

A Consortium Approach to Establish

**CONCURRENT INSTRUCTIONAL SERVICES
WITH NPTEL CONTENT OVER EDUCATION
GRID FOR QUALITY EDUCATION IN THE
ENGINEERING COLLEGES**

**A proposal under the
Kerala Education Grid**

**submitted to the
Department of Higher Education
Govt. of Kerala**

By

**INDIAN INSTITUTE OF INFORMATION TECHNOLOGY
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CONCURRENT INSTRUCTIONAL SERVICES WITH NPTEL CONTENT OVER EDUCATION GRID FOR QUALITY EDUCATION IN THE COLLEGES

1. BACKGROUND TO THE PROPOSAL

The Government of Kerala funded the Kerala Education Grid project project in 2003. Since then the project has achieved several milestones. The most significant of these are listed below.

- (i) Designing and deploying effective e-learning methodologies and content development that address quality of instruction directly;
- (ii) Establishing the Kerala Education Grid Portal www.edugrid.ac.in that (for almost two years [2]) gets no. 1 ranking under the Google search engine among the hundreds of such initiatives in many countries across the world;
- (iii) Establishing Education Grid Resource Centers at the College of Engineering Trivandrum, Cochin University of Science and Technology and National Institute of technology – Calicut that has helped these institutions commencing e-learning initiatives.
- (iv) Conducting a series of awareness and in-depth short courses and workshops related to e-learning and in key subjects of IT and other areas.
- (v) Working closely with the **National Programme on Technology Enhanced Learning** (NPTEL, see <http://nptel.iitm.ac.in/>) that is funded by the MHRD and executed jointly by the IITs and IISc to benefit from their development of content in a larger number of courses for the Engineering Colleges in the country.
- (vi) Mentoring and commissioning developments related to e-learning technologies, technology enhanced instructional processes and networking of academic institutions in the state.

In parallel, the NPTEL is getting ready to release authentic lecture-wise video recorded content in about 114 courses for the Engineering Colleges. The NPTEL institutions are also producing web-based content in about 124 courses. It is perhaps for the first time anywhere such systematically organized and presented authentic content for educational purposes has been produced. Now we have several opportunities to deploy and benefit from this content in the colleges for instructional purposes. Experience shows that distributing such content in the colleges will at best add to the collections in the

Digital Library and will not result in their effective usage, nor significantly add to the quality of instruction in the colleges.

We have earlier given a detailed outline ([1] enclosed as appendix to this proposal) of the principles and processes involved in quality educational delivery on how such content is profitably made part of the instructional purposes for ensuring high quality of education in the colleges. **The challenge addressed in this proposal is to design a system that is acceptable to the universities and colleges whereby such authentic and quality content as produced under NPTEL is effectively used as part of a formal system that addresses the urgent need of imparting quality instruction in the colleges.** It has to be a methodology that is acceptable to the formal university system and one that promotes the large number of young and inexperienced teachers in the colleges enhance their competency and capacity to become effective teachers and researchers in the future. Over a few years, the proposed system will also train novice teachers to become effective in imparting quality learning to the vast number of students.

This proposal presents a public-private partnership to deploy Education Grid services for supporting what we call as *Concurrent Instructional Services (CIS)* using NPTEL content for providing high quality of instruction in the different courses that are offered in the Engineering Colleges. There is a tremendous opportunity to provide quality education in the Engineering Colleges provided we implement and manage the technology assisted learning services as outlined in this CIS proposal. This needs some straightforward Government policy initiatives to finance and facilitate the CIS. We provide in the next section the different components and processes that have to go in establishing the CIS.

2. PROPOSED SYSTEM FOR CONCURRENT INSTRUCTIONAL SERVICES IN ENGINEERING COLLEGES

The deployment of Technology Enhanced Learning to enhance quality of education in the colleges has to take in to account the effective management of the following areas of systems and processes in the spirit of the '**Innovations Driven Learning Environment**', or, IDLE as outlined in [1]. Establishing IDLE requires developing and deploying a number of sophisticated systems and processes. We propose the following approach to address this complex issue.

