

Tutor Buddy: Peer2peer Collaborative Education Network

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Abstract—

With the rapid advancement from the hardware age to the software age and now to the internet age, we find ourselves in a pivotal era where everyone is connected to internet the inter-relationships of data hold immense significance. In today's landscape, Education - one of the pillars of growth for human civilization has become accessible to one and all. Now days every person got equal opportunities to learn about something new from internet. This platform of internet has become the largest library for knowledge in today's world. With advancement of time we had also seen growth in new industries related to Internet + Education, these new ways to teach and learn had pave the way for many who have difficulty for finding the right system and path to learn and get a chance to move forward in their life.

Keywords—Smart search and sorting, Platform based interaction, Security mechanism , Content provider

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I. INTRODUCTION

We have all learned about evolution of humans, industrial revolutions, agricultural revolutions but in case of education-one of the pillars to support human civilization advancement have we ever seen any change in the past few centuries? NO, definitely No this can be seen in last 100 years the same system, same problem to not able to give education to every being due to various reasons, but finally we had seen a hope, a path to provide education to masses with least resources.

“We need to bring learning to people instead of people to learning.” – Elliot Masie

Education in the past is provided in closed classrooms with limited students so that it can be effectively delivered. This led to the fact that most of the population can't receive quality education or simply no education until later time. Human want to receive education to learn skills to improve their life ,change their social standing and move forward in life. But lack of education has led to serious imbalance in numbers of people who can change and contribute their values to others.

It's not that nobody tried to solve this problem in time, many tried and mostly all failed. Reason, well simply imbalance in tutors and students ratio. Even if we produce millions of teachers every year the sheer population growth of students change the fact of ratio thing and the thought that every educated will be willing to teach other is almost impossible.

Finally with the arrival of E-Learning this kind of problem can be solved with E-Learning tens of millions to hundreds of millions of people can learn new knowledge through internet in a systematic manner. For this there are many different kinds of learning platforms based peer to peer , one to many , one to one, platform based .

“People think of the ‘E’ in e Learning as ‘electronic’. And certainly it's electronic. But here's a few more E's – Everywhere learning, Everyday learning, Engaging learning, Evolving learning ..” – Elliot Masie

E-learning is based on internet or different platform through which same data can be transmitted to many in a systematic manner so that people who are willing to learn have a chance to understand the working principle behind it.

Everyone is constantly pondering what the future holds and what we can anticipate from it. To achieve

this, it is crucial to reflect on the past. Likewise, every business must learn from its own history [16].

“Online learning can be a lifeline to those who have obstacles, such as geographical distances or physical disabilities.” – Paul Levinson

E-Learning has also major benefits as the student who want to study can see videos again and again can find different materials at one platform, can interact with different teachers related to same subject in minutes and solve their worries.

In 2020, the global online education market was estimated to be worth around \$200 billion, and it was projected to continue growing.

“It’s a fact that online learning is the future and will undoubtedly replace land-based learning in the future.” – Forbes

E-Learning provide a large platform for users to connect to education providers, resources and materials to people from a wide range of selections.

Even with these large platforms present we found that there is huge demand in one to one tutors in society. Parents believe that a one to one approach to a child is best way to educate, Specially in countries like India, where private tutoring is a major industry. Peer tutoring is an approach which helps to improve both academic skills and social behavior. It is described as an instructional strategy that makes use of peers to provide one-on-one instruction.[11]

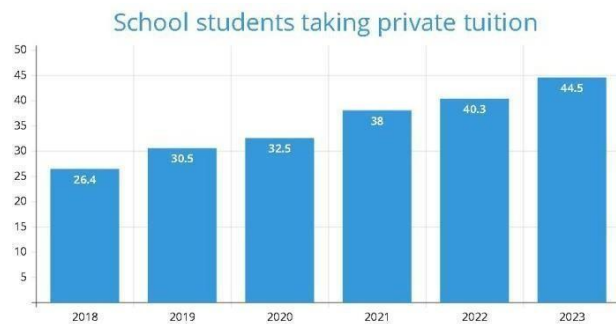


Fig1. Students taking private tuition in India (in percentage)

For a big country like India, E-Learning will give consumers more choices, advance materials, wider scope of thoughts and efficiency to users.

