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Asynchronous E-Learning in India: AComparative Study on NPTEL and Spoken Tutorials

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Abstract: *With scarcity of time and need to learn more for our own and organizations growth, e-learning modules come handy. Popularity of e-learning courses all over the world, and rising domestic need for skilled workforce has encouraged Indian government to take necessary measures. In 2009, Ministry of Human Resource Development started the digitization in education with NMEICT as an umbrella under which all IITs, IISc, UGC, and some of the best brains in the country were authorized to work for the development of necessary infrastructure for e-learning. Results are visible in past 8 years. We have developed a high quality e-content, a world class delivery system, and video-conferencing tools for online classrooms and other initiatives for technology enhanced learning. In this paper we will study the various efforts taken by Government of India in promoting e-learning modules and MOOCs. [18] We will prepare a comparative study on video based e-learning modules working under NPTEL and Spoken Tutorials Project. Both of these programs are hugely popular and offer a variety of courses. Our objective is to study the growth of these asynchronous e-learning course modules and prepare a comparative analysis and suggest recommendations for future growth.*

Keywords: E-Learning, E-learning in India, NPTEL, STP, e-content,

1. Introduction

In any civilized society, the aspiration for knowledge in its citizens show the level of potential growth. Knowledge acquisition was primarily considered as responsibility of Universities and other education institutes, until the evolution of concept of e-learning. This concept involves use of electronic medium for the purpose of learning, acquiring and upgrading knowledge. E-learning, as a concept, is not new and has roots going back to 1060s [1](Ekta et.al. 2013) when universities in US for the first time started use of computers and encouraged their students to learn using ICT. There is a vast section of students who want to learn a new technology, a new concept or even would like to continue with their education from where they left it. E-learning is the fastest growing solution for people with hunger for knowledge acquisition. Using e-learning, a university can reach to a wider audience hence reaching out to large number of aspirants who want to learn from best in the academia and industry. When e-learning gained popularity all over the world, understanding the need to cater to the large section of society, Indian government and universities also started the process of e-learning and e-content development. Implemented as a policy statement through AICTE, Ministry of Human Resource Development initiated e-learning as an integral part in its landmark initiative National Mission on Education through Information and Communication Technology (NMEICT). [20] (NMEICT web-link) Considering the vast divide in educational facilities in India, and to bridge this gap, NMEICT was launched in 2009 by MHRD. Two major factors in promoting e-learning are development of e-content specific to subject and domain, and ensuring a proper delivery mechanism for smooth transfer of knowledge. Promotional schemes were devised to provide high speed Internet connection to all the colleges and universities, even in remote areas. Similarly efforts were made to develop e-content of high quality. Various prestigious Institutes like IITs and IISc were authorised to develop this e-content. Some prominent examples being IIT-Bombay for 'Spoken Tutorials Project' and IIT-Madras for NPTEL. We have seen the growth of e-learning in form of Massive Open Online Courses (MOOCs) [18] in past few years and know the overwhelming response these courses have received. In this paper we present a study of the growth pattern of on-line courses in India along with the acceptance of e-content developed by them.

2. E-Learning

With the growth in need for education, e-learning has emerged as a most feasible and viable option. Various governments, universities and institutions are working in this direction to provide a virtual classroom environment to students across the region and beyond [1]. Students who discontinued their formal education due to some economic, social or personal constraint can pursue their education through this mode. Similarly a large section of employees, employed with organizations today also enrol for these online programs to enhance their skills w.r.t. to the changing needs of the dynamic environment. Education through online mode is now rapidly becoming an easy alternative to traditional classroom teaching and even continued education through correspondence mode. As depicted in the recent reports, online education is considered equally effective to the traditional face to face means of education. There are two modes of e-learning namely Synchronous and Asynchronous [1].

Synchronous Learning: A synchronous learning environment simulates a real classroom. A teacher or trainer teaches a class of students sitting in a university room using audio video techniques, like online video conferencing through computer networks. His interaction is with students attending the session sitting in their remote work places or different knowledge centres or nodal centres. In this way a session is acting as a direct telecast from one station to all the receiving stations spread across the geographic distribution. All students can not only listen to their trainer but also interact with him using online chat or voice interaction. A trainer can even maintain an attendance record of all the trainees. A trainer, just like a traditional classroom, can use any method of teaching ranging from presentations, video demonstrations, or even whiteboard teaching. Just like an ordinary classroom, a trainer can conduct a quiz or evaluate his group in any manner he wants. All trainees can have a direct interaction with the trainer and discuss their doubts first hand. This method has various advantages like, direct interaction with experts, no need to travel or live at university site, course is conducted in convenient timings like weekends or in evenings etc. The only disadvantage with this method is that trainees have to be present at the scheduled date and time at the training venue or must be logged in to Internet, otherwise he may miss out on complete lecture. Of course the availability of high speed Internet connection can be a constraint for few.

