

NPTEL AS A PATH TO MICRO-CREDENTIALS: AN EXPLORATORY STUDY

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ABSTRACT

Multitudinal and multidimensional sectoral transformations, with changes in the education ecosystem and ever-evolving international economic scenario, challenge the learners' requirements for skill and knowledge upgradation, and lay impetus on continuous competency enhancement and erudition to remain professionally relevant for the industry. Upskilling and reskilling micro-credential platforms matching the employment requirements are the need of the hour and are attained simultaneously with a formal degree or primary engagements. Burgeoning demand for credit-bearing or non-credit bearing micro-credentials, dominantly offered by higher education institutions (HEIs), can be attributed to flexibility, wider out-reach, self-paced, convenience, bridging skill gap, acquiring stackable credentials and niche micro qualification, remaining potentially employable, credit transfer to formal qualification, specialisation and upgradation, to name a few. Additionally, the Pandemic (2020 - 2022) distorted the educational canvas, compelling to look beyond the formal degrees. This prompted the Ministry of Education, Government of India, to launch a project in 2003, the National Programme on Technology Enhanced Learning (NPTEL), for providing more than 600 certifications of varied disciplines, through online learning, by a network of HEIs. This is an exploratory study on the contribution of NPTEL for adequate access to micro-credentials in India and abroad with the objectives of: making a comprehensive study of the contribution of NPTEL for facilitating to gain access to micro-credentials; presenting an overview and present status of the discipline-wise courses offered; portraying enrolment trend, gender distribution and professional background of the learners in this project; and deliberating the enrolment pattern, learners' success rate in the award of micro-credentials.

Keywords: Micro-credential, online learning, NPTEL, MOOC, micro-degree, credit transfer.

INTRODUCTION

Micro-credentials, be it online certifications, digital badges, micro-degrees, micro-masters, or Massive Open Online Courses (MOOCs), are short-term, specialised learning experiences, typically of few days or few weeks duration. Further, these are considered cost-effective, concentrating on specific areas of a particular subject that result in skill enrichment and competency enhancement. These bite-sized credentials could be credit bearing or non-credit bearing, depending on the nature of the course, industry necessities and student requirements. These, in general, fulfil the skill gap and knowledge deficits in the industry; therefore, they are often developed jointly in collaboration with industry and higher education institutions. Thus, all the stakeholders tend to benefit from such short-term tailor-made specialized courses that inculcate diverse micro-level subject areas that point towards managing diversity, enhancing equity, and promoting inclusivity, in other words, fulfilling the fundamentals of DEI.

Evidently, there are ample benefits underlying the various contributing entities in these credentials awarded by the institutions. Business entities tend to gain in several ways as they can induct people with specialised skill-sets suited to the fast-changing industrial landscape. They look towards micro-credentialing as a source for getting redefined talent catering to diverse future circumstances. Employers can also collaborate with the institutions to develop customised credentialing programs that suit their job requirements and facilitates in training their workforce on standard practices, legal compliances, and intellectual property rights wherever applicable to match their on-job criticalities.

The higher education providers offering the traditional certifications are yet another strategic stakeholder in this process because they are a pivotal link in this entire chain of entities. They are responsible for casting the programs per the industry's requirements as well as the demands of the learners. Designing of these nano courses render the much-needed innovations to the educators who can look beyond the traditional programs and re-cast these programs into short-term client-specific modules for credentials. They also get the much-needed incubative platform for faster design and development of tailor-made courses. The high-demand bite-sized courses act as additional sources of revenue generation for the institutions.

Micro-credentialing is equally advantageous for learners as they also stand to gain in several ways. It provides a much more focussed scope of gaining insight into specialised areas and multi-fold scope of expertise in niche areas. It encourages the acquisition of -oriented practical skills and demonstrable know-how that promotes career advancement opportunities and diversifies multiple skills. Further, such online platforms are an opportunity for the target audience to modulate a portfolio of stackable credentials that develops a learning pathway for an individual to advance in intra- or inter-dimensional scope of subject knowledge. Facilities of online learning networks such as need-based curriculum, self-paced learning, and wider flexibility, amongst other merits, also make this learning option attractive to a larger diaspora.

Unlike the conventional system of offering courses, micro-credentials follow a distinct pedagogical approach. Generally, these credentialing courses are offered online or in-person and at times in the Hyflex or blended mode, either individually by higher education institutions or by corporate bodies as a part of their upskilling or training programs, or as a collaborative partnership between HEI and corporate entity wherein there is an amalgamation of educational experience of the HEI and much needed expertise and knowhow of the industry. Course comprises several mandatory components such as course module lectures, assignments, quizzes, synchronous interactive sessions, discussion forums, assessments (by exams, practical work, tests), skill tests, portfolio, etc. Notably, the live synchronous sessions and discussion forums are advantageous for all the entities as they are facilitators for microculture formation. The educators, corporate trainers and learners/trainees get the much desired platform for interacting, exchanging ideas and networking thus developing a micro culture.

The ensuing discussion focuses on the micro-credential ecosystem of the Indian sub-continent. What follows is a spotlight on the multidimensional efforts and initiatives launched by the Government of India to bring this unique approach to the masses so that they can avail the advantages of these courses and upskill, upgrade and rejuvenate themselves at par with the essentialities of the career demands and job requirements.

MICRO-CREDENTIALS: THE INDIAN PERSPECTIVE

The Government of India has implemented a number of project-based initiatives under the National Mission on Education through Information and Communication Technology (NMEICT). In view of the importance of ICT in enhancing access to educational opportunities for over half a billion working Indian population, this national mission was launched in 2008-2009 by the Government of India. Under this Mission, "a proper balance between content generation, research in critical areas relating to imparting of education and connectivity for integrating our knowledge with the advancements in other countries is to be attempted. For this, what is needed is a critical mass of experts in every field working in a networked manner with dedication" (NMEICT Mission Document, 2008-09).

The main objectives of this mission was "to develop knowledge modules having the right content to take care of the aspirations and to address to the personalized needs of the learners; research in the field of pedagogy for development of efficient learning modules for disparate groups of learners; standardization and quality assurance of contents to make them world class; building connectivity and knowledge network among and within institutions of higher learning in the country with a view of achieving critical mass of researchers in any given field; availability of e-knowledge contents, free of cost to Indians; spreading digital literacy for teacher empowerment; experimentation and field trial in the area of performance optimization of low cost access/devices for use of ICT in education; providing support for the creation of virtual technological universities; identification and nurturing of talent; certification of competencies of the human resources acquired either through formal or non-formal means and the evolution of a legal framework for it; and developing and maintaining the database with the profiles of our human resources" (NMEICT Mission Document, 2008-09).

As a part of the fulfilment of the objectives set out by the Government of India in the NMEICT for enhancing digital fluency, an online integrated platform “SWAYAM” (Study Webs of Active Learning for Young Aspiring Minds), was developed indigenously for providing online courses to the population. This major initiative commenced with the landmark launch of National Programme on Technology Enabled Learning (NPTEL), jointly by IITs and IISCs. What follows here is a brief account of the journey so far and characteristics of this robust digital educational platform.

