International Virtual Education Network for the Enhancement of Science and Math Learning in Latin America

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IVEN is a joint project of the IDB, Brazil, Argentina, Colombia, and Venezuela, to develop multi-media mathematics and science teaching materials for upper secondary schools. The project combines conceptions of effective learning with appropriate computer, video and communication technologies. It includes instructional design of teaching/learning activities, production of web-based multimedia curricular materials, staff training, a distribution network, learning achievement assessment and overall program evaluation.

What is Iven?

The International Virtual Education Network (IVEN) for the Enhancement of Science and Mathematics Learning is a pilot collaborative cross-country project in Latin America. The project aims to harness the potential of information and communication technologies by combining conceptions of effective learning with appropriate computer, video and communication technologies.

IVEN is a comprehensive program that involves instructional design of teaching/learning activities, production of web-based multimedia curricular materials, staff training, a distribution communication network, learning achievement assessment and program evaluation.

Participating countries: Argentina, Brazil, Colombia and Venezuela
Funded by: Country resources, a grant and loans from the Inter-American Development Bank (http://www.iadb.org), and a start-up grant from UNESCO (http://www.unesco.org).
Timing: The project was designed in 1999 and launched in 2000. The pilot phase will require 3 to 4 years.
Advisory Coordinating Secretariat: Knowledge Enterprise, Inc. (http://www.knowledgeenterprise.org)

Rationale

There is a convergence in the status of science and mathematics teaching at the secondary level in participating countries that can be summarized as follows:

- There have been substantive reform efforts to align the science and mathematics curricula with the modern societal demands and the theories of learning along the following lines:
  - Balancing content with context and process;
  - Balancing content with social, environmental and technological concerns;
  - Building an element of real-life problem-solving situations that call on multidisciplinary inputs; and,
  - Going beyond the basic cognitive skills into higher level competencies of synthesis, application, problem-solving, learning to learn, etc.
- The science and mathematics program is intended to be hands-on, minds-on and reality-on, but the organization of instruction leaves major gaps between the intended and the actual.
- There is a wide variation in the background and qualifications of teachers. There is a significant number of teachers that are not specialized in the subject they teach and some do not even hold a university degree.

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- Student assessment is predominantly based on written tests, oral questions and lab reports.
- There are many serious attempts to use learning technologies, including on-line networks and production of educational software. Also a number of schools are well equipped and connected to the Internet. What is lacking is a comprehensive approach to the introduction of multi-media materials and processes as an *integral part* of the teaching/learning program of secondary science and mathematics.

Latin American countries face a formidable task of enhancing science and mathematics education and providing the conditions for *hands-on, minds-on* and *reality-on* teaching/learning programs. To attempt to do that with conventional tools is like digging a tunnel with a spoon. Modern information technologies, if properly utilized, offer Latin American countries the potential to leapfrog to the cutting edge of science and mathematics education.

In order to face the formidable task of enhancing science and mathematics education, harness the potential of information and communication technologies, and achieve economies of scale and expertise, the four participating countries have agreed to develop an *International Virtual Education Network (IVEN) for the Enhancement of Science and Mathematics Learning* that combines conceptions of effective learning with appropriate computer, video and communication technologies.

General Framework

Foundational Parameters

IVEN is structured within the following parameters:

- *IVEN is an educational project and not a technology project* - The project proposes to exploit the potential of technology to influence the teaching/learning process, as outlined in above.
- *IVEN is an instructional reform and not a curriculum reform* - The curricula of the participating countries are taken as a given. IVEN aims to enhance the translation of these curricula into an effective instructional scheme.
- *IVEN is an integrated system and not an additional layer of educational input* – The project proposes to enhance instructional strategies within existing systems of education, rather than creating parallel systems. It will, therefore, be a comprehensive program that involves articulation of learning objectives, translation of objectives/standards into teaching/learning activities, production of web-based multimedia curricular materials, staff training, a distribution communication network, learning achievement assessment and program evaluation.
- *IVEN enhances the classroom and is not a substitute for the classroom setting* – The project aims to enhance the role of the teacher as a facilitator and leader of the teaching/learning process, and to equally enhance the role of the student as a learner, thinker, investigator and problem solver.
- *IVEN is Internet-based and not Internet-dependent* - The system proposes to make the best use of the potential and resources of the Internet. Yet, it is designed in such a way that schools can access all the content provided by the network without the need to go through the Internet.
- *IVEN is sophisticated technologically and instructionally, but not complicated* - The system will utilize cutting-edge technologies and processes for its design and material development, but the front-end components for teacher and student use are simple and user-friendly. Schools can participate in the network with modest infrastructure and technical skills.

IVEN is not:	***IVEN is:***
X technology project	✍ education project
X curriculum reform	✍ instructional reform
X substitute for classroom	✍ classroom enhancement
X resource add-on	✍ integrated system
X Internet dependent	✍ Internet based
X complicated	✍ Sophisticated

Pilot Phase and Scaling Up

IVEN starts with a *pilot developmental phase of about four years* to allow for materials development under experimental conditions, and for the trial of these materials in a small number of schools. The pilot phase will be submitted to a rigorous formative and summative evaluation to test for feasibility, effectiveness and cost benefit before expanding on a larger scale. The pilot phase is restricted to:

? No more than 50 schools in each of the participating countries.
? Science and mathematics courses of the last two grades of secondary education.

At the end of this pilot phase the following "products" will have been achieved:

? A fully developed multi-media program covering the total two-year science and mathematics program.
? A trained cadre of multimedia production specialists in each participating country.
? Trained personnel in the use of science and math learning modules in all the pilot schools.
? A physical infrastructure within schools and across countries.

Once this pilot phase is successfully completed and the evaluation results are incorporated into the structure of the Virtual network, then the *Network can be scaled up over time in five directions:*

? More secondary schools in the pilot countries
? More countries in Latin America
? Other levels of science and mathematics education
? Other school subjects
? Life-long education

Overall Design

The engine of this initiative is the multimedia virtual network. IVEN is actually three interrelated networks:

First, IVEN is a *network of mathematics and science electronic content developers.* It draws together and trains, *for each country,* a team of content specialists, master teachers, technical experts, and electronic curriculum developers to work collaboratively across countries—via a virtual network—to develop electronically enhanced mathematics and science *"learning modules."* The supporting infrastructure consists of a state-of-the-art central development laboratory connected to sets of workstations in the participating countries.

Second, IVEN is a ***physical network for the distribution of mathematics and science learning modules.*** The organizing premises of the distributional network are as follows:

- The system is built around a distributed database and a World Wide Web architecture that uses the Internet and its TCP/IP network protocol as its delivery system.
- Most content is stored locally at the school level on an Internet "proxy" server until connectivity improvements provide a means for more central storage of content.
- Because video is storage and connectivity "intensive," video aspects of learning modules will be delivered in the form of videotapes or DVDs until such time when local connectivity improves. This does not exclude supplementary broadcasts where the infrastructure already exists.

Third, IVEN is a *human network of participating schools.* