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NEP based Smart Education System

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***Abstract*—With the growing requirements of our current education system in accordance to the demands of the students and training faculty, it is found that many educational institutions are underfunded, which has led to a lack of resources for teachers as well as students, under qualified facilities. The education system often perpetuates social and economic inequalities, with disadvantaged students receiving a lower-quality education and fewer opportunities. The education system often places more emphasis on rote learning and memorization than on developing critical thinking and creativity skills. Children from rural areas have yet to have access. The National Education Policy (NEP) provides for reforms at all levels of education, from school to higher education. This model will enhance the accessibility of education as well as restructure the system. The model allows for teachers across the country to connect with students, teach them various subjects and conduct assignments remotely. Students have easy access to primary education by using the model created to enter their credentials and learn from the content posted by the teachers. Students take up the assignments allotted for the subject which is further graded by the accredited teachers. This project aims to develop an e-learning-based model that utilizes full-stack technology to create a decentralized and secure system for storing and sharing educational data, such as student records and credentials.**

***Index Terms*— NEP[National Education Policy], Web Application, Full stack, Cloud Computing.**

I. INTRODUCTION

An e-learning system is a digital platform that allows students to access educational content and resources online. This can include interactive lessons, videos, quizzes, and other materials that are designed to enhance learning and engagement. E-learning systems can also include features such as progress tracking, assessments, and communication tools that allow students to interact with their teachers and classmates. These systems can be used to supplement traditional classroom instruction or as a standalone method of education. E-learning systems have become increasingly popular in recent years as they offer a flexible and convenient way for students to access education. One of the main advantages of e-learning is that it allows students to learn at their own pace and on their own schedule. This can be particularly beneficial for students who have busy schedules or who live in remote areas. Another advantage of e-learning systems is that they often include interactive and multimedia elements, such as videos, animations, and simulations, which can make the learning experience more engaging and effective. Additionally, e-learning systems can be customized to meet the individual needs of students, providing them with tailored learning experiences. However, e-learning systems also have some drawbacks. One potential issue is that students may no have access to the same resources and support as they would in a

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traditional classroom setting. Additionally, e-learning systems can be dependent on the internet and have technical issues, which can disrupt learning. Additionally, self-motivation and self-discipline are key factors in e-learning systems, which can be a challenge for some students. Overall, e-learning systems offer many benefits and can be a valuable tool for students of all ages and backgrounds. However, it is important to consider the potential drawbacks and ensure that students have access to the resources and support they need to succeed.
A NEP (National Education Policy)-based online education system for rural areas could leverage the principles and practices of participatory approaches to empower communities and individuals in remote and rural areas to access education and build their capacity for lifelong learning. This system could use full-stack technology to create a decentralized and secure platform for online education where educational content is stored and can be accessed by learners in rural areas. The NEP approach focuses on the active involvement of communities and individuals in the design, implementation, and evaluation of educational programs, which can help ensure that the education system is responsive to the specific needs and context of rural communities. This can include involving rural communities in the design of educational content and using local resources and traditional knowledge to inform the curriculum.
Cloud computing technology can be used to host e-learning websites, and offers several benefits over traditional hosting methods. One of the main advantages of using cloud computing for hosting e-learning websites is scalability. Cloud hosting allows for easy and on-demand scaling of resources, such as storage and computing power, as needed. This means that the website can handle large numbers of users and traffic without any downtime or slow performance. Another benefit of using cloud computing for e-learning websites is its cost-effectiveness. Cloud hosting eliminates the need for costly infrastructure and hardware, as the website and its resources are hosted on remote servers. This can save on upfront costs and ongoing maintenance expenses. Additionally, cloud hosting also provides better uptime and reliability, as the resources are distributed across multiple servers, so if one server goes down, the website can still be accessed from other servers. This can ensure that the e-learning website is always available for students. Overall, cloud computing technology can be an excellent choice for hosting e-learning websites. It offers scalability, cost-effectiveness, improved security, and reliability, which are all important factors for a successful e-learning platform.