In conclusion, it’s not that with the uprising of E- Learning the traditional education industry will go downhill but with the integration of traditional education industries with e-learning platforms will provide users with advance material, huge resources at fast and lesser costs and traditional industries would get an increase in users due to widespread of internet influence.

II. LITERATURE SURVEY

Conventional (lecture) method of teaching has its own usefulness but may not be an effective instructional method for improving students’ achievement in skill-based subjects because students’ involvement in teaching and learning process is low, and this makes students rely on their teachers for their learning needs.[7] It is therefore imperative that an education system is created which is capable of rapid adaption to its technological, social, cultural and political environment

Due to this the growth of the e-learning market globally is increasing at a very fast rate.



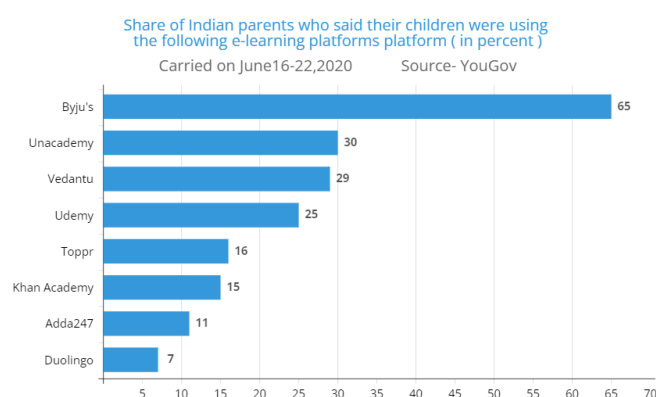
In terms of regional distribution, the largest student presence on the learning platform was observed in the Asia Pacific region, where 28 million new online learners enrolled in 68 million courses. Following Asia Pacific, North America, Europe, and Latin America also had significant participation. In contrast, Africa had a comparatively smaller presence, with just 3 million online learners participating in 5 million courses. However, it's worth noting that Africa experienced the most substantial growth in both student registrations, up by 43%, and course enrollments, up by 50%.

At the country level, the United States led the rankings with over 17 million individuals enrolling in online learning, followed by India with 13.6 million. A notable gap separated these top two nations from Mexico, which had nearly 5 million online learners. Brazil and China rounded out the top five countries on the list.

The growth of the e-learning market in India is predominantly influenced by the proactive measures taken by the Indian government to promote distance education, ensuring educational accessibility. This includes the incorporation of comprehensive e-learning solutions within the educational framework and the expansion of internet infrastructure. Additionally, numerous Indian universities have formed partnerships with foreign counterparts to offer online courses, while international companies are teaming up with local entities to adapt their offerings to the Indian market. These initiatives collectively contribute to the positive momentum observed in the market's expansion.

The YouGov survey findings also indicated that approximately 50% of Indian parents expressed hesitation about sending their children back to physical schools. Meanwhile, 48% of parents reported that their children were effectively learning through independent use of online platforms. Furthermore, 55% of parents noted that their children had now enrolled in online learning platforms, marking an increase from the 40% figure recorded before the onset of the pandemic.

The market size reached US\$ 6.4 billion in 2022 and is expected to reach US\$ 14.1 billion by 2028, growing at a compound annual growth rate (CAGR) of 13.7%. This indicates the huge potential and opportunity for e-learning providers and learners in India



E-Learning has been using various advance methods to tackle various problems for clients.

Using advance infrastructure, software's and technologies e-learning platforms are providing revolutionary path in education industry.

