\_list of  $w_i$  is {যান বাহনৰ ফলত}, Left\_quadrigram\_list of  $w_j$  is {যান বাহনৰ ফলত}.

Right\_quadrigram\_list of  $w_i$  is {বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ}, Right\_quadrigram\_list of  $w_j$  is {দূষিত হৈছে, বহুত দূষিত হোৱাৰ}.

Considering Eq. (11)

$$\begin{aligned} \text{Left\_score}_{\text{quadrigram}}(w_i, w_j) \\ &= \frac{\text{size of}(\text{Left\_quadrigram\_list}(w_i) \cap \text{Left\_quadrigram\_list}(w_j))}{\text{size of}(\text{Left\_quadrigram\_list}(w_i))} \end{aligned}$$

$$\begin{aligned} \text{Left\_score}_{\text{quadrigram}}(\text{প্রদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{\text{যান বাহনৰ ফলত}\} \cap \{\text{যান বাহনৰ ফলত}\}) / \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) \\ &= \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) / \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) \\ &= 1/1 \\ &= 1 \end{aligned}$$

Considering Eq. (12)

$$\begin{aligned} \text{Left\_score}_{\text{quadrigram}}(w_j, w_i) \\ &= \frac{\text{size of}(\text{Left\_quadrigram\_list}(w_i) \cap \text{Left\_quadrigram\_list}(w_j))}{\text{size of}(\text{Left\_quadrigram\_list}(w_j))} \end{aligned}$$

$$\begin{aligned}
Left\_score_{quadrigram}(\text{বায়ুমণ্ডল, প্রদূষণ}) &= \text{sizeof}(\{\text{যান বাহনৰ ফলত}\} \cap \{\text{যান বাহনৰ ফলত}\}) / \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) \\
&= \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) / \text{sizeof}(\{\text{যান বাহনৰ ফলত}\}) \\
&= 1/1 \\
&= 1
\end{aligned}$$

Considering Eq. (13)

$$\begin{aligned}
Right\_score_{quadrigram}(w_i, w_j) \\
&= \frac{\text{size of}(\text{Right\_quadrigram\_list}(w_i) \cap \text{Right\_quadrigram\_list}(w_j))}{\text{size of}(\text{Right\_quadrigram\_list}(w_i))}
\end{aligned}$$

$$\begin{aligned}
Right\_score_{quadrigram}(\text{প্রদূষণ, বায়ুমণ্ডল}) &= \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ}\} \cap \{\text{দূষিত হৈছে, বহুত দূষিত হোৱাৰ}\}) / \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ}\}) \\
&= \text{sizeof}(\{\Phi\}) / \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ}\}) \\
&= 0/2 \\
&= 0
\end{aligned}$$

Considering Eq. (14)

$$\begin{aligned}
Right\_score_{quadrigram}(w_j, w_i) \\
&= \frac{\text{size of}(\text{Right\_quadrigram\_list}(w_i) \cap \text{Right\_quadrigram\_list}(w_j))}{\text{size of}(\text{Right\_quadrigram\_list}(w_j))}
\end{aligned}$$

$$\begin{aligned}
Right\_score_{quadrigram}(\text{বায়ুমণ্ডল, প্রদূষণ}) &= \text{sizeof}(\{\text{বহুত বাঢ়িছে, পৃথিৱীৰ সমগ্ৰ জীৱকুললৈ}\} \cap \{\text{দূষিত হৈছে, বহুত দূষিত হোৱাৰ}\}) / \text{sizeof}(\{\text{দূষিত হৈছে, বহুত দূষিত হোৱাৰ}\}) \\
&= \text{sizeof}(\{\Phi\}) / \text{sizeof}(\{\text{দূষিত হৈছে, বহুত দূষিত হোৱাৰ}\}) \\
&= 0/2 \\
&= 0
\end{aligned}$$

Considering Eq. (15)

$$\begin{aligned}
Score_{quadrigram} &= Left\_score_{quadrigram}(w_i, w_j) + Left\_score_{quadrigram}(w_j, w_i) \\
&\quad + Right\_score_{quadrigram}(w_i, w_j) + Right\_score_{quadrigram}(w_j, w_i)
\end{aligned}$$

$$Score_{quadrigram} = 1 + 1 + 0 + 0 = 2.$$

Considering Eq. (16)

$$Score_{overall} = score_{bigram} + score_{trigram} + score_{quadrigram}$$

$$Score_{overall} = 3 + 2 + 2 = 7.$$

Considering Eq. (17)

$$Score_{FINAL} = \lambda_1 score_{bigram} + \lambda_2 score_{trigram} + \lambda_3 score_{quadrigram}$$

$$Score_{FINAL} = 0.2*3 + 0.3*2 + 0.5*2 \text{ [Here, } \lambda_1 = 0.20, \lambda_2 = 0.30, \text{ and } \lambda_3 = 0.50].$$

$$Score_{FINAL} = 2.2.$$

From the above final score value, it is cleared that the two words, viz. *প্ৰদূষণ* (pollution) and *বায়ুমণ্ডল* (environment), are having very good similarity value in their context. It is also very common that the two words *pollution* and *environment* appear in the same context, so they are kept in the same cluster. There are two threshold values in this clustering process: One is minimum threshold  $th_{\min}$ , and the other is maximum  $th_{\max}$ . The maximum threshold value for the final score is 4, and the minimum is found by using trial and error method, for the present clustering system the minimum threshold  $th_{\min}$  0.02. Any two words  $w_i$  and  $w_j$  to assign cluster, following algorithm is used.

**Algorithm: Procedure to Assign Clusters for Any Two Words.**

$C_p$  and  $C_q$  are two-word different clusters.

**Step-1:** if  $w_i$  is NOT in ( $C_p$  and  $C_q$ ) and  $w_j$  is NOT in ( $C_p$  and  $C_q$ )

Calculate  $Score_{FINAL}$ , if the  $th_{\min}$  and  $th_{\max}$  are satisfied to create a new cluster  $C_k$  for  $w_i$  and  $w_j$ .

**Step-2:** else if  $w_i$  is NOT in ( $C_p$  and  $C_q$ ) and  $w_j$  is in  $C_q$ .

Calculate  $Score_{FINAL}$  for  $w_i$  and each word of  $C_q$  if the  $th_{\min}$  and  $th_{\max}$  are satisfied for all the words of  $C_q$ , assign  $w_i$  to the cluster  $C_q$ .

**Step-3:** else if  $w_i$  is IN  $C_p$  and  $w_j$  is NOT in ( $C_p$  and  $C_q$ ).

Calculate  $Score_{FINAL}$  for  $w_j$  and each word of  $C_p$  if the  $th_{\min}$  and  $th_{\max}$  are satisfied for all the words of  $C_p$ , assign  $w_j$  to the cluster  $C_p$ .

**Step-4:** else if  $w_i$  is IN  $C_p$  and  $w_j$  is IN  $C_q$ .

Calculate  $Score_{FINAL}$  for each word of  $C_p$  and  $C_q$  if the  $th_{\min}$  and  $th_{\max}$  are satisfied for all the words of  $C_p$  and  $C_q$ , merge the two clusters  $C_p$  and  $C_q$  form a new cluster  $C_{pq}$ .

else if a few words of  $C_p$  and  $C_q$  satisfy the  $th_{\min}$  and  $th_{\max}$  then create a new cluster  $C_k$  with these criteria satisfying words,

else ignore  $w_i$  and  $w_j$ .

**Step-5:** else  $w_i$  is IN  $C_p$  and  $w_j$  is IN  $C_p$  OR  $w_i$  is IN  $C_q$  and  $w_j$  is IN  $C_q$  Report  $w_i$  and  $w_j$  are already in the same cluster.

**Step-6:** STOP.

## 4 Results and Discussion

The clustering system is tested with the corpus of size around 600K, and different pairs of words are randomly chosen from the corpus, and clusters are designed. There are 733 different clusters designed, and the maximum words in a cluster are 15. To find the accuracy of the clustering system, a manual evaluation is performed by 10 different users who have the depth knowledge of the Assamese language. These 10 users are asked to rate the clusters in the range of 1–10. Table 1 shows the manual evaluation of the clusters.

Table 2 shows the overall rating of the different users in terms of average and percentage. There are average 443.6 and 6.6 clusters rated with the score 10 and 2 respectively which are 60.52 and 0.09% of the total 733 clusters. The clusters rated as 10 are showing very strong contextual similarity. No cluster is rated with the value zero and which implies that almost all the clusters are somehow related in some point of their context.

**Table 1** Evaluation of the clusters by users

Users	User Rating									
	1	2	3	4	5	6	7	8	9	10
U1	0	11	8	4	0	15	22	55	121	497
U2	0	7	8	0	12	10	34	51	87	524
U3	0	10	12	3	7	15	50	62	75	499
U4	0	8	15	5	12	11	25	100	107	450
U5	0	0	0	0	15	10	58	80	70	500
U6	0	6	11	12	20	31	42	71	80	460
U7	0	10	15	20	40	10	33	53	150	402
U8	0	0	0	0	12	50	60	71	120	420
U9	0	4	25	41	23	67	79	125	80	289
U10	0	10	28	43	12	70	80	75	150	265

**Table 2** Overall results of users' rating

Users' rating	User rating									
	1	2	3	4	5	6	7	8	9	10
Average	0	6.6	12.2	12.8	15.5	28.3	45.8	71.2	97	443.6
Percentage	0	0.90	1.66	1.75	2.11	3.86	6.25	9.71	13.23	60.52

## 5 Conclusion and Future Works

The clustering of Assamese words is in the early stage, but it will accelerate the Assamese Language Processing and will be able to attract the researcher of Assamese Language Processing to solve various problems using word clustering. In the proposed method, the three N-gram models, viz. bigram, trigram, and quadri-gram, are shown. The score is calculated by using the contribution of all these three models. The overall accuracy is around 60% which is relatively good and total clusters formed are 733 which are small in the count, but the clusters and the accuracy can be increased by increasing the corpus size which is one of the future directions of this present research work. In the future, the proposed clustering system could be compared by implementing different word embedding techniques for the Assamese language. Moreover, there is a scope in the future to study the various parameters like  $\lambda_1$ ,  $\lambda_2$ ,  $\lambda_3$ , and  $th_{min}$ ,  $th_{max}$ , and their influence on the clusters and the accuracy, and word clustering of other Indian languages can also be a future direction of this research work.

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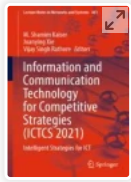
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**Information and Communication Technology for Competitive Strategies (ICTCS 2021)**, pp 59–69

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## Predict Future Events Over Smart Environment Through Modified Apriori Algorithm

[Lipichanda Goswami](#)  [Vaskar Deka](#) & [Manoj Kumar Deka](#)

Conference paper | [First Online: 10 June 2022](#)

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### Abstract

In a smart environment, mining of patterns of occurrences of the past events leads to the prediction of the appropriate event to be occurred as next event. As such, this work is to identify the challenges appearing in smart environment research with respect to finding the pattern of occurrences, followed by a proposed solution. The proposed solution is designed and implemented over the existing Apriori data mining algorithm with certain required modifications to incorporate the time information of occurrences of events. During the implementation of the said modified algorithm, appropriate datasets related to the events of daily activities of the inhabitants of the given environments have been provided; and it is found that the implementation has given the appropriate results with respect to the requirements of the work. Moreover, one more modification over the Apriori algorithm is made for considering all possible subsets of a candidate item set; otherwise impact of the introduction of the time duration information is not up to the level as desired. From the experiment through implementation, it is claimed that the proposed mechanism can choose the next event from the list of predicted events more accurately after inclusion of time duration information between consecutive events.

### Keywords

**Apriori algorithm**   **Smart environment**   **Internet of Things**

**Association rules**   **Frequent item set**

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**Proceedings of International Conference on Frontiers in Computing and Systems** pp 247–254

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## Voting-Based Extreme Learning Machine Approach for the Analysis of Sensor Data in Healthcare Analytics

[Tanuja Das](#) , [Ramesh Saha](#) & [Vaskar Deka](#)

Conference paper | [First Online: 28 June 2022](#)

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Part of the [Lecture Notes in Networks and Systems](#) book series (LNNS, volume 404)

### Abstract

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There has been a huge surge in the production of sensor-based clinical devices for health monitoring systems over the last few years. This sudden spike has been due to many different factors such as development in sensor device technology and also the efforts to promote research that address the necessity for providing new ways for healthcare given the

increasing challenges with an associated degree of an aging population. The processing and analysis of data is an important element of the research of such a system. The data generated from these healthcare devices are enormous and have the potential to ascertain well-being and to encourage effective management of health. In this work, a mechanism for the analysis of physiological sensor data from the healthcare devices, namely voting-based extreme learning machine, has been explored. The approach was also compared with the traditional extreme learning machine-based approach. Experimental results were very encouraging with respect to the performance accuracy as well as time taken by the voting-based extreme learning machine as compared to the traditional extreme learning machine to produce the output.

## Keywords

**Machine learning**      **Sensor data**      **Vital signs data**

**Extreme learning machine**

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# **Online Teaching-Learning**

## Issues and Challenges

Edited By

**Dr. Badan Barman**

**Dr. Kankana Baishya**

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House No. 8, Taranga Path, Krishnanagar

P.O.: Japorigog, Guwahati-781005, Assam, India



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**Badan Barman  
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## Edited By

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## Preface

Women Librarians' Association of Assam (WLAA) was established on 28<sup>th</sup> December, 2019 with the prime notion of societal development along with professional development. The Assam Library Association (ALA) was established on 1<sup>st</sup> January, 1938 and it recognizes WLAA as a division on 29<sup>th</sup> February, 2020. WLAA is a group of women Library professionals of Assam- the first of its kind in India and initiated its journey by inculcating reading habits among children by holding various activities and distributing books in the Children's home.

LIS Links is an academic social networking site for Library and Information Science (LIS) professionals in India. It is the first such network developed in the LIS domain in India and the largest social networking platform for LIS professionals. It was developed on 26<sup>th</sup> February, 2008 and has brought together more than 28,000+ LIS professionals under its umbrella and provides them different kinds of services in various sub-areas of LIS.

Women Librarians' Association of Assam (WLAA) in association with LIS Links organized an online National Seminar on Online Teaching-Learning: Issues and Challenges during September 3-4, 2020. The online event was attended by 179 participants from 28 states of India, Kuwait and Nigeria. The objective of the seminar was to bring to the surface and disseminate the paradigm shift of teaching-learning in the online mode in the realm of Covid-19. Out of the 74 research papers received, 40 papers were selected for publication in the form of an online edited book.

The editors are thankful to all people associated with the seminar especially to the Chairpersons, Co-Chairpersons, Moderators, Rapporteurs, Paper Presenters, Participants and all the stakeholders of Assam Library Association (ALA), Women Librarians' Association of Assam (WLAA) and LIS Links without which this work would not have been possible. We are also thankful to Ms. Phulasmitha Nath, Ms. Manmita Baishya, Miss. Pallabi Devi, Mr. Jiarul Choudhury, Mr. Narender Pal and Mr. Sanjeeb Deka for their all-round support.

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General Secretary  
Women Librarians' Association of Assam

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## E-Certificates Generation by Using Certify'em, Autocrat and Mail Merge

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### *Abstract*

*This paper discusses how to generate E-certificate automatically using the Google sheet generated out of the Google form. While doing any competition or any virtual meet, organizers take the feedback of the programme by way of Google Form and then it is being used to generate the certificate online. This paper discusses three ways to create the E-certificates automatically that can be sent either to the participants through email or upload them in the website of the organization to be downloaded later on by the participants. It discusses Add-on Certify'em in Google Form, integrating Google sheet with Autocrat Add-on and using the traditional Mail merge in MS word.*

**Keywords:** E-Certificate Generation, Certify'em, Autocrat, Mail Merge

**1. Introduction:** There was a time when teachers were gurus and the pupil had to go gurukul to attain knowledge and guru were the ones who used to certify the pupil about the completion of their studies. Gradually, this system changed, and in the new system both students and teachers go to a school or college or university for studies and after passing the examinations, students get their passing certificate in the printed form. With the advent of the digital era now teaching has been shifted to online mode and the certificate provided to the students is also in the digital form.

This is the era of Massive Open Online Courses (MOOCs). Online portals like SWAYAM, Coursera, Futurelearn, Skillshare, Udemy, Edx.org, Udacity are offering various courses on varied subjects. COVID 19 pandemic has increased online learning. Globally educational institutions are closed. The teaching and learning process has changed dramatically. Teachers and students are meeting online and all the evaluation process is online now, be it a quiz or a competition, everything is done using various online platforms. In the same way, organizations are organizing many webinars, lectures, training programmes in online mode. On completion of every course or on attending any virtual meet or after participating in any competition, participation or completion E-certificates is provided to the candidate.

Online learning portals have the in-built E-certificate process and on fulfillment of all the criteria a learner receives the e-certificate. Several softwares are available to generate an e-certificate. The process is tedious as firstly it needs to design a certificate, creating a certificate for each participant, and send it to the individual participant.

**2. Generating E-certificate:** If Add-on like Certify'em and Autocrat are used to generate a certificate, the certificate is automatically sent to the participant via email within a few seconds of filling of the form. But if the mail merge is to be used the certificate is made after the closure of the Google Form. Such a Certificate can either be sent through the email or uploaded alphabetically on the website of the organization. The choice can be made as per the quantity of the certificate to be issued. In case of generating the E-certificates using mail

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merge, there is no limit while generating E-certificates using Add-on like Certify'em and Autocrat the daily limit of Gmail is imposed.

**3. Preparing for E-certificate Generation:** For creating an E-certificate using Autocrat and Certify'em or even through the mail merge feature, an organization or a coordinator must have a Gmail account. If the coordinator has a Google Workspace (previously known as Google Apps and then as G Suite) account then 1500 E-certificates can be sent in a day otherwise the limit is 100 with a regular Gmail account. If the coordinator wishes to create E-certificate using the mail merge feature then MS word, MS Office 2007, or above version should be installed in the PC or Laptop. Access to the website of the organization should also be there to upload the generated PDFs of the E-certificates. The steps of creating the E-certificate are:

**a) Creating a Google Form:** Google Form is one of the tools provided by Google to collect data or to organize quizzes. It is connected through the Google drive of the creator but can also be collaborated with other Gmail account holders. A Google sheet is also generated with the Google form and any information that is filled by the participants in the form is saved in the auto-generated Google Sheet. If the coordinator wants to generate E-certificate for the particular form then providing email should be made mandatory while creating the form. A Google form can be customized in many ways from its appearances to the question types, to the collaborations and access to the users.

**b) Creating a Folder in Google Drive:** A folder should be made in Google Drive to organize the files. The E-certificate template (in the form of Google Doc or Google Slide), Google form, and the sheet generated should be part of that folder. The E-certificate created should also be saved in the same folder. The name of the folder should be in accordance with the name of the programme.

**c) Creating a E-certificate Template:** A certificate template must be designed before the collection of the data. The selection of design purely depends on the personal choice of the organization but few things can be taken care of while designing a template. Color combinations used should be sober and the fonts should be appropriate. The certificate should primarily include:

- i) Logo of all the organizations involved in the programme;
- ii) Full names of the organizations involved in the programme;
- iii) Name of the programme;
- iv) Title of the certificate (either for participation or for merit or any achievement);
- v) Tag for the name and institute of the participants, grades or marks if the certificate is provided for a competition or any other information which is to be provided in the certificate;
- vi) Digital signature of the organizers with their name and affiliations;
- vii) Date of issuing and or a certificate number.

The certificate should be designed using Google Doc or Google Slide and saved in the programme folder in the Google drive. It can also be saved to the PC and Laptop as an MS Word document.

**4. Creating E-certificate Using Certify'em Add-on in Google Form:** Certify'em is a free tool and was introduced in 2017. It can be used to give E-certificates of participation and also of examinations and quizzes. It can be used as an Add-on with Google Form or Quizzes (and extension of Google Form) to provide automatic E-certificates to the participants or to the exam or quiz takers with the grades or numbers of the percentage of passing as a PDF attachment. To create E-certificate using Certify'em the coordinator must have a Gmail account and if it is a regular Gmail account, the Google form will automatically stop taking


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entries on completion of 100 submissions with a customizable message and the link will be again activated after 24 hours.