II. Literature Survey

Ajay Kurien and others et al. [1] detailed the study of the impact of the Covid-19 pandemic on education in our country. Since educational professionals never anticipated the adjustments that NEP 2020 had suggested, they have been touched by them. The policy is a comprehensive framework for elementary education, higher education, and vocational training in both rural and urban India. The policy aims to transform India's education system by 2021. The main problems faced by the Indian higher education system include enforced separation of qualifications, early specialization, student streaming into restricted research areas, less focus on research at most universities and schools, a lack of competitive peer-reviewed academic research funding, and large affiliated universities leading to low levels of undergraduate education. The paper also highlights the salient features, which are- multiple entry and exit programs; tech-based options for adult learning through apps; e-courses available in regional languages; foreign universities setting up campuses in India; and a common entrance exam for all colleges. There is also a necessity for more evidence-based decision-making to adapt to rapidly evolving transmutations and disruptions. NEP has reassuringly provisioned for real-time evaluation systems and a consultative monitoring and review framework.
Mr. Sachin J. Sakhare et al. in [2] demonstrated the role of a teacher and the features of NEP 2019. They talk about the traits a teacher must possess, such as being passionate, motivated, and well qualified in content, pedagogy, and practice. Teachers serve multiple purposes, such as teaching knowledge, creating classroom environments, role modeling, and mentoring. shed light on school related observations such as early education and care, the RTE Act (2009), the curriculum framework, and school examination reforms. NEP will play a significant role in the development of pre-primary education and the higher education system.
Dr. Shweta SMRITA SOY et al. [3] proposed that a dedicated unit for the purpose of orchestrating the building of digital infrastructure, digital content, and capacity building will be created in the ministry to look after the e-education needs of both schools and higher education. The policy goals must be to create an "information and communication technology [ICT] literate community," promote universal, equitable, open, and free access to ICT enabled tools for all students and teachers, and motivate and enable wider participation. The emergence of digital technologies must be used for content creation, digital repository and dissemination, building virtual labs, conducting online assessment and exams, providing blended modes of learning, training and incentives for teachers, and laying down standards. Since, there are numerous challenges to conducting online examinations at

scale, including limitations on the types of learning, unless online education is blended with experiential and activity based learning, it will tend to become a screen based education with limited focus on the social, affective, and psychomotor domains of learning.

Dany Laksono et al. [4] have examined the quantitative comparison of geospatial big data processing performance between SQL (PostGIS) and NoSQL (MongoDB) databases. In order to evaluate how MongoDB and PostGIS will perform in the real world when managing a sizable amount of simulated geospatial data, a NodeJS-based angular-framework web app was created. To test the capabilities of both databases to store and load geographical data, a variable number of points was generated. The test was carried out by contrasting each database's XHR (XML HTTP Request) results. The outcome demonstrated that MongoDB, a NoSQL database, outperforms traditional SQL databases employing PostGIS when it comes to importing large amounts of geospatial data.

In K. Saundariya et al. in [5] demonstrates that the online website makes it simpler to schedule your own employees at the proper time and cost, making the employees available with only one click at your doorstep. Workers who are handymen can put their work and talents into different areas to promote themselves. It also enables experts to profit financially and professionally. The workers are listed, depending on location and cost, with their name and contact information when users login for the services they require. There are various categories and services. React JS speeds up website development, increases productivity, and is SEO-friendly. MongoDB is a schema-less database that is simple to scale out, making data management easier. The site provides an authorized login for the customer, the handyman, and the admin to ensure confidentiality. If a user wants to become a worker in the future, they are able to do so with the same login. For every action of the user and worker, they will be informed beforehand.

Tariq N. Khasawneh et al. [6] describes that in light of the classic relational database management systems' limitations and the ever-growing use of non-relational databases, another name for scalable management systems that can handle large data quantities is "NoSQL" databases. In order to compare the various NoSQL management systems, this work classifies them into four main categories: key-value stores, column-oriented, document-oriented, and graph-oriented. The CAP theorem and BASE properties are used to compare each of the categories. Different types of data, including structured, semi-structured, and unstructured data, are supported by NoSQL databases. It is intended to address a few of the shortcomings of relational database management systems, particularly when handling large amounts of highly variable data. NoSQL can be characterized as a database that scales horizontally and is appropriate for applications with hierarchical data stores.