- i) **The generation, maintenance and modernization of content for teaching purposes is best done by programs like the NPTEL ably supported by premier institutions** and experts in the field. The IITs/IISC have provided a head start in the engineering and associated sciences subjects with funding by the MHRD. Similar initiatives have to be launched in other subject areas.
- ii) **The development and management of courses-specific portals, associated discussion boards, linked digital libraries, online services linking course experts, teachers in the subject and students, necessary course management and academic administration systems and web-accessed resources like computational, streaming and e-publications management are best delivered through the Education Grid and ERNET.** Over time, shared Data Centers may be established through public-private partnership to take care of the underneath hardware, networks, systems and data centers. In other words, we need to outsource the technology related information and interaction services to systems and enterprises facilitated through the Education Grid. This removes the difficulty of establishing and maintaining sophisticated systems and technology driven processes from the colleges and universities who do not have the capacity to run such sophisticated services.
- iii) The process of technology enhanced learning as part of formal courses management needs acceptance in the university system under whose authority the affiliate college conducts the courses for students. We suggest the formation of an academic body called the **University VISTA Academic Council**, or, UVAC as given in Section 5 later to play this role.

The role of the three bodies are illustrated in Fig. 1. **We refer to the combined instructional management and delivery mechanism by the three bodies, i.e., (i) NPTEL and experts from premier institutions, (ii) Education Grid/IIITM-K and (iii) UVAC of the concerned university, as part of the overall concept of the 'Virtual Institute of Science, Technology and Arts', or, VISTA.** VISTA, as a collaborative institution was delineated in an earlier Kerala Virtual University Project Report [4]. In the framework of Fig. 1 given here, any university, autonomous college, or, a deemed university may run its own VISTA programs. We may say that VISTA is the formal inter-institutional way of supporting courses through Technology Enhanced Learning Processes that may be run by any collaborative group of institutions and universities as per Fig.1 management and delivery model. Here below we outline how we constitute such a VISTA body to run and