To generate E-certificates through Certify'em, kindly follow the following steps-

- i) Open the Google Forms;
- ii) Either create a new form or click on the existing one;
- iii) Click on the three vertical dots in the extreme right, click on it and then click on Add-on;
- iv) A window of Google Workspace Marketplace will open, search for Certify'em Add-on and click on the App and install it, it will ask for Gmail account access and some other permissions. Click on allow to proceed further;
- v) After the Certify'em has been installed, close the Google Workspace Marketplace box and return to Google form;
- vi) An icon of Add-on  will be displayed in the menu, click on it and click "Show Certify'em Controls";
- vii) A popup window will be there in the right corner, "Turn on Certification", set passing percentage between 0 to 100, if you are using for the quiz otherwise, keep it 0; Choose from the available templates or the one customized and saved in Google;
- viii) If you want to choose a customized certificate then "Template" from the drop-down menu, choose the "Use of a Custom Template", a pop will appear, select the file from your drive and save the changes;
- ix) If you want to use a customized E-certificate then, after designing the certificate you have to add Identifier Questions. The first identifier question is always "Email Address" which will be used to send the certificate, so make the setting to "This form is collecting email addresses". The second identifier is always the "Full Name" of the participant. You can add many "Identifiers" in the form but you have to add Merge Tag using `{{identifier}}` to the certificate template used. Certify'em has defined Merge Tags and only these tags can be used during customizing an E-certificate (Figure 1);

Merge Tag	Description
<code>{{full name}}</code>	Full name of the exam-taker (from first question in exam, following email collection)
<code>{{title}}</code>	Title of the Google Quiz (this is different than the file name of the Quiz)
<code>{{other identifier}}</code>	The first, optional "other identifier", which follows the full name
<code>{{other identifier2}}</code>	The second, optional "other identifier", which follows the first "other identifier"
<code>{{other identifiers}}</code>	A combination of all available "other identifier" tags, separated by a comma
<code>{{date}}</code>	The date of exam submission in appropriate regional format (e.g. MM/DD/YYYY for USA, DD-MM-YYYY elsewhere)
<code>{{date2}}</code>	The date of exam submission in DD-MM-YYYY format
<code>{{percent}}</code>	The exam-taker's score as a percent (example: 95%)
<code>{{passing percent}}</code>	The percent score required to pass the exam (example: 80%)
<code>{{points}}</code>	The number of points the exam-taker scored
<code>{{points possible}}</code>	The total number of points possible to score in this exam
<code>{{certificate id}}</code>	A 7-digit serial number, unique to this exam and exam-taker
<code>{{other identifier3}}</code> <small>Certify'em Gold &amp; Platinum only</small>	The third, optional "other identifier", which follows the second "other identifier"
<code>{{other identifier4}}</code> <small>Certify'em Gold &amp; Platinum only</small>	The fourth, optional "other identifier", which follows the third "other identifier"
<code>{{other identifier5}}</code> <small>Certify'em Platinum only</small>	The fifth, optional "other identifier", which follows the fourth "other identifier"
<code>{{other identifier6}}</code> <small>Certify'em Platinum only</small>	The sixth, optional "other identifier", which follows the fifth "other identifier"

Figure 1: Merge Tags in Certify'em

- x) Although you cannot use any other identifier in the E-certificate if you want to add some other information like "Name of the Institution" or "Name of the City" you can first write "Other Identifier" in the question followed by the required information. If you want some

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more information you can use “Other Identifier2” in the question followed by the required information. A sample of Google Form is given in Figure 2;

**Figure 2: Google Form for Identifier**

xi) In the certificate template, you have to write {{Full Name}} to include Name and {{Other Identifier}} for the Name of the Institution (Figure 3);

**Figure 3: Certificate Template**

xii) There are some Advanced Options like customizing the message to be sent to the participants along with the PDF of the Certificate;

xiii) You can also select with the certificate attachment should be sent as Image or Pdf

xiv) Once you are done with all the settings just check that “Certification is ON”

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xv) Now your form is ready to be filled and generate automatic E-Certificate.


xvi) A sample of the certificate is attached as Figure 4.



**Figure 4: E-certificate Sample Generated through Certify'em**

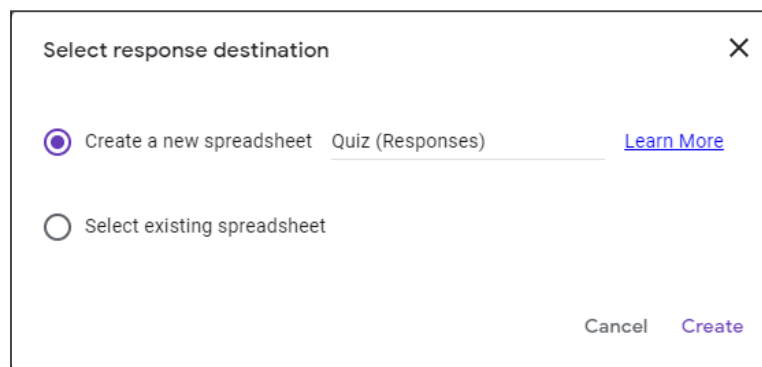
**5. Creating E-certificate by Integrating Autocrat Add-on in Google Sheet:** Autocrat is an App which can be used as a merge tool to automatically create and share the PDFs via email. It is developed by CloudLab. It is an Add-on for Google Sheets. It can be used to create a participation or attendance certificate by integrating it into the response sheet created with Google Form. There are two provisions for sending an E-Certificate via Autocrat i.e. sending the certificate automatically with the filling of form or the send them after the closing date of Form Submission. Choice purely depends on the programme coordinator. The only difference in the settings is running the Autocrat Certificate Generation process before the launch of the form or doing it after the form has stopped collecting responses.

The steps for E-certificate generated by Autocrat is outlined below-

- i) The first step is to open the created folder and customize the E-Certificate which is to be used for the programme. Insert the <<merge tags>> for filling up the personalized information in the E-certificate;
- ii) Now create a Google Form in the form of a Feedback to collect the data. Please remember to collect the information on the fields which are to be used for <<merge tags>>, preferably with the same headings to avoid confusion;
- iii) Now go to the “Responses” of the Form and click on the sheet icon  on the page. A popup window will appear asking about creating a new spreadsheet or selecting an existing Spreadsheet, Open the new otherwise select the second option (figure 5). Select the option and click on “Create”.

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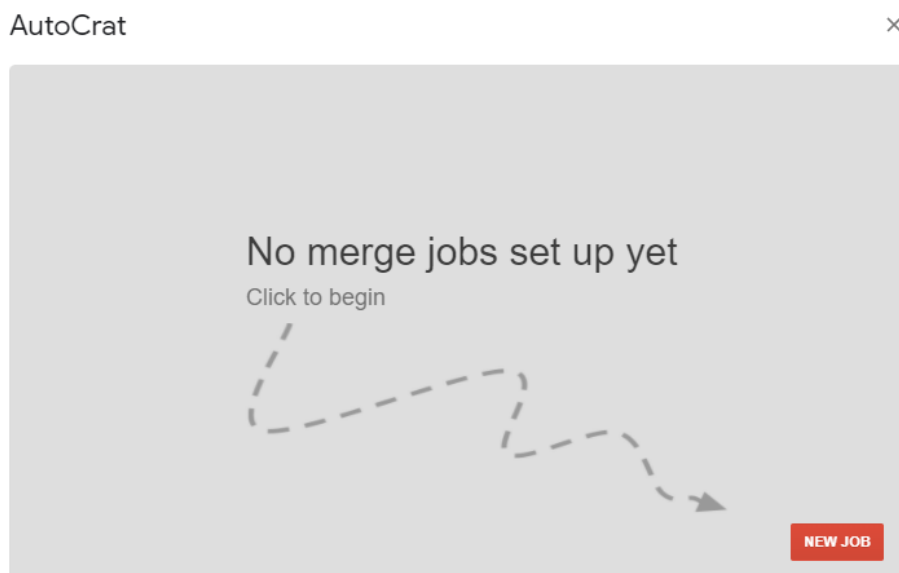


**Figure 5: Opening Response Spreadsheet of Google Form**

iv) Once the Spreadsheet is opened the first thing is to install the Autocrat Add-on. Click on Add-ons → Get Add-ons. The Google Workspace Marketplace window will appear. Find the Add-on Autocrat and install it, it will ask for Gmail account access and some other permission. Click on allow to proceed further. After the Autocrat is installed close the Google Workspace Marketplace box and return to the Spreadsheet.

v) Now again Click on Add-ons → launch Autocrat.

vi) A pop window will appear (Figure 6) click on “New Job”



**Figure 6: Launch of Autocrat**

vii) In the next window, you just have to write the name of the merge job. Click on Next.

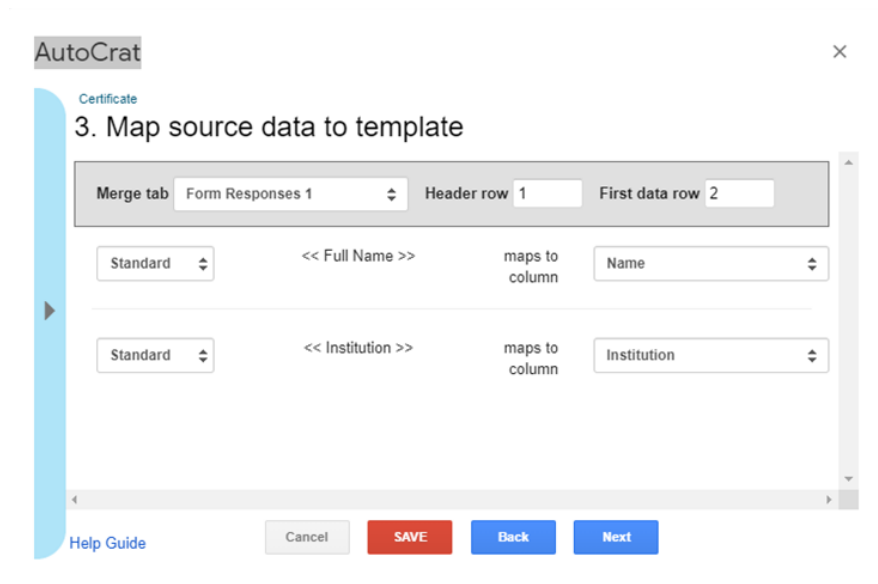
viii) In the next step, “Choose Template”. You can choose Google Slides/doc as a job template from your Google Drive. Click on select “From Drive” and choose the E-certificate template on Google slide/doc created for the programme.

ix) The next step is very important. Here you have to do the Mapping of the tags to names of the respective column in the spreadsheet. Mapping can be done through the drop-down menu (Figure 7).

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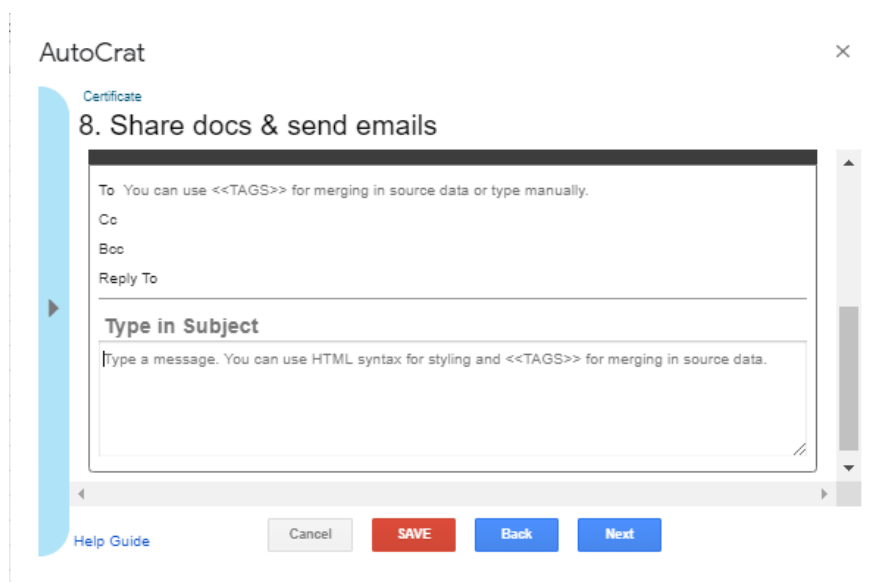


**Figure 7: Mapping of the Tags in AutoCrat**

x) After mapping, click on the Next button and in the next window give the name of the certificate. By this name only, the certificate will be saved and sent to the respective participants. In the “Type”, “Google Slide” is by default but choosing “Pdf” will enable to send the certificate as a pdf attachment. Choose Output as “Multiple output mode (classic mode)” not “Single output mode”, click on next.

xi) For the next step “Choose destination folder(s)” click on choose folder which you have already created in your Google drive. This will enable you to save all the merged docs in that folder only.

xii) You can skip the next two steps: “Dynamic Folder Reference” and “Set Merge Conditions” and press next.



**Figure 8: Share docs and Send Mails**

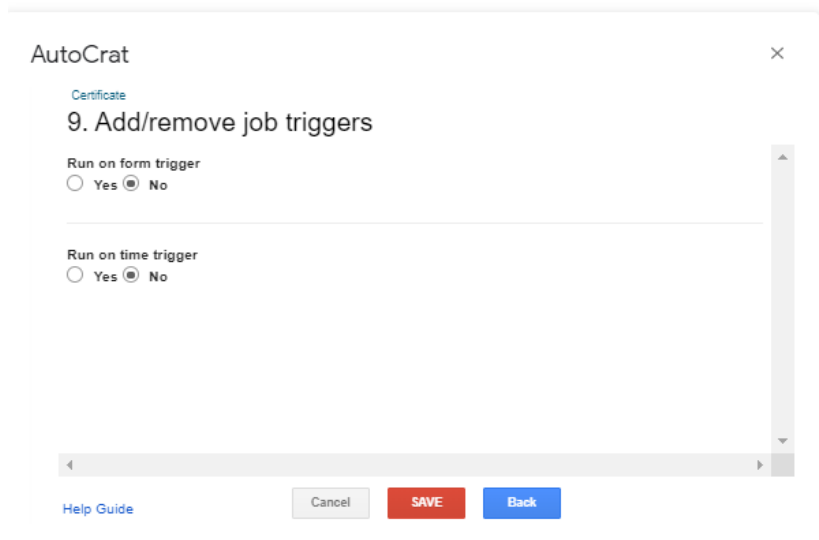
xiii) The next step is again very important. “Share docs and Send Mails” click on “yes”. The window will be extended. For “Allow collaborators to re-share” and “Allow collaborators to re-share” keep “No”. As shown in figure 8 in “To” write the title of the email address column of the spreadsheet in tags <<Email Address>>. Through this the designated email

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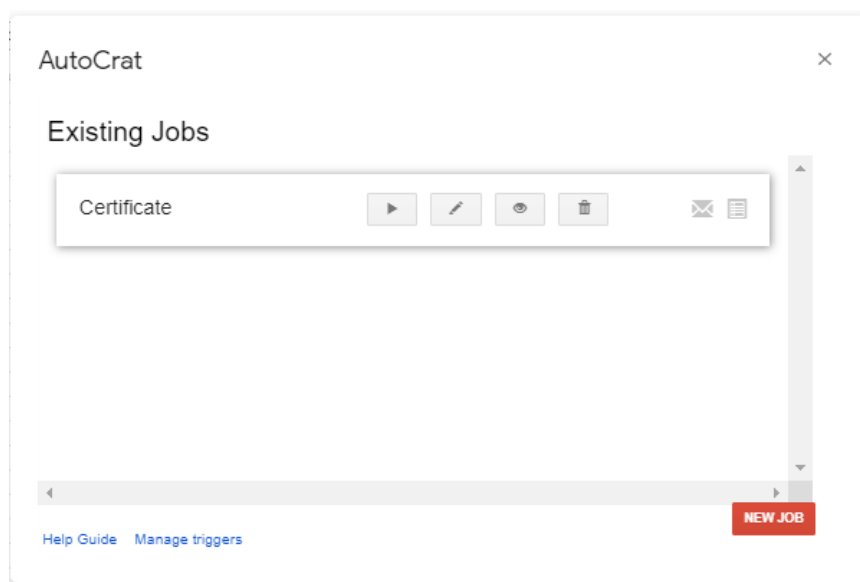
address is selected for the email to be sent to the respective participants. Write the appropriate subject (it's a must) and a message to be enclosed in the Email with the certificate. Now click on next.

xiv) A pop-up window will appear asking "Add/Remove job Triggers". This step is for Running Triggers. Click "yes" to "Run the Form Trigger" and keep "no" for "Run the Form Trigger" (Figure 9), click on Save.



**Figure 9: Running the Autocrat Process**

xv) The last step is to Run, Edit, and preview the Job. Once you save and you have got no error, and your screen will be like figure 10. Now the certificate has been attached to the Google Form. If you have attached the E-certificate to the form before the opening date of Google form, whosoever fills the form will receive the E-certificate but if this step is performed after the closing date of Data collection then click on the play button, merging will start and certificate will be sent one by one.



**Figure 10: Certificate Creation Ready in AutoCrat**

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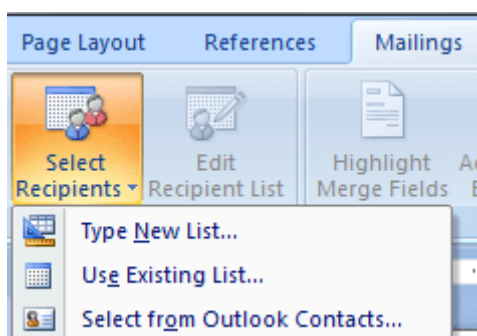


**Figure 11: Sample of the Certificate Generated by Using AutoCrat**

**6. Creating E-certificate by Using Mail Merge in MS Word:** “Mail Merge” is one of the finest features of the MS Word. It simplifies the process of producing personalized documents. Through the Mail Merge feature, one can create personalized documents, be a letter of a certificate, using the data of Excel Sheet, and send through the mail. Creating E-certificate through Mail Merge and saving them as pdf and uploading the list on the website is a very simple task. This method can be used to overcome the daily limit of Gmail. Before starting the process of creating a certificate, a software “Merge and Split” (MS Word Adon) should be installed. It is an add-on which enables us to split the previously merged documents as separate jpg or pdf files.

The steps to create E-certificate by using Mail Merge is provided below-

- i) The first step is creating an E-certificate in MS Word and saving it to the folder created for this purpose. The certificate should have definite places where the data has to be merged like the name of participants or institutions of the participant. Creating a Google form and collecting the data and opening the SpreadSheet is already discussed in the earlier part of the paper. Now, download the spreadsheet as MS excel in the same folder;
- ii) Now click on the Mailing tabs and click to “Select Recipients” and from the drop-down menu select the “Use Existing List” (Figure 12), now open the saved Excel sheet for the folder. Remember the pop-up window may show you many sheets select the one ending with “1\$”;



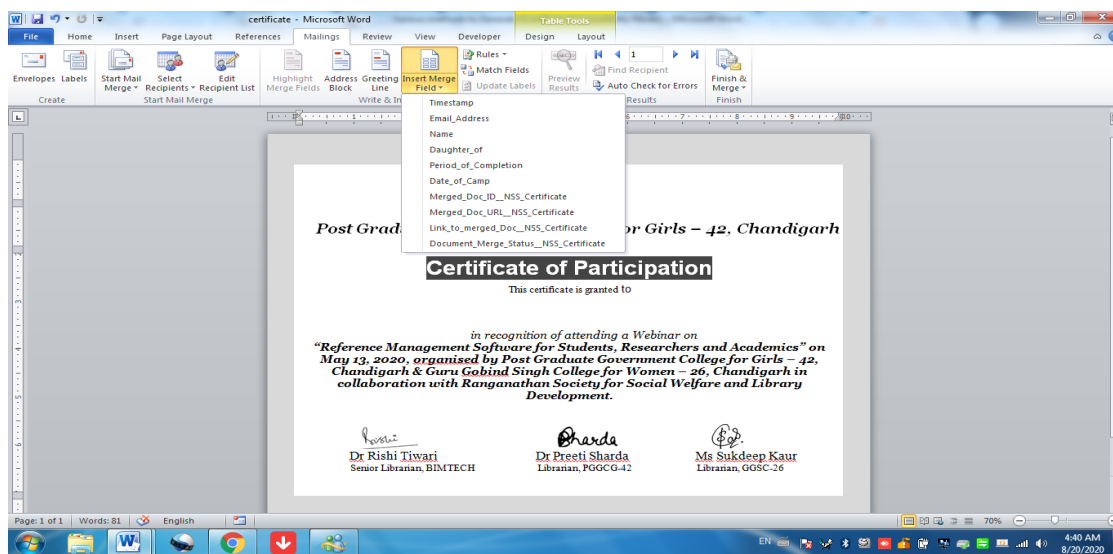
**Figure 12: Merging Excel Sheet with the Template in Mail Merge**

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iii) Now take your cursor where you want to insert the merge field and click on “Insert Merge Field” from the “Write & Insert Field” tab to select the field you want to merge (figure 13). From the drop-down menu select the fields you want to merge. If you want to merge more fields you can repeat this process;



**Figure 13: Merging Field**

iv) In this way, a document will be prepared with the all merge field. You can see the results of the merging on the “Preview Tab”;

v) When we normally use mail merge we run the “Finish & Merge” from the Finish tab and from the drop-down menu, we select the appropriate option either “printing the documents” or “sending the email”s. But since we are making the E-certificates in pdf format, this method won’t work here. We can do two things either creating Pdfs using the “Developer” menu and writing VBA code or to install a small add-on “Merge and Split” in the MS Office. The second option is easier to perform;

vi) If the “Merge and Split” is installed, one more tab will be created in the “Mailings” menu–“Merge & Split”. If you click on Merge & Split, it will ask for the location in which output is to be saved, name of each document has to be saved and format in which document is to be saved. Give the path to the folder made for saving the certificate in “Browse for Folder”, click the name in “Specify the field which contains the text to be used as the file name. Click on “create PDFs” and also click on the “delete document files after PDF creation”. In this way, only PDFs of the certificates will be saved in the specified folder. If you which to send the created E-certificate through email click on Merge to mail as shown in figure 14 (before this, you need to configure your email account in the outlook);