Jie Yang, Bo Dong, and others et al. in [7] aims to incorporate cloud computing into the e-learning ecosystem. The author focuses on the advantages that cloud computing can offer to an e-learning ecosystem and demonstrates the architecture and mechanisms of an e-learning ecosystem based on cloud computing infrastructure. There are a couple of viewpoints on the distributed computing commitment: i) the cloud offers services that are time, cost, and reliability guaranteed by QOS; ii) the cloud facilitates the acquisition of the necessary computing and storage resources by supporting a variety of applications; and, what's more, an infrastructure layer is the collection resource pool for the e-learning ecosystem and provides capacity for computation and storage for the top layer of the proposed cloud computing architecture. The majority of the content layer is made up of e-learning services like Web file systems, database systems, and Web services. The majority of the application layer is made up of systems and tools for two kinds of e-learning services. The monitoring module, which monitors the execution of requests and measures CPU, memory, and I/O usage, is one of the many modules that the architecture takes into consideration. Teaching and learning strategies are created and maintained in the policy module. The arbitration module changes also lay out usage modes for various types of clients in light of their learning styles, further developing asset allocation and executives. Before the provision module begins the execution of the resource allocation set by the policy and arbitration modules, a password and username will be provided in the event that the request comes from the user ID. The four main mechanisms used in the e-learning ecosystem are pre-scheduling, overall QOS assurance through reduced resource redundancy, and reduced I/O. The early warning mechanism of the e-learning ecosystem makes it possible to allocate resources effectively in response to sudden spikes in demand. Due to the self-recovery mechanism, it is able to recover quickly enough from hardware or software failures that cannot be avoided. Evolutionary mechanisms for efficient resource utilization can be guaranteed in the e-learning ecosystem. Their work aims to incorporate a cost-effective, diverse, QoS-guaranteed, and cost-effective cloud computing infrastructure into an ecosystem for an e-learning system.

N. Radhakrishnan and others et al. in [8] shown that the employability of cloud computing in the "Teaching and Learning as a Service" (TLaaS) ring of education and learning is discussed, highlighting its potential advantages and offerings. This paper attempts to examine the use of cloud computing in e-learning, develop an e-learning

cloud, and conduct active research and investigation for it in order to fully showcase the benefits of cloud computing. The advantages of making an e-learning system based on cloud computing are: i) the cost is low or even free in some cases; ii) mobile phones, for example, could be successfully employed as cloud clients due to their low hardware needs. iii) No special software needs to be downloaded or installed in order to join the cloud; only an Internet connection is needed. disadvantages i) The overall results may be impacted by the Internet connection speed; ii) The cost of the data center subscription fee may eventually be higher than the cost of purchasing the equipment; iii) When discussing data security, the necessity of backups and the quality of the service are both vital. Communities, countries, and education can benefit from cloud computing. The use of cloud computing for e-learning systems has favorable circumstances.

In [9], Md. Masud et al. integrates various e-learning features and characteristics to describe an architecture for distributed computing. As a result, the authors construct an e-learning cloud that they continuously study and actively research, considering the following factors: Architecture and Construction Methods This paper primarily focuses on the education sector by introducing cloud computing with the intention of increasing its scalability, adaptability, and availability in e-learning systems. The advantages and disadvantages of the traditional e-learning network model were examined, as was the possibility of transferring the system from educational institutions to enterprises and distance education within the cloud computing infrastructure. Advantages] Two important advantages are cost efficiency and the separation of entity roles. Issues] The institution is responsible for the school system and smooth administration and delivery, while the vendors are responsible for the development, support, and evolution of the system. The e-learning framework can be versatile both on a level and in an ascending direction. The amount to be paid by the educational institution is proportional to the number of servers used, which is based solely on the number of students enrolled. The infrastructure layer, the software resource layer, the resource management layer, the service layer, and the application layer are all components of their proposed cloud computing architecture. The largest part of the infrastructure layer is the teaching materials and information infrastructure; the product resource layer is mainly composed of working frameworks and middleware. To achieve loose coupling between software resources and hardware resources, the resource management layer is required. In addition, there are three main services in the service layer: software-as-a-service, platform-as-a-service, and infrastructure-as-a-service are all examples of SaaS. Instructional resources, such as courses and the sharing of instructional resources, make up the application layer of the cloud computing model. This cloud computing architecture for an e-learning system provides them with a number of benefits. These advantages include high computational and storage capacity, high availability, high security, adaptability, and improved interaction between students and teachers. Their work was conducted with the intention of finding a suitable architecture that utilizes cloud computing for higher education; furthermore, their subsequent research focused on the mindset and migration strategy for the proposed cloud-based architecture.

