

DIGITAL LEARNING REVOLUTION: A COMPARATIVE ANALYSIS OF NPTEL, NDL, SWAYAM, AND E-PG PATHSHALA IN INDIA'S EDUCATIONAL LANDSCAPE

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Abstract

The digital era has brought about a revolutionary transformation in the field of education, particularly in India, where various online platforms have emerged to supplement traditional learning methods. This paper presents a comprehensive comparative analysis of four prominent digital learning platforms in India: NPTEL (National Programme on Technology Enhanced Learning), NDL (National Digital Library), SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds), and e-PG Pathshala. The study aims to evaluate their impact, effectiveness, and contribution to India's educational landscape.

This study compares four major digital learning platforms in India – NPTEL, NDL, SWAYAM, and e-PG Pathshala – to assess their impact on education. Examining aspects like content diversity, accessibility, and user satisfaction, we find NPTEL excels in tech education, NDL is a comprehensive digital library, SWAYAM promotes interactive learning, and e-PG Pathshala focuses on postgraduate education. Challenges like internet connectivity and digital literacy are noted. Recommendations include increased collaboration and enhanced user support. This analysis informs policymakers and educators navigating the evolving landscape of digital education in India.

This comparative study will provide valuable insights for educators, policymakers, and e-learning platform developers in India. It will help them understand the strengths and weaknesses of these platforms, allowing for informed decisions on how to enhance the learning experiences of students across the country. Additionally, the study may contribute to the broader discourse on the role of e-learning in shaping the future of education in India.

Keywords: Digital Learning Revolution, Online Education, Distance Learning, Learning Platforms, Skill Development, Virtual Classroom, Artificial Intelligence

1. Introduction:

In recent years, India has witnessed a transformative shift in its educational landscape with the advent of digital learning platforms. This revolution has been propelled by the increasing accessibility of the internet and a growing demand for flexible, inclusive, and technology-driven education. Among the platforms contributing significantly to this transformation are the National Programme on Technology Enhanced Learning (NPTEL), the National Digital Library (NDL), SWAYAM, and e-PG Pathshala. This paper aims to provide a comparative analysis of these digital learning initiatives, shedding light on their

structures, content offerings, impact, and challenges within the Indian educational context.

- **NPTEL (National Programme on Technology Enhanced Learning):** NPTEL, initiated by the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc), focuses on providing high-quality technical education through online courses. It offers a diverse range of video lectures, assignments, and assessments in engineering, technology, and sciences. The platform has gained popularity for its

rigorous content and association with prestigious institutions. [1]

- **NDL (National Digital Library):** The NDL is a digital repository that aims to facilitate learning and research by providing access to a vast collection of digital resources. Developed by the Ministry of Human Resource Development (MHRD), NDL offers e-books, articles, theses, videos, and other educational materials. It serves as a comprehensive resource hub for students, researchers, and educators across various disciplines.
- **SWAYAM (Study Webs of Active Learning for Young Aspiring Minds):** Launched by the Government of India, SWAYAM is a massive open online course (MOOC) platform that offers a wide range of courses, including school education, undergraduate, postgraduate, and vocational training. It collaborates with universities and institutions to deliver interactive and self-paced courses, making education accessible to learners nationwide.
- **e-PG Pathshala:** Developed by the University Grants Commission (UGC), e-PG Pathshala is an e-content platform offering postgraduate-level courses in various disciplines. It aims to enhance the quality of postgraduate education by providing high-quality, interactive, and multimedia-rich content. The platform caters to diverse subjects, making it a valuable resource for postgraduate students and educators.

As these digital learning platforms continue to gain traction, several challenges and opportunities emerge. Challenges include ensuring internet connectivity in remote areas, addressing the digital divide, maintaining content quality, and fostering learner engagement. However, the opportunities lie in the potential to democratize education, reach a wider audience, and adapt to evolving pedagogical practices.

2. Brief overview of the digital learning revolution in India

The Digital Learning Revolution in India has witnessed significant transformations in the country's educational landscape, with various initiatives aiming to make quality education accessible to a larger audience. India, with its large and diverse population, has long recognized the need for accessible and quality education to empower its citizens. Online education platforms have emerged as a crucial means to address this challenge. The historical development of digital learning in India has been shaped by a complex interplay of technological advancements, educational policies, and societal changes. This narrative highlights key milestones and trends in the evolution of digital education in the country.