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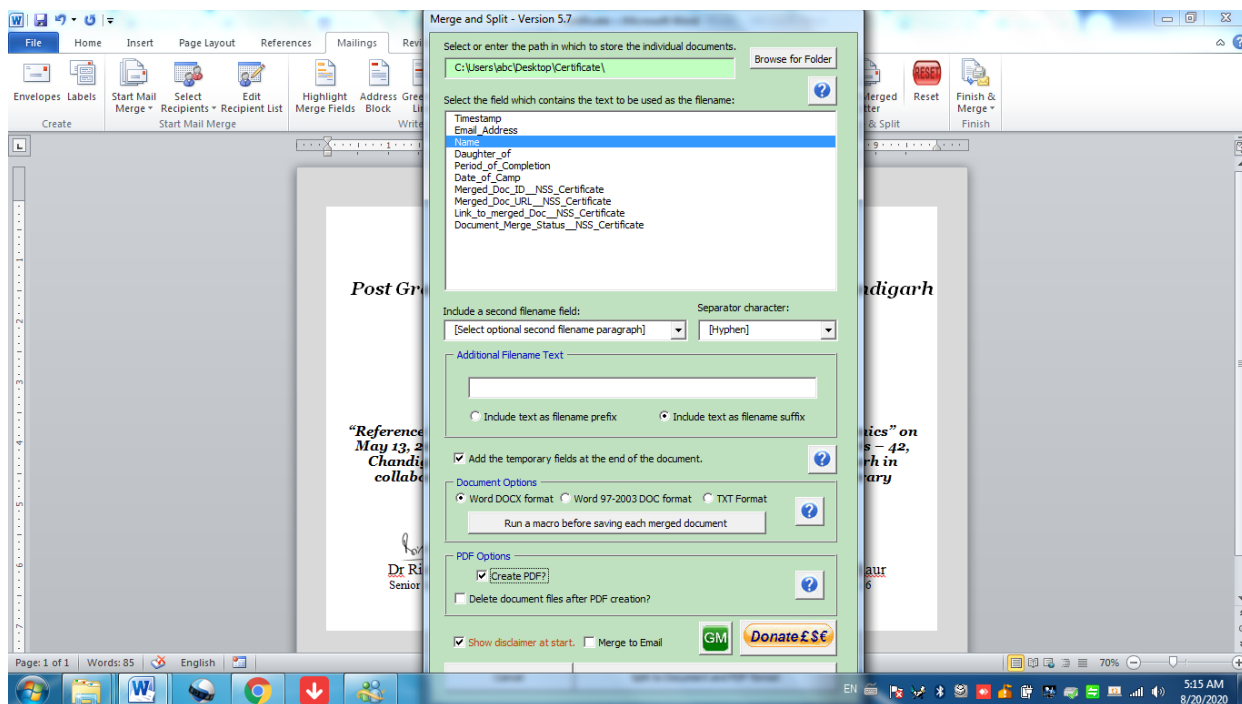


Figure 14: Sending Certificate via Email

vii) Now click on the “Split to Document”;

viii) It will show the list of the merged documents (Figure 15)

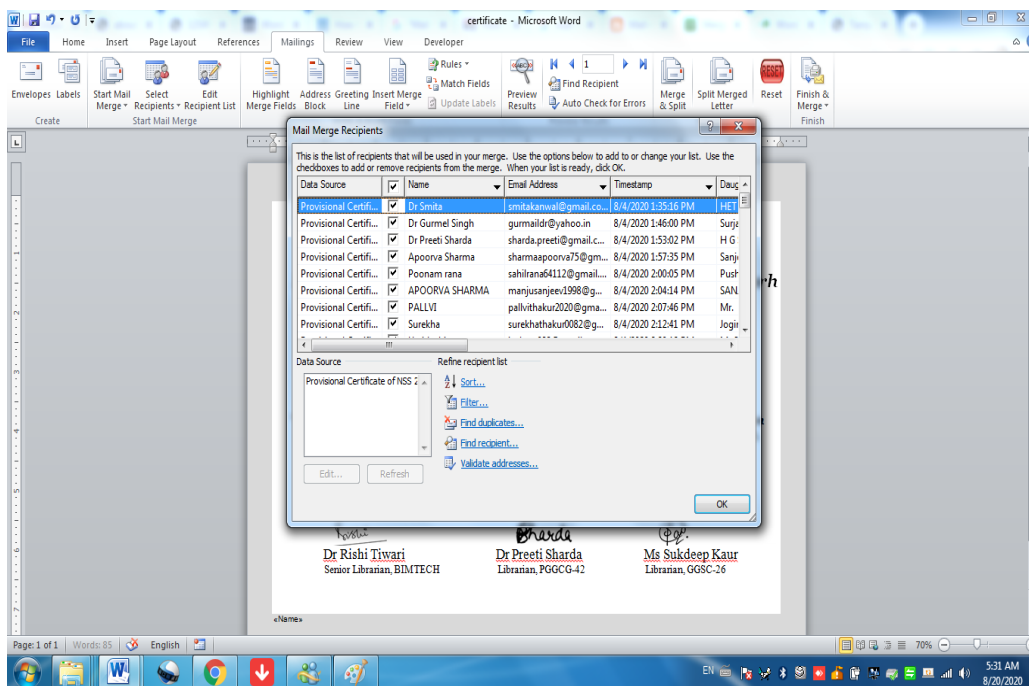
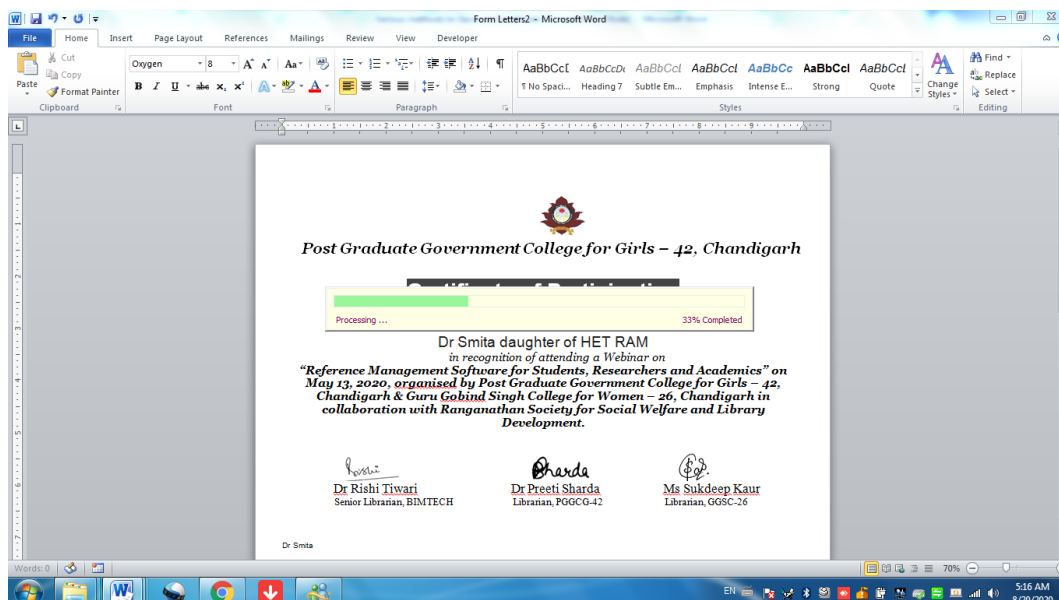


Figure 15: List of the Merged Documents

ix) Click ok and the creation of PDFs will start and all the PDF will be saved in the specified folder (Figure 16).

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**Figure 16: Process of E-certificate Creation through Mail Merge**

x) The PDFs can also be uploaded alphabetically on the website of the organization and participants will be able to download from there.

**7. Conclusion:** Organizing a programme is a very tedious job, be it face to face or online through a virtual platform. Creating certificates is again a big job and requires lots of effort. Participants look forward to the participation certificate. In the face to face programmes the certificate is given immediately after the completion of the programme. If the methods mentioned in the preceding sections are used even participation certificates on the online programmes can be delivered immediately after the programme is over. Initial problems may come while performing these processes but eventually it remains a task of a few minutes. The E-certificates are very important as they reflect the hobbies, interest and it is a proof that someone took part in a significant event.

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## Google Meet: An Online Smart Solution for Teaching-Learning

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### *Abstract*

*As a result of covid-19 pandemic situation, almost all the countries got affected. Educational institutions were closed for the last few months. Millions of children were missing their regular classroom. The situation was overcome by the co-operative efforts of educators & technologists wherein the whole education system was transferred from physical to virtual space. The leading software companies had developed different types of user-friendly E-learning software and mobile applications for video conferencing. Among them, "Google Meet" is a very much popular one. It has many advanced features with lots of advantages which allow it to create meetings, start virtual classes and so on. It also allows live streaming to up to 1,00,000 viewers within a domain. Google Meet is really a smart solution for the virtual teaching-learning processes.*

**Keywords:** *Google Meet, Online Video Conferencing Tool, Webinar Hosting*

**1. Introduction:** As an impact of COVID-19 Pandemic all the educational institutions that include school, colleges & universities are closed across the world. Approximately 1.2 billion children are missing their regular classrooms. As a result, the whole education system has changed overnight dramatically. Physical classrooms are transformed into virtual classrooms in a week. Teachers and educators have adopted the new E-Learning technologies, started teaching-learning processes on digital platforms so that our future generations should not suffer or get deprived of their academic needs due to the Pandemic situations. Many developers and agencies have started to design and develop their own E-learning tools, contents and E-resources and so on. The leading software companies are working to develop or upgrade different types of user-friendly E-learning softwares and mobile applications for video conferencing. Among a good number of video conferencing tools "Google Meet" is a popular one. Millions of people trust in it. According to Oliver Mientz, IT Manager, Burger King Deutschland GmbH "We're big fans of Meet... It's helpful to be able to see every participant. This is extremely helpful these days. All our internal meetings are on (Google) Meet right now as we are all working from home."

**2. Google Meet:** Google Meet is a free video calling app developed by Google. It is very much secure, reliable and a user-friendly video conferencing tool for a ton of users globally. Anyone having a Google account can create a meeting with a limit of 100 participants. Using the "advance features" available to Google Workspace users can start a meeting with up to 250 participants. These advanced features also allow the live streaming to up to 1,00,000 viewers within a domain. The app is available in Android and iOS platforms both. Apart from mobile phones and tablets we can use it over the web also by using browsers in our Desktops and Laptops.

To use Google meet in Android platforms at the very beginning users need to download it from Google Play Store or Apple Store and install it on the Android devices. After installation users can host, join a meeting or share screen easily. For computers like desktop or laptop, users can use any modern web browser like Google Chrome or Firefox to access <http://meet.google.com> directly without the need to install any additional software for this.

The different features available in Google Meet are listed below-

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- a) **Meeting Length:** A normal Google Meet meeting which is available for Gmail users can last for 1 hour. However, it can go upto 300 hours for premium members.
- b) **No. of Participants:** A meeting created by free Gmail users can accommodate 100 participants, however, for premium users it can go upto 250 users.
- c) **Number of Meeting:** Both free as well as premium members can have unlimited number of meetings in Google Meet.
- d) **Joining through Browser:** In the case of Desktop and Laptop, meetings created in Google Meet people can join through the browser. In the case of Mobile phones, people need to download a small piece of software.
- e) **Turn on Captions:** This feature can accurately convert the speech of the presenter into text if the speeches are in English language.
- f) **Recording Meeting:** The audio-visual of the ongoing meeting or classes along with the chat message can be recorded.
- g) **Change Layout:** One can change the visual layout of a meeting on the device screen to Auto, Tiled, Spotlight or Sidebar according to their convenience.
- h) **Full Screen:** This option gives a larger view of the meeting with all the features intake.
- i) **Settings:** To enable or disable some features, we can click the Settings option.
- j) **Participants Attendance:** The attendance of the participants can be collected automatically in Premium version.
- k) **Live Streaming Within Domain:** Meeting hosts can transmit live audio-visual over the internet for the viewers. It supports upto 1,00,000 viewers within the domain.
- l) **Use a Phone for Audio:** To speak and listen on our phone while in an ongoing meeting we can have Google Meet call our phone.
- m) **Report a Problem:** We can report a problem describing the technical issues with the help of the screenshots to the executives of Google.
- n) **Help:** We can take online help in some cases from the Google Meet executives.

In the months of August, September & November 2020, Google has added some new features to the updated version of Google Meet with the aim to support teaching and learning. Some of the new features are as follows-

- a) To manage the virtual classes or meetings Google provides moderators with more controls.
- b) The moderators can accept or reject the participants in bulk without consuming more time.
- c) If a participant has been ejected or denied twice, he/she will not be in a position to join the meeting again.
- d) The “End Meeting” feature will remove all the participants automatically when the class or meeting gets over.
- e) A new smart feature will restrict the participants who try to present and share his device screen in between an ongoing Meeting.
- f) With the new 7x7 grid view feature users can see up to 49 participants at once.
- g) The implementation of the collaborative whiteboard with jamboard is an excellent idea which can encourage students to share their innovative & creative ideas.

Some other interesting features are- replace background option, splitting classes into small groups, hand raising option, Q & A features, temporary recording feature, etc.

Some of the above features are only available from the PC or laptop, for mobile phones users in some cases there are certain restrictions. For example, in the mobile app, users are unable to see the features like- Recording Meeting, Start live streaming, or Change Layout.

To start a new meeting users need to log in to their existing Google account or sign up for free. After that the host user can create or schedule a meeting by going through a calendar which later can be sent or shared to anyone interested for the meeting. The

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participants have to tap the meeting link or enter the meeting code while joining. The participants can also join with an automated calling facility by using the dial-in number and PIN.

**3. Limitations:** Some flaws found in Google Meet are listed below-

- a) Host needs to accept the join request one by one which is a time consuming operation.
- b) Due to the lack of technical knowledge, most of the new users present their mobile screen instead of joining the meeting, which interrupts the ongoing presentation.
- c) Many times, it is seen that participants unmute their audio mic which creates a noisy situation.
- d) If any participant presents his/her mobile screen in between an ongoing meeting there is no way with the moderator to stop it except to remove that participant.
- e) If a participant gets out from a meeting and the meeting room becomes full with 100, 150 or 250 members as the case may be, he/she cannot join the meeting again until and unless the other participant leaves the room.
- f) Due to the Incoming phone calls a participant gets exit from a meeting.

**4. Suggestions to Overcome the Limitations:** The following measures can be taken as a solution to overcome the limitations found in Google Meet in some extent-

- a) Meeting hosts may engage more trained moderators to accept & mute more numbers of participants by sharing his/her user id and password of Google account with others.
- b) Host should set some basic rules & regulations regarding the audio mic, video and present option. Host can add these rules in the meeting information link or may circulate the same with the joining link so that the participants can mute their audio and video before entering the meeting room.
- c) If there is any background noise, moderators should find out instantly and should mute those participants whose mic remains unmuted.
- d) Except the presenter or sometimes other panelists, all other participants should mute their audio & video to experience a better meeting with quality audio visuals.
- e) If any member is not aware about the Google Meet rules and presents his/her device screen repeatedly in between a meeting, the participant should be removed and restricted to rejoin by the moderator.
- f) Moderators should login the meeting with two or more devices to escape from an unwanted exit.
- g) Moderators should use Android devices to admit the joining request which comes with a pop up notification. Pop up is very fast on Android devices than the PC or Laptop.

**5. Advantages of Using Google Meet:** There are a lot of advantages for Google Meet users. They are as follows-

- a) Google Meet allows “anti-hijacking” measures to protect users’ data and privacy. Even when the attendance is collected, Google only shows a portion of the full Email address.
- b) Google Meet is very easy to use and user friendly.
- c) It allows upto 250 participants to join a meeting.
- d) A meeting host can easily mute and remove any participant without asking them.
- e) Participants can ask questions via chat box without interrupting the presenter.
- f) Google Meet can automatically switch the view to the video of the speaker or host who is speaking.
- g) Meeting participants can mute their own audio mic and turn off the video.

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- h) The caption (CC) feature available in Google Meet is very interesting. It can accurately convert the speech into text if the speeches are in English language. Participants can read the caption texts as subtitles easily at real time speed.
- h) With the recording feature an user can watch the meeting later on.

**6. Conclusion:** Google Meet has become a daily life tool for distance learning in the educational institutions as well as among the other industries. It is a free, reliable, competent and user-friendly tool. When it comes to free solutions, literally it is the best platform for virtual meeting & classes in present day context. The upcoming versions of Google Meet with lots of pro smart features will definitely pull up the ICT industries to an advanced level.

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## Government Initiatives in Education during Covid-19

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### Abstract

*This paper presents different central and state government initiatives during the Covid-19 pandemic that helps the students to continue their study online. An attempt is also made to find out the special features of each major initiatives in education and problems faced in accessing those initiatives by the target group and how it can be mitigated in future.*

**Keywords:** Indian Government Initiative in Education during Covid-19, SWAYAM, SWAYAM Prabha, NDLI, Diksha, Smart India Hackathon 2020, Bharat Padhe Online

**1. Introduction:** The Education System in India always followed the system of offline classrooms and it was never estimated that the use of online education would emerge at such a high rate. CoronaVirus (COVID-19)-declared as a pandemic by the World Health Organization (WHO) developed a need for online learning because of the imposed lockdown in many countries including India. It became a challenge for the government as well as the educational institutions to shift to online education since the education system was very rigid especially when it comes to changing the mode of acquiring education. However, this pandemic taught us the need to change with time and keep applying the changes occurring in technology. Online education is very convenient when there is a need for a system that is less costly and is more affordable and can be accessed from anywhere no matter where one is.

But initially, everyone wasn't sure whether they would be able to adopt e-learning in such a short period but the efforts of the Government, as well as the educators, yielded a good result. Teachers started taking live classes using apps like Zoom, Google Meet and so on. Zoom became the next Paytm in terms of popularity like it became when demonetization occurred in 2016. WhatsApp groups were formed for regular updates and query sessions. Everything was done in the best possible manner but somehow it was very difficult to shift totally online since many didn't even have basic requirements like a laptop and a decent Wi-Fi connection. But, all the challenges were accepted and solutions to those challenges were made. Also, everyone is learning a lot from these experiences and many new opportunities are being discovered that were never in the part of our vision of the education system.

Online education saved the students from missing their lectures as it provided them time and location flexibility. Teachers tried their best to make the classes less boring and more interactive and used various techniques like showing videos and audio for better learning. Teachers tried a lot so that the human touch is not lost but still many problems hindered the process like few students which were not so serious made others feel uncomfortable having classes online but due to pandemic no other option was left. This led

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to frustration and affected their mental health. Also, technical glitches in between the classes and slow internet connection made the students lose their focus and they became more distracted.

The pandemic has made everyone realize the importance and scope of online learning and how it can be adopted as a method for learning education. Teachers and students are also becoming more technology-oriented and trying to adopt the virtual learning culture. Although adopting online education isn't easy as it has its own requirements and maintenance and special content and training is required for proper implementation but the teachers and students both are learning daily and are trying new and innovative ideas to make this digital process more engaging and understandable.

**2. Objectives:** This research study focuses on the below objectives:

- a) To study the various initiatives by the government on education during COVID-19.
- b) To study the implementation of these initiatives and to what extent they succeeded.
- c) To study the problems faced in implementing these initiatives and what solutions can be applied to solve those problems.

### **3. Central Government Initiatives in the Education Sector during Covid-19 Pandemic:**

Due to the nation-wide lockdown, all schools and colleges shut, the students were studying from home using minimal resources. But the Govt. of India challenged this pathetic condition of the future of the country and provided various online platforms for up-skilling the students. The Ministry of Human Resource Development (MHRD) has made various arrangements so that the learning of students isn't hampered even during the crisis. Some of the digital initiatives taken by government bodies for offering educational content are listed below:

**a) SWAYAM:** Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) is an initiative by the HRD Ministry in the favor of online education for students. It aims to reduce the digital divide and provide knowledge to the students who have remained untouched by the virtual revolution through various MOOC courses.

It offers courses from class 9<sup>th</sup> upto post-graduation. This program benefits the students by providing free access to video lectures, weekly assignments, examinations and then, certification. So, a systematic learning approach is followed to achieve the learning goals.

**b) SWAYAM PRABHA:** The Union HRD Minister launched this portal for e-classes where 32 DTH channels were made available so that students can get connected with their students even when they are away from classrooms. The initiative aimed at providing quality learning resources available in remote areas where Internet connectivity is a major challenge. Here, various educational programs are telecasted on a 24 hours basis using satellite.

