

Role of Mathematics in Digital India and Education Sector

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Abstract: *Since, the advent of digital media and technology, pedagogical methods and teacher-student interactions across the globe have evolved a lot. Today, the education sector is not only bound to the classroom or coaching sessions but in fact, has successfully merged with the internet to become a better serving industry. Due to digitalization and the availability of high-speed audio-video connectivity & solutions, the process of teaching and learning has greatly changed. This paper examines the role of mathematics in digital India and the education sector.*

Keywords: *Digital India, Technology, Mathematics, E-Learning, Video lectures, Indian Economy & Growth.*

1. Introduction

Digital India is a campaign launched by the Government of India in order to ensure the Government's services are made available to citizens in a faster and more effective way, by uprooting the barriers which are causing necessary hindrances & delays in the implementation, and curbing corruption in the way to execution of services towards the common public through electronically by improved online infrastructure and by increasing Internet connectivity or by making the country digitally empowered in the field of technology. The initiative includes plans to connect rural areas with high-speed internet networks. Digital India consists of three core components: the development of secure and stable digital infrastructure, delivering government services digitally, and universal digital literacy.

Digital India Program is a great emphasis on the policies of Liberalization i.e., by giving faster licensing and convenient & quick enactment of entrepreneurial innovations for the overall development in the Nation. Along with Liberalization, Digitization gives strength to the strong Globalization and pushed the Nation towards Economic Growth and persistent development. Strong privatization and entrepreneurship are emerging in a speedy way with a robust background. This Digitization was launched on 1 July 2015 by the Indian Prime Minister. It is both

enabler and beneficiary of other key Government of India schemes, such as BharatNet, Make in India, Startup India and Standup India, industrial corridors, Bharatmala, Sagarmala, dedicated freight corridors, UDAN-RCS and E-Kranti, etc.

As of 20 March 2022, India had a population of 140 crores 36 lakhs people. 131.68 crore Aadhaar digital biometric identity cards issued as of 31st October 2021. There are 502.2 million smartphones users as of December 2019. India has 658 million internet users as of January 2022. There is a 51 percent growth in e-commerce. Internet subscribers had increased to 500 million in India as of April 2017. On 28 December 2015, the Panchkula district of Haryana was awarded for being the best as well as a top-performing district in the state under the Digital India campaign. India is now adding approximately 10 million daily active internet users monthly, which is the highest rate of addition to the internet community anywhere in the world.

2. Role in Education Sector

As per the 'World Bank National Account Data' and 'OECD National Account Data' files, the GDP per capita (current) is US\$ 1927.708 in the year 2020; while it was US\$ 2100.751 in the year 2019. However, India is a low income, highly populous, poor, and developing nation, slowly, India is becoming digitally connected due to the efforts of the Centre under their scheme "Digital India", many online education aggregators have also come up and are participating in this revolution to change the way one thinks about learning. These online players focus on creating audio-video content with PPT, Excel, etc., for students across the educational spectra. They use animation and other tools with the help of professors, lecturers, teachers, and experts to create educative videos which are education-oriented yet entertaining. Not to mention, the presence of these aggregators is democratizing the educational scenario of the nation as the content they provide is available to everyone irrespective of affordability and not limited to people of any class. Students can browse through multiple providers to learn, understand and even revise concepts. Furthermore, online education aggregators provide room for more interaction

between students as opposed to traditional classroom environments where learning is restricted to a strict time of 30 or 40 minutes.

These websites also give the students the liberty to study at their own pace, and they can redo concepts they have doubts in. The aggregators also provide a wide variety of subject content from languages to science and from literature to mathematics. This diversity of content is especially attractive to people in colleges as well as those who are learning a new language as opposed to the traditional content available to them via their institutions and universities. Even for people who wish to re-skill themselves or revisit a topic that they had learned ages ago, learning through video content has made things easier for them as they are less time-consuming and more effective.

In this day and age, digital tools are the key to making learning more effective and fun. Video solutions have made education easier. Online education aggregators have made the availability of diverse content easy for all. They are proving to be a game-changer in the education sector. It is trying to achieve higher growth and better social and financial equality.

3. Role of Mathematics

We believe that engineering is just a veneer but it is mathematics that gives it substance. Engineering is the implementation of mathematics and physics. Engineering is critically important because it leads to industrialization and without a high level of industrialization India cannot move from the category of 'Under-developed' to 'Developing' to 'Developed' nation. This is the tertiary sector that empowered any country for the fast economic growth, increase in National Income, fulfilling the modernized & technical needs of the people to be gratified with prosperity. It is proved that countries with high income in the tertiary sector are leading ahead in economical power, health prospects, nuclear capacity, education parameters, and high standard of living.

