A Review of Open Educational Resources and Their Development in India

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Introduction

The Republic of India is the seventh largest country in the world, the second most populous with over 1.2 billion people and the world's biggest democracy. About 70% of the Indian population lives in and as rural inhabitants. It is among the world's oldest civilizations with a relatively young population. It is a pluralistic, multi religious and multi ethnic country. The nation is made up of 29 states and 7 union territories. Hindi and English are the most spoken and official languages of the nation, however the provinces, which are almost, all language based and also have their own official languages. The constitution of the country recognizes 22 "scheduled languages" but one study claims that as many 780 languages are spoken in India and as many as 86 written scripts still in use.[1]

India was ranked at 135 out of 187 countries in the most recent Human Development Index of the UN. Table 1 reflects some key development factors in the HDI measurements in 2014. Its economy is the worlds third biggest but it is also home to a third of the world's poorest. Besides being a country with the largest proportion of the poor India also suffers from being home to illiteracy rates of about 26% of is population above seven years of age.[2] On the bright side of this grim statistic is the fact that in the last thirty years, India has been able to reduce its poverty rate from a peak of 60% in 1981[3] to about 29.5% in 2011-12[4]; similarly her accomplishments in providing education to the people, especially in fulfillment of India's constitutional guarantee of access to education to all of her citizens,

HDI Rank	Life Expectancy in years	Expected years of schooling	Public expenditure on education [% GDP '05-'12]	GNI per capita [2011 PPP $]
135	66.4	11.7	3.3	5050

Table 1: India's HDI indicators[5]

[1] Accessed on 01-08-14 from http://www.newindianexpress.com/nation/780-languages-spoken-in-India-250-died-out-in-last-50 years/2013/07/16/article1686663.ece
[2] Accessed on 02-08-14 from http://www.educationforallinindia.com/chapter6-state-of-literacy-2011-census.pdf
[3] Accessed on 02-08-14 from http://www.worldbank.org/content/dam/Worldbank/document/State_of_the_poor_paper_April17.pdf
[4] Accessed from Hindustan Times on 07-08-14 on http://www.hindustantimes.com/comment/world-bank-s-poverty-figures-don-t-add-up/article1-1249063.aspx
[5] Accessed on 01-08-14 from http://hdr.undp.org/en/data

The general pattern of education adopted at the national level, commonly known as the 10+2+3 pattern, envisages a broad-based general education for all pupils during the first ten years of schooling. The elementary education which has now been made free and compulsory for the children of 6-14 years age group includes primary (I-V) and upper-primary/middle (VI-VIII) stages. Most states conduct examinations after class VIII for entry to secondary school. A policy of automatic promotion has been introduced at the elementary stages to encourage children to continue their education to at least Grade 8, whilst minimizing repetition and dropout. According to gross enrolment (GER) data available at the national level, India has achieved near universal enrolment in primary education in most areas. The average GER across all India was 108.5% at the primary level and 70.5% at the upper primary level in 2004-05. GERs at primary varied from less than 80% (Chandigarh, Punjab, to more than 120% (Chhattisgarh, Arunachal Pradesh), and at upper primary from less than 60% (Uttar Pradesh, Jharkhand, Bihar) to over 100% (Tamil Nadu, Himachal Pradesh). GER at post primary level 85.5%,[6] however while the trend towards improving access has been remarkable, UNICEF in 2014 reported that that about 11.9 million children [ages 6-13] are not in school.[7] In 2012 India expended 11.4% of its total government spending on education and averaging at 3.2% of GDP.[8]

Higher Education

India's higher education system currently is one of the two biggest in Asia, the other being China. Demographic trends seem to indicate that by 2030 India will be, by far, the world's biggest. Both the Central and provincial governments take joint responsibility and exercise oversight over the higher education institutions of the country. Exceptions to these are universities, referred to as the Central Universities, which are completely under the purview of the Central government.

At the time of independence, there were 20 universities and 500 colleges in the country. At present, there are 659 Universities and university-level institutions – 243 State Universities, 165 State approved Private Universities, 108 Central funded universities and other institutions such as the IITs and IIMs among which are 33 institutions of national importance established under Acts of Parliament and five Institutions established under various State legislations as well as 130 Deemed Universities. In addition, there are 33,023 Colleges including around 2,565 Women Colleges. Besides these there are also 12,748 diploma-granting institutions. India's higher education system is growing robustly and the nation's vision seems to be to target a 50% GER from the current estimated 22.5%.[9]

[6] Accessed on 07-08-14 from http://mospi.nic.in/mospi_new/upload/SAARC_Development_Goals_%20India_Country_Report_29aug13.pdf

[7] UNICEF[2014]: Global Initiative on Out-of School Children: Covering Bangladesh, India, Pakistan and Sri Lanka. UNICEF Regional Office, South Asia, Kathmandu, Nepal.

[8] Accessed from http://wdi.worldbank.org/table/2.10 on 20-08-14

[9] Source: Ernest and Young [2013]: Higher Education in India: Vision 2030. Ernest and Young, India.

	1857	1901	1951	1981	1991	2001	2009	2013Y
Universities	3	4	27	132	177	320	525	659
Colleges	27	191	578	4738	6500	10,152	25,951	33,023
Diploma-granting institutions	-	-	-	-	-	-	-	12,748
Students['000]	2	23	263	2905	4924	8399	13,642	30,500 [est.]

Table 2: The Growth of the Indian Higher Education System[10]

Note: GER [2013-14 est.] 22.5%

Y Source: Ernest and Young [2013]: Higher Education in India: Vision 2030. Ernest and Young, India.

Growth to date as well as a vision of further rapid growth is highly laudable especially when the ambition is to reach a 50% GER by 2030. On the flip side of this ambition are the enormous challenges the Indian higher education system has to overcome. Among them are the following:

- Inadequate and poorly trained faculty
- Outdated, irrelevant curricula and pedagogy where assessment and examination orientation remain the principal focus
- Low resources base, poor infrastructure and inadequate funding while private higher education suffers from an overemphasis on profit only
- Employability of graduates where often employers moan about the lack of skills especially in fields such as engineering
- Poor access, especially to minority groups and women.

Among the many strategies being discussed among Indian policy makers and higher education providers, to overcome many of the challenges listed above, is a greater use of digital and digitized resources. India currently has as many as 167 distance teaching institutions; some of them are dedicated DE institutions like the Indira Gandhi National Open University and about thirteen or fourteen similar state open universities and others dual mode universities. Digital resources such as radio and television assisted instruction, satellite based delivery systems of content and the use of web-based material to improve access and quality of curriculum and content are all being seriously promoted. Open Educational Resources are becoming a part and parcel of such conversations especially since India's national digital infrastructure is relatively well advanced. In short, technology has been nothing short of

[10] Pawan, A. & K. Sharma [2010]: Financing, Access & Equity : Indian Higher Education System. Paper presented at a seminar on Paper presented at a workshop organized by the Asian Development Bank on Higher Education in Dynamic Asia. June 2010.

disruptive for Indian higher education, harnessed to solve three of India's most pressing problems in higher education viz. access, equity and quality - at the same time.

ICT in Higher Education

India
Population: 1,220,800,359
Telephones [Fixed]: 31,080,000
Telephones [Cellular]: 893,862,000
% Household Computer Ownership:
Internet Hosts: 6,746,000
Internet Users: 61,338,000
Literacy rates: 62.80 [est. 2006]
Source:http://www.theodora.com/wfbcurrent/india/india_international_rankings_2014.html

ICTs in education are used extensively in India, through initiatives taken by the Central and State governments as well as through interventions by and through ICT based industries and businesses. The importance of using ICTs in education has received emphasis for well over three decades. As early as 1992 the National Policy on education has promoted the use of educational technologies in the nation's classrooms. Resulting from these early policy formulations, a number of initiatives had been launched. These include an ICT@schools scheme[11] which helped students develop ICT skills, the National Knowledge Network linking some 378 universities and about 18,000 colleges through a digital network making available bandwidth to support knowledge sharing, collaborative research and in 2008 the Ministry of Human Resources Development launched the National Mission on Education through ICTs. The main purpose of this last initiative is to make available 'high quality, personalized interactive knowledge modules over the Internet and Intranet to all learners in higher education institutions at anytime and anywhere. The 12th five year plan is expected to make provisions for a huge investment for this purpose. Besides these three major initiatives there has been any number projects advancing the use of ICTs in the education sector of the country. A few such major ones include the following:

- *ICT@Schools Scheme*:

The ICT@ Schools scheme was launched in 2004 with a view to provide opportunities to students to develop their ICT skills as well as use ICTs to aid the teaching learning process. Under this scheme, support is provided for procurement of computers, peripherals, software, connectivity, and so on. The scheme is currently being implemented in all states and union territories of India in government and government-aided secondary and higher secondary schools.