manage the CIS for the participating Engineering Colleges in Kerala

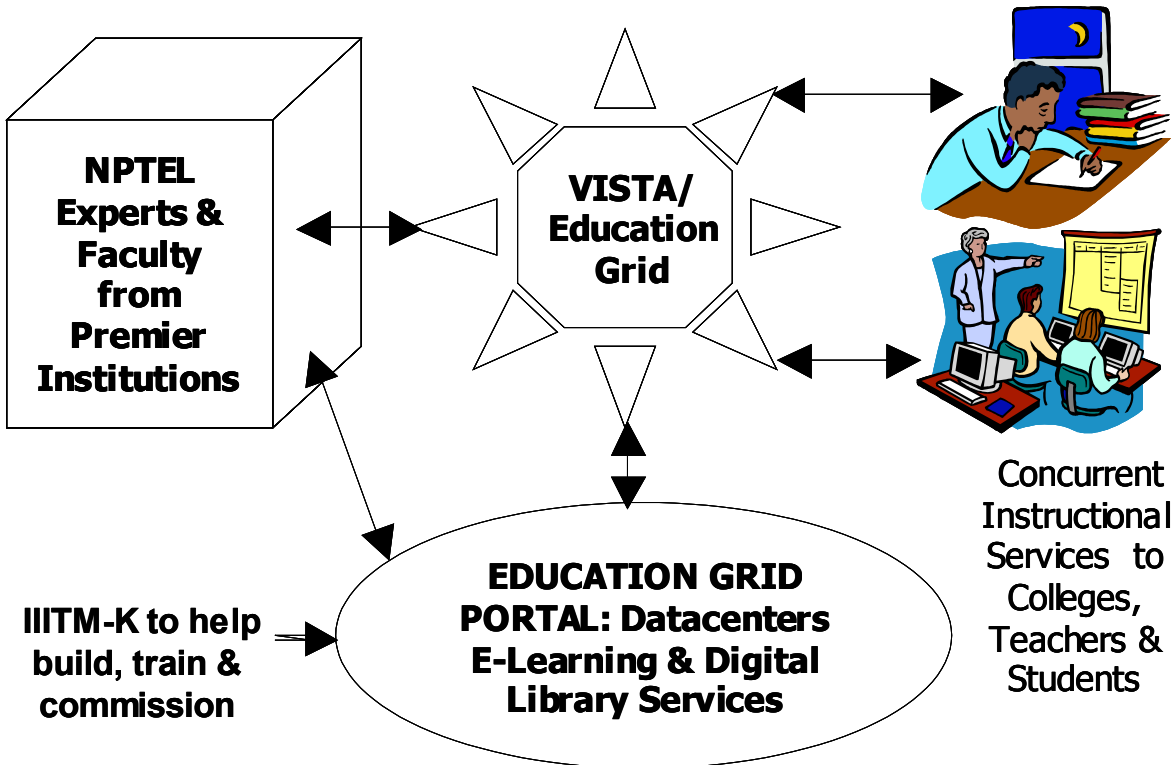


Fig. 1: Organization for Concurrent Instructional Services to Colleges

As shown in Fig. 1, there are three major interconnected parties in establishing and running the CIS. They are (i) the Education Grid and associated technology facilitated services that are needed to establish and manage the information infrastructure for the colleges; (ii) the UVAC (stated as VISTA/Education Grid in Fig. 1.), the academic programs related management and governance body; and (iii) the network of colleges and NPTEL experts that actually run the regular concurrent instructional services for supporting the courses in the colleges using the services of the Education Grid. The roles of the three bodies may be broadly categorized and grouped respectively as (i) Technology and Services coordination; (ii) Academic programs governance and coordination, and (iii) the concurrent instructional services and mentoring support for the academic programs respectively.

3. EDUCATION GRID SERVICES FOR CIS

The coordinating body for all the services relate issues needed to establish and manage CIS will be the Education Grid. At the national level, Education Grid model may

be adopted as the programs and services wing of the ERNET following suitable consultations across diverse stakeholders. That is for the Government of India to decide. In Kerala, we already have the Education Grid up and running. A fresh Government Order under the Higher Education Department is the one needed to empower the Education Grid to formally interact with the universities and colleges of the state and service the CIS for the Engineering Colleges as follows.

- i) The Education Grid project will coordinate the technology and CIS related services through its portal www.edugrid.ac.in, service web-accessed resources for the courses, support the course-specific discussion boards and ensure that all technology and network related services are in good healthy condition.
- ii) It will standardize the content distribution, interaction and collaboration methodologies taking into account instructional effectiveness, help the colleges establish their networking with ERNET and SWAN (State Wide Area Network) assistance, manage the Infonet/Inflibnet e-journals access, digital library services and provide consortia coordination for collective subscription of commercial e-publications, databases and e-journals.
- iii) It will create necessary systems for effective management of CIS and deploy them using existing or new IT industry as needed so that the universities and colleges are freed to concentrate on teaching, learning and imparting quality education.
- iv) It will facilitate establishing the advanced IT industry that is necessary for servicing the technology enhanced learning environment across the colleges through well managed datacenters, computational and information portals.
- v) It will conduct training programs, workshops and short courses for the teachers and others in the different organizations. It will also facilitate such programs organized by other institutions.

Education Grid has already much of the basic systems in place at the pilot level to commence the CIS. The NPTEL content is also to be released soon by the MHRD for us in the colleges.

4. NPTEL RELATED CONTENT MANAGEMENT AND EXPERTS SERVICES

The second major component of support required will have to come from the experts and experienced teachers available from the IITs, IISc, NITs and other well established

institutions. Retired eminent faculty, emeritus professors and experts from industry will also be of great value in this. On the part of the IITs and IISc – the executing institutions of the NPTEL, the commitment to continue supporting and modernizing the released content is necessary. This is best done by each NPTEL center in the IITs/IISc to establish content management and maintenance facilities to support CIS. This will require them to mobilize their faculty services as needed to respond to services requests for interactions over Education Grid, or, NPTEL portal based services in the different subjects and development of supplementary content as needed to sustain syllabus modernization. Typically their role will be as follows.

- i) Establish suitable video and content archive with advanced indexing and search facilities, registration and user tracking facilities needed for content distribution, e-publishing and training programs management.
- ii) Association of experienced faculty from the IITs/IISc and other institutions across India for supporting the CIS. The role of expert faculty associated with a given course is spelt out later.
- iii) EDUSAT supported training programs, seminars and workshops, teacher-development programs and such schemes that will enrich the learning ambiance, build competency and capacity for college teachers and researchers.
- iv) Managing the NPTEL portal that will publish the list of released courses with detailed list of lecture-wise topics, learning modules, interactions and e-publishing facility to keep posted with ongoing developments.

The NPTEL institutions may also use the infrastructure to conduct larger national open degree, research and continuing education programs for their own interests.

5. UNIVERSITY VISTA ACADEMIC COUNCIL FOR CIS COURSES

As stated in Section 2 earlier, VISTA stands for the 'Virtual Institute of Science, Technology and Arts'. VISTA is a formal collaboration of universities, colleges, and NPTEL institutions to deliver CIS support to identified courses and other open learning or degree programs. **Every university or deemed university with or without affiliate colleges may set up a University VISTA Academic Council (UVAC) to benefit from CIS.** At its core, the technology assisted learning services of VISTA are supported by the Education Grid/IIITM-K. As of today, the Kerala Education Grid has been the first to develop and experiment with

concepts and processes associated with VISTA. The role of UVAC is to ensure that the CIS supported courses are given the recognition due by the affiliating university. We propose the following procedures in constituting the VISTA Academic Council.