Asynchronous Learning: This method is the easiest alternative for traditional education or even synchronous e-learning. Asynchronous learning means making a recorded lecture available to trainees which he can view at his own convenient time. Recorded lectures or notes, also called as e-content, is recorded once using audio visual aids and then distributed to the trainees using portable storage media, CDs, DVDs or flash drives. Most universities make the content available on their web-sites for easy viewing or free downloads. Whenever a trainee enrols for an online-program, he gets all the video tutorials with a program module. Trainee can view the content whenever he feels comfortable and he is not under any pressure to miss out on any topic. He always enjoys the option of replaying difficult concepts without stopping the flow of a class. Asynchronous learning can be divided under two heads as self-paced or facilitated asynchronous. Under self-paced method, once enrolment is done, a trainee is given full flexibility to complete the course on his own pace and is expected to clear an online exam at the end of the schedule. Whereas in a facilitated asynchronous environment, trainee becomes a part of a study group where he can discuss about course content and topics with his trainer and other classmates. This can be taken as a bulletin board service or a chat group where messages can be exchanged and assignments can be submitted.

3. E-Learning: Indian Perspective

Concept of E-Learning is not new to India. Many Indian Universities, both from government and private sector, are running MOOCs programs and are hugely popular. The speed at which Indian students and professionals adopted e-learning is astonishing for few. Most of the organizations today are encouraging their employees to enrol for these learning modules to increase their skill set [2]. Same is the case with universities which now after understanding their inability to upgrade the industry specific curriculum in time, encourage their students to learn new technology from e-learning modules. Realizing the importance of e-learning modules in providing quality education of a large section of society, in 2009 Ministry of Human Resource

Development included e-learning as a major component in NMEICT. Under this project MHRD planned to provide quality education to all the students of the country using information and communication technology. Key focus was on high quality e-content generation, providing low cost devices to institutes and ensuring availability of high speed Internet connections [21].Following are the key projects started by Government of India under NMEICT-

3.1 **BroadBand connectivity to colleges**: Special schemes were introduced to provide high speed data links to all the colleges, institutions and universities across India to enable them a medium for e-learning. Initially more than 60% of mission budget was allocated to this area or connectivity. Project targeted 26000+ colleges and 2000+ polytechnics which were not yet connected with improved IT infrastructure and high speed internet connection.

3.2 **Low cost access device**: Aakash Tablet was launched by President of India on education day in 2012 to introduce a low cost smart device useful in e-learning modules. This project was developed in technical collaboration with IIT-Rajasthan and then IIT-Bombay and was receivedby masses and students.

3.3 **Virtual Labs**: Objective of virtual lab is to provide remote access to labs in various disciplines of science and engineering to cater to the needs of students and research scholars.Through virtual labs, a series of lab exercises and experiments have been designed by various IITs with solutions, simulations and animations. A major thrust was to make the costly apparatus and resources available to every engineering college of the country which was otherwise only available to a discreet set of institutions.

3.4 **Talk to a Teacher:** IIT-Bombay was sanctioned to lead this project under which thousands of teachers are being trained for Teachers Empowerment program. A-VIEW is an award winning indigenously built multi-modal, multimedia e-learning platform that provides immerse e-learning experience that is almost as good as a real classroom experience. A-VIEW is developed by Amrita Vidyapeetham and is awarded as global leader in Internet innovation by CISCO, FICCI excellence in technology award, South Asia education summit award etc. For past few years now A-VIEW is used as the most popular e-learning tool in most of the e-learning programs for students and short term courses organized for faculty training by National Institute of Technical Teachers Training and Research.

3.5 **Free and Open Source Software for Education (FOSSE)**: Foss project was designed to provide free support for all free and open source software with an aim of eliminating or minimizing the use of licensed or proprietary software in Universities and colleges [13]. It is done by providing links to download open source software, providing free access and help, providing textbook companions as tutorials, conducting free workshops and seminars to train teachers and students on open source software and providing help on lab migration from proprietary software to open source. In this mission, efforts were taken to promote scilab, python, oscad, openfoam etc. as replacement to their expensive counterparts. Till date more than 1000 textbook companions on open source software are made available and hundreds are in process [14]. Similarly thousands of self-workshops were conducted to enable and promote use of these software.