[11] Accessed on 28-08-14 from http://www.teindia.nic.in/e9tm/Files/ICT_Documents/ICTatSchoolsScheme.pdf

- *Sarva Shiksha Abhiyan:* A flagship programme of the Government of India in partnership with the state governments to support the states in creating, developing, and strengthening the formal primary and upper primary school systems.[12]
- *EDUSAT—Education Satellite:* Indian Space Research Organization (ISRO) launched EDUSAT (Education Satellite), the first Indian satellite built exclusively for serving the educational sector. It was launched primarily to serve the need for an interactive satellite to enhance the distance education system in the country. Many projects have been initiated to impart education through the satellite.[13]
- *Navodaya Vidyalaya Samiti:* is an autonomous organization under the Ministry of Human Resource Development, Department of Secondary & Higher Education Government of India. Its significance lies in providing quality education to the rural population who has been deprived of quality modern education typically available in urban areas.[14]
- *Project "Shiksha," Microsoft: Kendriya Vidyala Sangatahn [*KVS] an autonomous body of the Ministry of Human Resources Department of GOI has collaborated with Microsoft to implement Project "Shiksha" (literally meaning knowledge), which focuses on teacher training programs as well as monitoring the effectiveness of the training programs in the schools. Teacher training under Project Shiksha aims at enabling teachers to use technology in the classroom; they are trained on using visual presentation of theories and concepts in the curriculum.[15]
- *National Knowledge Network:* The National Mission on Education through ICT, launched in 2009, aims to leverage ICTs for enhancing the teaching learning experience of learners. A high-speed digital broadband network, the National Knowledge Network, is envisaged for interconnecting the country's major research and educational institutions, colleges, and universities.[16]
- *Sakshat Portal:* The Sakshat Portal launched by the MHRD in 2006 is a single window portal for all education-related needs of students, teachers, and lifelong learners. It provides a range of services from informational services like details of scholarships, tests, educational resources, as well as interactive services like a discussion forum, one-on-one sessions with teachers, career counseling, and video conferencing facility.[17]
- *National Library and Information Services Infrastructure for scholarly content(N-LIST):* The National Library and Information Services Infrastructure for scholarly content (N-LIST) is proposed to be built around electronic resources subscribed by the UGC-INFONET Digital Library Consortium for the universities and the INDEST-AICTE Consortium for technical institutions (IITs, IISc, and NITs). The project envisages providing access to electronic resources to Universities, technical Institutions & College.[18]

[12] Accessed on 28-08-14 from http://ssa.nic.in/
[13] Accessed on 28-08-14 from http://cec.nic.in/edusat/Pages/default.aspx
[14] Accessed on 28-08-14 from **nvs**ropune.gov.in/
[15] http://kvsangathan.nic.in/ProjectShiksha.aspx
[16] Accessed on 28-08-14 from www.nkn.in/
[17] Accessed on 28-08-14 from www.nkn.in
[18] Accessed on 28-08-14 from www.**nlist**.inflibnet.ac.in/

- *Information and Library Network INFLIBNET, and Developing Library Network, DELNET.* Information and Library Network and DELNET are computer communication networks for linking libraries and information centers in universities, deemed to be universities, colleges, UGC information centers, institutions of national importance, R&D institutions, etc in order to promote resource sharing among libraries in India.[19]

Uniform progress in adopting and implementing sound ICT policies, in a vast country such as India presents enormous challenges and constraints. Exacerbating the situation is the shared power arrangements between the central and state governments, which creates tension of its own kind. Some of the challenges include levels of techno-literacy amongst academic staff; the fear of technology often seen in rural and urban institutions, cost, unreliable connectivity, unavailability of uniform technical support throughout the nation, institutional fragmentation where different bodies at different levels make decision and the linguistic diversity of the nation have in one way or another impacted development. Serious efforts at harmonization and coordination, such as the proposed national ICT policy for education have to be expedited.[20]