5.1. The opting university or deemed university or institute first signs a Memorandum of Agreement with IIITM-K under its Education Grid project with the intent to use the CIS. A draft MoU will be submitted for approval once the proposed CIS is approved for funding under the Education Grid.

5.2. UVAC is constituted by the Vice Chancellor of the University (or the Head of the Institution of a Deemed University) as per following guidelines. It will have (i) UVAC Chairperson nominated by the Vice Chancellor in consultation with the Director of Technical Education (DTE); (ii) One University Academic Council member from each of the major disciplines that desire to have the CIS (for example, one in Computer Science, one in IT, one from Electrical Engineering, one from Mechanical Engineering and such others); (iii) Director of Technical Education or his nominee; (iv) two representatives at the level of principal or director from the affiliate colleges – typically one each from a Government college and one from the self-financing college; and (v) One Technical Representative from the Education Grid/IIITM-K. The Vice Chancellor of the university may consult the DTE and IIITM-K Director in the choice of the members. The goal is to have a balanced team to ensure the smooth coordination between the three major systems of the VISTA model of Fig. 1. The role of the UVAC is as follows.

(i) To receive the list of courses from the Education Grid made available from the approved NPTEL list of released courses with detailed lecture-wise syllabi in the different courses. We expect the NPTEL Portal will have the ready index of such courses published for the purpose.

(ii) It will forward the list of courses as requested by the affiliate colleges for CIS.

(iii) Recommend the appropriate subset of NPTEL video lectures in the requested courses that will be used in the course delivery.

(iv) It will ensure that the examinations and evaluation are compliant with the university approved system.

In short, the UVAC takes care of all the formal procedures required to make the CIS supported courses have the approval of the university system. The proposed approach allows for each university with affiliate colleges to have its own independent UVAC. UVAC

derives its authority by reporting the University's Academic Council and Board of Studies and getting their approval for its recommendations. This system allows for each university to have its own approved Academic Council.

The Education Grid is a common services provider for all the universities and the engineering colleges and one that liaises with the NPTEL group of institutions and associated experts. It also works with ERNET and industry (like the publishing industry) as needed to ensure the resources are accessible and in working condition.

6. THE MANAGEMENT OF TECHNOLOGY ENHANCED LEARNING ENVIRONMENT

There are four parties who have to cooperate in a mutually complementary manner to make successful implementation of the CIS. They are respectively, (i) The University System; (ii) The Education Grid; (iii) the NPTEL group of IITs and IISc and subject experts available from different places and (iv) the colleges. Besides, the facilitation of CIS will need some enabling policy and initial financial support from the Department of Higher Education and the Directorate of Technical Education. Here below we outline the roles and responsibilities of the key players in establishing the CIS.

6.1. Roles and Responsibilities of NPTEL

The roles of NPTEL are (i) to mobilize expert faculty to develop structured and modular content in video and web based forms; (ii) to maintain and upgrade the content as deemed fit to modernize the syllabus in the different subjects; (iii) to maintain an NPTEL Portal that provides the catalog and index of courses and subjects with detailed list with attributes of modules for which the content is available. News about ongoing content development activities and discussion boards in different subject areas and institutions, programs on modernization of curricula and such others will be of great help.

The second major role of NPTEL shall be to identify and build a panel of course experts in different subject areas from different institutions who will be able serve to serve as mentors for the live courses being conducted in the colleges using NPTEL content. The third role will be to support the Concurrent Teacher Development Program. Here we shall provide opportunities to the teachers involved in the subjects to be supported to learn the subjects they teach in real world context and be assessed for their proficiency by a peer body of experts in the field. On passing such a test, the teachers may take on the role of teaching such courses independently. This process is explained in Section 6.X.

6.2. Role of Universities in CIS supported courses

The primary objectives for proposing CIS are twofold. Firstly, it is intended to overcome the acute shortage of quality teachers in the colleges affiliated to the universities. This is to be done with minimal adaptations of the existing university system in the light of technology enhanced learning support for quality education to students in the colleges. The second is that the Higher Education System as a whole, including those under the universities assimilate and master technology enhanced learning methods. This will also modernize the university system. In achieving these objectives, the universities have the primary role to set in place suitable processes and monitoring bodies to benefit from the CIS methodology proposed here. We suggest that each university sets up a University VISTA Academic Council (UVAC) that functions under the overall purview of their existing Academic Councils. The UVAC is designed to provide the formal authority and monitoring powers to ensure the acceptance of CIS in the formal university scheduling and evaluation system.