SWAYAM: This is an integrated platform developed by AICTE for offering MOOCs/online courses to students ranging from school level to postgraduate level, teachers, and teacher educators. It is the world’s largest online free e-learning platform that aims at bridging the digital divide by making the best teaching learning resources available to the students who have hitherto remained untouched by the digital revolution and have not been able to join the mainstream of knowledge economy, and achieve three cardinal principles of Education Policy i.e. Access, Equity and Quality. For the production of best quality content, nine national coordinators namely AICTE, CEC, IGNOU, NCERT and NIOS, NPTEL, UGC, IIMB and NITTTR have been appointed in the field of self-paced and international courses, undergraduate education, out of school students, school education, engineering courses, non-technical, postgraduate education, management studies, and teacher training programmes. For offering free online learning, four quadrant approach i.e. e-tutorials, e-contents, self-assessment and discussion forum has been adopted, with availability of courses in all disciplines including engineering, law, management and other professional courses, and being translated into 12 Indian regional languages. With more than 6000 courses, 11 million registrations, 200 courses translated in regional languages and 800000 certificates awarded, SWAYAM plays a crucial role in promoting education through digital technology.

On successful completion of the courses on SWAYAM platform, certificates/credits are awarded to the learners that are acceptable by the Universities for transfer of credits (Press Information Bureau, 2018). The learners have been encouraged by UGC and AICTE regulations by allowing them to earn 40% of the credits from amongst the credit-based courses offered through SWAYAM platform. Two major initiatives have been taken specifically for online professional development of more than 1.5 million faculty/teachers engaged in higher education by offering Faculty Development Programmes (FDP) and Annual Refresher Programme in Teaching (ARPIT), enabling them to keep themselves abreast with the latest developments in their disciplines. 75 discipline-specific institutions had been notified as National Resource Centres in the first phase, which prepared online training material focusing on latest developments in the discipline, new and emerging trends, pedagogical improvements and methodologies for transacting revised curriculum and the courses under ARPIT were made available for the first time from 1st November, 2018 to 28th February, 2019.

NPTEL: NPTEL, an e-content development project under NMEICT was initiated in 2003 by seven Indian Institutes of Technology (IITs) and Indian Institutes of Science (IISc), Bangalore in five core disciplines of Engineering. In its first phase, 235 courses were developed in these core disciplines, however during the second phase of 2009 to 2014, 600 courses were developed not only in the field of Engineering but also in Physical Sciences and Management. It started offering courses in open online mode i.e. MOOCs in March 2014 with the facility of certification to the students outside the IIT system to get credentialed by IITs. Under this programme, the courses were earlier offered through an online portal and now they are being hosted through SWAYAM portal wherein the enrolment is free with an optional proctored certification. Since 2014, approximately 3500 courses with an enrolment of more than 10.58 million and 1.51 million proctored exam registration have been completed, with award of e-verifiable certificates from IITs and IISc. These NPTEL domain micro-credentials in core and elective courses help the learners to prepare for technical competitions and better career prospects. Under the NPTEL Industry Associate programme having 62 industry partners and six CSR partners, more than 120000 students have received exam fee waiver support through CSR partners and the courses co-offered under this programme upskill/reskill workforce, recruit NPTEL toppers, offer internships and provide soft skill training for NPTEL toppers, thereby providing access to the learning resources, nourishing the learners, and developing human resources.

The importance of this online platform and its key role in providing the much needed path to professional micro-credential for skill development, reskilling and upskilling, and enhanced knowledge acquisition, became the premise for conducting this study to determine the effectiveness of NPTEL in providing

access to micro-credentials in the country. The ensuing section focuses on the lead objectives of this study.

OBJECTIVES OF THE STUDY

The study on the contribution of NPTEL as an online learning national program for an effective access to micro-credentials for people in India and abroad was conducted with the following objectives:

1. To make a comprehensive study of the contribution of NPTEL as a national online project, its constituent institutions and local chapters as a facilitator to the people for gaining access to micro-credentials;
2. To present an overview of the discipline-wise courses offered and present status of these courses;
3. To portray the enrolment trend including its gender distribution and professional background of the learners in this online project;
4. To deliberate in detail the success rate of the learners in the award of micro-credentials;

The revelations from the data and report analysis are noteworthy, pointing to a few significant outcomes in support of the fact that NPTEL has proved to be a path to micro-credentials for the people in India and abroad. It is being growingly accepted as a cost- effective, credit-worthy and convenient digital platform for knowledge enhancement, skill development - both upskilling and reskilling, and brighter employability. This is being further discussed under the following heads.

INSTITUTIONAL NETWORK FOR DIGITAL OUTREACH

As discussed earlier, the courses through NPTEL online platform are being offered by a network of institutions, mostly known for academic excellence and reputation, also commonly referred to as Centres of excellence. As is evident, the learners have an opportunity to enrol in MOOCs offered by constituent institutions, offering online courses in varied subject areas, including streams of engineering, management, general STEM subjects, humanities, legal studies, etc.

Figure 1 depicts the contribution of these constituent institutions towards the NPTEL portal in terms of offering the number of courses. While IITs form a significant chunk in this endeavour, other higher education institutions such as IISER, IIM, IEST, IISc, ICMR, etc. are clubbed under the head "OTHERS". These include both Indian as well as foreign universities. The prominent Indian institutions in this group are Chennai Mathematical Institute, IIIT Bangalore, IISER Pune, IIMSc, and Visva-Bharati University in terms of the number of courses offered. Additionally, the foreign universities are Texas A&M University, having provided three courses on NPTEL portal, EM Strasbourg Business School (University of Strasbourg) and IITM jointly with one upcoming course, and KTH Royal Institute of Technology, Sweden which has also offered its courses on NPTEL domain.

Yet another noteworthy aspect of NPTEL platform as a multi-institutional network for micro-credentialing is the courses that are being offered under academia-industria joint collaboration such as those by IIT Kharagpur and IIT Madras jointly with Google. Thus, all these course offerings and partnerships testify to the fact that NPTEL is a digital institutional network with an enhanced academic penetration, bringing continuous skill development and knowledge enrichment at a close proximity to the target audience.

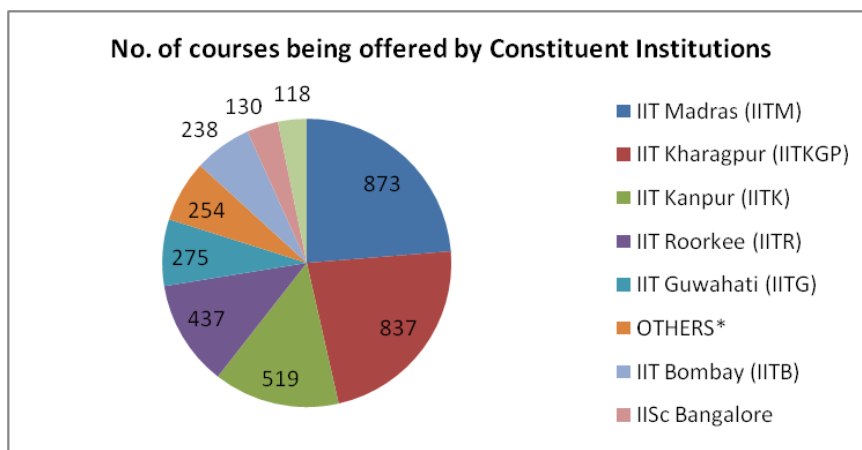


Figure 1. Constituent Institutions

Note: OTHERS* include IIT Ropar, IIT Mandi, IIT Patna, IIT Bhubaneswar, IIT(BHU) Varanasi, IIITD, IIITB, IIITH, IITH, IIT Tirupati, IIT Palakkad, IISER Pune, IISER Mohali, IISER Bhopal, IISER Thiruvananthapuram, IEST Shibpur (1 course by IIT KGP), Institute of Chemical Technology, Mumbai, ISI Bangalore, University of Hyderabad, University of Delhi, CMI, NIE, NIRT, CDSA, THSTI, DBT, KTH Royal Institute of Technology, Sweden, TU Berlin, IMSc, Kerala School of Mathematics, National Law School of India University, Texas A&M Univ., University of Strasbourg

The self-study online NPTEL platform, with its vast institutional network while providing a bouquet of courses, has made a sizable effort to further augment the outreach and ensure greater awareness. The initiatives include forging partnerships with colleges located in different cities across the country. Through this collaboration, NPTEL focuses on encouraging more students to derive benefit from this national program, participate in this digital learning experience, and gain better understanding and skill proficiency in their subject areas. These colleges act as Local Chapters (LC) of NPTEL, providing the latest initiatives and information such as the courses being offered, date of commencement of session, schedule for assignment submission, registration, exam form submission, examination date-sheet, venue of examination, etc. In a way, these LCs act as a Single Point of Contact (SPOC) for the learners from where they can seek all relevant information and guidance on the MOOCs available on the SWAYAM-NPTEL platform.

Table 1. Local Chapters

INSTITUTE TYPE	COUNT OF LOCAL CHAPTERS
Arts, Science and Commerce	1099
Education	15
Engineering, Technology and Management	3033
Health Science Institution/Medical	259
Law	14
Other	155
Grand Total	4575

Source: 1. <http://nptel.ac.in/LocalChapter/>; 2. NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

As can be seen from Table 1 below, there are 4575 LCs of NPTEL across the country, which are colleges with diverse disciplines. Notably, these LCs have significantly generated awareness towards these courses amongst the local communities. This can be appreciated from the figures shown in Table 2 which gives an account of the contribution of these colleges as LCs towards total registrations. Yet another important highlight of this significant educational digital drive is its growing international acceptability and presence through partnerships with higher education institutions abroad. These organizations act as LCs of NPTEL in the respective country. Therefore, the students in several countries have access to these online courses, appearing in the examination and getting online certifications as per their requirements. The colleges in these countries are the LCs which act as the SPOC for these learners from where they get all the relevant course-related information.

Table 2. Contribution of Local Chapters towards Total Registrations

Semester	LC REGISTRATION	TOTAL REGISTRATION	LOCAL CHAPTER PERCENTAGE
Jan – Dec 2021	318413	456375	70%
Jan – Dec 2020	174775	246570	71%
July – Oct 2019	207027	253648	82%
Jan – Jun 2019	173891	204063	85%
Jul – Dec 2018	132875	161256	82%
Jan – Jun 2018	64567	86954	74%
Jul – Dec 2017	50042	70316	71%

Source: NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

MULTI-DISCIPLINARY ONLINE INTERFACE

NPTEL with its extensive network of institutions and LCs is a dynamic online repository of courses representing several subject areas. It is evident from Table 3 that engineering as a discipline has numerous courses on this platform, commencing from aerospace, chemical, and design to metallurgical engineering. Besides, many courses are also management, humanities, and social sciences streams. The wide array of courses facilitates learners in enhancing their subject-specific comprehensioin-depth and in remaining abreast with the latest developments and innovations in these areas. Thus, serving the purpose of holistic lifelong gainful professional upgradation, leading to acquisition of digitally verifiable micro-credentials.

Table 3. Discipline-wise Courses Offered

DISCIPLINE	NO. OF COURSES
Aerospace Engineering	61
Agriculture Engineering	24
Architecture and Planning	62
Biotechnology and Bioengineering	184
Chemical Engineering	167
Chemistry	155
Civil Engineering	262
Computer Science and Engineering	414
Design Engineering	30
Electrical and Electronics Engineering	442
General	108
Humanities and Social Sciences	370
Law	7
Management	307
Mathematics	217
Mechanical Engineering	418
Metallurgical and Materials Engineering	144
Ocean Engineering	21
Physics	101
Textile Engineering	32

Source: NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

Table 4. Present Status of Courses Offered

SEMESTER	TOTAL NO. OF COURSES OFFERED	NEW	RERUN	REPURPOSED
Jan –June 2014	01	01
Jul – Dec 2014	02	02
Jan –June 2015	18	12	06	..
Jul – Dec 2015	36	32	04	..
Jan –June 2016	64	45	08	11
Jul – Dec 2016	104	80	15	09
Jan –June 2017	130	87	35	08
Jul – Dec 2017	159	105	46	08
Jan – Apr 2018	226	115	108	03
Jul – Dec 2018	270	157	113	..
Jan – Apr 2019	300	153	147	..
Jul – Dec 2019	357	164	193	..
Jan –June 2020	389	122	267	..
Jul – Dec 2020	417	96	321	..
Jan – Apr 2021	507	112	395	..
Jul – Dec 2021	525	100	425	..

Source: NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

The number of courses on this online interface has experienced a continuous increase from a single course in the year 2014 to 525 courses in the year 2021. This growing number is not just of rerun courses but new courses have been adding to this ever-rising figure. Hence, it can be said that the NPTEL is in fact a multi-disciplinary dynamic online educational interface catering to the needs of national and international audiences, with widening geographical coverage and subject-specific diversities.

ENHANCED ACCEPTABILITY OF MICRO-CREDENTIALS

Yet another critical dimension that credits NPTEL to be the path for attaining micro-credentials is its growing acceptability amongst the stakeholders. The enrolment trend, as shown in Figure 2 here, reveals that there has been a continuous rise in the number of learners enrolling for different online courses on this platform. With the widening institutional network attached with this project, greater geographical penetration, and expanding coverage of subject areas, learner enrolment has also been gradually increasing, demonstrating that this digital interface has emerged as a popular medium for attaining micro-certifications in various domains.

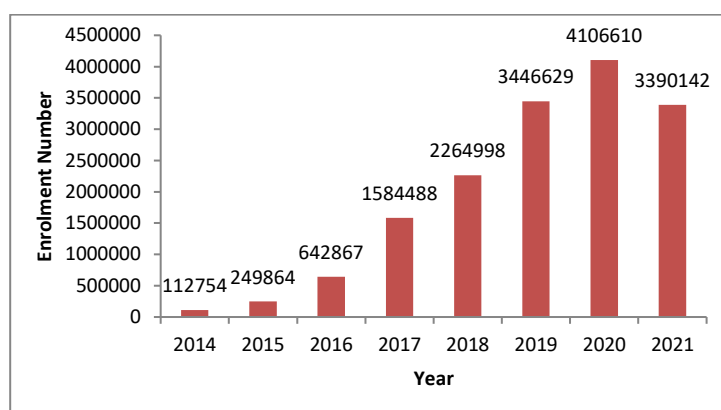


Figure 2. Enrolment trend since 2014

Distinctly, the thriving popularity of micro-credentials is not gender specific, it is equally in vogue amongst both male and female audiences. In fact the number of female learners has experienced a steady rise over the years and they comprised more than 40% of the total enrolment in the July-December 2021 session, as is seen in Table 5. Likewise, this program is being utilized more and more by teaching faculty to fulfill the mandatory requirements for career progression by earning micro-credentials in various courses equivalent to faculty development programs. Completing a certain number of faculty development programs is compulsory for upward elevation in higher education. Therefore, this online platform enables the teaching community to complete their certifications while on the job at their workplace, without having to travel to a different location to attend these courses. Thus, both the institution where they are employed and the individual tend to gain from this system.

Table 5. Profile of the Learners in the NPTEL

SEMESTER	GENDER WISE DISTRIBUTION (IN PERCENT)		PROFESSIONAL BACKGROUND (IN PERCENT)		
	MALES	FEMALES	FACULTY	STUDENT	OTHERS
Jan –June 2014	100.00	0.00	-	-	100.00
Jul – Dec 2014	66.49	33.51	-	100.00	-
Jan –June 2015	70.89	29.11	-	100.00	-
Jul – Dec 2015	62.17	37.83	-	56.33	43.67
Jan –June 2016	62.71	37.29	11.70	82.10	6.20
Jul – Dec 2016	58.76	41.24	12.23	80.71	7.06
Jan –June 2017	58.07	41.93	12.30	82.75	4.95
Jul – Dec 2017	60.56	39.44	16.32	77.47	6.21
Jan – Apr 2018	59.52	40.48	17.56	76.71	5.73
Jul – Oct 2018	60.39	39.61	16.51	78.61	4.88
Jan – Apr 2019	60.04	39.96	18.49	77.85	3.67
Jul – Dec 2019	57.01	42.99	21.21	78.79	-