3.6 **Spoken Tutorials**: Spoken Tutorials project started as an implementation of FOSSE project for preparing e-content for all free and open source software [16,17]. This is a series of small video tutorials on various technologies/languages developed in more than 20 Indian languages to provide easy understanding about technology to interested students. Today Spoken tutorials provide video tutorials on 75+ courses with total hundreds video modules. STP team has conducted 65000+ workshops and has trained and certified approximately 35 lac participants [17]. Video course which started as a part of talk to a teacher project, now covers software training in areas of programming, chemistry, bio-chemistry, animation and graphics etc.

3.7 **E-Content development**: For any e-learning program to be successful, it requires a good delivery mechanism and a quality content [6]. Under NMEICT task of generation of e-content was allocated to various sub-projects like NPTEL, CEC and ePGP. One of the most famous and successful e-content provider and pioneers in e-learning modules in India is NPTEL project. National project on technology enhanced learning (NPTEL) works under leadership of IIT-Madras but content is provided by all major IITs and IIScof the country. Content is provided in form of recorded lectures by professors in various streams of engineering, science and humanities. It serves the aim of providing quality education to all the engineering colleges of the country by means of various online courses. Today it offers 400+ web courses and 450+ video courses on all streams of engineering.e-PGPathshala is a portal which offers high quality curriculum based interactive

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content in 77 subjects across all disciplines of science, arts, humanities, mathematics, natural languages etc. this content is developed by UGC under NMEICT.

4. FOSSEE

FOSSEE (Free and open source Software in Education) is the funded project by the MHRD and is the part of the national mission on education through ICT (NME-ICT), now it is maintained and based in IIT Bombay [13]. The main idea behind this was to provide the open source tools for the education so that the proprietary software's should be used less and instead of using these licenced software's the interested students should use the open source tools called FOSS (free and open source software) tools.

The aim of the MHRD was to promote the open source software's and hardware's in teaching, research and also to create the documentation. This helped in improving the quality of the education as the users can see and modify the source code, redistribute and improve the source code. All tools are benefiting all the academic institutions, Entrepreneurs, Defence, Research organisations and Private industries. These are helpful for everyone who so ever wants to learn the new technology the FOSS tools (ref Figure 1) are available and these will resolve the requirements of the individual as a whole.

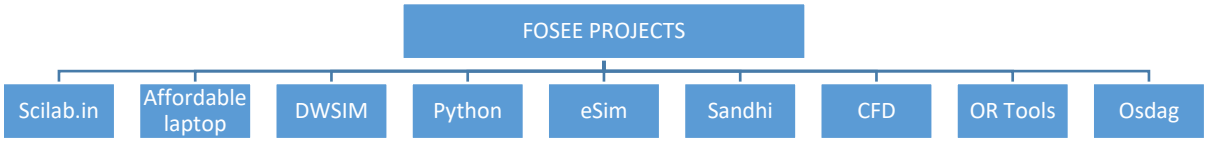

Figure 1 : Various Focus Areas of FOSSE [15]