- I. Learning Management Systems (LMS): LMS serves as a central technology in e-learning, providing the infrastructure for content delivery, management, and monitoring. Widely used LMS platforms include Moodle, Blackboard, Canvas, and Google Classroom.
- II. Video Conferencing and Webinars: E-learning platforms often incorporate tools like Zoom, Microsoft Teams, or Adobe Connect for hosting live virtual classes, webinars, and interactive sessions.
- III. Content Authoring Tools: These tools empower educators to create and customize digital learning materials, including interactive multimedia, quizzes, and assessments. Examples encompass Articulate Storyline, Adobe Captivate.
- IV. Gamification and Game-Based Learning: Gamification elements, such as badges, leader boards, and rewards, motivate learners, while game-based learning employs interactive educational games to infuse enjoyment and engagement into the learning process.
- V. Big Data Analytics: Data analytics tools empower educators to monitor student progress, identify learning patterns, and implement data-driven enhancements to teaching methods and course content.
- VI. Social Learning Tools: Integration with social media and discussion forums fosters collaborative learning, peer-to-peer interaction, and knowledge sharing among learners.
- VII. Accessibility Tools: Technologies like screen readers, captioning, and text-to-speech converters ensure that online learning content is accessible to all learners, including those with disabilities.

VIII. Chatbots and Virtual Assistants: AI-driven chatbots and virtual assistants provide immediate learner support by addressing queries, offering guidance, and facilitating communication with instructors.

Various technologies included are

- I. Online E-Learning
- II. Learning Management System
- III. Mobile E-Learning
- IV. Rapid E-Learning
- V. Virtual Classroom
- VI. Others

Breakup by Provider:

- I. Services
- II. Content

Breakup by Application:

- I. Academic
- II. K-12
- III. Higher Education
- IV. Vocational Training
- V. Corporate
- VI. Small and Medium Enterprises
- VII. Large Enterprises
- VIII. Government

Breakup by Region:

- I. North India
- II. West and Central India
- III. South India
- IV. East India

TABLE I. LITERATURE SURVEY SUMMARY

<i>Study/Source</i>	<i>Key Findings</i>
1	E Learning has been growing in global market at a very phenomenal rate
2	Global E-Learning market size had increased to more than 200 billion US\$
3	Increase in Indian E-Learning market is supported by Indian government
4	The basis of increase in E-Learning market is due to basic human instinct of learning new things and due to its easy and innovative measures
5	E-Learning does not only mean electronic learning but it also represents a lot of different models, here's a few more E's - Everywhere learning, Everyday learning, Engaging learning, Evolving learning
6	Today E-Learning providers are mostly under two categories, either they are providing services or content
7	Increase in network speed and cheap network are major factor for increase in free e-learning platform users
8	Different sectors had given enough space for different e-learning platforms to grow

III. METHODOLOGY

Effective registration technique

Effective registration is a much needed method that is needed to be present in every application. In the project "Tutor Buddy", a registration system has been designed in such a way that both the parent as well as the tutor will have to provide a few details of their background so that the integrity of the system may be protected. Some age verification methods will include the details of Aadhaar Card. The current education details will be done through the detail filling in a form with some additional details. The tutor will have to upload his/her resume so that the parents will be easily able to select the best tutor for their child.

Parent : Basic educational details -> Mark-sheets of the students of the latest academic year and some other formalities

Tutor: Basic educational details -> Mark-sheets of 10th and 12th along with the current pursuing courses
-> Aadhaar Card number for age verification and some other formalities

Identity validation on Login

During the login whether as a parent or as a tutor, it is necessary to provide a high secure algorithm so that only the authorized users may be able to get the access to the application. Both the users will have to enter their email and password in order to get access to the application. The email and password both will be unique and know only to the valid user who is trying to login. If the user will give the correct credentials, then only the access will be granted to the users, but if the credentials are wrong, the access will not be granted to the users. Also for the verification that the user who is signing in is a human, a human verification captcha will be added to both the panels.

Login : Email id -> Password -> Captcha verification -> Validation of the credentials -> If details are correct, the access is granted -> If details are wrong, the access is denied

Smart search

Smart search is a very unique technique that is required in the applications so that it would be easier for the user to get the most optimal result they want. In this project, the parent will be given the option of the smart search. This smart search will include various filters that will optimize the search of the parent in an effective manner. Various searches like search according to the subject, qualification of the tutor, within a particular range of distance, the range of the tuition fee and others.