Free and Open Source Software (FOSS) in EducationK

The Open Source community offers a database where educational institutions can tap the full potential of software available in the Open Source domain. This software which is available free of cost is developed, tested and upgraded by programmers and users on a regular basis. In April 2005, the Ministry of Communications and Information Technology, Government of India set up the National Resource Centre for Free and Open Source Software (NRCFOSS) in an effort to bridge the digital divide and strengthen the Indian software industry. NRCFOSS encompasses research and development, human resource development, networking and entrepreneurship development and it serves as a reference point for all FOSS related activities in the country. (http://nrcfoss.org.in/). In India the adoption of open source solutions is primarily under the state governments. The Government of Kerala initiated the IT@SCHOOL

[19] Accessed on 29-08-14 from www.**inflibnet**.ac.in/

[20] InfoDev and Price, Waterhouse and Coopers [2010]: Information and Communication Technology for Education in India and South Asia . [http://www.infodev.org/en/Document.828.pdf]

project in 2000 to provide ICT enabled education in the state and has achieved the status of the World's largest simultaneous deployment of FOSS based ICT education.
KSource: InfoDev and Price, Waterhouse and Coopers[2010]: Information and Communication Technology for Education in India and South Asia .

The Legal Environment for OER

India is an active proponent of the Free Open Source Software [FOSS] movement with the Ministry of Communications and Information Technology of the Government of India setting up of the National Resource Centre for Free and Open Source Software, in 2005, as a means to bridge the digital divide [see Box 1]. The application of FOSS in ICT education has been happening in the state of Kerala for well over a decade.

Despite FOSS and the provisions of 'Fair Use' in the Indian Copyright regulations there are considerable anxiety that these provisions do not empower free users to the extent that the freedoms desired by OER is being met. As India moves towards a greater knowledge based economy with a vibrant IT, Pharmaceuticals and publishing industries among others policy makers have great interest in protecting the IP rights of these industries. In 2012

India's copyright regulations were created during colonial times. These have undergone significant changes since the nation gained its independence from the United Kingdom in 1947. The Act first saw its major amendment in 1957 with a major overhaul and the last in 2012. The Copyright Amendment Act of 2012 specifically seeks to make the Indian legislation compliant with Internet treaties, WIPO Copyright Treaty [WCT] as well as the WIPO Performance and Phonograms Treaty [WPPT]. A redeeming feature of this treaty as seen by some is the section dealing with the Relinquishment of Copyright [Section 21] by authors.[21] This feature is beneficial to CC and similar licenses. The most important of this being permits to owners of copyright allowing them to relinquish, partly or wholly, their rights by way of notice to the Registrar of copyrights as well as by way of a public notice, as opposed to only the former option in a specified format as before. Declaring content in the case of learning materials under a CC license is a window for sharing educational resources in as open a manner as an owners or an author wishes to.

The Indian Chapter of Creative Commons licenses were re-launched in 2013. Its first launch was in 2007 by three organizations viz: Wikimedia India

[21] Kapur, Pranavakshar [2011] Creative Commons: Impact on Indian Copyright Law. Available at SSRN:http://ssrn.com/abstract=2047662 or http://dx.doi.org/10.2139/ssrn.2047662

[http://wiki.wikimedia.in/], Centre for Internet and Society [http://cis-india.org/] and Acharya Narendra College, Delhi [http://andcollege.du.ac.in/]. The 2013 launch, by the same trio 'is tailor-made for Indian Law i.e. the Indian Copyright Act'[22] and comprises the following options:

India	CC-BY 2.5 India	CC-BY NC-2.5 India	CC-BY NC-ND 2.5 India	CC-BY NC-SA 2.5 India	CC-ND 2.5 India	CC-SA 2.5 India

Table 3: Types of CC licenses in India

OER Activities

Aspirationally there is much hope that providing OER free of restrictions will help India in its ambitious agenda to enhance access to higher education and human developmental efforts.[23] In its report to the Government of India the National Knowledge Commission, established by the Prime Minister of the country in 2005 specifically dealt with this issue extensively and included in its recommendation that[24] the Government and the nation's institutions:

- Leverage the global open educational resource movement to take advantage of content initiatives
- Support the production of quality content by a select set of Indian institutions.
- Undertake a large scale e-Curriculum development effort directed toward adaptation and adoption support.

More specifically the Commission proposed emphasis be given to disciplines such as agriculture, teacher training, basic and applied sciences and engineering, technical education, liberal arts and social sciences, communication skills, ethics and values, public health, and high end skills including management, all of which were seen as essential to the nation's socio-economic development.

As is often the case in many lower and middle income countries, including those such as India where the talent pool available for the production of OER is considerable, the greater use of both the indigenous as well as off shore resources to follow through with the recommendation of the Knowledge Commission has been impeded for a variety of reasons including the cost of broadband connectivity, skills, a paucity of policies especially in education where both the state and central governments have supervisory role and language issues. Inspite of these impediments since the publication of the Commission's report OER related activities have been increasing especially at the national levels. This also includes the creation of

[22] Quote attributed to Mr. Lawrence Liang of *Alternate Law Forum* and accessed from http://www.medianama.com/2013/11/223-creative-commons-india/ on 23 August 2014.

[23] Kumar, M.S.V [2009]: Open Educational Resources in India's national development Open Learning: The Journal Of Open, Distance and e-Learning, 24:1, 77-84.

[24] A report of the National Knowledge Commission of India, accessed from http://knowledgecommission.gov.in/downloads/documents/wg_open_course.pdf on 20-07-14

policy instruments through the National Mission on Education through ICT [NMEICT].[25] The policy advocated is based on the following principles:

- All information products (content, software and technology) shall be treated as national resource. Unless specifically declared, all such information shall be freely accessible the general public through the Web.
- Community engagement shall be a part of all activities, and use read-write tools available on the web shall be encouraged.
- Information and knowledge resources generated shall be made available in a persistent permanent basis freely to all through the Web.
- Information creation/authoring and dissemination shall be done using commonly accepted standards in such a way so as to encourage discoverability, and capture relevant metadata to promote sharing.
- While the moral rights of the creator will remain with the original contributor, all intellectual property rights (IPR) shall be transferred to the Govt of India to enable it to be released in an appropriate open license.
- All information and knowledge resources shall be released in a suitable open license to optimise social and economic value of the investment

These principle are supported by a set of guidelines as follows:

- There shall be a single portal/gateway for all the knowledge resources developed under the NMEICT. Sakshat can be the common gateway for this purpose.
- Regardless of whether these resources may remain in distributed platforms or on a NMEICT Cloud, the Portal/Gateway will provide links, and also ensure permanent access to them.
- All educational materials shall be released under an appropriate open licensing regime, current preference being CC-BY-SA. This license will permit users to share (copy and redistribute) the material in any medium or format; and adapt (remix, transform, and build upon) the material for any purpose, even commercially. The user shall provide attribution to the original creator, and also, mandatorily, distribute any adaptation and/or enhancements under the same license.
- When the grantee/creator use other open license materials in his/her works, the license shall adhere to their specific licensing conditions, and intimate NMEICT about the same.
- All software delivered under the project, these shall be released in open source using an appropriate license and the source code shall be made available online on a permanent basis using an acceptable depository.
- The agency or institution that has developed the software shall create a community of developers to ensure long-term sustainability of the project.
- All content developed under the Mission shall use open formats for delivery of the outputs. Use of proprietary software will be strongly discourages. However, if proprietary software is used for any development work, the source file in its final version along with the relevant APIs should also be made available online to enable others to re-use the same.

[25] Accessed on 28-08-14 from http://www.sakshat.ac.in/Document/OER_Policy.pdf

The following list is illustrative of a few major efforts on OER in India:

- *NATIONAL KNOWLEDGE COMMISSION*

The National Knowledge Commission is a high-level advisory body to the Prime Minister of India, with the objective of transforming India into a knowledge society. In its endeavor to transform the knowledge landscape of the country, the National Knowledge Commission has submitted around 300 recommendations on 27 focus areas during its three and a half year term. While the term of the NKC has come to an end, the implementation of NKC's recommendations is currently underway at the Central and State levels. http://knowledgecommission.gov.in/focus/default.asp

- *A-VIEW*

A-VIEW (Amrita Virtual Interactive e-Learning World) is a multi-modal, multimedia e-learning platform that provides an immersive e-learning experience that is developed by Amrita e-Learning Research Lab. A-VIEW is part of Talk to a Teacher program coordinated by Indian Institute of Technology Bombay and funded by the Ministry of Human Resource Development (MHRD) under the Indian Government's National Mission for Education using Information and Communication Technology (NME-ICT) along with various other projects in Virtual Labs, Haptics and Natural Language Processing. A-VIEW is now deployed at several IITs, NITs and other leading educational institutions across the nation. http://aview.in/

- *EKALAVAYA*

Ekalavaya is an Open Source Educational Resources Animation Repository [OSCAR] is a project located at the Indian Institute of Technology in Bombay, India. It develops and provides web-based interactive animations for teaching various concepts and technologies. OSCAR provides a platform for mentors/professors to suggest ideas for animation and for developers/students to create content based on the suggested ideas and guidance. Funding for the Ekalavya and OSCAR project comes mainly from private industry. http://ekalavya.it.iitb.ac.in/

- *OPEN EDUCATIONAL RESOURCES for SCHOOLS [OER4S]*

A project initiated, sponsored by the Rajiv Gandhi Science and Technology Commission (RGSTC) and implemented in collaboration with Maharashtra Knowledge Corporation Limited (MKCL) and the Indian Consortium for Educational Transformation (I-CONSENT). It aims at developing and field testing electronic educational material useful for all stakeholders: parents, teachers and students within a four fold framework: information, activity, creation and interaction. The material so developed will be made available to all the stakeholders through MKCL in the distributed classrooms spread all over the stateThe material is in different formats like story, cartoon based presentation, question- answer form, skit, etc.
http://www.hbcse.tifr.res.in/research-development/projects/open-educational-resources-for-schools-oer4s

- NATIONAL PROGRAMME on TECHNOLOGY ENHANCED LEARNING [NPTEL]

The NPTEL objective is to enhance the quality of engineering education by developing curriculum-based video and web courses for the students. Faculty from these various institutions are involved in developing their classroom course material in electronic form. Currently, the program has 120 web based courses and 115 video courses in the core sciences, computer science, civil engineering, electrical engineering, electronics and material engineering. The NPTEL also provides an opportunity for teachers and students from rural areas to learn from these high quality lectures and improve the quality of teaching in these rural colleges. http://nptel.iitm.ac.in/index.php

- NATIONAL INSTITUTE OF OPEN SCHOOLING [NIOS]

Established in NIOS is providing a number of Vocational, Life Enrichment and community oriented courses besides General and Academic Courses at Secondary and Senior Secondary level. It also offers Elementary level Courses through its Open Basic Education Programmes (OBE). Government of India through a gazette notification vested NIOS with the authority to examine and certify learners registered with it up to pre degree level courses. NIOS initiated Open Educational Resources (OER) specifically for Vocational programmes to be offered at Secondary and Sr. Secondary (+2) levels, including stand alone programmes, in partnership with state level institutions and organizations. These educational resources will be accessible to millions of learners interested in development of their skills in various vocations. http://oer.nios.ac.in

- E-GRID

The E-Grid initiative at the Indian Institute of Information Technology develops and maintains pedagogically sound and refereed Educational Resources in identified subjects. Subject specific portals are developed and subject experts within the program govern these portals. The Ministry of Human Resource Development at the Indian Institute of Information Technology, State of Kerala, supports this project. Currently, this program also offers Open Educational Resources only in the sciences and engineering sciences. www.iiitmk.ac.in

- NATIONAL REPOSITORY of OPEN EDUCATIONAL RESOURCES [NROER]

The Ministry of Human Resource Development (MHRD), Government of India recently launched the National Repository of Open Educational Resources. The development of it has been a combined effort of the Department of School Education and Literacy, Ministry of Human Resource Development, Government of India, the Central Institute of Educational Technology, National Council of Educational Research and Training and Metastudio which is the platform that hosts the Repository. The Repository is based on the concept of Semantic Maps. It organizes its collections into the ever-growing semantic maps of concepts. The map itself is a learning resource for teachers, through which they can critically assess the curriculum and aids them in the construction of their own unique learning themes for their classrooms. The digital resources are all mapped to subjects, which currently are divided into 5 categories namely, Math, Science, Social Science, Languages and Art Education. Each subject has a list of concepts. This enables access to a library from where teachers can access audio, videos, learning objects, images, question banks, activities/presentations and more related to the concepts. They can also upload resources, which are subject to review by experts. In addition to this, NROER allows teachers to

download, share, and comment and rate media resources. All NROER content carries the CC BY-SA license. http://nroer.in/home/