**c) National Digital Library of India ((NDLI):** The NDLI in a single window integrated content from various National and International libraries. This platform was created by the great minds of IIT Kharagpur. In this, educational material is available for every field of interest. This system has been made flexible by not only providing e-books to students but also audio, video lectures, presentations, questions, solutions, etc. The government has focused on providing content in all Indian languages so that there's no language barrier.

**d) DIKSHA:** This portal is specially designed for students and teachers to learn several concepts. Here, the teachers can earn badges on completion of certain courses which may help them in professional development. It aids to train the teachers by providing various resources.

**e) Smart India Hackathon 2020:** An initiative by AICTE which provides students a platform to solve the nation-wide problems. The best suggestions get rewarded by the

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Government. Here, the most innovative solutions are developed for the existing government or industry problems. It aims to solve the challenges faced by the country. This year, the Government conducted its largest-ever online Hackathon in the world.

**f) “Bharat Padhe Online” Campaign:** Launched by HRD Ministry on April 10, 2020, the program aimed at inviting the best minds from the country to address the problems in online education with possible solutions to overcome them with the Education Ministry. The campaign got a lot of popularity over social media sites with over 3700 suggestions within 3 days of the launch.

The government hasn't only provided plenty of new portals for the flow of education in fact it has tied up with private firms like Tata Sky, Airtel DTH operators for increasing the reach of education-based content. Hence, the online initiatives in the education sector are also taking the country closer to its aim of “A Digital India”.

**g) E-Pathshala:** E-Pathshala learning app has been launched by NCERT for students of classes 1 to 12. It provides free e-resources like audios, videos, books, etc for students, parents, and teachers which can be accessed anytime, anywhere. All the NCERT books have been digitized for students. The stakeholders can access the e-content using flexible media like mobile phones, tablets, or laptops, and desktops with the content being uploaded in multiple Indian languages including Hindi, English, and Urdu.

**h) UGC's notice on Regular communication:** The University Grants Commission issued a notice stating that all universities must have a helpline no. and Email ID for Grievances Cell where students can stay connected and ask their doubts related to academics, examinations. The initiative was taken in the view of students for proper communication between students and teachers so that there isn't any anxiety or mental health issues.

**i) MANODARPAN:** This initiative by MHRD provides assistance on mental health. It was launched during the Aatma Nirbhar Bharat Abhiyan being launched by the Prime Minister. It provides psychological support due to stress at the time of Covid-19 to students, teachers, and parents. The Government has made available a toll free no. for assistance. This campaign can also be used for increasing productivity and human capital under Aatma Nirbhar Bharat.

**j) AICTE Internship Enterprise Portal:** This initiative is also called The Urban Learning Internship Program (TULIP) which acts for advancing skills. The All India Council for Technical Education (AICTE) has brought a portal for internship opportunities for college students. This portal provides an opportunity to the students to get hired by the industry/organization. The certificate (provided after completion of internship) makes value addition to the students' CV.

#### **4. State Government Initiatives in the Education Sector during Covid-19 Pandemic:**

State Governments on their individual level also took their initiatives during this COVID-19 pandemic. Some of them are highlighted below:

**a) SMILE:** This project is known as Social Media Interface for Learning Engagement, an initiative taken by the Government of Rajasthan wherein students from class 1 to 12 receive e-content on the Whatsapp Groups. The e-content being sent to students is reviewed by the State's academic body, Rajasthan State Council of Education Research and Training (RSCERT).

**b) Padhai Tuhar Dwar Portal:** The online education portal was launched by the Chhattisgarh government for conducting online classes of school children from home. The scheme is cost-free and involves a simple enrollment procedure to gain access to the portal.

**c) Happiness Classes:** Delhi's education minister launched this initiative with a motive to make students introspect and know themselves better. Herein, various activities were performed like storytelling, meditation and so on. Government teachers conduct online sessions for this happiness curriculum.

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**d) CR Initiative:** Director of Higher and Technical Education and Director of Education and Literacy, advise students, teachers, schools, and colleges to participate in CR School-a free social initiative startup. CR School is a platform with cool features like interactive communication between teachers and students on-the-go access to study materials, personal evaluation and updated lesson plans of online classes.

The government hasn't only provided plenty of new portals for the flow of education in fact, it has tied up with private firms like Tata Sky, Airtel DTH operators for increasing the reach of education- based content. Hence, the online initiatives in the education sector are also taking the country closer to its aim of "A Digital India".

**5. Special Features of the Various Initiatives:** The special features of the various central and state government initiatives in education can be looked into from the following angles-

**a) SWAYAM**

- i) This is an e-learning platform of the HRD ministry which has been accessed by 5000+ students during lock-down as it provides knowledge in all fields of study.
- ii) Here, the parameters are set to evaluate the quality of learners which is kept the same at the National level. This will help in maintaining a standard value in the Indian education system.
- iii) In SWAYAM, after the successful completion of examination for the course enrolled by the student, the marks secured are transferred to the academic records of the students. This special feature of SWAYAM has increased the credits as it adds a few points in their overall academic performance. So, many students who couldn't score well in examinations have obtained these online courses so that their overall percentage is not disturbed.
- iv) An average of 59,000 viewers is viewing the videos of SWAYAM PRABHA DTH TV channels every day.

**b) National Digital Library of India (NDLI)**

- i) Every student can use it in a personalized way depending on his level of education and language choice for difficulty level and other such factors.
- ii) This initiative by IIT Kharagpur, can be accessed 24×7 in an integrated environment where students can find out the right resources within seconds and minimum efforts. But a disadvantage of this portal is that upon searching for a specific book, the portal sometimes shows irrelevant results. Due to this, the user does not get the expected output.
- iii) A total of more than 60 types of learning resources are available such as manuscripts, video lectures, thesis, books etc. and in 70 different languages.

**c) DIKSHA**

- i) Unlike other portals, this portal is not for students. It is specially designed for teachers. It serves as a capacity building of the teachers based on CBSE training manuals and NCERT's NISHTHA modules.
- ii) Till June 2020, only two courses were added for the teachers i.e. "Pedagogy of Environmental Studies" and "Health and Well-being in Schools". Various teachers across the country took these courses and got digital certificates after completion.
- iii) This initiative has strongly served the purpose of teachers' community which in turn will be reflected in their teaching process.

**d) Smart India Hackathon 2020**

- i) This initiative was a huge success as it provided solutions to the major problems occurring in the country. It was noticed that through this initiative, the students worked on real-life challenges and came up with innovative solutions.

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- ii) The students from various State, Central Universities took part in it and presented solutions on Waste management, Crime Free Bharat Mission, Agriculture and Rural Development using Blockchain. In addition to this, various colleges conducted an intra-college hackathon and best teams were selected to apply at Smart India Hackathon, 2020.
- iii) Among Smart India Hackathon Winners the students from IIT-H, NIT-W who won cash prizes got a lot of appreciation. Ultimately, this initiative is one of the most successful initiatives due to its nature of competition among the great minds of the country.

**e) Bharat Padhe Online**

- i) It was a week-long campaign for the crowd-sourcing of ideas on improving the online education system in India.
- ii) This online program was launched by the HRD ministry and was valid from April 10, 2020 till April 16, 2020.
- iii) It can be said that it was successful as it was trending in the top 10 on Twitter on 14th April 2020 and received 3700 + suggestions in just 3 days.

**f) E-Pathshala**

- i) Due to the rise of COVID-19 and lockdown in the entire country E-Pathshala became a very good source to study online and the usage of the portals exceeded up to 5 times in this period.
- ii) Government also added 200 new textbook courses which made the portal more beneficial and helped in raising the standard of education.
- iii) All E-Pathshala material was made available on the UMANG App wherein E-pathshala provided 3855 audios and video content.
- iv) UMANG App has a good rating on Play Store as well and can be accessed in Hindi, English, and Urdu languages at present.

**g) UGC's Notice on Regular Communication**

- i) UGC has taken several steps in order to reduce the anxiety levels in students due to the arrival of COVID-19 pandemic. Students can ask any grievances related to examinations or any academic problems which they were facing during the pandemic through a dedicated portal.
- ii) A special helpline number 011-23236374 has been set up for this purpose only.
- iii) A special Email Address covid19help.ugc@gmail.com has also been initiated.
- iv) A Task Force has also been constituted to monitor the concerns of students, teachers and institutions.
- v) All the colleges were requested to upload a notice regarding the same on their websites and to share them via email and other digital media to all the teachers and students.
- vi) There is also an existing Online Students Grievance Redressal Portal which can also be used for this purpose.

**h) Manodarpan**

- i) Lockdown was something that was never experienced by the students and this could affect their mental health and there was a need for psychological support which the Manodarpan initiative helped in overcoming stress.
- ii) Since mental health is also very important with academic needs, special counseling services, online resources and helpline number 8448440632 was created so that students don't face stress, anxiety and fearfulness.
- iii) The website is specially designed for the purpose and also includes a 21<sup>st</sup> century life-skills handbook.
- iv) The website also includes a live chat option which is very interactive and the required advisory guidelines were provided.

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v) There is also a database present on the national level and directory of counselors which can be accessed in case someone requires counseling during this pandemic.

**i) SWAYAM PRABHA**

i) Under this initiative, NCERT has started providing live sessions to students' teachers and parents through a TV channel named Kishore Munch (Swayam Prabha).

ii) There is also an option to access this channel online through Kishore manch app play store.

iii) In addition to interaction with the viewers' hands-on activities are also demonstrated in the live sessions.

**j) AICTE Internship Enterprise Portal**

i) Students are required to sign up with their Student ID provided by the college/ university/ institute.

ii) The internships are provided from Work from Home with a stipend. These internships provide practical experience and opportunity to learn strategies like teamwork multitasking, time management, etc. in an industrial setup.

iii) This platform provides an opportunity to students to meet new people and develop relations among industry people and make their network.

iv) The Government aims to provide 1 Crore Internships by 2025 from 250+ companies. It has been made available in most Indian cities with PAN India locations.

**6. Problems Faced in Accessing the Government's Initiatives:** The following problems may be encountered by the students and institutions in accessing the government initiatives in online education-

i) The problem of unavailability of high-speed internet and poor economic conditions to afford mobile phone/laptop refrain a large number of students to avail benefits of these initiatives.

ii) It increased the responsibility of parents to educate their children. Some educated parents might be able to guide their children but uneducated parents would not be able to do the same.

iii) Not all study fields can be effectively used in e-learning. E-Learning tends to be more suitable for social science and humanities, rather than scientific fields such as medical science, accounting and engineering which require a certain degree of hands-on practical experience. The online lectures cannot substitute this need for medical students or mathematics, accountancy students, or real-life industrial training for a budding engineer. This might be changed in the future, but we are currently not yet reached a point where we can fully teach all those subjects online.

iv) Because of COVID-19 pandemic, students have no other source to learn apart from e-learning and some might not be able to grasp much & would prefer traditional face-to-face learning.

v) Unlike Diksha, E-Pathshala isn't much successful which can be observed from its 2.8\* ratings on android based Google Play Store whereas the Diksha app has ratings of 4.4\* as on 18th August 2020.

vi) Learning with social distancing may continue at least till next year, students may somehow manage to cope-up with their studies but these invisible restrictions may constrain the joy of school or college life minimizing their physical movement & affecting their physical & mental health

vii) Lack of interaction both ways i.e. between teacher-student & students-students under these initiatives will make the students feel bored.

viii) There are a number of courses available to students but there is not much guidance that which course is personally suitable for what kind of student.

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- ix) It's no shame in accepting that computer literacy is very poor in India even some senior teachers found it difficult to teach through their device on the internet as it was very hard for them to accept this new way of teaching all of a sudden.
- x) It may create a rise in the gap of academic performance between learners from low-income groups and high-income groups as the low-income group won't be able to access the technology required for learning and can afford the costlier gadget to participate in online learning.
- xi) Unfortunately, one of the biggest disadvantages of E-Learning continues to be cheating through various methods. This applies while using DIKSHA & SWAYAM PRABHA. Students can cheat in assessments easily as they take assessments in their own environment and while using their own personal gadgets. They cannot be directly observed during assessments or MOOCs without a video feed, this makes cheating detection almost next to impossible. Additionally, without a proper identity verification system in place, users taking online assessments might be able to let a third party take the assessment instead of them, resulting in a wholly fraudulent test result.
- xii) Personalized feedback has a positive impact on students, as it makes learning processes easier, richer, and more significant, all the while raising the motivation levels of the students. In traditional classrooms, teachers can give students immediate face-to-face feedback. Students who are experiencing problems in the curriculum can resolve them quickly and directly either during the lecture or during the dedicated office hours. On the other hand, E-Learning still tends to struggle with student feedback. It's possible for students to provide teacher feedback but providing student feedback in an online setting is still a relatively not researched topic, and it might take a while for any specific strategies to become fully research-based and proven to be effective.
- xiii) Some private universities are not able to conduct online examinations for the final year students as they rely on students' fees for infrastructure unlike state and central universities which have government for their financial backup. Final year examinations have not been conducted which directly mean a delay in degree/certification or in getting jobs for students or direct loss of 1 year.
- xiiii) Skills like public dealing, communication skills, stage/ public representations, management can be learned only when done practically and are required in everybody's life. The online initiatives may be best for the academic but cannot sprout or develop such practical skills in any student.

**7. Suggestions for Proper Digital Learning Implementation:** The Indian Government had launched various initiatives for Digital Learning but there have been some areas that were escaped due to which the education in India has been disrupted. Following are the suggestions which can be taken into consideration for future aspects.

- i) As there was a lack of awareness to use the digital portals so the government should take measures to give training to faculties and learners. They should be taught the process of using the technology. In fact, due to digital-divide some students had access to technology whereas some didn't. So, the government should provide tablets, mobile phones for distance learning with the in-built process of using that technology and then, provide free access to the Government Digital Portals.
- ii) Due to lockdown, many youngsters lost their jobs so immediate action should be taken so that various new jobs, internships, projects can be accessed by those people from their homes.
- iii) For the blur view of the reopening of colleges, the authorities can bring a common approach for all colleges for the online academic session so that education isn't hindered

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even in tough times. India can prepare a B-Plan in case the situation doesn't get better in the long term.

iv) For availing the various Government Initiatives online, there's a requirement for the proper availability of Internet connectivity. For this, the telecom industry must expand its network to each city and village, so that India can be benefitted from this by providing jobs, internships or volunteering to talented youth in this sector. This will ensure completion of two objectives i.e. Internet availability everywhere and source of income for jobseekers.

v) Due to the online mode of study, the institutes prefer to teach theoretical subjects. So whenever the pandemic is over, the students must be exposed to the practical experience of the theories learned.

vi) Because of the long time sitting habits at home, students feel stressed out due to restrictions on stepping out and interacting with one another. So, educational institutes can lessen the cognitive load and increase interactivities during e-teaching.

vii) Communication skills are set to play an important role in showcasing one's personality. So, peer-to-peer group activities can be conducted during an online learning environment as it is necessary for real-life success.

viii) The college students were promoted by assessing them based on past examinations score. It was because there isn't any proper system of online examinations. The higher authorities can create online proctoring systems like Examity for protecting the authenticity of online education. Such systems can be used for anti-cheating during examinations as it has a valid ID verification and machine learning for a check.

**8. The National Educational Policy (NEP) 2020:** While the country was facing the pandemic crisis, the Union Cabinet approved the New National Education Policy 2020 (NEP-2020), with an objective to up-skill India with modification in the education system.

The policy aims for making "India a knowledge superpower". Now, learning will be made holistic, engaging, integrated, and enjoying. It is all done keeping in view the students who were mugging up the syllabus and the prevailing system was talking more on marks than skill development. The steps have been taken for the quality education system as a forward-looking vision. For school education, the government has replaced the 10+2 system by 5+3+3+4 curriculum. More focus will be made on skill development rather than memorizing the facts. No division of academic streams in school. So now students can choose the subjects according to their interests and make a career in that field without any restrictions. The emphasis of Vocational Education will begin from class 6 with internships for building skills. More emphasis is being given to make students learn Hindi Language. For higher education, the facility of multiple exit options has been provided with proper certifications. The new system has come with various modifications to move towards a holistic and multidisciplinary education. A common body for higher education will be created named as Higher Education Commission of India (HECI). It is therefore a progressive shift for cognitive learning and social & physical awareness to a scientific approach to learning. Hence, the new policy will focus on people's skills, technical expertise, and good knowledge.

**9. Conclusion:** CoronaVirus (COVID-19) experience has made everyone realize the fact that one needs to keep adopting the changes happening in their surroundings. Just like this, covid-19 pandemic totally changed the way people considered education. Previously, it was always believed that acquiring education means physical classroom and face to face teaching system and e-learning was never considered a better way to acquire education but now it has been observed by everyone that the future of education is e-learning since it becomes very accessible from any part of the world.

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Although digital learning has its own limitations but if it is adopted the limitations in the future will be limited with updating technology. Also, when one would be habitual to online learning one will always be prepared in advance to deal with such pandemic situations and there will be a reduction in mental health and anxiety level issues since everyone would be habitual to this source of education as well. India is on the infancy stage in adopting digital learning but if the government trains the system by increasing their knowledge of information technology the day isn't far when online learning would reach in even in the remotest parts of the country. Since work from home is becoming the new way of doing work, continuing the focus on e-learning will also help the students in adopting this modern way of working so focus on e-learning should be carried forward even after this lockdown and COVID-19 situation ends. Students pursuing courses which have maximum practical exposure can use Springboard and Udacity that provide hands-on practice based online courses.

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## State Government Initiatives on Education in North-East India during Covid-19 Pandemic

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### Abstract

*This paper discusses the various steps, both online and offline, taken by the respective state governments of North-East India to facilitate learning for students. It also makes a comparison of the learning initiatives undertaken by the state governments of North-East India based on the existing literature. This paper is qualitative and descriptive in nature. Data used are based on secondary sources such as surveys and reports of UNESCO, Ministry of Human Resource Development (MHRD) etc.*

**Keywords:** *E-Learning in North East India, State Government Initiative during Covid-19, Learning from Home*

**1. Introduction:** With the COVID-19 pandemic, the government all over the world in order to curb the spread of the disease, declared lockdowns and curfews and hence almost all the economic activities came to a standstill. Although the pandemic has impacted almost every sector of the economy, yet the education sector has been worst affected. According to the UNESCO, nationwide closures have adversely impacted the education of 290.5 million students globally. Almost 91% of students around the world were out of school during the height of school closures in April 2020 and about 40% of low and lower-middle-income countries have not supported learners at risk of exclusion during this crisis, such as the poor, linguistic minorities and learners with disabilities (Global Education Monitoring Report, 2020). In India, 14 crores of primary and 13 crores of secondary students have been affected by the pandemic (Jena, 2020b, p. 12582). Hence, both the Central Government and the State Governments have been undertaking various initiatives in order to ensure continuation of learning among the individuals. The Ministry of Human Resource Development (MHRD) in order to cover the educational requirements of students, scholars, teachers, and life-long learners has undertaken a comprehensive initiative called PM-eVidya on 17<sup>th</sup> May, 2020 with the aim of unifying all efforts related to digital, online and on-air education to enable equitable multi-mode access to education (India Report on Digital Education, 2020), envisaged to benefit nearly 25 crore school going children across the country. Some of the online resources developed by the Government are- Diksha Platform, e-Pathshala, National Digital Library, Swayam, Swayam Prabha, Nishtha and National Repository of Educational Resources (COVID-19: Stay Safe Digital Learning Initiatives of Ministry of HRD, 2020). Similarly, the state governments of North-eastern India which comprises Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura have also been undertaking numerous steps for providing e-learning facilities in these states. But being comparatively less developed, it will be a great challenge for these states while coping up with the various educational requirements.

**2. Literature Review:** Few recent studies have focused on the impact of Covid-19 on education in India. For instance, Tarkar (2020) examined how the education system of India has been impacted with the sudden transition from offline learning to online learning during the pandemic. The author noted that the low income private and government schools are not having access to online e-learning solutions thereby causing a threat to continuity of learning

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of students. In a related work, Raj (2020) describes that India is not ready to adopt an online education system as more development is required in the areas of internet, electricity and e-learning. Although, there has been serious implication of Covid-19 pandemic on education in a country like India, it has also provided the opportunity for the country to move into the advanced mode of learning which was not present earlier.

Moreover, there have been attempts to examine the various initiatives undertaken by the Government of India for promoting education in the period of crisis caused by the pandemic. Jena (2020a) described how the Higher Education Institutions (HEIs) of India ensured the continuity of the teaching-learning process, research and service by using some tools and techniques despite all the challenges posed by the Covid-19 pandemic. The author also noted that the pandemic has made virtual education at all levels of education the most preferred mode of education with an opportunity to change the pedagogical approaches. Jena (2020b) focuses on the various initiatives undertaken by the Government of India for providing seamless education for both secondary and higher levels of education in the period of crisis caused by the pandemic. The author concluded that apart from developing the knowledge and information technology infrastructure to cope up with the crisis like Covid-19, the government should formulate policies to include individuals living in remote areas, those belonging from marginalized and minority groups for effective delivery of education.