Mathematics and physics are everywhere around us which justifies a huge number of phenomena happening around us every fraction of a second. Numerous mathematical and physical techniques are used to design various digital platforms, systems, and modules and also to implement them. E.g. sensors and signals, and their related systems are very important subjects that play a pivotal role in implementing the digital India project. These subjects thrive on calculus and trigonometry. Also, they involve matrices and linear modeling. In fact, they are all about mathematics.

When we make a mobile call there is a tremendous amount of mathematics at work. Right from modeling the channel (curve fitting), GSM cell division strategies (differential equations), routing algorithms (linear programming), etc.

Furthermore, mathematics integrated with electronics, communication, and computer science, can lead to the following important applications:

(i) Tools for personalized and adaptive learning:

Learning platforms, software and digital devices are together creating countless new ways to modify education. This way, the academic potential, strengths, weaknesses, aptitude, and learning pace of every single student are catered to. Precise, mobile, and reliable applications are being created to teach students, help them practice their learnings, take assignments, and manage their schedules. Schools are now providing their students with digital devices like desktop computers, laptops and tablets, and accessories needed for online & digital education. These devices are aiding them in the teaching process while also helping them understand how students learn and how to enhance their learning process. The 'one size fits all' teaching model is being supplemented by adaptive, personalized learning pedagogies. Going forward, this will be the new trend in formal learning that will enable students to be technologically skilled and equipped for modern workplaces.

(ii) Two-way conversations in E-Learning:

In the traditional classroom seating scenario, students are unable to get the individual attention they need due to time constraints. In contrast, the one-to-one context of learning in digital mediums currently students learn through videos and chat with an expert. The upcoming 'Learning Management System' will continue the two-way communication model between students and experts. More importantly, it will let students track their coursework progress, identify improvement areas and offer ways to make the most of them. Through the help of 'Big Data', experts will be able to capture student feedback within the framework of the content provided. With this alone, they'll be able to improvise and enhance their offerings in new ways to further benefit students.

(iii) Mobile-based learning:

Over the past few years, mobile learning has been picked up by the populace who have gradually assimilated it into their lives. It has offered students the flexibility to access educational content seamlessly

across multiple digital devices like desktops, laptops, tablets, and smartphones. The Smartphone user base in India continues to increase, in both urban and rural areas. Coming years will witness users accessing most of their educational content through internet-powered smartphones in a massive way. Most educational content, including even online courses, will be optimized entirely for mobile devices.

(iv) Video-based learning:

Video learning has always appealed to students since it closely mirrors the traditional classroom teaching style. Earlier, students watched video lectures as a form of homework and then discussed them during the next class. Over time, this habit brought about a remarkable improvement in their performance, with a noticeable improvement in grades. Video lectures allowed students to learn subject syllabi at their own pace and dedicate time spent in class towards interactions. This will continue to be a trend in the future where students will have access to rich and interactive content, that will be useful for both formal training as well as performance enhancement. The increase in video-based learning on mobile devices will eventually account for 80 percent of all internet traffic by 2019.

(v) Open educational resources:

Open digital education resources have commonly been used in distance learning courses. They consist of freely accessible media for learning, teaching, and research purposes. They are licensed to be revised and disseminated freely by teachers among students. This allows the latter to gain access to an extensive arrival of study material that is otherwise restricted indigenously. Open educational resources also facilitate the creation of a flexible environment where teachers can customize educational content for individual sessions or classroom settings. This is applicable for typical curricular subjects like mathematics, sciences, and languages, as well as business and fine arts.

(vi) Usage of Virtual Reality (VR) and Augmented Reality (AR) for learning:

Virtual Reality and Augmented Reality are already buzzwords in the technology space. Their advent in e-learning has massively impacted the efficiency with which it is offered to students and the way it assesses their performance. VR allows students using e-learning platforms on mobile devices to directly interact with study material. This keeps their engagement levels high and motivates them to learn more and better. On the

other hand, AR facilitates teachers and trainers in performing tasks, they previously haven't or cannot, in a safe environment.

4. Conclusions

It is strongly believed that mathematics is critically important in digital India and the education sector. Mathematics integrated with electronics, communication, and computer science, can lead to important applications and they will create an environment of learning & improving knowledge & skills, that is unique, engaging, and productive. Digital India is a big contributor towards economic development & growth. Digital India has provided great feasibility and convenience for a huge number of entrepreneurs in a wide variety of fields throughout India, for export, import & domestic businesses in technical as well traditional areas. Digital India is poised to become a lot more widespread in its usage and impact in the future.

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