Jan –June 2020	58.59	41.41	26.59	73.41	-
Jul – Dec 2020	57.61	42.39	11.04	88.96	-
Jan – Apr 2021	54.65	45.35	15.23	84.77	-
Jul – Dec 2021	56.88	43.12	13.99	86.01	-

Source: NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

Table 6. Enrolment pattern, success rate of the learners in the award of micro-credentials

SEMESTER	ENROLLED	REGISTERED		ATTENDANCE		PASS PERCENT
		NUMBER	PERCENT	NUMBER	PERCENT	
Jan –June 2014	53807	1380	2.56	1182	85.65	46.19
Jul – Dec 2014	58947	1653	2.8	1549	93.71	98.52
Jan –June 2015	89045	2564	2.88	2113	82.41	91.39
Jul – Dec 2015	160819	7291	4.53	6006	82.38	52.7
Jan –June 2016	241691	17292	7.15	15292	88.43	67.04
Jul – Dec 2016	401176	31444	7.84	26544	84.42	73.82
Jan –June 2017	535223	44099	8.24	38405	87.09	81.02
Jul – Dec 2017	1049265	70316	6.7	63398	90.16	85.32
Jan – Apr 2018	934182	86954	9.31	76126	87.55	86.88
Jul – Oct 2018	1330816	161300	12.12	144078	89.32	86.28
Jan – Apr 2019	1619065	204061	12.6	183282	89.82	88.33
Jul – Dec 2019	1827564	253387	13.86	222826	87.94	73.94
Jan –June 2020	2042505	87086	4.26	30614	35.15	79.54
Jul – Dec 2020	2064105	191653	9.29	170043	88.72	73.95
Jan – Apr 2021	1663929	178687	10.74	141824	79.37	74.09
Jul – Dec 2021	1726213	236628	13.71	225530	95.31	72.32
Total	15798352	1575795		1348812		

Source: NPTEL (n.d.). NPTEL Statistics. Retrieved May 20, 2022, from <https://archive.nptel.ac.in/resources/statistics/>

Due to crucial characteristic features such as inherent flexibility, online mode of delivery, relevance for the learner in terms of credit transfer from these credentials to their primary degree or program of study, equivalence granted and considered as a faculty development program, the number of candidates enrolling in the courses, registering and appearing in the examination, and finally receiving the certification is also witnessing a gradual increase. As seen in Table 6, in the earlier years, the number of candidates enrolling for the courses vis-à-vis the number of candidates completing the courses was quite large, meaning a significant number used to enrol and then drop the courses. However this trend is gradually changing and a larger number of enrolled students are appearing in the examination and getting their certifications. This signifies the growing acceptance and utility of this national online educational portal for micro-credentials.

CONCLUSION

NPTEL, now being hosted through the SWAYAM MOOCs online platform, can be said to have achieved the three cardinal principles of Education Policy: access, equity and quality. It has been successful in its mission of providing access to quality short term online courses which are being offered by a network of premier educational institutions. The stakeholders have derived multiple benefits from this online interface, one, they could enhance their knowledge and upgrade their skills through this mode. Second, people got direct access to the premier institutions by enrolling in their diverse courses, thus promoting equity. Therefore, NPTEL, an online learning national program, can be credited as a pioneer in creating a path for adequate access to micro-credentials for people in India and abroad.

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