Hence, several studies have addressed the impact of Covid-19 on the Indian education system and how the government has been adopting various initiatives for continuation of education in the country as a whole, but, there is a lack of robust research on the status of e-learning in various states of the country and various initiatives undertaken by the different state governments. The present study focuses on various initiatives undertaken by the respective state governments of North-East India and makes a comparison among the states regarding the various initiatives of learning during the period of pandemic.

**3. Objectives:** The main objectives of this study are as follows:

- a) To discuss the various steps, both online and offline, taken by the respective state governments of North-East India to facilitate learning for students.
- b) To make a comparison of the learning initiatives undertaken by the state governments of North-East India.

**4. Methodology:** This paper is qualitative and descriptive in nature. Data used are based on secondary sources such as surveys and reports of UNESCO, Ministry of Human Resource Development (MHRD) etc. The study also extracts data from secondary literature such as books, journals, articles, newspapers, websites, etc.

**5. Initiatives undertaken by the State Governments of North-East India:** According to India Report on Digital Education, 2020, various states of India have been undertaking different initiatives of digital learning across the nation. Hence, some of the initiatives undertaken by the respective state governments of North-East India are as follows:

**5.1 Arunachal Pradesh:** Various initiatives undertaken by State Government of Arunachal Pradesh are:

- a) **Live Classes through EDUSAT:** It is an initiative where selected teachers are required to take live classes through a network of EDUSAT. For this, a state-of-art studio has been created along with strengthening of the EDUSAT network.
- b) **Radio School Programme:** Radio School Programme is an initiative undertaken by the Department of Education, Government of Arunachal Pradesh in collaboration with All India Radio (AIR), Itanagar for broadcasting online radio talk to class 1 to 5.

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c) **Online Classes Programme:** Classes on TV channels have also been initiated in consultation with Kendriya Vidyalayas for the students of class 9 to 12 in various TV channels through DTH services such as Swayam Prabha, Airtel TV, Tata Sky, Videocon D2H, Dish TV as well as various local cable operators between Monday to Saturday.

**5.2 Assam:** Various initiatives undertaken by State Government of Assam are as follows:

a) **Gyan Brikshya-Live Digital Classroom:** Gyan Brikshya-Live Digital Classroom is an initiative under which Live Tele Education are being broadcasted for the students of class I to X every day on subjects like Mathematics, English and Science by expert teachers from Studio set up at SPD Office. The classes are telecasted by two local cable TV channel broadcasters- ACC and GTPL as well as are also broadcasted in Jio TV since Assam has more than 80 lakh subscribers of Jio services.

b) **Biswa Vidya:** Biswa Vidya is a Radio Learning Programme which has broadcasted through All India Radio (AIR), Guwahati and Dibrugarh for imparting elementary classes on English, Assamese, Social Science and EVS for three days in a week for a duration of fifteen minutes.

c) **Tele Classes, Doordarshan, Assam:** Doordarshan, Assam has undertaken tele classes where lessons on Science and Mathematics are imparted for class IX and X for four days in a week.

d) **Biswa Vidya Assam:** Biswa Vidya Assam, a user friendly, free of cost with smooth navigation mobile application have been developed where e-contents of class VI to X for Science, Mathematics, English Vocabulary and Grammar are made easily available.

**5.3 Manipur:** Various initiatives undertaken by State Government of Manipur are:

a) **E-Content Portal:** An E-content portal Laireek ([www.laireek.net](http://www.laireek.net)) has been created by the Department of Education, Government of Manipur which comprises both audio and visual classes for all subjects (over 200 in number) for classes 1 to 12 in bi-lingual mode. The department has been working with a large number of teachers for taking classes as well as curation work. Moreover, the class-wise contents are shared on a mobile application called "Lairik". In order to reach out to a maximum number of students, classes are also broadcasted through Radio, other community radios, and local TV channels.

b) **Bosemebook:** Bosemebook ([www.bosemebook.in](http://www.bosemebook.in)) is a platform which comprises digitized textbooks of class I to X. These e-textbooks are also shared in a mobile application named "BOSEM eBook".

c) **Comic Textbooks:** To supplement learning and make learning fun, comic textbooks for classes 3 to 5 containing Language, EVS and Mathematics have been created, a part of which is available in e-format.

**5.4 Meghalaya:** Various initiatives undertaken by State Government of Meghalaya are:

a) **E-Learning Portal:** E-Learning portal (<https://crschool.online/>) is an initiative of the Government of Meghalaya in collaboration with CR projects for classes KG to X to ensure continuity of students' studies as they faced with an inability to carry out normal learning activities in a school/classroom environment. This portal has been created to permit accessibility to study materials and most importantly to ensure the students that their teachers are within reach. The platform features a robust system of communication, collaboration and sharing of digital content which allows access for schools, teachers and students to ensure availability seamless and free online classes, syllabus-wise class lessons with anywhere and anytime access to study materials, interactive learning process and communication between teacher and student, conducting prometric tests and student evaluation, uploading of video

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lessons by teachers, etc. The registration for the e-learning portal has been made free for everyone to encourage participation of schools from all over Meghalaya.

**b) Free Online Course for Teachers:** Online course for teachers at free of cost for better conducting of e-learning process have been undertaken by the Meghalaya School Improvement Programme (MSIP) team from Directorate of Educational Research and Training (DERT), Meghalaya for offering online course to help teachers for improvement in various aspects such as setting up their own online classroom, analyse course and lesson contents for students, prepare simple online formative and summative assessment tools, use ID to plan their online lessons, offer a platform for networking with other teachers across the state and share best practices etc.

**c) Digital Content Portal:** Digital content portal (<https://niceinfotech.co.in>) is an e-scholar portal which was launched by the Department of Education, Meghalaya aimed at providing digital content for secondary level for project schools under Supporting Human Capital Development in Meghalaya (SHCDM) Project. But with the pandemic, access has been given to all secondary and higher secondary schools to aid their studies. This portal provides contents for all subjects except MIL. The department has been ensuring that schools are made aware regarding the portal through the Meghalaya School Improvement Programme, State and District teams.

**d) Radio Programmes:** Radio Programmes are undertaken by the Department of Education, Meghalaya in collaboration with Doordarshan Kendra, Shillong and AIR for broadcasting lessons to students by focusing on hard spots of school curriculum. In order to listen to the lectures, students can tune to All India Radio (AIR), Shillong, Tura or Jowai.

**5.5 Mizoram:** Various initiatives undertaken by State Government of Mizoram are:

**a) Online Education Challenge, 2020:** Online education Challenge is a weekly challenge for Elementary and Secondary school students of Mizoram initiated by the State Council of Education Research and Training (SCERT), Mizoram with the aim of engaging students and teachers in productive time investing activities during the lockdown period. The SCERT invited challenges for students on poster making, collage making, card making, letter writing, making best out of waste, drawings and paintings on themes like “Heal the World”, “Single Use Plastic”, “Thank you note to doctors and nurses and other task forces on COVID-19”, on lockdown, picture characters from Mizo folktales, etc. The teachers were also invited to participate in challenges like making videos on their innovative teaching practices, article writing on their memorable teaching experiences, short video clips on teaching of English Vocabulary, development of video clips on fun ways of teaching mathematics, etc.

**b) Diploma in Early Childhood Education (ECE):** Diploma in ECE, a much anticipated 6-month diploma course for in-service teachers has been initiated in the beginning of the month of May 2020. Teachers who have enrolled for the course are given an online pre-test to determine their level of knowledge in ECE which is a very important factor for identifying the needs of teachers in terms of the content and delivery system for the course. Various faculties from SCERT and DIETs are engaged to deliver learning for the course.

**c) Workshops:** Workshops are conducted by SCERT, Mizoram for creation of high quality e-contents for QR codes of Elementary school textbooks. Moreover, SCERT faculty and teachers have been trained to develop contents on the workspace of DIKSHA App where more than 100 contents have been created for Mizo and Hindi Elementary textbooks.

**5.6 Nagaland:** Various initiatives undertaken by State Government of Nagaland are:

**a) Audio and Video Lessons:** Audio and video lessons are broadcasted through Doordarshan Kendra (DDK) and All India Radio (AIR) in collaboration with the Department

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of School Education, Nagaland where recorded lessons are imparted on a daily basis. Initially, both audio and video broadcasts have been done for students of classes 8 to 12 but the department has proposed to extend the same for students of classes 5 to 7. In order to ensure maximum coverage for the DDK and AIR broadcast across the states including the remote areas, all the District Education Officers, Sub-Divisional Education Officers and School Heads were directed to work in association with the District Administration in each district and make necessary arrangements for students who do not have TV facilities at home to view/listen the broadcast at a common place like Village Hall, School Auditorium etc. The broadcast schedule was made in such a way that children could follow the social distancing norms while viewing the broadcasts from public places.

**b) Online Evaluation Portal:** Online evaluation portal (<https://dosenl.in>) for Upper Primary and Secondary School children has been developed by the Department of School Education, Nagaland as evaluation is an integral part of education and is very much essential for guiding students towards development. This portal is developed in such a way that it could be easily accessed through any mobile, laptop, PC and work efficiently even in 2G internet connections.

**c) Information Education and Communication (IEC) Materials on Safe Online Learning:** ICE (<https://education.nagaland.gov.in/>) materials on safe learning is an initiative to protect the children from clutches of cyber predators. This is because with the introduction of online teaching by schools, there were reports about possibility of online exploitation of children and increase in activity related to child sexual abuse materials.

**d) Bright Tutee:** Bright Tutee is a mobile application supporting learning of Mathematics and Science for classes 9 to 10. It has also offered broadcasting of live classes for classes 6 to 8 in the subjects of Mathematics and Science based on the books published by NCERT.

**5.7 Sikkim:** Various initiatives undertaken by State Government of Sikkim are:

**a) Radio Programmes:** Radio Programmes have been implemented by the Department of Education, Government of Sikkim in collaboration with AIR Gangtok and FM Kanchenjunga which started a Live Phone in Educational Broadcast Programme entitled “Stay Home, Study at Home” for students in Sikkim. The teachers have been imparting lessons on scheduled topics after which the phone lines are opened for the students to put forward questions and clear their doubts.

**b) Samvaad TV:** Samvaad TV- the local news channel of Sikkim has also been broadcasting video lessons for Science and Mathematics for students of classes 5 to 8 on a daily basis.

**c) Sikkim Edutech:** Sikkim Edutech is a mobile application which connects all the schools of Sikkim under the State Education Department. The teachers through this platform can plan their classes online and after completion of lessons can also give assignments online. Similarly, students can watch the lessons imparted online by the teachers and submit their assignments online to the teachers.

**5.8 Tripura:** Various initiatives undertaken by State Government of Tripura are:

**a) Digitization of Textbooks:** Digitization of books (<https://scerttripura.org/ebooks.php>) have been undertaken by the SCERT, Tripura where digitized textbooks of Class I to XII were made available in their website so that the students have access to digital copy of their textbooks from anywhere and continue their study.

**b) State Repository of Open Educational Resources (SROER):** SROER is a platform created under the initiative of SCERT, Tripura where 200 audio-visual contents for reference are made available. It also contains audio/video contents for students of classes VI to XII free of cost covering subjects like Bengali, English, Physical Science, Life Sciences and mathematics.

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c) **Creation and Telecast of E-classroom:** Creation and telecast of E-classroom (<https://tripurainfo.com/OnlineClassesHomepageSearch.aspx>) is another initiative of SCERT where episodes of e-classes are recorded and transmitted over Doordarshan and Local Television Channels. The classes have been conducted for covering subjects like English, Maths, Science, Bengali, Social Sciences for classes III to XII.

d) **EDUSAT Programme:** EDUSAT programme has also been undertaken where live and interactive classes are imparted by the teachers for the students of classes VI to IX on the subjects Science, Mathematics, English, Physics and Chemistry. The students from far-flung areas of the state got the benefit from this initiative.

e) **EmpowerU Shiksha Darpan:** EmpowerU Shiksha Darpan is a mobile application which was already in use, is now being used as a facilitator for meeting the appraisal of students in annual examination for the academic year 2019-20 during the period of crisis caused by the pandemic.

**6. Comparison of the Learning Initiatives:** As the state governments of North-East India have undertaken significant initiatives of e-learning, this study has made an attempt to make a comparison among the states and show if a particular state is lagging behind the other states while undertaking such initiatives.

Table 1 shows that the state governments of Arunachal Pradesh and Assam have successfully undertaken the initiatives of learning such as digital classrooms, ICT labs, offline books or textbooks, Educational TV and Radio Channel, while the government of Manipur has been lagging behind. Digital classrooms are provided in all the states except Manipur, Mizoram and Nagaland. All the governments took the initiative of imparting lessons through educational TV (except Sikkim) and radio channels (except Mizoram and Tripura). Again, books or textbooks have been provided offline for continuation of learning in the states except Manipur and Mizoram.

States	Initiatives				
	Digital Classrooms	ICT Labs	Offline Books/Textbooks	Educational TV	Educational Radio Channel
Arunachal Pradesh	*	*	*	*	*
Assam	*	*	*	*	*
Manipur	-	-	-	*	*
Meghalaya	*	*	*	*	*
Mizoram	-	*	-	*	-
Nagaland	-	*	*	*	*
Sikkim	*	-	*	-	*
Tripura	*	-	*	*	-

**Table 1: Learning Initiatives Undertaken by State Governments of North-East India**

**Source: India Report on Digital Education, 2020**

Table 2 shows that among all the North-Eastern states of India, Meghalaya has adopted all the initiatives i.e. provision of E-books, creation of e-learning portal, computer based learning, development of mobile application and has also undertaken the digital initiatives of competitive learning. In this respect, Arunachal Pradesh, Assam and Mizoram have been lagging behind. E-learning portal has been created only in Manipur, Meghalaya, Nagaland and Sikkim while digital initiatives for competitive learning is only adopted in Meghalaya and Mizoram. Again, mobile application for learning has been developed in

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Assam (Vishwa Bharati Assam), Meghalaya (CR School App), Sikkim (Sikkim Edutech) and Tripura (EmpowerU Shiksha Darpan). But the digital initiatives for competitive exams which is an important aspect is only undertaken by the states of Meghalaya and Mizoram.

States	Initiatives				
	E-Books	E-Learning Portal	Computer Based Learning	Mobile Application	Digital Initiatives for Competitive Learning
Arunachal Pradesh	-	-	*	-	-
Assam	-	-	-	*	-
Manipur	*	*	*	-	-
Meghalaya	*	*	*	*	*
Mizoram	-	-	-	-	*
Nagaland	-	*	-	-	-
Sikkim	*	*	-	*	-
Tripura	*	-	-	*	-

**Table 2: Learning Initiatives Undertaken by State Governments of North-East India**  
Source: India Report on Digital Education, 2020

**7. Conclusion:** The Covid-19 pandemic has made a huge transformation in the education system of India in general and North-Eastern states in particular as teaching and learning processes are now getting conducted through online mode. But the North-Eastern states, while undertaking various learning initiatives, are still lagging behind in comparison to other states of the country such as Gujarat, and Kerala which are significantly developed. This is due to less infrastructural development such as lack of electricity and internet facilities, unavailability of electronic gadgets such as mobiles, laptops, PCs etc. in the hands of most of the students especially in the rural and remote areas and those who belong to marginalized sections of the society. For instance, in Gujarat, both the primary and secondary school departments have been undertaking various digital initiatives of learning for a very long time to connect teachers and students and provide quality educational content as for example Command and Control Centre (CCC) has been established in June 2019 to ensure 100% enrollment, improving regular attendance of students and teachers, etc., whereas in Kerala, Public Education Rejuvenation Mission was launched in 2016 with the aim of improving the quality and equity aspects of education and hence public education has been transformed through well planned, interactive, community supported, and globally competitive activities, all planned and guided by the General Education Department (India Report on Digital Education, 2020). Hence, the state governments of North East India should focus on proper infrastructural development and make necessary tools and equipment available to those individuals who are lacking them. Moreover, for proper implementation of this new mode of learning, proper training of teachers, students, faculties etc. are equally important. E-learning has now become the new normal, and it is very important for these states to take necessary steps to ensure equal and quality education.

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## Vidhyagam: An Education Initiative Program of Karnataka State Government during Covid-19 Outbreak

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### *Abstract*

*This paper highlights the Vidhyagam program initiated by the Karnataka state government. It describes the vision of the program, its objectives, parts of the program, handling the responsibilities and challenges faced in its implementation.*

**Keywords:** Vidhyagam, Karnataka State Government Educational Initiative during Covid-19, Kshira Bhagya

**1. Introduction:** The Karnataka state government has taken the step to connect the students, teachers and other officials related to education through the “Vidhyagam” program. Through the Vidhyagam the teachers can impart the education to students in the lockdown imposed due to Covid-19 pandemic.

“Vidhyagam” in its literally form is vidhy+Agam=Arrival of education in the vicinity and comfortable zone of the students/learner.

**2. Vision:** “No child’s dream should be affected by natural calamities, pandemics and other disasters to make their dream true”.

**3. Objectives:** Vidhyagam program launched keeping in view of the following objectives-

- i) Continue the learning of children at this critical moment of closure of schools.
- ii) Planning the program in such ways so that all children are covered in the program.
- iii) Connecting the teachers with students till the schools get open.
- iv) Supply the text books /worksheets/ workbooks through parents to students to motivate them to learn.
- v) Supply the mid-day meal food items and kshira bhagya (Milk powder) materials to students through the parents.
- vi) Avoid the child labor, child marriages and other social evils.
- vii) Improve and strengthen the confidence of the students to face the worst situation.
- viii) Confirm the no drop out from the school.
- ix) A special priority should be given to special children, nomads and migrated.
- x) Involve the School Development and Monitoring Committee (SDMC), administrators, volunteers, parents and community people in the program.

**4. Vidhyagam Program:** The Vidhyagam program launched by the Karnataka state government includes the following-

**a) Classroom Concept:** In order to achieve the stated objectives 3-type of imaginary classrooms are suggested. They are

**i) Type-1 Classroom:** A classroom without any type of electronic gadgets.

**ii) Type-2 Classroom:** A classroom with mobile but without internet.

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**iii) Type-3 Classroom:** A Classroom with Smartphone/ Tablet/ computer/ laptop with internet facility.

**b) Face to Face Meeting:** In all the above said type of classroom ‘guidance teacher’ should meet the students at least once in a week to check the progress and achievement of the students.

**c) Textbooks:** the pdf versions of the textbooks are uploaded in D.S.E.R.T. website as well as public library website. Fortunately, the textbooks are printed before covid-19 lockdown hence the text books are supplied to the students through their parents to all government, government- aided, and private-unaided schools.

**d) Method of Teaching:** The following method of teaching is followed in the Vidhyagam program.

i) All the subjects are handled by the guidance teachers for class 1 to 5<sup>th</sup> standards.

ii) Guidance teacher should coordinate with subject teachers of school in the case of class 6 to 10<sup>th</sup> standard.

iii) The worksheets/ Learning plan/ Learning materials should be prepared and supply by the concerned subject teachers to the coordinating (or) guidance teacher.

iv) The formative assessment question papers should supply to the students. The suitable remedial program should be organized after evaluation of the answer sheets.

v) The formative question papers can also be downloaded from DSERT website.

**e) ‘Samveda’ T.V. Program:** Engage the class through Chandana channel (Government Channel) from class 1 to 10. The time-table of broadcast is provided through newspapers, SMS and other social Medias.

**f) Makkala Vaani:** It is another platform of learning through T.V. where more emphasis is given to learn through learning by doing activities, play way methods and self involvement of learners. It is a one hour program.

**g) YouTube Classes:** The English and Kannada medium classes’ teachings are uploaded to YouTube channels of DSERT’S “Gnana Deepa” portal. It helps those students to learn who are unable to watch the live program.

**h) Bridge Course Program:** A supportive program for “Samveda” Classes, through TV conducted for class 8<sup>th</sup> to 10<sup>th</sup> standard students. After completion of the bridge course classes the “samveda” classes started.

**i) Mechanisms to Manage the Individual Differences:** In this critical condition also the ‘Vidhyagam’ program is well knitted with some mechanisms to manage the special children and others. The children of wanderers, migrants and nomads are enrolled in the imaginary classroom without any formal documents. The parents’ permission and consent is enough to get admitted into the imaginary class rooms.

The physically challenged and deaf children are supported by NIOS sign language TV Channels to learn.

**j) Psychological Support:** The program included with the psychological support for all the stakeholders. Hence, the link is given to “Manodarpan” which is started under the Human Resource Development ministry (Now Ministry of Education). The Psychological stress, needs of adolescents, problems of families and other problems are going to address through this program. The 7 page life skill education hand book is uploaded in this regard.