- TESS-INDIA

TESS-INDIA is a collaborative project between the Ministries of Education of a number of Indian states and the British Open University. It receives funding from the UK Department of International Development.The TESS-India initiative seeks to significantly improve the classroom experience of millions of pupils in elementary and secondary schools across India. The seven focus states for the first phase of the project are Bihar, Orissa, Madhya Pradesh, Uttar Pradesh, Karnataka, Assam and West Bengal. TESS-India aims to use OER in training new teachers and in improving the practice of inservice teachers. http://www.tess-india.edu.in/

- SAKSHAT

The vision of SAKSHAT' is to cater to the learning needs of Indians through the 'National Mission in Education through Information and Communication Technology (ICT). The scheme is to provide connectivity to all institutions of higher learning to world of knowledge in the cyber space, to leverage the potential of ICT, in providing high quality knowledge modules with right e-contents, to address to the personalized needs of learners, in order to take care of their aspirations. These modules are to be delivered through 'SAKSHAT'. The scheme may also have a provision of certification of competencies of the human resources acquired through formal or non-formal means as also to develop and maintain the database of profile of human resources. The development of content and or selection for inclusion in this SHAKSAT portal is a collaborative effort by a number of Indian institutions including IGNOU, Delhi University, Kendriya Vidyalaya Sangthan (KVS), Navodyaya Vidyalaya Sangthan (NVS), National Institute of Open Schooling (NIOS) and National Council for Educational Research and Training (NCERT) and prominent academicians in the field. In addition, some NGOs had also provided the contents developed by them free of cost for this portal. http://www.sakshat.ac.in/

- eGYANKOSH

eGyankosh is a project of the Indira Gandhi National Open University of India [IGNOU]. It offers high-quality courses through the Open and Distance Learning (ODL) Mode. Besides that, it also provides study material by post in DVD or Books for various courses such as Doctoral Degree, Master Degree, Post Graduation Courses, Bachelor's Degree, Diploma Course, Certificate Courses, Appreciation Programmes and many more. Study materials are available in hard-copy (Books, papers, assignments, etc.) as well as in softcopy. These materials and have been digitized and made available to IGNOU students through the IGNOU web portal. Making available through the web enables students to access download their course without having to wait for the hard copy deliveries. Discussions have been going on at IGNOU to make all these materials universally as an OER through a CC license. Since the eGyanKosh site has been under repair for quite a while it is difficult to confirm if this has been done! http://www.egyankosh.ac.in/

- *NATIONAL CENTRE FOR EDUCATIONAL RESEARCH AND TEACHING [NCERT]*

National Council of Educational Research and Training (NCERT) is an organization set up by the Government of India to assist and advise the Central and State governments on academic issues related to school level education. The organization publishes in English, Hindi and Urdu. It has embarked upon a project to provide school text books freely for the students and teachers through its website. The books are based on the National Curriculum Framework 2005.
http://ncert.nic.in/textbooks/testing/Index.htm

· *CONSORTIUM FOR EDUCATIONAL COMMUNICATION (CEC)*

It is an inter-university centre on electronic media, established by University Grants Commission. The CEC in coordination with 17 Educational Multimedia Research Centres produces T.V.programmes in various subjects in English, Hindi and vernacular languages. The audiovisual programmes are based on the syllabus of schools and colleges. The programmes are broadcast on national educational television channels. These programmes are reusable. CEC has set up Learning Object Repository (LOR) and Digital Video repository) to provide worldwide access to these qualitative learning resources. http://www.cec-ugc.org/

Research and Recent Publications on OER

- Agarkar, S. C. and Deshmukh N. D. (2012). Supporting school mathematics education through open educational resources, In M. Kharatmal, A. Kanhere, K. Subramaniam (Eds.), Proceedings of the NIME National Conference on Mathematics Education, HBCSE, TIFR.
- Agarkar, S. C. and Deshmukh N. D. (2011). Developing Open Educational resources in school mathematics, In Charles A Shoniergun and Galya A Akmayva (Eds.) Proceedings of the London International Conference on Education, Infonomics Society.

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Repositories

India is an active player in the open software movement; likewise it is also active in the OA movement with well over 81 scientific journals accessible as OA. A major initiative in this is a project coordinated by the Indian Institute of Science, Bangalore along with Carnegie Mellon University in which 21 Indian Universities are participating. Collectively they have digitized more than 450.000 books of which 220,000 are web accessible.[26] Besides the major effort by the Indian Institute of Science there are many other OA repositories in the country. Chakraborty and Ghosh listed 20 of them as open resources for higher education in India.[27]

Name	Host Institution	URL	No. of Items	Types of Documents	Software Used
Librarian"s Digital Library (LDL)	Documentation Research & Training Centre (DRTC)	https://drtc.isibang.ac.in	236	Research Papers, Articles, Reports,	DSpace

[26] Kumar, M.S.V [2009]: Open Educational Resources in India's national development Open Learning: The Journal Of Open, Distance and e-Learning, 24:1, 77-84.