- (i) **Early Initiatives (1990s-2000s):** The introduction of computers in Indian education began in the 1990s, focusing primarily on computer literacy. However, the limited availability of technology restricted its implementation to a few urban schools and institutions. The National Policy on Education (NPE) in 1986 emphasized the use of technology in education, but progress was slow. [2]
- (ii) **Emergence of E-Learning (2000s):** The 2000s witnessed the growth of e-learning platforms and initiatives. Organizations like the National Programme on Technology Enhanced Learning (NPTEL) and the Indira Gandhi National Open University (IGNOU) began offering online courses. [3] Nevertheless, internet penetration remained low, limiting access to a broader audience.
- (iii) **National Mission on Education through ICT (2009):** In 2009, the Indian government launched the National Mission on Education through Information and Communication Technology (NME-ICT) to leverage technology for expanding the reach of quality education. [4] This initiative led to the development of the Sakshat portal,

offering access to educational resources.

- (iv) **Digital India Campaign (2015):** The Digital India campaign, initiated in 2015, aimed to transform India into a digitally empowered society. In the education sector, there was a push towards digital content creation, online assessments, and the integration of technology in classrooms. [5]
- (v) **Online Learning Platforms Boom (2010s-2020s):** Over the past decade, there has been a significant rise in online learning platforms such as BYJU's, Coursera, Udacity, and Khan Academy. [6] These platforms provided diverse courses and study materials, and the increasing availability of affordable data and mobile penetration played a crucial role in making digital education more accessible. [7] [8]
- (vi) **COVID-19 Pandemic (2020):** The COVID-19 pandemic accelerated the adoption of digital learning in India. Temporary closures of schools and colleges necessitated a rapid transition to online teaching, highlighting the importance of digital infrastructure and teacher training in online pedagogy. [9]
- (vii) **Government Initiatives (2020s):** Government initiatives like the National Digital Education Architecture (NDEAR) and the PM e-Vidya program [10] continued to promote digital learning. Efforts were made to address challenges such as the digital divide and ensure inclusive access to online education. [11]

3. Historical context of NPTEL, NDL, SWAYAM, and e-PG Pathshala

In the evolving landscape of education in India, several initiatives have been introduced to enhance the quality and accessibility of learning resources, especially in higher education. NPTEL, NDL, SWAYAM and e-PG Pathshala stand as pivotal contributors to this transformative

journey. These initiatives, launched in the early 21st century, signify a paradigm shift in how education is imparted and accessed, leveraging technology to break down geographical and financial barriers. Here is a brief description of One by One.

- (i) **NPTEL (National Programme on Technology Enhanced Learning):** NPTEL is a project initiated by the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc) to provide high-quality education in engineering and science through online courses. It was launched in 2003 and is funded by the Ministry of Education (formerly the Ministry of Human Resource Development) in India. NPTEL aims to enhance the quality of engineering education by making course materials available online for free. The courses include video lectures, lecture notes, assignments, and exams. NPTEL is an initiative by the Indian Institutes of Technology (IITs) and the Indian Institute of Science (IISc) to provide online courses and certification in engineering and science disciplines [12] and is aimed to enhance the quality of engineering education by making course materials available online. Over the years, it expanded its course offerings and introduced certification for learners. [13]
- (ii) **NDL (National Digital Library of India):** The National Digital Library of India (NDL) was initiated in 2015 as a project under the Ministry of Human Resource Development. It aims to facilitate learning and research by offering a diverse collection of e-books, articles, videos, and other educational resources. NDL provides access to a vast repository of academic content in various formats, including books, articles, theses, and multimedia. [14] It was launched in 2016 with the goal of facilitating learning and research by making educational resources easily accessible to students, teachers, and researchers across the country. NDL is a

digital repository of academic resources with a focus on educational materials. It provides a platform for students, researchers, and teachers to access a wide range of content. [15]

(iii) **SWAYAM (Study Webs of Active Learning for Young Aspiring Minds):** SWAYAM is an online platform launched by the Government of India in 2014 to provide free online courses, covering a wide range of subjects from school-level to postgraduate education. SWAYAM aims to bridge the digital divide and ensure that quality education is accessible to all, regardless of geographical location. It offers courses developed by faculty from various institutions, including IITs, IIMs, and central universities. It integrates with conventional education and allows students to earn academic credits. [16] Launched in 2014, SWAYAM is part of the Government of India's efforts to promote Massive Open Online Courses (MOOCs) and make quality education accessible to a larger audience. It collaborates with institutions and professors across the country. [17]

SWAYAM Prabha: To cater to learners who have limited internet access, SWAYAM Prabha was launched, providing access to educational content via 32 satellite channels. This initiative ensures that even those in remote areas can benefit from SWAYAM's offerings. [16]

(iv) **e-PG Pathshala:** e-PG Pathshala is an initiative by the University Grants Commission (UGC) in India to develop high-quality, curriculum-based e-content at postgraduate levels. Launched in 2014, it offers a wide range of online courses and e-resources for postgraduate students across disciplines. The content includes video lectures, e-books, and other learning materials. The goal is to enhance the learning experience for postgraduate students and promote the use of technology in higher education. The project was launched to address the need for comprehensive and accessible postgraduate education resources. It offers e-content in the form of e-books, video lectures, and other multimedia formats. [18]

4. Importance of comparing NPTEL, NDL, SWAYAM, and e-PG Pathshala

Comparing NPTEL, NDL, SWAYAM, and e-PG Pathshala is essential for students, educators, and policymakers to understand the strengths and weaknesses of each platform. These platforms play a crucial role in providing educational resources in India, and assessing their merits can help individuals make informed decisions about which one to use or support. Here are some key aspects to consider when comparing these platforms:

S. N.	Platforms	Focus Area	Content Type	Coverage	Collaboration	Certification
1	NPTEL	Primarily focuses on engineering and science courses	Offers video lectures, course materials, and assignments.	Provides a wide range of courses from basic to advanced levels.	Collaborates with premier institutes and professors.	Provides certification for completed courses.
2	NDL	A digital repository that hosts a variety of educational content including books, articles,	Not a course provider, but offers access to a vast collection of educational resources.	Provides resources across multiple disciplines.	Collaborates with various institutions to collect and host digital content.	Does not provide certification for courses.

		theses, and multimedia.				
3	SWAYAM	Offers a wide range of courses across various disciplines, including arts, science, commerce, and more.	Provides video lectures, reading materials, quizzes, and discussion forums.	Collaborates with universities and professors to offer courses.	Collaborates with institutions and professors across India.	Provides certification for completed courses.
4	e-PG Pathshala	Targets postgraduate education and provides high-quality e-content in different subjects.	Offers e-textbooks, audio/video lectures, and supplementary materials.	Covers a range of postgraduate level subjects.	Developed by UGC (University Grants Commission) in collaboration with INFLIBNET (Information and Library Network).	The focus is on learning resources, and it may not provide certification for courses.

Each platform serves a specific purpose, and the choice depends on the learner's preferences, academic needs, and the type of content they are seeking. Where the NPTEL is renowned for its technical and engineering courses, while NDL boasts a vast repository of academic content spanning various disciplines. SWAYAM caters to a broad spectrum of learners, from school-level students to postgraduates, and e-PG Pathshala focuses on higher education.

4.1 Here's are the analyze summary for each platform in a table

S. N.	Platforms	Details	Summary
1	NPTEL	<ul style="list-style-type: none"> • Developed by IITs (Indian Institutes of Technology) and IISc (Indian Institute of Science). • Primarily focuses on engineering and science disciplines. Offers video lectures, course materials, and assignments. • Collaborates with premier institutes and renowned professors. • Provides certification for completed courses. 	<ul style="list-style-type: none"> • NPTEL is a high-quality online learning platform developed by prestigious institutions. • Its primary focus is on engineering and science courses. • The platform provides comprehensive video lectures, course materials, and assignments. • Collaboration with top-tier institutes and renowned professors ensures the quality of content. • Certification is offered for successful completion of courses, adding value to the learner's credentials.
		<ul style="list-style-type: none"> • A digital repository offering a diverse collection of educational resources. • Hosts books, articles, theses, and multimedia content. • Not a course provider but a 	<ul style="list-style-type: none"> • NDL serves as a comprehensive digital library, offering a vast collection of educational resources. • It is not a course provider but rather a repository for books, articles, theses, and multimedia content.

2	NDL	<p>resource hub.</p> <ul style="list-style-type: none"> • Collaborates with various institutions to collect and host digital content. • Does not provide certification for courses. 	<ul style="list-style-type: none"> • Collaboration with various institutions contributes to the richness of the content available. • NDL does not offer certification, as its primary focus is on providing access to a wide range of educational materials.
3	SWAYAM	<ul style="list-style-type: none"> • A government initiative offering courses across diverse disciplines. • Provides video lectures, reading materials, quizzes, and discussion forums. • Collaborates with universities and professors across India. • Offers certification for completed courses. 	<ul style="list-style-type: none"> • SWAYAM is a government-supported initiative that provides a broad spectrum of courses across various disciplines. • The platform offers interactive features such as video lectures, reading materials, quizzes, and discussion forums. • Collaboration with universities and professors ensures a diverse and high-quality course catalog. • SWAYAM provides certification upon successful completion of courses, enhancing the learner's academic achievements.
4	e-PG Pathshala	<ul style="list-style-type: none"> • Developed by UGC (University Grants Commission) in collaboration with INFLIBNET. • Tailored for postgraduate education. • Offers e-textbooks, audio/video lectures, and supplementary materials. • Covers a variety of postgraduate level subjects. • Focuses on learning resources rather than certification. 	<ul style="list-style-type: none"> • e-PG Pathshala is specifically designed for postgraduate education, providing tailored content for advanced studies. • The platform offers e-textbooks, audio/video lectures, and supplementary materials to support postgraduate level subjects. • Developed in collaboration with UGC and INFLIBNET, ensuring credibility and academic relevance. • While it emphasizes learning resources, e-PG Pathshala may not provide certification, focusing more on the educational content for postgraduate students

5. Evaluation of the impact on India's educational landscape

The impact of platforms like NPTEL, NDL, SWAYAM, and e-PG Pathshala on India's educational landscape has been significant and multifaceted. Here's an evaluation of their impact:

- (i) **Increased Access to Quality Education:** These platforms have significantly increased access to quality educational resources, especially in remote and underserved areas of India. Students can access lectures, study materials, and courses

from prestigious institutions like IITs and IISc through NPTEL and SWAYAM, thus democratizing education.

- (ii) **Diversification of Subjects:** These platforms offer a wide range of subjects, including technical, non-technical, and interdisciplinary fields. This diversification allows students to explore various disciplines and pursue their interests, contributing to a more holistic education landscape.

- (iii) **Certification and Recognition:** NPTEL and SWAYAM offer certifications that are recognized by

industries and institutions. These certificates have helped students enhance their employability and academic credentials. They also promote lifelong learning and upskilling.

Promotion of Open Access: NDL promotes open access to educational resources, contributing to a culture of sharing knowledge. It has made research papers, books, and other educational materials accessible to a wider audience, including researchers and the general public.

(iv) **Enabling Lifelong Learning:** These platforms have made it easier for individuals of all ages to engage in lifelong learning. Professionals can update their skills, and adults can pursue further education without the need to enroll in traditional courses.

(v) **Complementary to Traditional Education:** These platforms complement traditional education, providing additional resources and support to students. They can serve as supplementary study materials for classroom learning. In Negative impact While these platforms have expanded access to education, challenges related to internet connectivity and device availability in rural and remote areas still persist. Not all students have equal access to these resources.

(vi) **Quality Assurance:** Ensuring the quality of courses and materials across these platforms can be challenging. While prestigious institutions are involved, quality assurance mechanisms need to be continuously strengthened.

(vii) **Impact on Conventional Institutions:** These platforms have the potential to disrupt traditional educational institutions. While they offer access to quality education, they also pose competition to conventional colleges and universities.

(viii) **Government Support and Policy Impact:** The Indian government's support for these initiatives has been instrumental in their growth. Policy initiatives have helped in standardizing and promoting the use of these platforms in the education sector.

6. Government support and policies

Government support and policies have played a pivotal role in shaping the landscape of online education in India. Here are some key aspects of government support and policies in the context of educational platforms like NPTEL, NDL, SWAYAM, and e-PG Pathshala.

(i) **Financial Support and Funding:** The Indian government has allocated significant financial resources to support the development and maintenance of these educational platforms. This funding has enabled the creation of high-quality course content, technology infrastructure, and outreach efforts. [19]

(ii) **Regulatory Framework:** The government has established a regulatory framework to govern the functioning of online education platforms. This framework includes guidelines for certification, accreditation, and quality assurance

(iii) **Digital India Initiative:** Educational platforms align with the government's Digital India initiative, which aims to promote digital literacy and access to digital resources for all [20] These platforms contribute to this goal by providing free and open access to educational content.

(iv) **SWAYAM Prabha:** As part of SWAYAM, the government launched the SWAYAM Prabha initiative, which provides 32 high-quality educational DTH (Direct-To-Home) television channels. [20] This initiative enhances access to educational content, especially in remote areas with limited internet connectivity.

