

PROJECT PROPOSAL TO ESTABLISH
AICTE-NPTEL EDUCATION GRID PORTAL

FOR DEPLOYMENT OF NPTEL CONTENT AND SUPPORT SERVICES
FOR ENHANCING QUALITY OF EDUCATION IN ENGINEERING COLLEGES

To facilitate content deployment, open supplementary content generation and capacity building of teachers and colleges for effective practice of Technology Enhanced Learning

Project to be executed by the Indian Institute of Information Technology and Management in association with NPTEL and ERNET India

Submitted to AICTE for study and approval

May 2007

1. THE OBJECTIVES

Under the MHRD's National Programme on Technology Enhanced Learning (NPTEL), over 320 faculty members in the IITs and IISc have developed content in about 230 courses in the undergraduate engineering curriculum. This content is available in the form of Recorded Video Lectures (RVL) and as supplementary for regular engineering college courses in web-accessible format. The objective of NPTEL is to enhance the quality of education in the undergraduate programs of the country's 1500+ engineering colleges. With broadband networking and EDUSAT services available, our next challenge is how to make use of this NPTEL content in ways that help enhance the quality of education offered in the Engineering Colleges.

Our immediate challenge is to establish effective and innovative TEL systems and processes in the affiliating/deemed universities and colleges so that the students and teachers are benefited by the NPTEL content. **This proposal is aimed at establishing several services using the Education Grid (www.edugrid.in) for the colleges, teachers and students to benefit from the NPTEL content.** We propose a comprehensive set of systems and services for the deployment and utilization of NPTEL content, open generation of supplementary content and sharing of best teaching-learning practices across all the 1500 + engineering colleges under the purview of AICTE. Since the vast majority of the colleges are under an affiliate university system, the proposal also brings out how we address some of the issues relating to evaluation and monitoring systems for the universities that are essential for quality education. We refer to the documents [1, 2, 3] on the kinds of and spirit behind establishing systems and processes that are needed for teachers and students centred Technology Enhanced Learning (TEL) environment in the colleges and affiliating universities.

This proposal assumes that NPTEL will focus on quality content and e-learning resources development and assist through experts faculty towards capacity building in the colleges through workshops and short courses through effective practice of TEL under various subjects. Towards this, the NPTEL portal will

have the necessary features and feedback discussion forums for the courses that help in improving the content quality and utility to users. NPTEL is already attracting global attention.

On the other hand, there is a need for course-content interactions, collaboration and supplementary content development for the colleges under the AICTE purview to facilitate its deployment and develop TEL capabilities in all the institutions concerned for improving the quality of instruction offered therein.

The value of NPTEL content to students and colleges will be much higher when its relevant components are presented with instructional and evaluation guidelines in the context of the syllabi of courses taught in the colleges. These vary from one university to another. This proposal offers to support services for 'personalising' different contents and amplify them through open supplementary content generation systems in the context of each module or topic that is taught as per the local syllabi. Such personalisation and augmentation of content will help the universities to drive their local syllabi driven education programs in their affiliated colleges. Such supplementary content will include building of FAQs, refereed wiki driven community participation in content extensions and links to openly accessed content of relevance.

This proposal also includes dynamic services to teachers and students that use NPTEL (and other open) content. A note [4] was already circulated to the Board of Studies of AICTE on the types of services and methodologies for the deployment and utilization of NPTEL content. The concept of Tutored Video Instruction was proposed to support students in colleges and in subjects that lack experienced and mature teachers. This proposal is submitted formally to commence such support through the Education Grid Portal and guiding appropriate e-learning oriented educational infrastructure in the colleges and applicable universities.

2. THE APPROACH

The long-term approach is to build and offer the relevant services through a Course Interaction Portal imbedded in the master Education Grid Portal (www.edugird.in) for each formally released NPTEL course. Each of the Course Portals will support the following features for each course.

- (i) For each released NPTEL Course with content in video and/or web format, **a master course home page** linking the primary NPTEL Course Content area and accessing several other courses related content of relevance available over the net will be deployed.
- (ii) A portal area to receive requests and **service RVL and other content distributions** in the colleges.
- (iii) An **AICTE Academic Services portal** for guidelines and query management regarding NPTEL content related deployment and TEL services.
- (iv) Each course will have **a content submission interface**. This will allow anyone with supplementary content like worked out problems, explanatory documents, illustrative video clips,

animated illustrations, case studies and such rich content uploaded in formats like multimedia, animation, rich content and advanced containers like zip folders to be uploaded openly by registered users as contributors. Anyone may register online freely for such services.

- (v) An **interaction and collaboration facility for servicing content in each NPTEL subject above by a virtual group of subject experts** will be provided. Such subject experts may be nominated by NPTEL jointly with relevant systems recommended by the AICTE Board of studies. Such a formal group will be referred to as the **Subject Experts Group (SEG)**. SEG will be a refereeing and monitoring body like an editorial board that is actively engaged to validate and moderate the content received and approve the same for posting in the open course pages as supplementary content.
- (vi) A **web-accessible online service for indexing and abstracts posting** of the topics in each learning module in each NPTEL course of lectures and web-content will be provided. This will be in conformance with state-of-the-art Open Access publishing and Digital Library practices. Such index-abstract service will be of value to affiliating universities and colleges to link NPTEL content with added localized modules for personalizing their respective courses. Such indexing will provide for aligning the content with local syllabi in the different universities.
- (vii) An **Education Grid back-office for servicing of queries and content management** by a team of professionals for smooth operation and timely response to users' needs and requests.
- (viii) An **Open Discussion Forum with FAQ facility** for inviting discussions by the open subject communities.
- (ix) Establish a **TEL Capacity Building Services (TELCS) facility** that will help establish necessary e-learning infrastructure in the user colleges and affiliating universities, facilitate establishing managed services provider located in mentoring institutions and train people therein to manage TEL systems effectively.
- (x) **Assistance to affiliating universities in ICT facilitations** to manage their academic affairs and monitoring of colleges. These will include guidance for establishing systems and processes in evaluations design and quality instruction across the systems of the university and colleges concerned. This will address the challenge of bringing greater credibility for honest assessment of the different components of evaluation like continuous evaluation, desired degree of university examination and others as relevant.
- (xi) **Promoting virtual communities of teachers in each course moderated by Course Experts** nominated by affiliating universities will be supported. Such interactions will focus on local affiliating university relevant issues and complement the nationwide SEG-driven forums. This is a group forum for affiliating universities to communicate with teachers in their respective affiliate colleges their specific guidelines on the use of NPTEL content and courses management. This

will be forward-linked to the respective affiliate university portals for detailed guidelines and instructions.

While it will take sometime for establishing and absorbing the services into the education system in all the above parameters, this Education Grid proposal is focused to take up the services stated in the next section as Phase-I of Education Grid deployment. This is to get a quick deployment of NPTEL content and commence programs in as many colleges as possible.

3. DELIVERABLES UNDER THIS AICTE-NPTEL EDUCATION GRID SERVICES

The following services and developments are committed to be launched at the earliest under this proposal.

- (i) **Physical distribution of NPTEL Video Content:** The process of compressing NPTEL Recorded Video Lectures (RVL) is on. Once compressed, IITM-K, under its Education Grid services will package ~ 40 lecture hours of each course in two or three DVDs and supply the same as per service charges fixed by NPTEL. This will service all NPTEL released RVL content.
- (ii) **Compressed RVL download service from an appropriate video streaming or file server** for individuals' use. This may be hosted in a suitable Content Delivery Server in the ERNET, or, BSNL Content Delivery Network. The RVLs posted here will be linked to the proposed course wiki accessible in the Education Grid portal. A proposal for the same will be prepared and speedily implemented following due approval process.
- (iii) **AICTE-NPTEL Interactive Academic Information Portal:** This will be a part of the Education Grid portal for providing guidelines on academic policies and assistance provided by the AICTE on using the NPTEL content. It will host a query management system to respond to diverse requests related to use of NPTEL content, TEL environment and AICTE recommendations on the same.
- (iv) **Course Wikis for each of the active released NPTEL courses:** This is critical to invite open content in each of the subjects that use NPTEL content. This will have both open Wiki editing area accessible from a browser, an **upload and mounting facility for sophisticated content like multimedia, or zip folders** that need to be mounted before linking over the Wiki. The role of the wiki and its relation to the NPTEL content in the larger gamut of Education Grid support services for AICTE is illustrated in Fig. 1 and section 3.
- (v) **Integrating ERNET and other relevant academic network services** with the AICTE-NPTEL Education Grid services. One possibility is to adapt the BSNL Content Delivery Network to host high-bandwidth streaming and file downloads content. With a suitable interoperability arrangement between ERNET, BSNL-CDN and Education Grid, the PoPs (Points of Presence) of ERNET will also be upgraded to support NPTEL content dissemination to all users – be they institutions or ind

- (vi) **TEL Capacity Building Services (TEL-CBS):** Under this, specific consulting services and training programs will be offered to affiliating universities and colleges and help them establish modern ICT infrastructure and their management for absorbing TEL as a part of the academic infrastructure. If necessary, an Open Education Grid Consortium (OEGC) that promotes a PPP model for such services will be formed.
- (vii) **Tutored Video Instruction (TVI) support in the colleges:** TVI is a powerful method of using NPTEL RVL content to improve the quality of instruction in colleges that do not have adequate number of, or, experienced teachers. It will also make effective use of AICYE-NPTEL Education Grid portal and local Learning Management Systems (LMS).
- (viii) **Host a Joint AICTE-NPTEL-Universities web-forum (JANUF)** to discuss implementation and policy issues and issue necessary recommendations and guidelines on effective alignment of university requirements, NPTEL content and Education Grid Processes.
- (ix) **Work with Industry to promote better industry-academia interactions in TEL.**

On specific goals with some milestones under this proposal is committed to the following.

- (i) All portal components related to the above services will be operational within six months of receiving the first instalment of funds.
- (ii) The necessary systems upgrade and bandwidth for the Education Grid services will be completed within six months of receiving the funds.
- (iii) We expect to launch comprehensive content dissemination and open wiki services in 10 courses within the first four months of receiving the funds.
- (iv) This scope of this proposal will include an approach paper on establishing a comprehensive Content Delivery and Distribution Network with services that support all NPTEL content. As and when this approach is approved, it will also take up the additional responsibility of its implementation.
- (v) Necessary forums and management bodies will be constituted following due discussions within six months of receiving the first instalment of funds.
- (vi) The project will include development of a 'Systems Requirement Document' as part of an extended ERNET infrastructure for an integrated e-Learning, digital library, open access publishing and ERP solutions for colleges and affiliating universities. The same will be implemented with additional funds as approved.
- (vii) The project also targets formation of an Open Education Grid Consortium (OEGC) as a PPP model through a charter that will be developed under this proposal.
- (viii) The project will be monitored live by a joint committee of AICTE-NPTEL-IIITM-K with members from relevant key stakeholders for ensuring excellence in execution.

The deliverables as stated above needs a coherent and dynamic structure for management of AICTE-NPTEL Education Grid services. These are given in Section 4 of this proposal. To support and coordinate the above services, the AICTE-NPTEL Education Grid Portal will have and provide access to different functional components as illustrated in Fig.1.

There are several ways by which the different components of the above-illustrated Education Grid services will help the TEL enhanced learning in the colleges and affiliating universities. We call them together as **Open Supported Learning (OSL)** services. The outline of these services is given in the annexure.

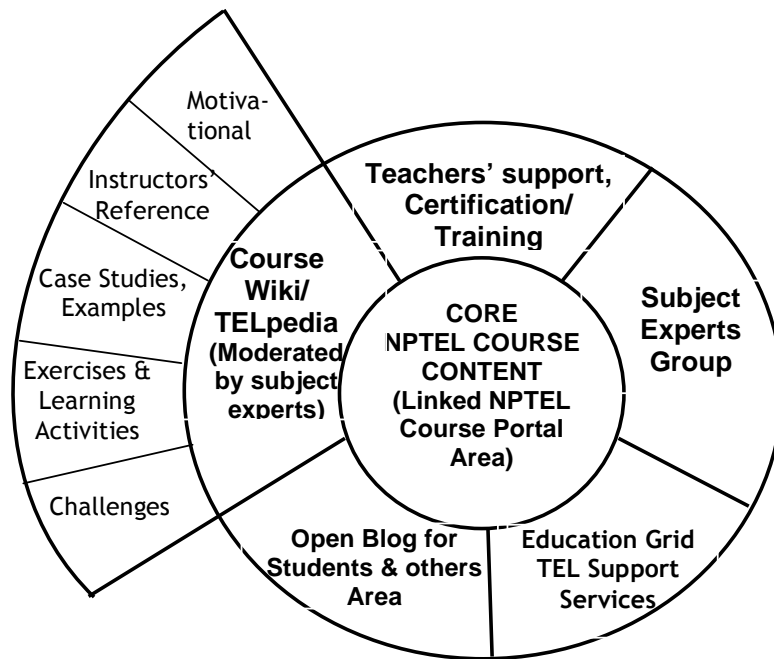


Fig. 1: AICTE-NPTEL Education Grid Courses support Services – A Functional View

4. PROPOSED PROJECT MANAGEMENT AND STEERING STRUCTURE

In view of the fairly complex mix of systems, processes and services, this project requires a **Project Execution and Monitoring Committee (PEMC)** that has representative members with mutually complementary expertise and collectively representing the different stakeholders in its wide scope. The AICTE Board of Studies may be given the additional role of Project Governance. This makes the AICTE Chairperson - as Chairperson of AICTE Board of Studies will also act as the Chairperson for the Project. We suggest the following composition of the PEMC.

- | | | |
|--|---|---------------------|
| 1. Project Director | - | Chairperson of PEMC |
| 2. Project Executive Coordinator | - | Convener |
| 3. Two nominees from AICTE Board | - | Members |
| 4. Two nominees of NPTEL PIC Chairperson | - | Members |

5. A representative from an affiliating technical university - Member
6. ERNET Executive Director or nominee - Member

The present Director of IITM-K will be the Project Director for this project period. This project will have a duration of two years. A fulltime Project Executive Coordinator will be employed by IITM-K to provide undivided attention to the successful deployment of systems and services. The above committee will provide the dynamic guidance necessary for the execution of the project. The committee will hold meetings every quarter to assess progress and evolve guidelines. There will be the following four broad areas of activities as briefly explained below.

(i) Portal related technology, networking and systems development

The activities here include: (a) Augmentation of server systems including proper Digital Assets Management needed to support the services; and (b) Development of different portal components as needed to achieve the functionalities in Fig. 1. These will be done as extensions to the already established Education Grid Portal. (c) We have to expand the access bandwidth to the portal from the present ERNET PoP link of 2 Mbps to 8 Mbps.

(ii) NPTEL Content dissemination and networking

There will be content dissemination in both hard media like the DVDs and over the Internet using Content Delivery systems like those offered by BSNL and the web-servers of NPTEL and Education Grid. We also need to link NPTEL content from leading universities and organizations with other open content. This will enrich the quality of NPTEL itself and its use in the colleges.

(iii) Course wikis and TVI related support system

A standardized template using Mediawiki (the same software as the one used for Wikipedia) will be used in the Education Grid Portal for open community participation in supplementary content development. A team of two or three nominated subject-experts will moderate the subject-wiki development. We expect these subject-wikis to evolve in the different component areas as indicated in Fig. 1. They will be of great value for teachers in colleges to share and get to know the approaches on how we teach and communicate concepts and practices.

(iv) TEL-CBS services.

Capacity Building Services for the colleges in the context of TEL capabilities and TEL systems driven processes are essential to make NPTEL a success. Effective deployment of different e-learning related systems, Internet access, making teachers proficient in TEL, the college management getting the benefits of TEL, affiliating universities innovate new e-evaluation and syllabus management systems – these will evolve as the country gains experience in using NPTEL and managing TEL processes. The Education Grid will have a TEL development and adaptation service for catering to such needs.

The timeline for the project is indicated below. The period indicated is in months from the date of release of the first instalment of funds.

i) AICTE-NPTEL Education Grid Portal home pages with interaction -	0 – 2 Months
ii) Course Wikis and query management systems development -	1 – 3
iii) AICTE Course Home Pages and Wiki services in the first 5 courses -	2 – 6
iv) DVD copying, video compression and distribution facility for RVL -	1 – 3
v) Servers augmentation and ERNET broadband connectivity -	1 – 5
vi) Open indexing and abstracts services linked to NPTEL content -	1 – 5
vii) Setting up of back-office services for query management & feedback -	2 – 6
viii) First joint workshop with affiliating and deemed universities -	3 – 6
ix) Subject-Experts driven virtual community services in 10 Courses * -	4 – 8
x) Launch of Open Teachers Training programs in the first 10 Courses -	4 – 8
xi) Establishing a Content Delivery Network with BSNL & ERNET -	6 –12
xii) Additional 50 courses with open wiki and subject experts support -	6 – 14
xiii) TEL-CBS commencement -	3 rd month
xiv) Charter development for Open Education Grid Consortium -	4 – 9
xv) Joint AICTE-NPTEL-Education Grid Workshop -	6 th month
xvi) Refinement of TEL assisted pedagogy and instruction management -	6 –18
xvii) Joint NPTEL-Affiliating Universities-Deemed Universities Workshop -	12 th month
xviii) Extending course-wiki support to all NPTEL Courses -	12 – 20
xix) Workshop on extending the project to a National Education Grid -	18 th month
xx) Project review and integration with NPTEL Phase-II -	14 –24
xxi) Discussions and launch of open certificate and degree programs -	15 th month

Remark: * Subject experts are to be appointed jointly by AICTE & NPTEL.

Based upon the broad agenda of activities, we propose a budget plan and also a possible self-financing mechanism for the long run. These are outlined in the next section. The activities are to be supported initially by relevant grant from the AICTE. The long term support and financing mechanisms for different activities will be worked out and recommended by the PEMC for study and approval by the AICTE/MHRD.

5. PROJECT CONSOLIDATION AND FUTURE DIRECTIONS

This project is possibly the first instance or roll out of a major national mission for quality education using NPTEL set over an Education Grid environment. This will continue to grow and evolve into the networked e-learning framework for all types of educational needs. Our first goal is to see that the quality of education offered in the 1500+ engineering colleges is significantly and perceptibly improved. This requires a change management strategy shared and jointly executed by the AICTE and NPTEL over the Education Grid framework. This framework needs long-term commitments from all relevant

stakeholders. We need several enabling policies and new structures bring this technology induced cultural change. This change requires massive mobilization of academicians, experts, institutions and cooperation of the present affiliate university systems and the colleges. Although the task appears to be very large, it is feasible if we have the right policies and adapt an inclusive approach to mobilize all relevant stakeholders, people and resources.

The key parameters in establishing TEL environment are the technology and processes deployment in all the relevant universities and institutions. Academic institutions in the country have been poor developers and managers of e-resources that we will need in plenty for managing TEL environments in the colleges. Hence we need a multi-tier strategy with enough room for different established and new entities to grow. So we propose that an Open Education Grid Consortium with an appropriate charter is formed to drive this Open AICTE-NPTEL Education Grid is driven jointly by the industry, academia and the government.

Finally, we need to ensure that the NPTEL – Education Grid is both self-financing and generates a momentum of its own through a much needed cultural change in the educational system and society's orientation to it. It is possible to cover the content development costs, their dissemination, and education grid supplementary services, and the additional systems and content deployment with capacity for their effective uptime and quality of services if we adopt innovative ways. For example, we may create an advance capital pool by asking the colleges to provide the equivalent of Rs. 1000 per student per year as a technology services fee for TEL and Education Grid services, e-journals and newsmagazines deployment, College Gateway systems management. We may note that with 15 Lakh students in 1500+ colleges, the deposit mobilization will be to the tune of Rs. 150 Crore. The deposit of each college will be held in an open web publicised account under an Academia-Industry-Government Open Education Grid Consortium. AICTE may help the formation of the consortium by new policies and recommendation to the colleges to treat this fee of Rs. 1000 per year per student as technology services fee. The handling of the finances may be contracted to an appropriate public sector bank. The consortium will publish consortium-negotiated rates for the many kinds of services. A part of this fee will be ploughed to financing NPTEL related activities. These services will be categorised, the services provider and their prices (as negotiated by the consortium) published dynamically in the Education Grid portal. As and when different colleges subscribe to the different services, their charges will be debited from the open web account of the deposit. These services will range from active support for NPTEL courses, INDEST or Infonet subscriptions, e-books from different vendors (like Pearson, O'reilly, etc.), systems and network maintenance contracts, teacher training programs, cost of workshops to promote NPTEL and e-learning usage, etc. This proposal aims to arrive at the modalities and launch of TEL Consortium services after due deliberations to arrive at a national consensus at the earliest.

6. REFERENCES

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ANNEXURE

DEPLOYMENT OF NPTEL CONTENT AND MANAGEMENT OF TECHNOLOGY ASSISTED INSTRUCTIONAL DELIVERY AND EVALUATION PROCESSES OVER AN AICTE-NPTEL EDUCATION GRID

Indian of Information Technology and Management – Kerala

April 2007

1. THE NPTEL OPPORTUNITY

Under the MHRD's National Programme on Technology Enhanced Learning (NPTEL: visit: <http://npTEL.iitm.ac.in/>), the IITs and IISc have generated content in over 230 courses of relevance for improving the standards and quality of education in the engineering colleges. These contents are in the form of recorded video lectures and web-accessible supplementary material for the courses. NPTEL is also planning Phase-II to continue such developments in more courses. Our immediate need is to come up with methods of deploying the content and augmenting the teaching – learning methods in the AICTE accredited colleges so that they will overcome the several deficiencies in the present system and support quality education to their students.

In parallel to NPTEL, IITM-K had been developing the Education Grid (www.edugrid.in) as a reference and collaborative portal for the colleges, teachers and students in the colleges. Combining both, we had earlier suggested in [1] the launching of 'Concurrent Instructional Services (CIS) over NPTEL Content' as process to enhance the quality of instruction in the colleges. This paper may be downloaded from the following link.

<http://www.edugrid.ac.in/webfolder/download/cis-nptel-92k5.pdf>

The same is appended with this proposal. In this paper we state specific approaches that AICTE may launch for reaching the benefits of NPTEL to all the colleges. In the next section we state the systems and process requirements for effective use of NPTEL content in the colleges.

2. INFRASTRUCTURE AND LOGISTICS REQUIREMENTS FOR TELT AND OSL

Our goal is to improve the quality of instruction very substantially through Technology Enhanced Learning and Teaching (Telt) in the colleges that is serviced by the NPTEL Portal and Education Grid for Open Supported Learning (OSL). We call this as OSL because it supports the more conventional classroom teaching and education by Telt driven open support processes. The resulting consequences in terms of quality of education offered in all the colleges will be far reaching.

The first requirement is that the NPTEL institutions of IITs and IISc have to set up effective open courseware repositories of the content generated (and new content being added) in the NPTEL web sites. The work towards this has already commenced. The web-content is being made available. The video

content is being suitably edited and compressed for distribution to the colleges. A broad agreement has been arrived at that the video lectures will be made available in compressed H.264/MPEG-4 format at 512 Kbps. this may be played using the free Quicktime player.

The second requirement is that we need a master National Technical Education Grid Portal as a web-accessed collaborative and coordination forum. The role of this portal is to service the query management, subject or course specific collaboration moderated by experts, add contextually linked content in each course, and invite the teachers, students and the subject community at large to participate in discussions and blogs. The portal will also have a reference template on how each module may be taught with associated instructional delivery considerations with associated feedback, learning activities and recommended evaluation processes.

The third requirement is that each college has a minimal Technology Enhanced Learning and Teaching Infrastructure for effective practice of NPTEL content facilitated OSL over the Education Grid framework. A note on the second and third requirements [2] has already been sent to the AICTE and some members of its Board of Studies. The same document is also appended with this paper.

The fourth requirement is that AICTE has to nominate about three subject experts to steer and moderate the OSL in each course. They, as subject experts will ensure that the queries and requirements of of teachers are responded promptly. They will also help conduct appropriate teachers orientation and training programs in the colleges. The experts will be backed by the Education Grid Portal and serviced by professionals deployed under the TELT services of Education Grid.

There are reasons for separating the content and learning resources development under the NPTEL and the servicing of content, its deployment and utilization in the colleges. The first part is best served by highly qualified academicians in premier institutions. The TELT driven OSL part is a major virtual institution itself. An independent National Technical Education Grid best serves this role. The second one will provide the necessary feedback as relevant for content upgrade and learning resources development. The total system of a national TELT driven OSL framework appears as illustrated in Fig. 1 below.

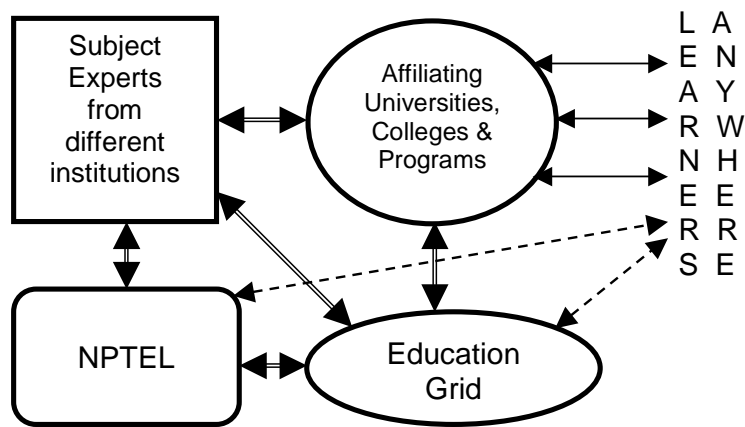


Fig. 1: Proposed National Open Supported Learning System for Technical Education

The figure illustrates the different systems that have to be in place to drive the OSL in the colleges. The dotted lines are used to show that the concerned portals are openly available to the concerned learners.

3. LAUNCHING OF OSL SERVICES – IMMEDIATE TASKS

AICTE can benefit immediately from three programs that can be launched by the collaborative systems as outlined in Fig. 1. These are summarized below.

(i) Deployment of Basic Systems in the colleges

The concerned minimal systems were outlined in an earlier document and the same is appended to this proposal. The systems conform to the recommendations of the AICTE-Industry Conclave held at Infosys Bangalore and given by the IT Infrastructure Group. IITM-K in collaboration with ERNET India is ready to provide the base configuration systems for the colleges. AICTE should provide a directive to the colleges to establish the recommended configuration. The basic systems will provide the following facilities: Video on demand streaming server, Learning Management System, Internet Gateway and Mail Server Systems and associated discussion forums. We may also add any INDEST or INFLIBNET consortium recommended e-library facilities.

(ii) Teachers Orientation and Proficiency Certification Programs on TELT

In association with IGNOU and using its Satellite Interactive terminal (SIT) IT classroom facilities, IITM-K and NPTEL are in a position to conduct a series of teachers' orientation programs across the country. The large IGNOU infrastructure and s IGNOU's experience in managing SIT driven classrooms are an asset and better suited than the current EDUSAT support. The programs over this network will orient and train the teachers on effective use of and practice of OSL. IGNOU is also coordinating the massive Open Distance Learning programs under the 11th Plan. Further, we are in a position to design and conduct effective proficiency certification program for teachers in the different subjects using the NPTEL content as guided self-learning course with term papers and presentation work. A large national exercise in this is called for to bridge the gap in the availability of experienced teachers. We may create an autonomous entity under the Distance Education Council for certification and degrees under these programs.

(iii) Launching Tutored Video Instruction (TVI) in the colleges

TVI is a well established and proven methodology that uses the recorded video lectures for effective instruction in the colleges even in situations where the teacher is not that well experienced. Prof. James Gibbons of Stanford University developed the system for delivering courses to working professionals in the industry. The method involves groups of 4 to 6 students listening to a video recorded lecture with provision for pausing and discussions. A local tutor helps steer the discussions in the different groups. We

may post the group's discussions and doubts in a course discussion forum. Today, using SIT facilities experienced teachers may conduct tutorial sessions answering posted doubts and responding to comments once every week. Prof. A.K. Ray and his team practiced such method with great effect under the EInet-3L program of IIT Kharagpur. The local teacher acts as the tutor to respond to student's queries. Bundled with teachers' proficiency certification and TVI, over a few years we will be in good position to make good the shortfall in the number of reasonably competent teachers.

(iv) Curricula Integration and OSL in the Affiliating and Technical Universities

Ultimately, the evaluation processes are conducted by the affiliating and technical universities. Hence, we suggest that each affiliating university or autonomous college to have its own courses portal hosting relevant content taken from the NPTEL and Education Grid Portal posted in its own server and LMS systems. Each of them may practice their own version of the 'Concurrent Instructional Services' driven TELT methods. The affiliating and technical universities in turn need to understand and practice the OSL methodologies for enhancing the quality education in their colleges. These OSL methods support both the teachers and students in several ways as given below.

- Video streaming in the colleges provide recorded lectures-on-demand for use in TVI system of teaching and for students or teachers to review lectures as and when necessary.
- The master Education Grid Portal and wherever possible local affiliate university Education Grid portal provides the detailed course content that provides NPTEL content, course wiki with links to relevant e-content anywhere and students blogs for collaboration.
- Course wikis to have pedagogically structured framework of course related instructional delivery, feedback driven interaction facilities, learning activities and evaluation processes.
- Ready availability of subject experts for teachers to interact with.

Proficiency certification and postgraduate educational opportunities for teachers through OSL. The services associated with all the above needs a nationally coordinated education grid as support for NPTEL content deployment and their use in the colleges for learning and teaching.

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