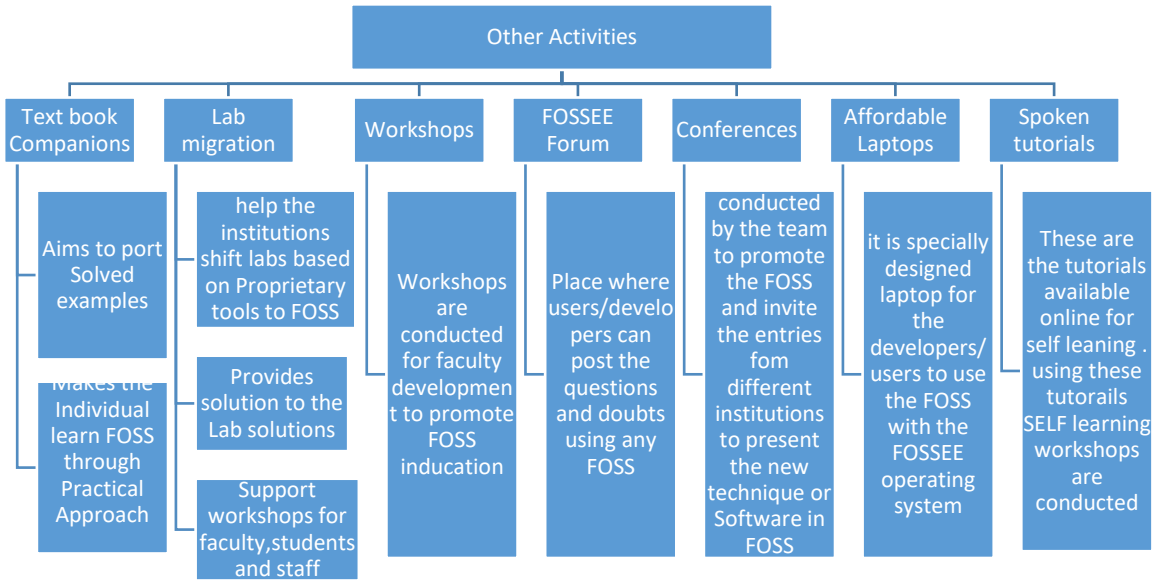

Figure 2: Authors view on various efforts undertaken for promotion of Fosse tools in India [15]

With The help of the Spoken tutorials the Foss Tools are easily understandable by the various students, trainers, faculties and employees in the organisations. Since all the tutorials are in more than 22 languages, no one face problem in understanding the basic technology. Since these tools and the tutorials are freely available on the web. Anyone sitting anywhere in the world can access and learn the new technology anytime. The team also conducts the software Trainings and provides certificates to the registered candidates after conducting an online test.

5. NPTEL Introduction

The concept of multimedia based courses with high potential of interactivity has become a popular and a viable option for both the developed and the developing nations, though for different reasons. The National Programme on Technology Enhanced Learning (NPTEL) is the initiative taken by seven Indian Institutes of Technology (IITs), the Indian Institute of Science (IISc) Bangalore and Technical Teacher Training Institutes (TTTI) which was later funded by the MHRD[10]. The objective behind this project was to develop the curriculum in Audio-video format in form of educational videos and web based content in form of downloadable pdfs etc.[11] The course curriculum is specifically designed on lines of course content of IITs for engineering and science students and Faculty members.

These courses were developed with an objective of providing the content everywhere so that anywhere, anyone can enhance his/her skills and improve the technical knowledge in any suitable area.[9] This initiative helped the institutions all over country in enhancing the knowledge base of engineering graduates. This also helped the companies to train their employees in the Engineering and science domain.

In 2007 there were around 110 video courses and 129 web based courses which has been increased to 514 videos and 409 web courses in 2017[12]. The video courses includes the video files, Classroom lectures and some of the videos transcribed with subtitles. There are many new initiatives taken by the NPTEL like there is a new YouTube channel which provide the links for downloads. Anyone can view the various videos available on the YouTube and prepare the subject he /she is interested in.

Journey of the Project

In 2007 there were very less colleges and institutes that were connected to the NPTEL project but as soon as the number of videos and Web content was uploaded to the website, also the awareness and utility of the Project was understood more than 1000 institutes from all over India are using more than 900 courses available[9][11]. All the seven IIT's and IISc team are responsible for drafting the curriculum and the disciplines in which the courses need to be designed. Once the courses are designed the trainers or the faculties from the reputed institutes are invited to upload the relevant videos or the web content suggested and approved by the AICTE[12]. Gradually the new techniques were implemented wherein a new channel was developed on the YouTube where all the content from 25+ disciplines are available in MP3 format [11].All the contents were now displayed in better formats using the transcripts and the subtitles in different languages.Specialcourse like the AIDE for Gate Predations was introduced so that the Engineering students can get help for the preparations for higher education. The papers were also available for their reference or practices. New and special courses for SME's of national and international eminence acclaim their respective areas. In the near future the objective of this Project is to forge strong ties with major academic initiatives worldwide such as MIT OCW, Commonwealth of Learning, British Open University, Australian Open Universities and Digital Library initiatives (to mention a few) and with industry for developing new technological tools for learning and dissemination.[12]

6. Spoken Tutorials

The Spoken Tutorial project is the initiative of the 'Talk to a Teacher' activity of the National Mission on Education through Information and Communication Technology (ICT), launched by the Ministry of Human Resources and Development, Government of India.[16] The use of spoken tutorials is to popularize software development and its use. The spoken tutorials mainly focus on all the FOSS tools available, they also provide guidance to the new learners how to download and work on the various Foss tools available. Spoken tutorial is a SELF Learning module where anyone can learn about any software sitting at home or office with the online assistance as well. [18] Also the trainings are conducted by the team where the certificates are issued to the one who pass the online test.[16]