6.3. The Role of Education Grid

The Education Grid and its associated VISTA were founded with the vision, **“Enable, Educate and Empower Every Citizen and Community Through Knowledge”**. In the same spirit, the Education Grid provides the anchor and the pivot around which all the activities related to CIS are done. The important difference is that its roles are restricted to enabling and empowerment and not the controlling role exercised by the universities in syllabus, exams, evaluation and degree granting. The roles and responsibilities of Education Grid are as follows.

- i) Coordinate the three way communications between the NPTEL, Education Grid and the University – Colleges system.
- ii) Establish subject specific CMS and open course interaction and information pages for the students in the Education Grid portal.
- iii) Provide the necessary back office portal support for the teachers, course experts and open interactions management for students.
- iv) Build and service the associated Digital Library and e-publications management for the colleges.
- v) Promote Education and Research related technology and business incubation that helps build an Educational Technology Services industry that is capable of running future Data Centers, Data Grids, Computational Portal and such others associated with establishing

the future virtual learning campuses as outlined in [5].

vi) Promote and service NPTEL type activities in subject areas other than Engineering subjects, like Arts and Science, Commerce, Health, Agriculture, Management, Governance and Administration.

In other words, the very considerable technology and services development, and systems that are needed for the future technology enhanced learning and R&D environments with the immediate focus on establishing the CIS for engineering subjects will be the primary work of Education Grid. Education Grid fulfills a major vacuum in the present higher education system. As presented in [1] and [4], the universities and colleges have to learn to use modern computational and information systems in a very big way if at all they have to produce technology and knowledge savvy scholars and teachers in the coming years. Presently almost all universities in our country have been technology poor and we can not afford to remain so. This vacuum is ably filled by deploying Education Grid services in the colleges and universities in a big way. We may also notice that the proposed approach is also economically the most efficient way of deploying hi-tech resources and profiting by the synergies of mutual collaboration. Launching the Education Grid and CIS with NPTEL support will make Kerala the leader in the applications of IT for the social and science and technology sectors.

6.5. The Roles and Responsibilities of the Colleges

The whole CIS approach is ultimately targeted at enhancing the quality and depth of education offered in the large number of engineering colleges that suffer from acute shortage of quality teachers. **The aim is to provide a wholesome learning environment and ambiance to all our students in the colleges and open their eyes to the real world related knowledge.** Hence much of the work has to be done in the colleges and across them with active services support from the Education Grid. The two together should sincerely attempt at establishing the '**Innovations Driven Learning Environment**' as we described in [1]. For effective participation by the colleges, they have to be adequately equipped. This includes reasonable Internet connectivity, LAN and access systems or PCs in adequate numbers for the teachers and the students. Secondly, they should have classrooms with LCD projection facility for the recorded lectures playback. Practically all engineering colleges appear to have these basic systems in place, though not in the best functional sense. In addition, the Education Grid will equip them with video-on-demand streaming servers with relevant NPTEL content placed in the college LAN. The college

management should ensure that the teachers are suitably equipped to access the Education Grid portal and Internet. Colleges should also subscribe to e-journals and promote the use of digital library by the students.

6.5. Concurrent Capacity Building in Teaching and Postgraduate Education

The CIS methodology proposed here is also best integrated with capacity building to generate quality teachers. It provides for web-based apprenticeship for inexperienced teachers under experts from premier institutions as mentors for them. Every inexperienced teacher is first inducted into teaching by making him/her a Demonstrator, or, a facilitator for the course he/she is assigned for the duration of the course in a given semester.

In every class of recorded lecture playback conducted as per course time table, the teacher takes attendance and collates the doubts and questions posed by the students of the class. These are posted by him/her in the Course Discussion Board internal to the Education Grid portal. This area is accessible to all such teachers from different colleges, but not open to the students. Students will be given a free open discussion board where they may discuss with fellow students from the different colleges. **After every three recorded lectures playback in a typical week, the teacher has to take one problem solving class for the students.** Before this problem solving class, the teacher prepares with assistance from the Course Expert(s) over the web. This helps clear doubts and making the teacher learn from the weekly postings in the course discussion board that is accessible over the web. The Education Grid will also build the course specific linked digital library content that provides the teachers with rich material for the class. Such weekly classes will also help in aligning the educational process with the more rigid university examination system.