**5. Distribution of Responsibilities:** In order to implement the program effectively the work is distributed among ‘Guidance Teacher’, Headmaster, SDMC presidents and members, administrative staffs, district public officials, NGO’s and parents. In the Vidhyagam program the distribution of the responsibilities were done as per the following-

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**a) Guidance Teachers:** The guidance teachers are the regular school teachers of the government schools. One guidance teacher is deputed to the 15-10 students 'neighbor group' (students in a particular geographical area) to look after the activities of the 3 types of classrooms in the case of 1 to 5<sup>th</sup> standard and one such guidance teacher should coordinate with other subject teachers in the case of 6 to 10<sup>th</sup> standard. The responsibilities of the guidance teachers are as follow

- i) Identify the 'neighbor children' and organize 'neighbor children group'.
- ii) Coordinate between other subjects teachers.
- iii) Identify the Guest teachers/graduates working for the implementation of the program.
- iv) Upload the data of learning regularly to the student's portal.

**b) Head Master:** He/she is government school Head. His/her responsibilities are-

- i) Motivate the guidance teacher to work.
- ii) Conduct regular meetings with other subject teachers.
- iii) Identify the NGO to take part in the program.
- iv) Coordinate between the other authorities.
- v) Preparation of the plan for continuous learning.

**c) B.R.P./B.E.O:** Taluka level Government official's responsibilities are-

- i) Visit the imaginary classrooms through different modes both online and offline.
- ii) Attend the coordination meeting conducted by Heads of the school.
- iii) Submit the report to higher authority every week.
- iv) Guide and support the teachers.

**d) Deputy Director for Public Instruction (DDPI):** He/she is the district head for Education. His/her responsibilities are-

- i) Observe the children portfolio submitted by the schools forwarded by H.M./B.R.C./B.E.O.
- ii) Identify the NGO's, other charitable trusts to participate in the program.
- iii) Coordinate Z.P. and Town Municipalities to smooth implementation of the program.

**e) D.C/CEO(ZP):** He/she is the district administrative head. His/her works are-

- i) Facilitate the schools and teachers with internet and other suitable techniques/methods to carry the program smoothly.
- ii) Co-ordinate the different officials and public representatives like M.L.A., M.P., M.L.C.

**f) SDMC:** The committee is headed by the president and chosen by the parent council to ensure the quality in school education on behalf of parents of the children. His/her responsibilities are

- i) Motivate the graduate, young people to get involved in the 'Vidhyagam' program.
- ii) Ensure the admission of students in any of the three types of classroom.
- iii) Help the officials to avoid and stop the child labor and child marriages.

**6. Challenges:** Apart from the proper planning of the program, many challenges are faced by the students, teachers and others who are involved in the program. Some of such challenges are as follows-

- i) Risk of the teachers and students to get affected by covid-19 is hindrance to implement the program.
- ii) Parent's co-operation and other stakeholders co-operation is not promise-able.
- iii) Lack of motivation and facilities to implement the program.
- iv) Less priority to education than livelihoods weakens the program.
- v) Problem of suitable place to run the face-to-face "vatara school" (Veranda).
- vi) Lack/No training to teachers to handle the online classes.
- vii) Problem of accountability in all dimensions.
- viii) Ignorance of students and parents about the program.

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ix) Not possible to conduct summative assessment.

**7. Conclusion:** The preparation to engage the learners in this covid-19 pandemic situation through Vidhyagam program is a good initiative. The “Makkalvaani” TV channel program, Samveda program and bridge course program are interlinked and very creative. The lessons are useful for learners. The program is still not reaching many stakeholders because of less (or) no proper advertisements. Neither critical comments nor constructive feedback are given by the parents, educationists, experts to the program. No debate is held in mass media, social media on the program and its implementation. Even a single article is not published in journals or newspapers on the ‘Vidhyagma’ program. There is another problem that is the government did not insist on the private school to engage in such classes. So, private schools adopted their own mechanisms to reach their students. There is no uniformity between government program and private schools program in teaching and learning mechanisms in the critical situation that arise due to covid-19.

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## Students' Perceptions on the Use of Google Classroom as an E-learning Platform

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### **Abstract**

*Adoption of Google Classroom platform as an e-learning tool in higher institutions is increasing day by day. It is one of the most popular e-learning systems adopted by many countries all over the world. This quantitative survey paper examines the perceptions of 30 PG students from three different universities and has come with positive opinions towards the different aspects of Google Classroom as an e-learning platform. However, the results are difficult to generalize since convenience sampling technique was adopted to select the respondents. In addition, although the study admits that moderators such as gender, demography, IT skill etc. may influence the results, which are not highlighted in the study.*

**Keywords:** E-Learning Platform, Google Classroom

**1. Introduction:** Google Classroom allows us to create a virtual room or a virtual classroom in which a teacher or a student can create a class and add classmates and other teachers anywhere around the globe. During this pandemic, academic fraternity is bound to go for e-learning and it is found that Google Classroom is really easy and very convenient even for those who are not much techno savvy. Teachers don't face hard time using this tool.

Google Classroom assists in smooth communication between teachers and students by integrating docs, sheets, slides, gmail, and calendar into a single platform. Here students are invited to join a class through a private code, or automatically imported from a school domain. Teachers can create, distribute and mark assignments all within the Google ecosystem. Each class creates a separate folder in the respective user's Drive, where the student can submit work to be graded by a teacher. Assignments and due dates are added to Google calendar, each assignment can belong to a category or topic. Teachers can monitor the progress for each student by reviewing revision history of a document, and after being graded, teachers can return work along with comments.

Google Classroom is designed to be as easy to use as possible, so originally it was providing one class Stream for teachers and students to share new content and ideas. But a single stream, while simple, became too crowded, and it was hard for teachers and students to find what they needed. That is why a new Classwork page was introduced, which lets teachers better organize the assignments and questions by grouping them into modules and units.

With a dedicated page for Classwork, the Stream can be a better hub of class discussion and activity. It is conveniently organized in a separate page to reduce mess so that the students can have discussions in the Stream to develop their online communication skills within their classroom community. Thus, from the very beginning, Google Classroom focused on simplifying technology, so that teachers and students could spend time on learning not on technology.

**2. Functions of Google Classroom:** Different types of users can perform different functions through Google Classroom which are tabulated below–

#### **a) Teachers**

- i) Create and manage classes, assignments, and grades online without paper.
- ii) Add materials to the assignments, such as YouTube videos, a Google Forms survey, and other items from Google Drive.

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- iii) Give direct, real-time feedback.
- iv) Use the class stream to post announcements and engage students in question-driven discussions.
- v) Push content to students' screens.
- vi) Invite parents and guardians to sign up for email summaries with a student's upcoming or missing work.

#### **b) Students**

- i) Track classwork and submit assignments.
- ii) Get feedback and grades.
- iii) Share resources and interact in the class stream or by email.
- iv) Share screen with a teacher.

#### **c) Guardians**

- i) Get an email summary of the student's work.
- ii) Review announcements and activities.

#### **d) Administrators**

- i) Protect data and set permissions for users.
- ii) Set up classes and rosters.
- iii) Create, view, or delete any class.
- iv) Add or remove students and teachers from classes.
- v) Get 24/7 support.

**3. Facilities Available on Google Classroom:** Google Classroom generally provides the following facilities-

- i) Stream
- ii) Classwork: Within the Classroom there is a scope for Topic, Assignment, Quiz Assignment, Question, Material, Reuse, Google Calendar and Class Drive Folder.
- iii) People
- iv) Grades and
- v) Setting

**4. Types of Google Classroom User Accounts:** Depending on the learning setting, there are different types of accounts for Classroom. These are-

**a) Personal Google Account:** A personal Google Account is one that we create. We are likely to use it with Classroom outside of a school setting, such as a tutoring center or homeschool. In case of personal account, the limit of teachers for a single class is 20 whereas the limit of teachers and students together for a single class is 250. Moreover, in a single day the number of invitation that can be sent by a teacher to join a class is 100. Similarly, here 100 number of participants can attend video meet together. Again, teachers can't invite guardians to sign up for email summaries. Moreover, there are some other limitations like lack of originality checking of assignment, lack of grade importing, students can't email classmates and so on.

**b) Google Workspace Account:** A Google Workspace (formerly G Suite) account is typically used in large organizations that run Google Workspace Business Starter, Business Standard, Business Plus and Enterprise, or Google Workspace for Nonprofits and Education. Organization's admin creates and manages these accounts and gives email address and password to the participants. Children aged 13 and under should only use Classroom with a Google Workspace for Education or Nonprofits account. Google Workspace versions are of following types -

**i) Google Workspace for Education:** Google Workspace for Education is a suite of free Google tools and services that are tailored for schools, colleges and universities. It is

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available globally to all educational institutions that qualify. Google reserves the right to determine an organization's eligibility for Google Workspace for Education. It takes around 2 weeks to process an application; however, in response to COVID-19 global school closures, it is expediting school approvals for Google Workspace for Education. Here the limit of teachers for a single class is 20 whereas the limit of teachers and students together for a single class is 1000. Moreover, in a single day the number of invitation that can be sent by a teacher to join a class is 500. Moreover, here 100 number of participants can attend video meet together. Again, teachers can invite 20 guardians to sign up for email summaries. Moreover, there are some other features like originality checking of assignment, scope for grade importing, and so on.

**ii) Google Workspace Business Starter Edition:** Google Workspace Business Starter edition is a suite of collaborative productivity apps that offers professional email, shared calendars, online document editing and 30 GB storage, video meetings etc. It costs Rs. 125/- per user per month. With Google Workspace Business Starter, users can get following features –

- i) Gmail: Send and receive mail using professional address.
- ii) Calendar: Share calendars to easily schedule meetings and events.
- iii) Docs: Collaborate in real-time on online documents, spreadsheets, and presentations.
- iv) Drive: Store and back up files securely in the cloud.
- v) Meet: Video meetings with upto 100 participants.

Moreover, it has administrative control features like –

- i) Manage user accounts and security settings from a central Admin console.
- ii) Control user access to features and services
- iii) Remotely manage mobile fleet.
- iv) Track usage trends via audits and reports.
- v) Receive 24/7 support from Google Workspace experts.

**iii) Google Workspace Business Standard Edition:** G Suite Business edition includes everything available in Google Workspace Business Standard, with some additional features costing Rs. 672/-per user per month. It provides 2 TB storage and archiving which can be distributed within Gmail messages, Google Photos, and files in Drive. Organizations that received a Google for Nonprofits discount, or have 4 or fewer users, get 1 TB of Google Drive storage for each user. With shared drives, files belong to a team instead of an individual. If members leave, files stay where they are so the team can continue to share information and get work done. With Google Workspace Business Standard, users can get following features –

- i) Business email through Gmail.
- ii) Video and voice conferencing.
- iii) Team messaging.
- iv) Shared calendars.
- v) 2 TB cloud storage (or 1TB per user if fewer than 5 users).
- vi) Documents, spreadsheets, and presentations.
- vii) Presentation builder.
- viii) Professional surveys builder.
- ix) Website builder.
- x) Shared notes.
- xi) Engage employees.
- xii) Automate, integrate, and extend with Google Workspace.
- xiii) Smart search across Google Workspace.

Moreover, it has administrative control features like –

- i) 24/7 standard support.
- ii) Admin Security and administration controls.

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- iii) Archive and set retention policies for emails and chats.
- iv) Data regions for Google Workspace.
- v) Enterprise-grade access control with security key enforcement.
- vi) Advanced Protection Program.
- vii) Vault Retain, archive and search data.
- viii) eDiscovery for emails, chat, and files.
- ix) Audit reports to track user activity.
- x) Endpoint Management.
- xi) Remotely manage mobile fleet.

**iv) Google Workspace Business Plus Edition:** Google Workspace Business Plus edition includes everything available in Google Workspace Business Standard, with some additional features costing Rs. 1260/-per user per month. It provides 5 TB storage and archiving. Premium office suite with enhanced security, controls, and customization. With Google Workspace Business Plus, users can get following features –

- i) Gmail: Business email through Gmail.
- ii) Meet: Video and voice conferencing.
- iii) Chat: Team messaging.
- iv) Calendar: Shared calendars.
- v) Drive: 5 TB cloud storage (or 1TB per user if fewer than 5 users).
- vi) Docs: Documents, spreadsheets, and presentations.
- vii) Sheets: Spreadsheets.
- viii) Slides: Presentation builder.
- ix) Forms: Professional surveys builder.
- x) Sites: Website builder.
- xi) Keep: Shared notes.
- xi) Currents: Engage employees.
- xi) Apps Script: Automate, integrate, and extend with Google Workspace.
- xii) Cloud Search: Smart search within and outside of Google Workspace.

Moreover, it has administrative control features like –

- i) 24/7 priority support.
- ii) 1 hour target response time for critical issues.
- iii) Designated Google advisor (minimum 1000 seats).
- iv) Admin Security and administration controls.
- v) Archive and set retention policies for emails and chats.
- vi) Data regions for Google Workspace.
- vii) Security center for Google Workspace.
- viii) Data loss prevention for Gmail.
- ix) Data loss prevention for Drive.
- x) Hosted S/MIME for Gmail.
- xi) Integrate Gmail with compliant third-party archiving tools.
- xii) Enterprise-grade access control with security key enforcement.
- xiii) Gmail log analysis in BigQuery.
- xiv) Advanced Protection Program.
- xv) Vault Retain, archive and search data.
- xvi) eDiscovery for emails, chat, and files.
- xvii) Audit reports to track user activity.
- xviii) Cloud Identity, Premium Manage users, devices, and apps.
- xix) Endpoint Management.
- xx) Remotely manage your mobile fleet.
- xxi) Context aware access.

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**5. Objectives of the Study:** The study is based on the following objectives –

- i) To find out students' compatibility with online teaching-learning process.
- ii) To find out students' perceptions on the use of Google Classroom.
- iii) To find out the problems faced by the students in using Google Classroom.

**6. Methodology:** This is a survey based study. For this study telephonic interview was conducted among 30 Post Graduate students of three different universities. Convenient sampling technique was adopted in selecting the respondents. The study is quantitative in its approach.

**7. Findings:** The findings can be divided under the following major sub-headings

**a) Students' Compatibility with Online Teaching Learning Process:** Here it is seen that, majority of the students are compatible with the technological changes occurred in their teaching learning process. Moreover, they had fantasy to learn through technology. Therefore, they hardly faced any major challenge in accepting online learning.

**b) Students' view on Using Google Classroom:** In general, the students expressed their positive views of learning through Google Classroom. Especially the students recognize the value of interactive sessions with their teachers and peers through Google Classroom as they receive from lecturer and peers. Moreover, they gained new experience by using Google Docs, Google slides, Google drive, Google calendar etc.

**c) Students' Satisfaction on the Interactions Between Teacher-Students and Students-Students through Google Classroom:** In general, students have positive opinions towards the teacher and their peers' communication through Google Classroom. However, the first task of the teacher is to push students actively in giving comments, and involving in the discussion which is considered as a hard work for the teachers. Then, inviting students to participate through Google Meet is another task that they need to complete. Moreover, teacher can bring Google Docs into the classroom that helps half of the teacher's task to persuade students as active learners. The writing class could make good use of Google Docs as an interactive platform for teaching-writing. It provided either for the lecturer or students to be able to exchange

**d) Students' Awareness on the Features Available on Google Classroom for Students:** Here it is found that majority of the respondents are aware of the features available on Google Classroom for students. They are aware that they can track classwork like topics, assignment, quiz assignment, question, material, class drive folder, Google calendar etc. Moreover, they are also aware that they can submit assignments, get feedback, share resources and interact in the class as well as share screen with a teacher.

**d) Limitations of Online Learning through Google Classroom:** Here respondents have pointed out some limitations of online learning through Google Classroom; these are – students not receiving invitation sent to them, unclear audio in Google meet, network problem, power cut problem, etc.

**8. Conclusion:** Technology is changing rapidly in modern time, and the learning is changing due to technological changes. Adoption of Google Classroom platform as an e-learning tool in higher institutions is increasing day by day. It is one of the most popular e-learning systems adopted by many countries all over the world. This quantitative survey paper examines the perceptions of 30 Post Graduate students from three different universities and has come with positive opinions towards the different aspects of Google Classroom as an e-learning platform. However, the results are difficult to generalize since convenience sampling technique was adopted to select the respondents.

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## Learning at Home: Engagement of Academic Community during COVID-19 Pandemic

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### **Abstract**

*This study concentrates on understanding the engagement of the academic community in webinars during COVID-19. A questionnaire was prepared and distributed among the post graduate students, M.Phil and Ph.D. research scholars and working professionals of Central University of Tamil Nadu, Gauhati University, Mizoram University, North-Eastern Hill University, Tezpur University and Tripura University and their responses were recorded, analyzed and presented.*

**Keywords:** Webinar, Webinar User Survey, Education during Covid-19

**1. Introduction:** A webinar is a web-based presentation, lecture, workshop conducted over the internet using video conferencing software. A webinar allows people to access real-time quality online education at home via the internet. Now, a learner may access knowledge and skills without investing in transportation or accommodation and the host need not require to invest in arrangements, saving cost for both parties.

Due to COVID-19 pandemic, the prohibition of traditional conferences and seminars saw the sudden rise of webinars to great numbers. The age of the digital world has impacted the teaching and learning process significantly and with increased usage of technology is influencing the new academic culture.

**2. Literature Review:** Webinar enables the audience to participate in a session beyond geographical boundaries without investing in travel cost and attend in a personalized environment. Especially the personalized space relaxes introverted learners from nervousness. Emphasizing on delivering conceptual knowledge than procedural knowledge for the webinar is preferred by participants. The instructor should promote a highly interactive lesson plan and engaging session for smooth flow (Wang & Hsu, 2008). With the advent of technology, the process of transition from traditional to technology-based learning habits has begun. Multimedia aids such as power-point presentation, audio-visual contents, etc. started getting used in the classroom. Techniques such as E-Mentoring and E-learning, Webinar have provided learners with the opportunity of learning at their own pace and comfort (Verma & Singh, 2010). Usage of multiple-choice questions and answers and immediate feedback engaged medical students in the session more actively. The instructor kept the answers hidden until everybody responded. This process led students to self-evaluation, ultimately stimulating interest in subjects (Mayorga, EP & Bekerman, JG & Palis AG, 2014). One of the advantages of the webinar is that it can be recorded for future viewing. This helps students and instructors both. An instructor may be able to re-watch the session for self-need assessment and to learn efficient management. One of the disadvantages is that a presenter requires to take body language, background, environment, etc. into consideration to keep the audience's attention. Also, the audience may choose not to show their face or to speak, resulting in the presenter unable to follow whether participants are giving attention or not. Engagement in a webinar also depends on the availability of internet connectivity of the participants and host. Issues such as transmission delay, audio-video disconnection may potentially break the fluency of a webinar (Ahrens & Zašcerinska, 2015). Using visually attractive slides, frequent interactive surveys and discussing pre-designed questions in chat during the webinar attracts attention from the participants (Smirnova &

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Kamenez, 2019). Among Traditional face-to-face, asynchronous online instruction and Webinar; the webinar was found to be more effective concerning student learning, even though the difference is marginal. But about student satisfaction, among all three face-to-face instruction was found to be more favoured by students followed by webinar and asynchronous online instruction was least favoured (Ebner, Christian & Gegenfurtner, Andreas, 2019).

**3. Objectives:** COVID-19 pandemic has produced a unique challenge to the world. Academics is no exemption. Due to the pandemic, the academic world saw the transformation from traditional mode to technology-based platforms. The webinar is also such a technology-based method most of the academic organizations are using to perform different teaching-learning programs. This study was conducted to observe the engagement of the academic community with a webinar during the pandemic. Three structured objectives considered for the study were as follows-

- a) To observe the engagement of participants with webinars
- b) To understand the requirements of participants
- c) To find out the issues and challenges faced by participants

**4. Methodology and Scope:** For this study, a random sampling method was adopted. At the first phase, an online questionnaire was distributed randomly among the PG students, Research Scholars and faculty members of the Central University of Tamil Nadu, Gauhati University, Mizoram University, North-Eastern Hill University, Tezpur University and Tripura University. In the second phase, the respondents were asked to circulate the questionnaire among the other members of the academic community through different social media platforms. The responses were recorded within the time frame of March-June 2020. All the responses were downloaded in excel format and data were analyzed and presented with some informative tables and figures.

**5. Analysis:** The responses were analyzed under the following headings and subheadings-

**a) Participants:** Out of 156 individuals participated in this survey, 67 were postgraduate students, 14 M.Phil. Students, 33 Ph.D. scholars and 42 Working professionals.

Designation	No.	Percentage
Post Graduate	67	43%
Working Professional	42	27%
Ph.D.	33	21%
M.Phil.	14	9%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 1: Designation of Participants**

**b) Self-assessment of attention and satisfaction by webinar attendees:** Among 156 individuals self-assessed their average attention during the webinar, 1 being the least and 10 being the most, 16 participants marked between 1-4, 119 people noted their average attention is between 5-7 and 21 participants marked themselves between 8-10.

Attention Level	No. of Responses	Percentage
Low 1-4	16	10%
Medium 5-7	119	76%
High 8-10	21	14%

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<b>Total</b>	<b>156</b>	<b>100%</b>
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**Table 2: Attention in Webinars**

Among self-assessed 156 individuals about their average satisfaction during the webinar, 1 being the least and 10 being the most, 27 participants marked between 1-4, 115 people noted their average attention is between 5-7 and 14 participants marked themselves between 8-10.