The number of courses offered in the spoken tutorials are more than 40 which includes the latest technologies like Kturtle, Git, Java business Application, JmolApplication,Latex etc. Also the upcoming courses would be Joomla, Moodle,STEMI, Front accounting, Koha Library Management System, Arduino, Advanced

Geogebra, Synfig 2D animation. More than 3500 institutes are using the tutorials for the various FOSS tools available in the FOSSEE.[15]

7. Comparison Study on NPTEL and STP

In the Broader term both the Spoken tutorial and the NPTEL is helping the students, teachers and others learn online through the videos, YouTube channel, Web contents. All the registered candidates are allowed to use the open forum to discuss and submit their queries to resolve their doubts. Participants can appear in the online test for the certification in any respective course. These two initiatives, by the MHRD, encourage the students to learn more in all major disciplines of Engineering using the FOSS tools.[14] These projects also welcome the academic expertise from the private sector to contribute in this e-content development. It will also help students through workshops and discussion forums for implementing NPTEL content in correlation with Foss tools. The teams of both the projects would invite feedback to help them improvise for future courses.

On basis of the Curriculum and Course content of both NPTEL and Spoken Tutorials, authors have prepared following comparative analysis in forms of Table 1, Table 2 and Table 3 which areself-explanatory and compare both project of various parameters. Below is shown Table 1 which indicate a comparison based on video and web courses of Spoken tutorial and NPTEL.

Table 1: Comparative analysis of Spoken Tutorial and NPTEL video courses on basis of courses and curriculum

Basis	**Spoken tutorials**	**NPTEL**
Content	Tutorials based on FOSS tools	Videos and Web content available on all Engineering and Science disciplines [9]
No of courses available	85+[16]	1000+[12]
Target audience	All who are keen to learn new technology	Who all are interested in the Science and Engineering Qualification at Graduation and post-graduation level
Understanding	The videos are available in more than 22 languages [16]	Transcripts and Subtitles are available for better understanding [11]
Ease to use	Contents are available on Website	Contents and Videos are available on YouTube channel [12]
Technological Barriers	All the contents are available only on the FOSS tools. No content is available on any proprietary software.	All the contents are approved by AICTE and prepared according to UGC guideline on e-content writing. [6]
Interactive	The interaction with the speaker is feasible [18]	Interaction is possible in the form of questions on open forums [12]

Below table (table 2) shows a comparative study of video content on the basis of acceptability and adaptability by students and teachers.

Table 2: Comparative Analysis of Spoken Tutorials and NPTEL on basis of acceptability by students and teachers

Basis	**Spoken tutorials**	**NPTEL**
Accessible	Only Videos are available	Website , Videos on YouTube channel [7] , Web content
No of Institutes involved	3500+	1000+
No of trainings conducted	68226	No individual trainings
Certifications	11266 of online test	More than 13K on the basis of online test

Table 2 -Source: Statistics of the courses, trainings and certifications, published by MHRD [17]

Below table (table 3) show a comparative study based on Effectiveness in learning through E learning using Spoken Tutorials and NPTEL.

Table 3: Authors view on comparative study of Spoken Tutorial and NPTEL on basis of effectiveness to learn through E-Learning

Basis	**Spoken tutorials**	**NPTEL**
Time involved	Depends on FOSS tool	10-50 minutes per video
Cost involved	Free	No cost except the online test registration fee
Human resistance factors	Download the content for future reference	Download the transcripts, videos and web content
Utility	Highly beneficial for the new users	Mostly used by the Science and Engineering students to gather extra Knowledge

8. Conclusion

In past few years, E-Learning has emerged as a popular tool in knowledge sharing and has gained its place as an alternative to classroom education in India. Indian student have accepted web-based learning and video tutorials as a part of their extended learning. Courses which universities are not teaching due to irregular syllabus updating pattern,but are necessary in matching the requirements of industry, are also provided by these e-learning modules. Engineering students find NPTEL courses more attractive since it covers more streams of engineering and science and gives them an insight on concepts as taught in prestigious IITs and IIS. Whereas students and institutions interested in learning open source software are generally more interested in spoken tutorials as it helps them to move towards more cost effective and easy platforms. Moreover, since both programs offer a certification from Indian Institute of Technology, it helps students to attain a recognition in the respective curriculum.

9. Implications and Future Work

This study recognizes e-learning as the new trend of learning new courses and software amongst students and teachers.In this study, authors have defined the effectiveness and adaptability among students regarding two of the most popular modules of e-learning. Authors also believe that e-learning can be very helpful in filling the gap between Industry and Academia which can be considered as an important area of research and can be implemented in future research.

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