In addition to the above, the CIS under the Education Grid will include one or two teachers orientations workshops on the teaching and learning aspects of the subject under the supervision of the Course Experts. Interested teachers may register under the NPTEL group of institutions to be examined for their effective knowledge communication skills and obtaining a teaching proficiency certificates. This may be given part credit and later lead to a postgraduate degree under one of the premier institutions. Thus, over a few years, many of the colleges will have increasing number of good teaching faculty. A small percentage will also mature into doing Ph.D. And enhance the research base in the institutions at the graduate and post doctoral levels. Thus, CIS provides a working framework for the rejuvenation of the entire higher education system in alignment with the emerging knowledge era.

7. EXAMPLE SCENARIO OF CIS SUPPORTED COURSE MANAGEMENT

In reading the above details, we are likely to miss the real impact the proposed CIS method of supporting courses in the colleges will have. Its impact is likely to be far reaching in totally modernizing and offering quality education even in colleges that are starved of both physical resources and quality teachers. The important aspects of managing quality learning environment and how it is supported by technology assistance based upon NPTEL content was brought out in an earlier document [1]. Here we bring out by example of how a typical course will be managed and make it learner centric is brought out.

7.1 Example of Conducting a Course in Electromagnetics with CIS

Let us assume that an Engineering College does not have experienced teacher (in some subjects, some colleges do not have teachers) in Electromagnetics. The following sequence typifies how we set up and manage the CIS.

- i) The College applies for CIS support to the affiliating university's UVAC with copy to DTE and the Education Grid through the Director, IIITM-K.
- ii) NPTEL provides the list of video recorded lectures and syllabus in the relevant subjects to the University and the Education Grid.
- iii) UVAC studies the detailed syllabus of lectures delivered by expert faculty in the area that are available in video recorded form under the NPTEL. The modified syllabus and schedule of lectures are communicated to the University Academic Council and the Colleges. Education Grid prepares the approved set of recorded lectures (with some supplementary topics to fulfill the university syllabus) in the course conforming to the university requirements. This is communicated to the Education Grid. This is to be done at least 6 weeks in advance from the start of the course.
- iv) Education Grid receives similar requests from a number of colleges – say ten of them and they may be under different universities.
- v) Education Grid provides for the following.
 - (a) It opens an Electromagnetics Course Portal with rich web-references, open course discussion board for the students undertaking the courses and creates a Group Collaboration Forum (GCF) of teachers in the desiring colleges and experts to moderate and service the forum for assisting the teachers who manage the course in the colleges. We call this as the Course GCF, or, CGCF for short. CGCF is accessible to the group of teachers across the colleges teaching the course and the Course Experts from premier

institutions servicing the course.

(b) Under an agreement with NPTEL, or, a member institute of NPTEL like IIT Madras, we identify two experts in the subject as Course Experts, or, CE. This is taken from the NPTEL approved panel of subject experts who may or may not be a faculty of the IIT.

(c) Education Grid packages the set of video lectures in a streaming server that will be placed in the colleges over its LAN. This allows for both teachers to have video lectures on demand and also for different time tables in the different colleges as suited best for them.

(d) Education Grid registers the concerned college teacher as member of the Course Management System (CMS) in its portal. Here the teacher may interact freely with teachers in different colleges who are members of the CMS in the subject. The Course Expert(s) become the moderator for the group in their discussions.

vi) The concerned college uses the recorded lectures as per its schedule every week – say three lectures per week in a given course. The attendance of students in these classes is mandatory. Teacher must collate the doubts and comments expressed by the students and post them after every lecture (together with any answer they may have given) in the CMS of the Education Grid.

vii) Designated Course Expert provides comments on the doubts, uploads worked out problems of relevance for the week's classes.

viii) The college teacher with the web supported assistance of the Course Expert takes every week a problem solving/case studies/doubts clearing class for the students in the college. He may post the same in the CMS for the benefit of other colleges.

ix) The teacher may register as a scholar under the Concurrent Teacher Development Program in the subject and later subjects himself/herself to be examined by a peer group under NPTEL for teaching proficiency certificate in the subject.

x) Such teachers in turn will help mentor other teachers over time. The CMS in the Education Grid Portal builds up as the reference course portal for all colleges and universities over time.

The proposed method is in many ways superior to that of centralized EDUSAT type lecture broadcasting. This approach decouples course scheduling and management issues from the logistics of finding proper teachers to teach and the heavy administrative burden of managing the course across multiple college under different universities (or under a

centralized Technical University). Further it emphasizes activities related to capacity building in the institutions.