Smart search for parent options:

1. Subject wise
2. Range of the distance from their home
3. Educational qualification of the tutor
4. Range of the tuition fee

Optimized sorting

Sorting the data in any particular field adds more to the overall proper functioning of the application as it becomes easier for the user to obtain the result. In this project, sorting can be done in various ways according to the data in the database. Some of the most effective sorting options can be closest one from the parent's home in which the tutor that will be at the least distance will be displayed on the top, the tuition fee of the tutor in which both the lowest and highest will be displayed according to the user's feed i.e., if the user want to watch the tutor with the lowest tuition fees will be displayed on the top and vice versa, another way of the sorting can be the rating of the tutor which means that the tutor with the highest rating will be displayed on the top.

Effective sorting can be done in the following ways:

1. Closest tutor from the home of the parent
2. Lowest and the highest tuition fees of the tutor
3. Rating of the tutor

Interactive engagement of parent and tutor

A good interaction is very much needed in between the parent and the tutor. So when the parent will be selecting the best tutor for their child, they will be given an option either to directly communicate with the tutor with their contact details i.e., phone number or they can email them using the email id.

Data storage

The optimized storing of the data is a very important aspect when it comes to delivery a good content and services to the users. The overall storage of the data will be done on the database in such a way that the live update will keep happening so that the users might have the availability of the real time data. The database used will be the Firebase database. This tool has various inbuilt algorithms that store the data in a very effective manner. This data can be fetched anytime and in any order the users want. The updated data will also be stored in such a way that it will be automatically updated in the database and this way the real-time data will be displayed to the parents. The database will contain multiple users that will require to login using their credentials. The credentials that will be given by the users at the time of the login, will be verified with the data given in the database while they were signing up for the first time. The verification algorithm will search the password related to that particular email id, which will lead to verification of the details of the users.

Session Termination

A session that is being carried out at any instant of time is needed to be secured so that no other party could use our private data that will be displayed on the screen till the session is not terminated. For example, the person who is using the phone leaves the phone at a place and some other person owns the app and steals the personal data of the users, this incident can create a lot of problems in the overall ecosystem of the app. To prevent this situation, the project will be having a feature of session termination in the form of re login using a pin. Once the user exits from the app, the current session will be terminated till the user logs in again using the pin. Whenever the user will open the app again he/she will need to enter the pin that he had set during the sign up. This will directly minimize the risk of security concerns. Such a kind of session terminating function adds more to the overall advanced features of the app.

Session termination: User exits the app -> Session is terminated

-> User opens the app again -> Security pin is needed to be entered -> Correct security pin -> Session resumes -
 > If security pin is wrong -> The user is unable to login

IV. ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

In the realm of e-learning, utilizing user engagement data and delivering customized learning recommendations has become a potent strategy for enriching the learning encounter. Similar to how e-commerce platforms utilize metrics like click rates and wish lists, e-learning platforms can make use of user interactions, such as course preferences and progress monitoring, to provide individually tailored learning suggestions. For instance, an e-learning platform has the capability to assess a student's prior course history, detect areas of interest, and propose related courses or learning materials to facilitate ongoing educational development. This approach elevates the educational voyage by providing students with pertinent content and opportunities for expanding their knowledge in a manner that feels natural and encouraging.

Moreover, e-learning platforms can deploy advanced algorithms and data analytic to furnish instant feedback and adaptive evaluations. These systems can modify the complexity level of assignments or quizzes based on a learner's performance, ensuring that the content remains challenging but not overwhelming. Furthermore, the progress of users can be continuously monitored to pinpoint areas where additional assistance or resources may be beneficial, enabling educators and administrators to intervene effectively. By customizing the learning experience to suit individual needs and preferences, e-learning platforms establish an immersive and efficient educational environment. In such an environment, students are motivated to explore and excel in their chosen subjects, all while enjoying a seamlessly personalized learning journey.