S. N. Mahfuzah, M. Khanapi, et al. proposes a concept for cloud-based e-learning system architecture in Education 4.0. An architecture that can be used as a guide when developing cloud-based e-learning systems that comply with Education 4.0's requirements is the objective. Five layers make up the architecture of cloud-based e-learning systems: There are layers for software, infrastructure, resource management, service, and application business. The application layer, which distinguishes it from various frameworks in the execution of distributed computing, is referred to as the "business application layer" among these. This layer is made up of three additional layers: the content layer, the application layer, and the infrastructure layer. E-learning content like web file systems, web services, database systems, and so on make up the content layer. A collection of cloud e-learning resources is called "layer infrastructure." The "e-learning era" is the third development in education. It can be divided into two categories: those where the web-based E-Learning Framework is alluded to as "conventional" E-Learning, and those where the E-Learning Framework depends on "distributed computing." Most of the assets for conventional e-learning are given by foundations, while cloud-based e-learning utilizes cloud administration offices to further develop viability and proficiency. The business application layer of the distributed computing-based e-learning framework design has been altogether modified by Time Instruction 4.0. This is shown by connecting the features of Education 4.0 and the Layer on E-Learning System Architecture. In Era Education 4.0, it is therefore possible to draw the conclusion that a cloud-based e-learning system architecture can be transformed into a cloud-based e-learning architecture system through AI-based modifications to the business application layer.

III. Problem Statement

Education is essential to advancing a student's skills and potential in order for them to succeed in the fiercely competitive professional environment of today. With 365 million young people, India has the biggest youth

population in the world, making it crucial to give its children access to the best educational opportunities. With a focus on curriculum flexibility and the elimination of compartmentalization across various learning streams, we created a framework model for an online E-Learning system that focuses both on academic and non-academic areas in order to revolutionize school education.

IV. Proposed System

According to the survey done on the NEP policies and the technology required to implement the said education system, the proposed system is to create an interactive and informative website that can be accessed by users through web-browsers on laptops, desktops, and even mobile phones. a well-guided interface with suitable animations and innovation to keep young children engaged while providing quality education following the guidelines provided by NEP. Pedagogy is a systematic conceptualization of the process of education and the conditions of human development in both the individual and societal life spheres. The aim is to make a website interactive and fun for children while motivating them to participate and fostering long-term-engagement.

Key Components:-

1. Login Page- Student and Teacher
2. Signup Page- Student and Teacher
3. Video and text content
4. Assignments, quizzes, and timetable
5. Viewing Important Points in a Few Taps
6. Optimal learning with the ability to download and study lessons offline

V. High Level Design

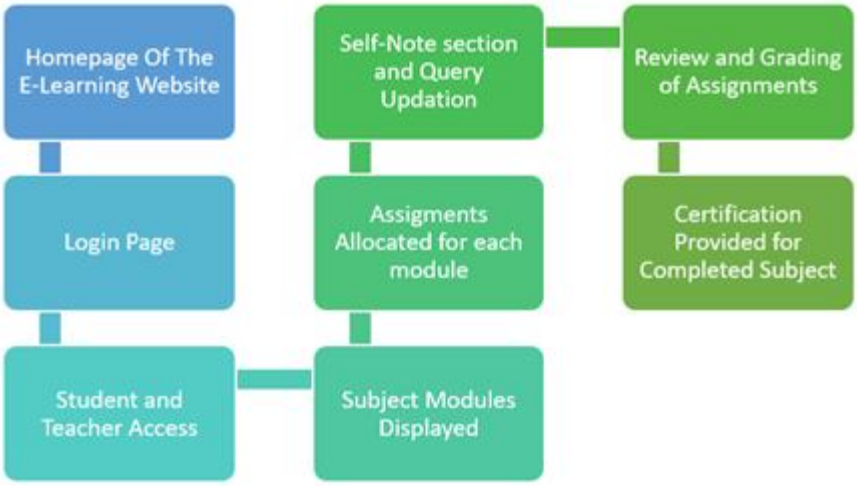

Figure 1.1

The proposed framework will be a website. Upon opening the website, the homepage will be viewed. An option to Login in which you can login based on your designation of a student or teacher. Once logged in, subject modules posted by the teachers will be displayed and can be viewed in any order. Once the student completes the assignments, his work is reviewed by accredited teachers across various regions and the certification of completion is provided.

VI. Conclusion

By offering a single, standard platform for managing and tracking educational data and results, a full stack-based smart education system can aid in the implementation of national education policy. Full stack technology has the potential to increase school administration's efficiency and openness, guarantee safe and tamper-proof records, and enhance evidence-based decision making. Incorporating full stack into the national education policy can support fair access to high-quality education, opportunities for lifelong learning, and a competent workforce, all of which can help a nation thrive overall. However, in order to fully realize the promise of a full stack-based

smart education system, it is crucial to take into account the scalability, security, and adoption challenges that must be overcome in the future.

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