8. FINANCING STRATEGIES FOR CONCURRENT INSTRUCTIONAL SERVICES

Here we propose a consortium approach for financing the CIS and a monitoring strategy that will help the healthy growth of CIS and associated educational technology services. We should recognize that the kind of ICT infrastructure needed for education in the coming years is much more than Internet connections and email. It is going to be Grid based – Data Grid, Information Grid, Computational Grid and such others. All such technology will have a federated architecture with users getting what they want from multiple sources in a focused manner through functional portals of diverse kinds. The mix of such sophisticated systems was given in an earlier paper [5]. Colleges and universities will find it difficult, or, uneconomical to own and service such distributed knowledge infrastructure. So we need service entities like the Education Grid to establish and provide the services to colleges. This needs a membership and subscription approach to fund such infrastructure. Here we propose such a model with transparent accountability.

Firstly, we need an initial grant to start the operations. The proposed CIS for the colleges is essentially a continuation of the ongoing services deployment under the Education Grid project. Out of the original outlay of Rs. 7.31 Crore, a sum of approximately Rs. 3.00 Crore is yet to be utilized. We propose that of this Rs. 100 Lakh is earmarked for upgrading the Education Grid Operations Center to coordinate and host the course-specific portal and CIS management activities. The balance Rs. 200 Lakh is spent on networking and infrastructure for the colleges. Here below is the breakup of the proposed expenditure to launch and manage the CIS services for the next two years.

7.1. Education Grid Operations Centre Budget Requirements

Presently the Education Grid Operations Center has a small balance left to coast through about two months of operations. We need Rs. 100 Lakh released at the earliest for the following activities and operations.

Equipping the EDUSAT classroom with lecture-studio facilities and satellite head-end – This may be requested from ISRO EDUSAT sources as was done for the VTU in Karnataka.

- i) Preparation of 4000 Sq. ft. space for EDUSAT central classroom – Rs. 30.00 Lakh *
- ii) Internet (min. 2 Mbps) link - Rs. 12.00 Lakh

iii)Salaries for 12 persons X 2years for operations and management	-	Rs. 30.00 Lakh
iv)Upgrading software and hardware	-	Rs. 10.00 Lakh
v) Technology services	-	Rs. 10.00 Lakh
vi)Short courses and workshops	-	Rs. 2.00 Lakh
vii)Contingencies, travel and digital database subscription	-	Rs. 2.00 Lakh
viii)Systems AMC and services contract	-	<u>Rs. 4.00 Lakh</u>

Total - Rs. 100.00 Lakh

The remaining Rs. 200 Lakh (approximately) will be spent in networking and EDUSAT facilities for the Government colleges. We may consider investing the Rs. 200 Lakh mostly for the networking and infrastructure of the Government aided Engineering Colleges. The Higher Education Department should release this amount from the already allocated plan funds for the Education Grid. We expect the project to be self financing after the first two years through course memberships and industry sponsorships.

7.2. Professional Services Account and Consortinum Model for Colleges

Here we propose a novel consortium approach to finance the colleges information infrastructure and the CIS under the Education Grid. The colleges will deposit into a Professional Services Account (Or, PSA for short) that will be governed as per the policies in force time to time under the Education Grid CIS Program. The operation of this scheme is as follows.

- i) Education Grid will have an Education Grid Services Consortium (EGSC) of member colleges, institutions and universities. The EGSC will have an apex Education Grid Services Consortium Committee (EGSCC, that will be constituted by a Government Order) to discuss and recommend the diverse services related activities and their membership subscriptions costing.
- ii) Participant college deposits a sum of Rs. 1000/= per year per enrolled student for the Networking, Information and Concurrent Instructional Services (NICIS).
- iii)The college's Internet connection as per ERNET policy, e-journals subscription services as per INFLIBNET, or, UGC Infonet and useful databases (like the Pearson publishers web content for their text books in Computer Science and IT and such others) as negotiated by the EGSC will be paid out of this collection funds. Likewise a service charge for

Education Grid services will also be deducted from this collection.

- iv) Colleges that subscribe for CIS in specific courses, we shall have typical services charges as follows: (a) Web content (on as-is basis) and course discussions board support only – Rs. 200 per student per course for the full semester period; (b) Packaged NPTEL approved Video Lectures on Demand and web-based collaboration support – Rs. 300 per student; and (c) Item (b) plus computational services access in special courses (like SPICE for Electronic Circuits, FEM, Mathlab packages, etc.) - Rs. 400 per student per course. These are charged only for students registered in the courses. These are indicative figures and about comparable to the cost of typical textbook.
- v) Any surplus in the PSA of a college after deducting the different services subscriptions for the CIS and Education Grid services may be used by the college for strengthening its IT infrastructure related to education, or, additional subscription for paper books, e-books and such others that helps build its learning resources.