V. PROPOSED SYSTEM

We will be using one to one (peer to peer) e-learning model due to its vast popular use history in Indian subcontinent. With increasing cost of private tutoring in India which is becoming more expensive than compulsory education cost, This situation gives a beneficial position for e-learning platforms to grow. We can see cost comparison of these things below.



The dataset used for this study gives us a basic idea of Indian families increasing needs as well as industries price growth. The dataset includes 12 attributes related to people from different economical backgrounds, children age, public-private education fees structure, inflation and various factors. The dataset comprises 1,000 variations, partitioned into a 80:20 ratio of training data and test data.

From the dataset we found India is in need of one to one education providing platform the most, but here comes the previous problem lack of teachers for this service. For this there comes a solution providing senior secondary students as a teacher and guide for primary and secondary students. With increase in student base every year we will get fresh senior students regularly which can act as a guide for juniors and can earn some fees

without breaking any law.

With another survey we found that junior students are more close to their senior while interaction rather than a teacher which make it easier for them to communicate and learn and as a fresh student who had learned the same knowledge few years back they found it easy for them to teach others with greater tricks and efficient methods. The instructor prepares the course material via a number of educational strategies to suit the different learning styles of students. Lecturers can use a number of strategies to highlight the goals of an assessment [5]. These strategies can be built by the information learned through forecasting deep machine learning techniques on e-learning platforms. This is because in a peer tutoring class, students are actively involved in the learning process; it allows the transfer of control to the students in the classroom with active guidance of the teacher; it gives students the opportunity to explain their ideas in a manner that the other tutees will comprehend.[10]

Key Features:

1. Comprehensive Online Content:
 - A vast library of educational resources, including video lectures, interactive quizzes, e-books, and tutorials, covering a wide range of subjects and topics.
 - Content is accessible 24/7, providing flexibility for students to learn at their own pace and convenience.
2. Peer Tutoring System:
 - A unique peer-to-peer tutoring system that allows junior students to connect with senior students who have excelled in the same subject or topic.
 - Junior students can request one-on-one or group tutoring sessions with senior mentors.
3. User-Friendly Interface:
 - An intuitive and easy-to-navigate platform that ensures a seamless user experience for both junior and senior students.
 - A personalized dashboard for each user, displaying their courses, progress, and upcoming tutoring sessions.
4. Progress Tracking and Analytics:
 - Robust tracking tools and analytics to help students monitor their learning progress and identify areas where they need improvement.
 - Detailed reports on quiz scores, study time, and tutoring feedback.
5. Community Building:
 - Discussion forums and chat features to facilitate peer interaction, collaboration, and knowledge sharing among students.
 - Virtual study groups where students can collaborate on projects and assignments.
6. Mentorship Program:
 - An optional mentorship program for senior students, providing them with opportunities to develop leadership and teaching skills.
 - Senior students can earn recognition and rewards for their contributions to the platform.
7. Support and Guidance:
 - Dedicated customer support and assistance for students to ensure they have a positive learning experience.
 - Resources and guidelines for both junior and senior students to make the most of the platform.

VI. SUMMARY

The Peer2Peer Learning Platform is an innovative online education initiative designed to provide a dynamic and interactive learning experience for students of all ages. This platform combines comprehensive online content with peer-to-peer tutoring, allowing junior students to connect with knowledgeable senior students for personalized assistance and guidance in their academic pursuits.

Benefits:

- Empowers junior students to receive personalized guidance and support from their peers, fostering a sense of community and collaboration.
- Enhances the learning experience by offering a diverse range of multimedia educational content.
- Encourages senior students to take on leadership roles and contribute to the academic success of their peers.
- Promotes self-directed learning and flexible scheduling, accommodating various learning styles and preferences.

The Peer2Peer Learning Platform aims to revolutionize the way students access education by combining comprehensive online content with peer-to-peer tutoring, creating a collaborative and engaging learning environment for students of all levels. This project seeks to empower students to take control of their learning journeys while fostering a sense of community and knowledge-sharing among peers.

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