<b>Satisfaction Level</b>	<b>No. of Responses</b>	<b>Percentage</b>
Low 1-4	27	17%
Medium 5-7	115	74%
High 8-10	14	9%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 3: Satisfaction of Participants with Webinar**

**c) Platform used for webinar conduction:** Out of 156 individuals participated in this survey, 84 individuals used Zoom, 41 individuals used Google Meet, 6 individuals used Microsoft Team, 14 individuals used Cisco Webex, 8 individuals used GoToWebinar and 3 individuals used other platforms to join in the webinar.

<b>Webinar Platform</b>	<b>No. of Responses</b>	<b>Percentage</b>
Zoom	84	54%
Google Meet	41	26%
Microsoft Team	6	4%
Cisco Webex	14	9%
GoToWebinar	8	5%
Others	3	2%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 4: Platform used for webinars**

**d) The objective of the participants:** In this question the participants were given the option to select multiple responses. Out of 156 participants, 116 responses received in favour of attending webinars in their subject area, 82 responses were in favour of webinars related to hobbies and interests, 77 responses were in favour of webinars which were awareness related and 55 responses were in relation to the webinar which was skill associated.

<b>Theme of the Webinar</b>	<b>No. of Responses</b>
Strictly to your subject area	116
Hobbies and Interests	82
Awareness related	77
Skill related	56

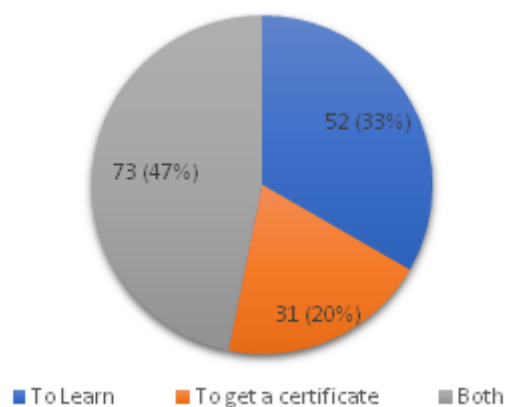
**Table 5: Objective of the Participants to Attend the Webinar**

**e) Purpose of Webinar Attended:** Out of 156 individuals participated in this survey, 52 individuals joined webinars to learn, 31 individuals joined to get a certificate and 73 individuals joined a webinar to learn and also to get a certificate.

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**Figure 1: Purpose of webinar attendance**

In another question, the participants were asked what the individual most likely would do if a webinar attracts the individual but does not provide a certificate. Out of 156 participants, 74 say that they would still attend the webinar, 68 say that they would search for a similar webinar with a certificate and 14 say that they would ignore the webinar.

Webinar without a Certificate	No. of Responses	Percentage
Still attend	74	47%
Search similar webinar with certificate	68	44%
Ignore the webinar	14	9%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 6: Attending a Webinar without a Certificate**

**f) Ideal Length of a webinar:** 23 participants say that a webinar should be less than 1 hour, whereas 87 participants think that an ideal length of the webinar should be between 1-2 hours and 46 individuals feel that the length should be in between 2-3 hours.

Ideal Length	No. of Responses	Percentage
<1 Hour	23	15%
1-2 Hours	87	56%
2-3 Hours	46	29%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 7: Ideal length of webinars**

**g) Ideal Day of Webinar:** According to 68 participants, the webinar should be organized in the early week whereas 17 people say that it should be organized in mid-week and 71 individuals think that it should be arranged on the weekend.

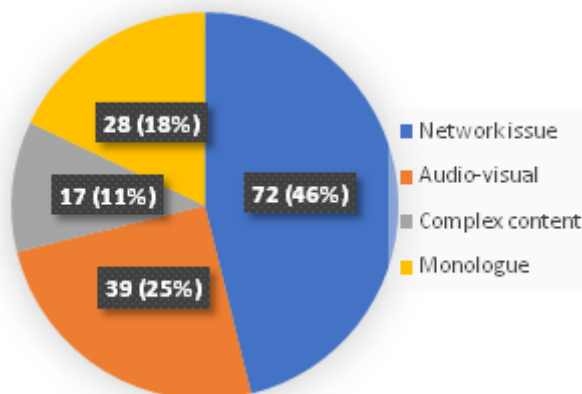
Ideal Day of Webinar	No. of Responses	Percentage
Early Week	68	44%
Mid-Week	17	11%
Weekend	71	45%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 8: Ideal day of the webinar**

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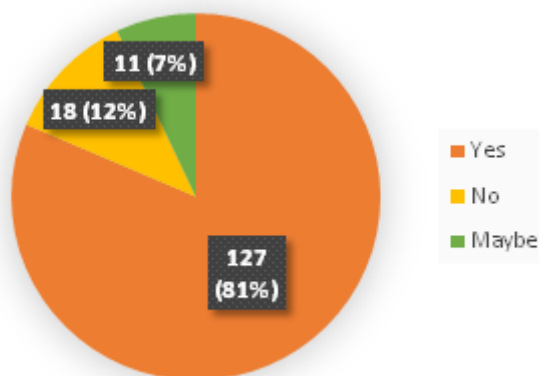
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**h) Challenges Faced by the Participants:** Out of 156 participants, 72 had network issues during a webinar, 39 individuals had audio-visual issues, 17 participants felt hard to understand due to complex content and 28 participants experienced monologue from the host.



**Figure 2: Challenges faced by the participants**

**i) Live Question Answer Session:** 127 participants agree that live question-answer session in a webinar is needed whereas 18 people disagree with it. 11 participants are not sure about their needs.



**Figure 3: Challenges faced by the Participants**

**j) Source of information about the webinar:** 61 participants reported that they came to know about the webinar from institute websites, whereas 72 individuals said that they were informed from social media. 23 people said that they got to know from personal references.

Source of Information	No. of Responses	Percentage
Institutional website	61	39%
Social Media	72	46%
Personal	23	15%
<b>Total</b>	<b>156</b>	<b>100%</b>

**Table 9: Source of Webinar Information**

**6. Engagement of Participants:** Data from the survey indicates that the webinar has been able to attract attention from the higher education students and working professionals in academia. 90% of the participants reported that they were able to provide attention in between medium to high range. 83% of participants note their satisfaction between medium

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to high. This certainly points towards the effectiveness of webinar and the engaging nature of it. Regarding platform, most of the participants used Zoom (54%) and Google Meet (26%) to connect to webinars showing the popularity of it among the webinar hosts. The study also shows that people got to know about webinar mostly from social media (46%), followed by the institutional website (39%) and lastly by personal references (15%). This shows that information regarding webinar gets more disseminated through institutional websites and social media. These two modes attract more attention from potential participants.

**7. Requirements of Participants:** Participants chose to join webinars strictly to his/her subject area as far as possible which is maximum (35%) followed by hobbies and interests (25%). People also attended awareness related (23%) and skill-related (17%) webinars. This signifies the preference of the participants while opting for webinars. A maximum number of individuals (47%) said that they joined webinar intending to learn and also to get a certificate followed by participants who joined to learn (33%) and lastly some respondents (20%) reported that they joined webinars to get a certificate. Among the participants, 44% of people said that even though a webinar attracts them, but does not provide any certificate for it, they would search for a similar webinar which would provide a certificate. 47% respondents note that they would still join the webinar and 9% surveyed individuals reported that they would ignore it. It indicates that even though most of the participants are looking for knowledge, providing a certificate may attract more participants. 56% participants suggest that a webinar should be in between 1-2 hours in length followed by respondents (29%) who think that it should be between 2-3 hours and lastly 15% people think that the ideal length of the webinar should be in between 2-3 hours. Among the participants, 45% think that ideally webinar should be conducted on the weekend whereas 44% of respondents vote for an early week. 11% surveyed individuals said that the ideal days were mid-week. This points out that the participants prefer those webinars which are conducted either in early weekdays or weekend days and in between 1-3 hours in length. 81% of people inform that they prefer to have a live Question-Answer session in a webinar, whereas 12% of participants vote against it. 7% of respondents remain undecided about it. This shows that having a live question-answer session will engage the users more with a webinar and participants like to have an opportunity to clear doubts.

**8. Issues and challenges faced by participants:** Network issue (46%) is the most reported challenge tackled by the participants followed by audio-visual (25%) issue. 18% of individuals point out the monologue as an issue from the host in webinars whereas 11% of respondents account for the complex nature of content. This indicates that guests prefer to have two-way communication during a webinar. One individual said that many of the webinars just cover basic understanding than going into the deeper level, which ultimately reduced interests from the guests. One of the participants said that the host should be attentive towards the network connectivity of the participants. One respondent reported that many of the participants are unaware of the software, and there is a need for capacity building for that as well. Another commented that due to the frequent and increasing number of webinars might reduce participants' interest in it.

**9. Suggestions:** The information of the webinar should be shared through social media and institutional websites to draw more guests. The host should prepare crisp and clear course content with audio-visuals to attract the guests. Conducting webinars during early-week or weekend may appeal to more people to join. A webinar of 1-3 hours is ideal to organize. To keep the participants engaged, live poll, pre-prepared question answers can be used. Providing a certificate may grab interest from people. Live Question-Answer session at the

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end of the webinar is important as it provides the opportunity for users to clear doubts from the experts.

**10. Conclusion:** A webinar is an affordable teaching-learning tool to facilitate synchronous communication. As webinar supports real-time audio-visual content demonstration, it attracts students to get engaged with. Webinars can be recorded as well for future reference and viewing. One major disadvantage of the webinar is that the instructor may not be able to see the guests, hence unable to determine how much attention participants are paying. The absence of view of the body language may lead to misunderstanding or confusion as well.

Even though the webinar has been existing for years, it is still relatively new to academia. The teachers and students are still in need of building capacity around it and their experience needs to be analyzed.

Webinar will successfully create and deliver online content if invested towards technical capacity building of educators, ensure engagement of participants and experience of educators and students are analyzed for developing course content.

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## Online Teaching-Learning during Covid-19 Period

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### Abstract

*This paper aims to identify, acknowledge, and realize the benefits & satisfaction level of online education and the need to accept this new paradigm of education. There are various important key factors and advantages of online education along with offline classroom teaching. Online teaching & learning is here to stay and will serve as a catalyst to reform our education system. The prerequisite of a course and its curriculum will define the extent of online teaching and learning. With the proliferation of information and knowledge students must become lifelong learners in today's world and online teaching & learning plays an important role in helping individuals access learner-centered and self-directed learning in the education system. This new paradigm has united the whole world beyond boundaries and the institutions across the globe are on the same platform.*

*This paper covered aspects like flexible deadlines, educate-educator bond, online platforms, audio-visual learning, cost-effectiveness, effect on physical and mental health, effect of environment and benefits of innovative learning to acknowledge that education is not limited to classrooms.*

**Keywords:** Online Teaching-Learning, Teaching-Learning during Covid-19

**1. Introduction:** Education is the process of learning or acquisition of data, skills, values, and beliefs. Education is essential for every human being to produce a civilized society and forms the foundation of any society. The COVID-19 pandemic has affected educational systems worldwide causing functional changes in the working of schools, colleges, and universities. As of now, approximately 1 billion learners are affected worldwide (UNESCO, 2020). During these testing circumstances due to impromptu functioning, the process of education has shifted from classroom to online teaching & learning that has become a critical lifeline and a blessing for millions of students in these crucial times.

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Learning is no longer confined within four walls of a classroom. Education has come a long way and opened new vistas in the field of education. Online teaching & learning gives students an opportunity to reach educators as they may not be able to enroll in a traditional classroom course and supports students who need to work on their own schedule and at their own space. This was the need of the hour and these changes were due in the whole education system. The education system now is united as the world is on the same platform during this pandemic. The diversity and scale of online courses is increasing and now students need not limit themselves to just one stream and can always avail various courses from different streams.

Online teaching & learning is seen to have various benefits, students have flexibility in taking classes and working at their own pace and time, students learn to become responsible for their own education with information available at their fingertips, find the submission of assignments easy and convenient and can voice their opinions, share and debate issues (Online Business School, 2020). Online learning also helps in easy assessment and evaluation. In the present time, quality of education is better understood by continuous assessments which can be efficiently managed through online medium. Students now are also able to perform different hobbies related activities by staying home and can concentrate and take better care of their health and hygiene.

**2. Methodology:** A survey is conducted through Google forms. The questionnaire comprised 18 questions. The questions were related to the benefits and satisfactory levels of online teaching & learning among students.

An interaction is also made with individuals personally who are currently attending online classes to understand their views and opinions about online teaching & learning.

The data received were tabulated, analyzed statistically using diagrammatic presentation and further interpreted with biochemical perspective to understand the satisfactory physiology.

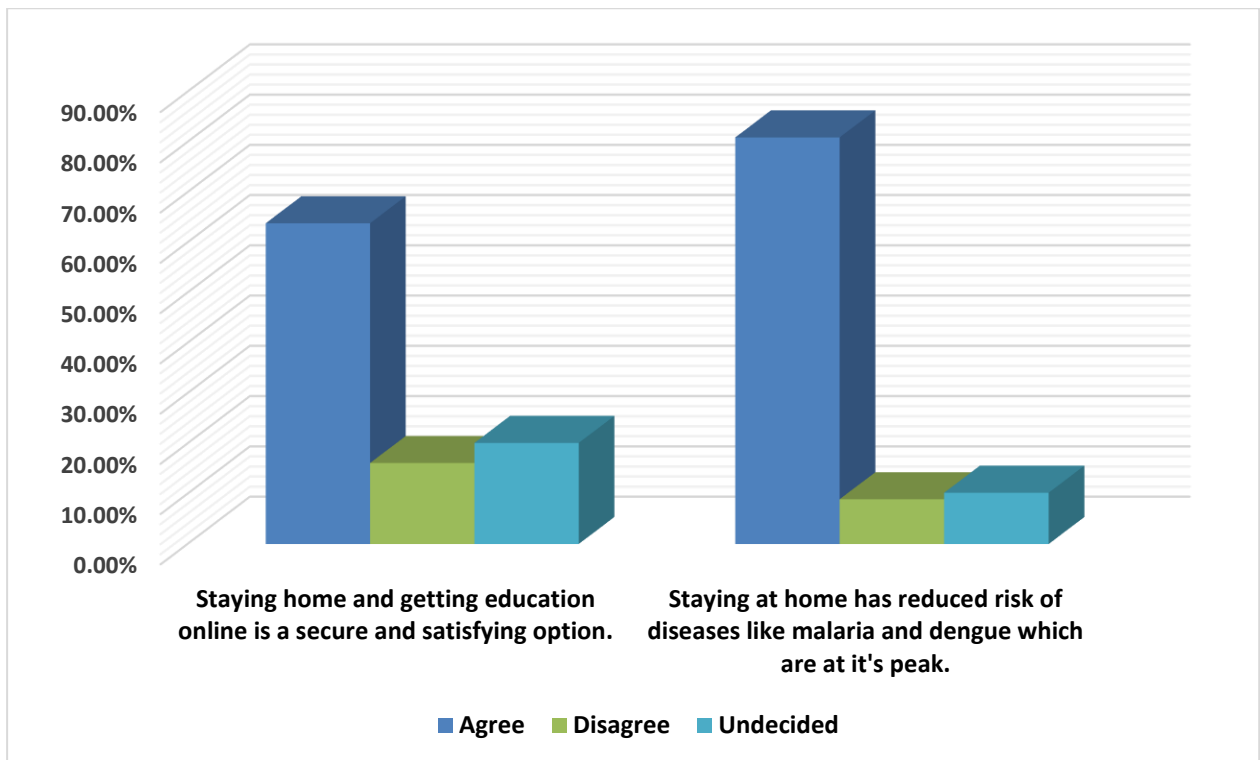
The Google form link of the survey conducted is available at: <https://forms.gle/TLmWiQAqCFFHFVmL6>

**3. Result:** More than 300 responses from all over India under the age groups from 15 years to more than 18 years were received. The data collected has been interpreted in the following through statistical bar diagram and pie charts.

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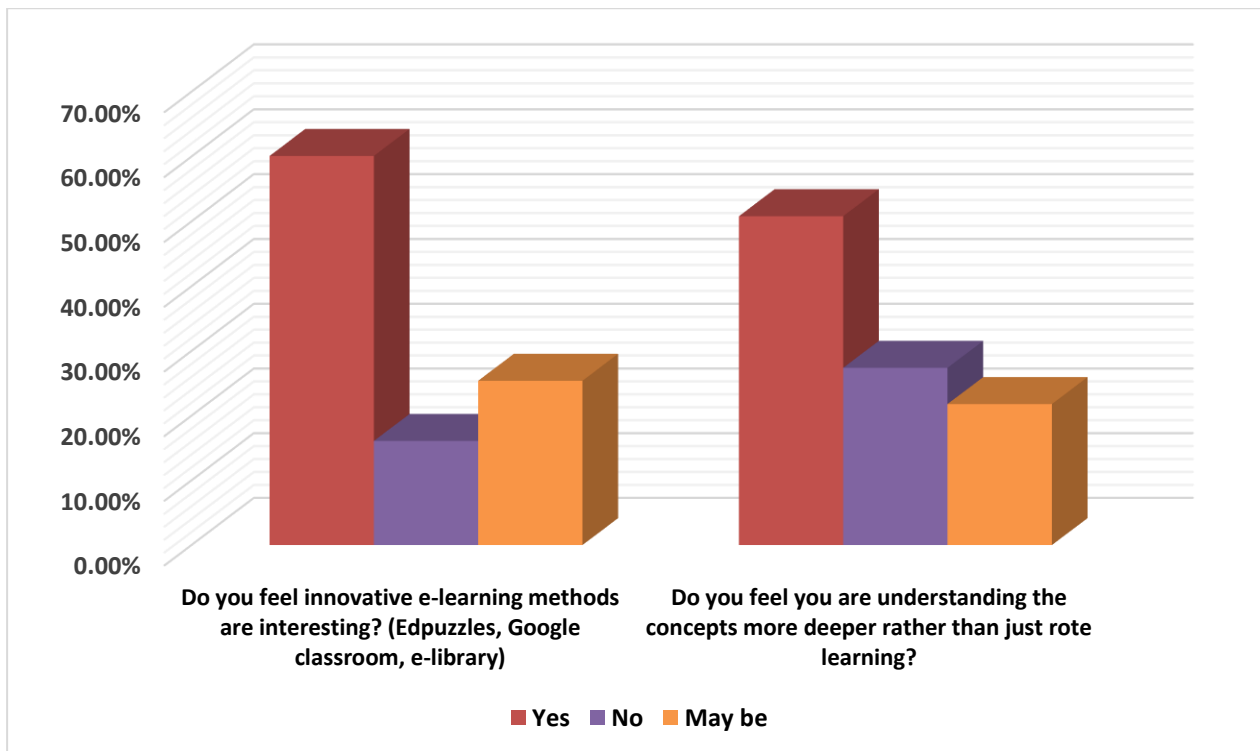
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**Figure 1: Online Education is Secured and Satisfying**

63.8% students agreed staying home and getting education is a secured option & 80.9% students have agreed that staying at home has reduced the risk of diseases.



**Figure 2: E-learning Methods are Interesting and Help in Understanding the Concept at Deeper Level**

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59.9% students feel sources like Edpuzzle, Google Classrooms are satisfactory & 50.8% students agreed that instead of rote learning they are understanding concepts more deeper and better.

Over the past three months 63.8% students have attended few seminars and workshops while 21.1% have attended many online seminars and workshops and 15.1% have attended several seminars and workshops.

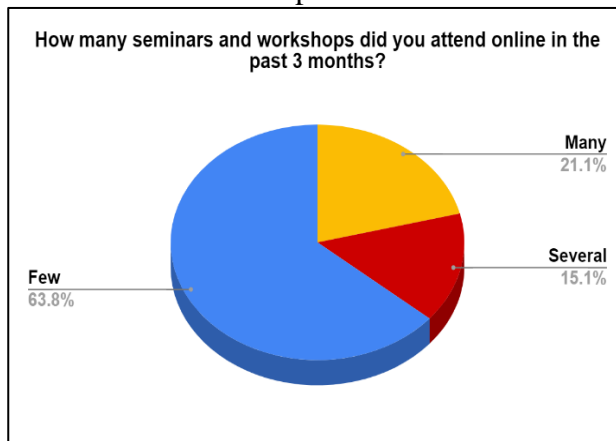


Figure 3: Seminars and Workshops Attended in the Past Three Months

47.2% students agreed that the bond between the teacher and students has become interactive and healthier in the online teaching-learning process.