- (v) **National Education Policy (NEP) 2020:** The NEP 2020 emphasizes the importance of online and digital education. It envisions the integration of technology in education and supports the development of online resources and platforms. [21]
 - (vi) **Promotion of Open Educational Resources (OER):** [22] the government encourages the creation and sharing of open educational resources, which align with the principles of platforms like NDL. This promotes transparency, affordability, and accessibility in education. [23]
 - (vii) **Support for Skill Development:** Government initiatives like Skill India align with the goals of platforms like NPTEL and SWAYAM, which offer courses to enhance skills and employability.
- 7. Future Prospects and Trends in India's Educational Platforms**
- (i) **AI and Personalized Learning:** Educational platforms are likely to increasingly incorporate artificial intelligence (AI) to personalize learning experiences. AI algorithms will analyze learner data to recommend courses, adapt content, and provide real-time feedback tailored to individual needs. [24]
 - (ii) **Online Skill Development for Employment:** Platforms like NPTEL and SWAYAM will continue to offer skill development courses to enhance employability. In response to evolving job market demands, more courses on emerging technologies and soft skills will be introduced. [25]
 - (iii) **Blended Learning Models:** A hybrid of online and offline learning, known as blended learning, is expected to gain prominence. Institutions may integrate platforms like SWAYAM and e-PG Pathshala into their curriculum, combining traditional teaching with online resources. [26]
 - (iv) **Digital Credentials and Micro learning:** Micro learning modules will become more popular, allowing learners to acquire specific skills or knowledge in bite-sized formats. Digital badges and micro-certifications will gain recognition as credible credentials for employment and advancement.
 - (v) **Multilingual Content:** Platforms will diversify their content offerings by providing courses and resources in multiple Indian languages, making education more accessible to non-English-speaking learners.
 - (vi) **Augmented and Virtual Reality (AR/VR):** AR and VR technologies will be integrated into educational platforms to create immersive learning experiences. This trend will enhance the understanding of complex concepts in science, engineering, and other fields.
 - (vii) **Data Privacy and Security:** As the use of educational platforms grows, ensuring the privacy and security of user data will be a critical concern. Stricter data protection measures and compliance with data privacy laws will be necessary.
 - (viii) **Collaborative Learning and Social Integration:** Platforms will facilitate collaborative learning through features like discussion forums, group projects, and peer assessments. Social integration will be encouraged to create a sense of community among online learners.
 - (ix) **Government Initiatives:** The Indian government will continue to support and fund educational platforms, expanding their reach and impact. Policies related to online education will evolve to address emerging challenges and opportunities.
 - (x) **Global Outreach:** Educational platforms will extend their reach beyond India, attracting international learners. Collaboration with foreign institutions and the recognition of

Indian certifications globally will increase. [27]

8. The role of NPTEL, NDL, SWAYAM, and e-PG Pathshala in shaping India's educational landscape

- NPTEL, NDL, SWAYAM, and e-PG Pathshala are initiatives that have significantly contributed to shaping India's educational landscape. Each of these programs plays a unique role in providing quality education, promoting digital learning, and enhancing access to educational resources. Here's a brief overview of their roles:
- NPTEL has democratized access to quality education, especially in technical fields, by making courses from top institutions available online for free. It has benefited students, professionals, and educators across the country.
- NDL has played a crucial role in providing a centralized repository of digital educational content, making resources easily accessible to students and researchers. It promotes self-paced learning and helps bridge the gap in resource availability.
- SWAYAM has expanded access to education, reaching learners in remote areas and those who might not have access to traditional educational institutions. It offers a variety of courses, enabling learners to choose based on their interests and career goals.
- e-PG Pathshala contributes to the digitalization of postgraduate education, providing resources for students pursuing higher studies. It enhances the quality of education by offering standardized content and supporting self-directed learning.
- Together, these initiatives have transformed the educational landscape in India by leveraging technology to increase accessibility, affordability, and the overall quality of education across various levels and disciplines. They have played a crucial role in addressing the

challenges of traditional education and promoting a culture of continuous learning.

9. Conclusion

The Digital Learning Revolution in India, exemplified by NPTEL, NDL, SWAYAM, and e-PG Pathshala, has transformed the educational landscape. These initiatives prioritize democratization, making quality education accessible across diverse demographics. Leveraging technology for flexibility, these programs offer self-paced learning and a wealth of resources. Collaboration among institutions ensures high-quality content, while technology serves as a key enabler, driving a shift towards tech-driven education. With a specific focus on postgraduate education, these initiatives align with governmental policies, signaling a strategic commitment to the integration of digital learning in India's educational framework. Overall, they signify a transformative and inclusive future for education in the digital age.

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