The size of the proposed CIS and PSA methodology may be gauged as follows. Suppose 50 self financing colleges take up this program. Each has, say 1200 students on average. This will contribute to a resource pool of Rs. 600 Lakh per year. In addition, we may estimate Rs. 200 Lakh for network services costs, Rs. 200 Lakh for e-journals and related subscription costs and the balance Rs. 200 Lakh for Education Grid services costs. In addition, let us say 20 courses with 60 students each in 20 colleges per course are offered with CIS support, we shall collect Rs. 72 Lakh for course related services. The result of this effort will be far reaching as it addresses the critical need for providing quality education and learning ambiance to the large number of aspiring students.

The advantage of the proposed PSA approach are several. Firstly, the Education Grid drives a consortium for procuring services and library resources. This results in considerable discount for the colleges. The colleges gain substantially due to resulting decrease in costs for services and subscriptions. With the State Wide Area Network (SWAN) becoming available for educational network also, we can negotiate substantial discount in network tariffs also. Much more than that, we shall have the collaboration between colleges to share people's resources. It is up to the Government to approve relevant policy as to whether the subscription charges are to be collected as additional fee from the students.

Once CIS gets started, universities will understand the several academic and management issues involved in technology enhanced learning. This will help them to collaborate, thereby making VISTA a reality. It will evolve through a natural process of universities coming

together. With some experience in web-assisted pedagogy, enhanced quality of instruction and technology enhanced learning, open learning programs and evening classes type degree programs of VISTA can be started using existing colleges as the centers.

The EGSC will also serve to drive several innovation that are necessary to develop future grid based information and computational services for education and research. With IIITM-K acting as the convergence institute, the Education Grid, National Centre for Innovation, Incubation and Entrepreneurship, KISSAN-Kerala, Portal for Computational Chemistry and Continuing Medical Education initiatives, the many colleges and their students will get many opportunities to contribute to new services and knowledge resources.

8. EPILOGUE

We have proposed here the Concurrent Instructional Services using NPTEL developed content for enhancing the quality of instruction in the vast number of Engineering Colleges for the many subjects where they do not have adequate number of quality teachers. An administrative and management methodology based upon the earlier VISTA proposal has been suggested to ensure the acceptance of the CIS in the formal university/AICTE system. This system is based upon effective four-way coordination between universities, colleges, Education Grid and NPTEL. The financing of this is proposed to be done through a Consortium approach with a Professional Services Account based upon membership subscription that is administered and governed by a peer body under the Education Grid.

The proposed model is based upon a consortium approach driven by the Education Grid Consortium Committee. It will not only result in adding much to better learning and web-accessed resources to the colleges and their students, but also result in considerable savings (in the form of 'more bang for the buck') for the colleges through collective bargaining and resources sharing. The proposed NPTEL/CIS/Education Grid/VISTA approach will also act as the role model for other educational areas also.

We may ask ourselves whether the proposed system is the best approach that achieves the dream of 'Quality Education Independent of Geography'? In a sense the proposed approach needs to be seen as a result of systems thinking. We may recall Albert Einstein once stated that, "There exists no solution to problems within the conditions that created them in the first place". The present problems in Higher Education is the result of an educational system that has no built in, or, bootstrap mechanisms to regenerate itself by sustaining innovation and creativity in teaching and resources management. If we study the eleven Malcolm

Baldrige parameters for educational excellence [6], we find that all our institutions, including the more respected ones like the IITs severely fall short of systems that nurture excellence with social responsibility on a sustainable basis. The approach taken here is to create a constructive intervention in the form of a consortium coordinated by the high-technology services of the Education Grid. It is based upon enabling approaches to build educational excellence through the Education Grid and NPTEL in a way that has the acceptance of the university type system. The suggested approach is likely to have far reaching impact not only on the present higher education system, but also in building the next generation knowledge processes industry. This is the need of the hour and we need to move fast to establish this. Thanks to the pilot implementation of the Education Grid in Kerala, we are uniquely positioned to implement this without delay.

The Kerala Education Grid project and IIITM-K are ready to take upon the responsibility of launching this CIS. The proposal is submitted hereby to the Department of Higher Education, Government of Kerala for approval and implementation.

9. ACKNOWLEDGMENTS

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