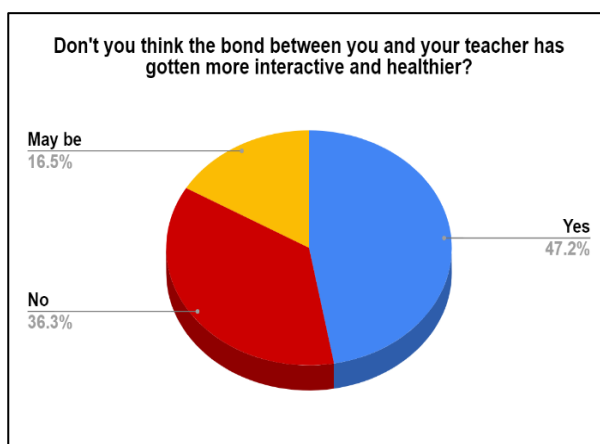


Figure 4: Relation Between Teacher and Students in Online Teaching-Learning

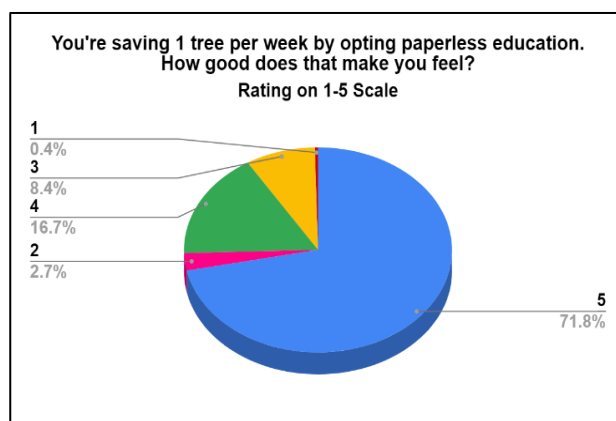
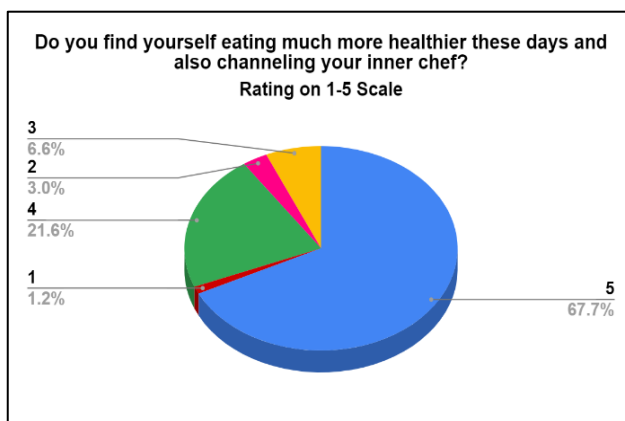


Figure 5: Feeling of the People towards Paperless Education

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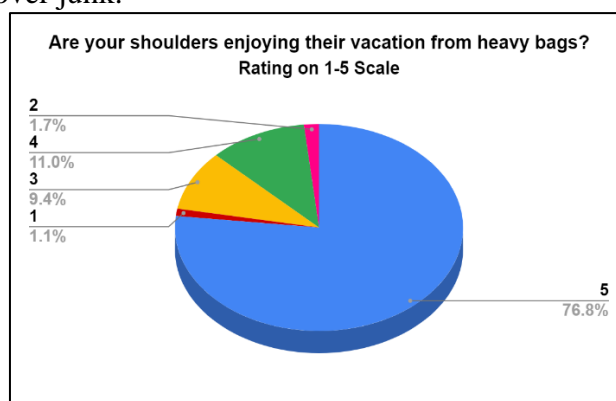
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71.8% students feel good by opting for the decision of paperless education.



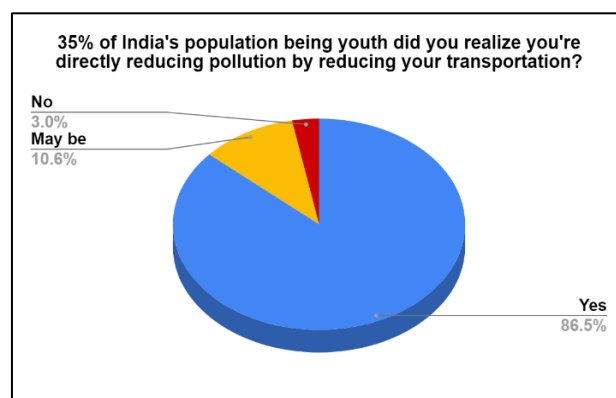
**Figure 6: Change of Eating Habit during Covid-19 Period**

67.7% students have a change in their eating patterns and even noticed that they are eating healthier food over junk.



**Figure 7: Impact of Covid-19 in the Shoulders**

76.8% students have given a 5 on rating scale as they feel that their shoulders are free from the burden of heavy bags.

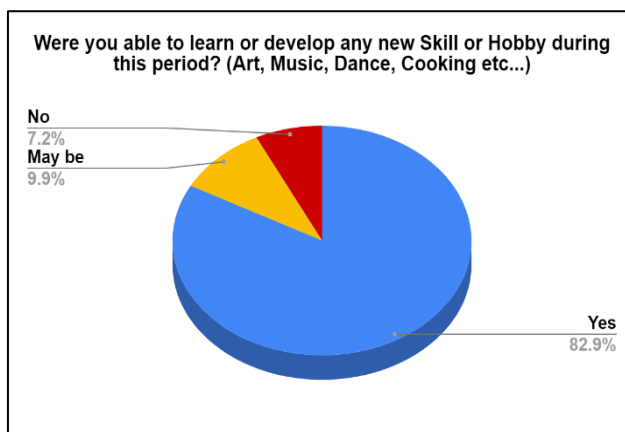


**Figure 8: Impact of Covid-19 on Environment**

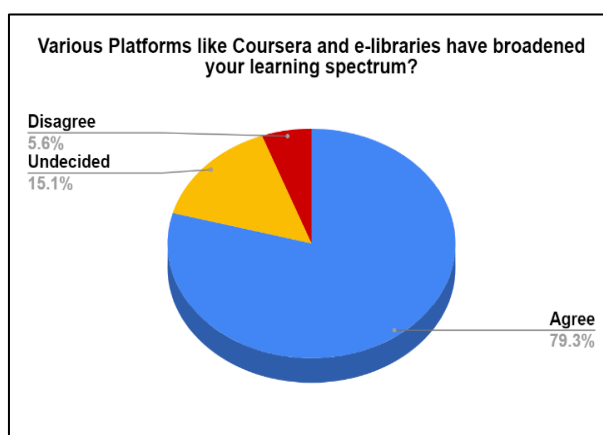
86.5% of students realized that reducing transportation has reduced pollution.

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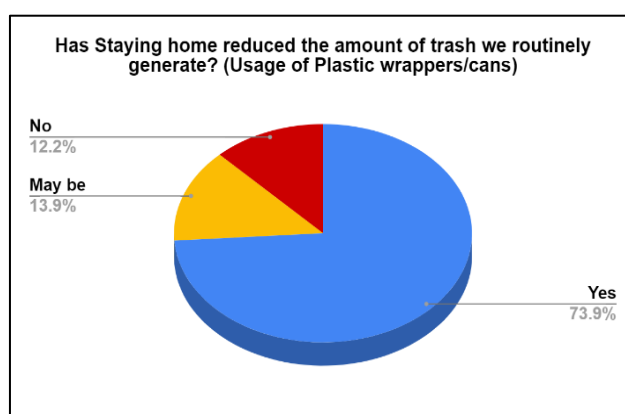


**Figure 9: Impact of Covid-19 in Developing New Skill or Hobby**  
82.9% students have developed a new skill or a hobby in this period.



**Figure 10: Impact of Coursera and E-Libraries**

79.3% students agreed that platforms like Coursera and e-libraries have broadened their learning spectrum.

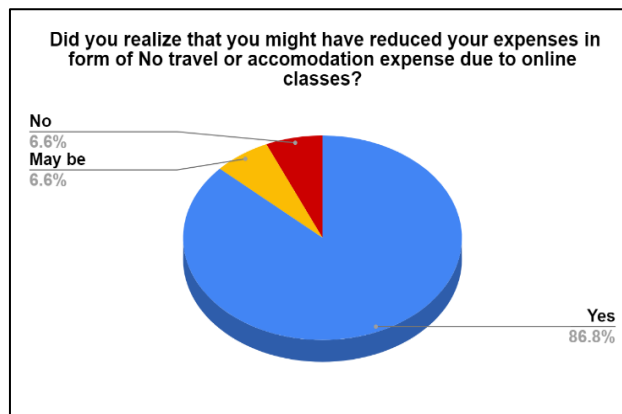


**Figure 11: Impact of Covid-19 on Trash**

73.9% students agreed that they have reduced the routine trash that is generated.

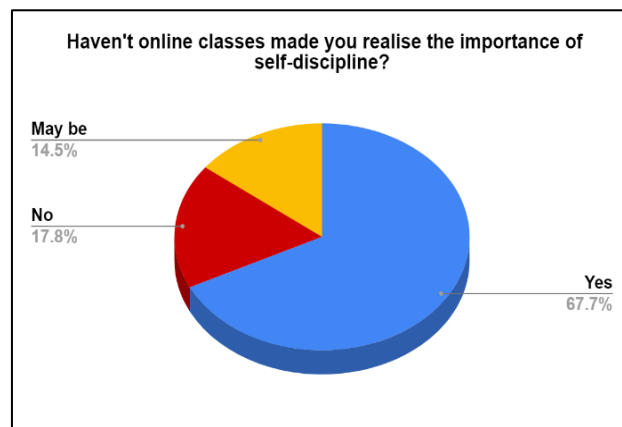
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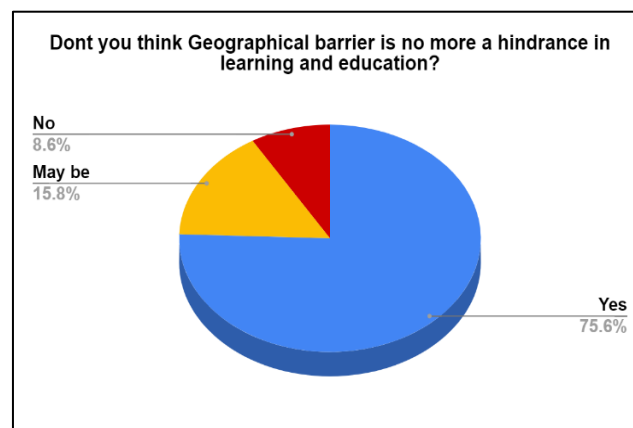
**Figure 12: Impact of Covid-19 on Expenditure**

86.8% students have realized that they have reduced expenses due to online classes.



**Figure 13: Impact of Covid-19 in Maintaining Self-Discipline**

67.7% of students realized the importance of self-discipline during online classes.



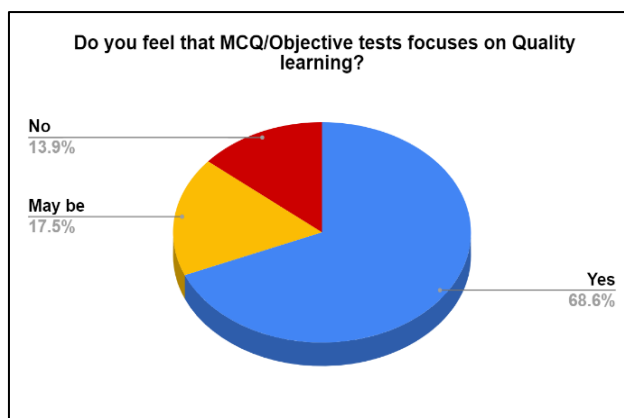
**Figure 14: Breaking the Geographical Barrier in Teaching-Learning**

75.6% students agreed to the point that geographical barriers are no more a hindrance in learning and education.

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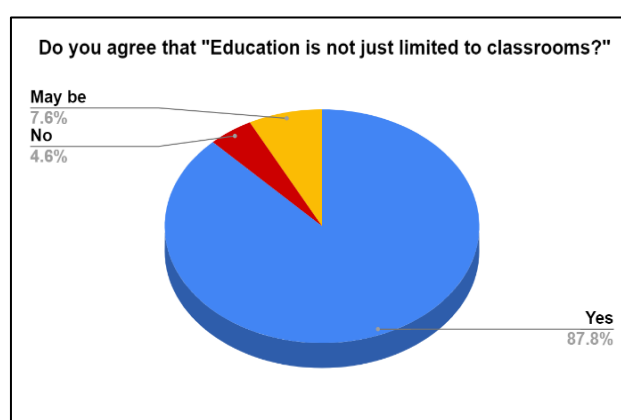
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**Figure 15: MCQ on Quality Learning**

68.6% students feel that objective tests focus on quality learning.



**Figure 16: Education is not Limited to Classroom**

87.8% of students agreed to the fact that “Education is not limited to just classrooms.”

**4. Online Teaching-Learning during Covid-19:** With the computer and internet coming into existence in the late 20<sup>th</sup> century, the new course of online learning often termed as e-learning had begun. Various methodologies and applications like MS Word, MS Excel, MS PowerPoint, etc. created a boon for online learning niche. The concept of e-learning had begun. With the due course of time, e-learning courses had become popular among businesses and trainers (Ferrer, 2019). Although it was not widely accepted all over the world. It has taken a pandemic for the population to accept and get acquainted with e-learning. E-learning is now less marginalized and gradual transition has taken place from IT to mainstream academics. As advancement continues to occur in technology, an increasing number of students are having access to the internet thereby making online education the future of learning.

E-Learning methods are strong. There are plenty of innovative online tools available and educators can use a combination of audio, video, and text to reach out to their students to maintain human touch especially in times of crisis like the pandemic of Covid-19. Here comes the question, how is innovative learning beneficial over the use of simple chalk and board? Chemicals play an important role in learning. Strategies of Brain-based teaching & learning is efficient in understanding and learning of subjects. Brain-based teaching & learning includes use of color, audio, images, videos, interactive quizzes etc. The basis of

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learning and memory creation lies in changes in electrically active neurons and connections between them called synapses. Chemical neurotransmitters are used to send signals across synapses and the neuron integrates all signals it receives and produces sensible responses. Learning appears to occur primarily because of changes in the strength and number of connections between existing neurons, a process termed Synaptic Plasticity (Georgic, 2015; Owens & Tanner, 2017) (Figure 2 & 15).

Brain-based teaching & learning builds stronger connections and circuits which produce neurotransmitters involved in learning and memory more efficiently making a student to learn, remember and store knowledge. Situations of novelty, visual representation and reward are associated with release of neurotransmitters like

a) Acetylcholine releases and supports different types of memory from working to long-term memory.

b) Dopamine a potent neurotransmitter makes one curious about ideas and fuels the brain to search for information.

c) Serotonin regulates brain function and develops cognitive skills to think, read, learn, remember, reason, and pay attention (Adaes, 2018; Mandal, 2019) (Figure 10).

Online teaching & learning is now increasingly considered as a viable alternative in these difficult times of pandemic to the traditional path of attending brick and mortar colleges. Flexibility in online interaction is often cited as being a greater advantage of online teaching and learning. The cost effectiveness has emerged as an important factor. Attending a campus life is more expensive. Traditional schools and colleges come with a certain kind of experience filled with dorms, dining halls, big-brick academic buildings, swimming pools, playgrounds etc. all of which comes at a cost. Offering all these amenities requires a significant amount of overhead and hence turn out to be expensive. On comparing online classes might cause quite less and hence it is a crucial aspect in today's economy where job losses and pay cuts are rampant. Online teaching & learning becomes relatively cheaper by avoiding costs of transportation, accommodation and over institution costs. With online teaching & learning students can be assured that economic blows dealt during pandemic will not affect their education. Governments and institutions are constantly putting efforts to help and assist students and ease the process of online education by creating conducive infrastructures (Figure 12).

Eventually the monsoon season is here! Monsoon season brings countless diseases every year due to deleterious viruses. The airless and windy surroundings spread many infectious diseases. Common monsoon diseases are: Cold and Flu, Hepatitis A, Mosquito Borne Diseases (Dengue and Malaria). Dengue and malaria are two vulnerable diseases. Every year there are numerous cases of people who are suffering from these air-borne diseases. Comparatively this year the numbers of cases have reduced, and the main reason for this is because much of the population has avoided travelling for education and hereby preferring online education. Staying at home is not only helping us get education but is also protecting us from other diseases as monsoon is at its peak. By staying at home in this hard time we are saving our life! Hence justifying the statement "prevention is better than cure" (Kokilaben Dhirubhai Ambani Hospital, 2019) (Figure 1).

Successful management of data during traditional education uses enormous amounts of paper for maintenance and the procedure is not immediate, moreover, the advantage of online education is- everything is digital, and the work gets completed quickly in a systematic way. It also reduces the burden and efforts that the teachers must put to check every student's assignment. Hence artificial intelligence on online learning has made work easier for both the teachers and the students. This mode is giving weightage to assessment and evaluations than examinations. It can replace rote learning to give way to concepts and understanding in the learning process. The relation between students and teachers also plays

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a major role in flight of a student's academic progress, social development and during online-learning the classes are found to be more interactive and has allowed students having introverted nature to communicate with teachers (Figure 4).

**a) Self-Discipline:** Online learning is growing increasingly. As this method of learning is more accessible and affordable than traditional courses, it also requires more discipline. To succeed in an online program, one needs to reduce the possibility of distractions and understand how to manage time. Just being online can cause distractions to students and they may have an urge to use social media, gaming sites and the list goes on. However, if the student cannot have a control on their urges then they should often switch off their devices which take away their attention from their work. One needs to select a calm place to complete all the work and plan the events of the day beforehand for effective time management. By learning the importance of work to be done, one becomes self-discipline and learns various methods to avoid distractions. Online-learning gives us the opportunity to learn more than what we could learn via traditional classes (Brian Tracy International, n.d.) (Figure 13).

**b) Healthy Food:** Over the past few years' foods like vada pav, pizza, french-fries, and many other dishes have pierced in every corner of our country. Almost anywhere we go, we can find these junk food varieties. The consequences that these junk foods have on our health are horrific, irrespective of whether you have it once, twice in a week or even daily. Problems which arise are obesity, high blood pressure, depression and many more. One can deal with these severe problems only by taking proper care of themselves, by eating nutritious food cooked at home and avoiding fast food (Rupavate, 2014). Staying home has given students the opportunity to concentrate on their health. They are now able to eat healthy home cooked meals and avoid junk food (Figure 6 & 11).

Road transportation is the most convenient mode of transportation for students to reach their respective educational institutes and contributes a major share to pollution. Previously, education and road transportation went hand in hand but since online classes have begun during this time of the pandemic, it is no longer a barrier between students and their education. With increasing road transportation phenomena like "global warming" is at its zenith. Carbon monoxide when inhaled combines with hemoglobin due to high affinity and has toxic effects on our health (DetectCarbonMonoxide.com, n.d.. Various particulate matter and gaseous pollutants can have a detrimental impact on our skin, lungs, kidney etc. Prolonged exposure to traffic or noise pollution can have an impact on us unknowingly like stress and increased blood pressure (Australian Academy of Science, 2020). So, online classes are not only beneficial to us but for the environment too. Reducing transportation is not only saving us from the pollution and its harmful effects but it will also slowly reduce the impact of pollution on nature (Rose, Wang, Xu, McTiernan, Shiva, Tejero, & Gladwin, 2017 & *Does air pollution lead to atherosclerosis*, 2007) (Figure 8).

"Online learning will help pave the way for paperless education". E-libraries, publishing houses and online learning platforms help us to get education without cutting down trees. This will eventually reduce our paper consumption and help in reforestation. Every year innumerable trees are cut down to print textbooks for schools and colleges and this practice can be slowed down by opting online learning. It was necessary to throw light on these aspects because as time goes by both education and pollution will have a steady exponential growth. Paperless education is a boon for our forests and reforestation is a blessing. These might seem as minor changes, but the impact will be the change that we need. Small steps taken today will take us a great distance in the future (Figure 5)

Last but not the least, online platforms of learning and teaching have united the whole world and put countries together for better learning and teaching. So many libraries and publication houses have gone digital and are available free of cost in these difficult times of

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Pandemic. Teachers and students are exploring virtual-labs and virtual learning means. Prestigious universities have opened their doors for students beyond the boundaries across the globe. We could attend several webinars, workshops, and conferences online and enriched our academic level (Figure 3, 10 & 14).

**5. Conclusion:** Education is a vital asset which can be acquired from the four corners of the world, but it depends on the willingness of the student. During these terrifying yet unavoidable times of the pandemic, there is a silver lining which was brought to light. The educational platform across the world has become one and united by connecting students through various online programs like courses, seminars, workshops, e-libraries etc. The survey conducted had around 20 questions which helped us get an insight into a student's mind-set on how online learning and teaching was perceived by them.

Rote learning has taken the back seat so that online learning and teaching can be the need of the hour. Both online and traditional educational methods have merits of their own but taking the current circumstances into consideration, online learning and teaching is a path we can opt to ensure that we can focus on our education as well as health and hygiene. It is also noteworthy that these online platforms offering approachable and imaginative learning must not terminate once situation improves. Belonging to the era of technology and development, youth understands and relates to information technology much better and this understanding can be used to broaden our spectrum of education, thus, serving as a catalyst to reform the education system. Both traditional and online learning must go hand in hand to bring about a satisfactory and innovative learning experience. Many educational institutes are enhancing facilities allowing students to participate in some sort of virtual learning along with traditional methods. With the continual development of technology, online teaching and learning will go on to improve and flourish.

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