[27] Chakraborty, S. and S.B. Ghosh, "Open resources for higher education: the Indian scenario." Proceedings of the IATUL Conferences. Paper 32. http://docs.lib.purdue.edu/iatul/2011/papers/32

				etc	
DSpace at GBPUAT University	G.B. Pant University of Agriculture & Technology	http://202.141.116.205/dspace e/	82	Research Papers, Articles, Reports, Thesis, etc.	DSpace
IIA Repository	Indian Institute of Astrophysics	http://prints.liap.res,in/	725	Research Papers, Articles, Reports, Thesis, etc	DSpace
EPrints@IIITA	Indian Institute of Information Technology, Allahabad	http://eprints.iita.ac.in/	22	Research Papers, Articles, Reports, Thesis, etc	EPrints
DSpace@IIMK	Indian Institute of Management, Kozhikode (IIMK)	http://dspace.iimk.ac.in/	133	Research Papers, Articles, Reports, etc	DSpace
EPrints@IIMK	Indian Institute of Management, Kozhikode	http://eprints.iimk.ac.in/	**25**	Research Papers, Articles, Reports, etc	EPrints
EPrints@IISC	Indian Institute of Science (IISC),	http://eprints.iisc.ernet.in/	3645	Research Papers, Articles, Reports, etc.	EPrints
ETD@IISc,	Indian Institute of Science (IISC	http://etd.ncsi.iisc.ernet.in/	153	Theses & Dissertations	DSpace
EPrints@IITD	Indian Institute of Technology, Delhi (IITD)	http://eprint.iitd.ac.in/dspace/	1296	Research Papers, Articles, Reports, etc.,	DSpace
DSpace at INSA	Indian National Science Academy (INSA)	http://61.16.154.195/dspace/	818	Conference Papers, Articles, Reports, etc.	DSpace
ISI Library Bangalore	Indian Statistical	http://library.isibang.ac.in:8080/dspace/	10	Research Papers, Articles,	DSpace

	Institute, Bangalore			Reports, etc	
DSpace at INFLIBNET	INFLIBNET	http://dspace.inflibnet.ac.in	428	Research Papers, Articles, Reports, etc	DSpace
NAL Institutional Repository	National Aerospace Laboratories (NAL	http://nal-ir.nal.res.in/	418	Research Papers, Articles, Reports, etc	EPrints
DSpace at NCRA	National Centre for Radio Astrophysics	http://ncralib.ncra.tifr.res.in/dspace/	22	Research Papers, Articles, Reports, Thesis, etc.	DSpace
EPrints at NCL	National Chemical Laboratory (NCL)	http://dspace.ncl.res.in/	290	Theses, Research Papers, Articles, Reports, etc.	DSpace
OpenMED@NIC	National Informatics Centre (NIC)	http://openmed.nic.in/	1035	Research Papers, Articles, Reports	EPrints
Digital Repository Service of NIO	Digital Repository Service of NIO National Institute of Oceanography	http://drs.nio.org/drs/	55	Journal articles, conference proceeding articles, Technical reports, thesis, dissertations, etc	DSpace
Dspace@NITR	National Institute of Technology, Rourkela	http://dspace.nitrkl.ac.in/dspace/	223	Theses, Research Papers, Articles, Reports, etc.	DSpace
Digital Repository of RRI	Raman Research Institute	http://dspace.rri.res.in/	1064	Research Papers, Articles, Reports, Thesis, etc.	DSpace
Vidyanidhi	University of Mysore	http://www.vidyanidhi.org.in/	1835	Theses & Dissertations	DSpace

Table 3: Institutional Repositories that contain open resources for higher education in India.

None of the above listed repositories are dedicated to OER though they may contain content licensed as OA for free use. Not listed in the above are the more recently established NROER and the slightly older eGyanKosh[28] both of which are focused on OER .

[28] eGyanKosh has been under repair for quite a while and may not be accessible.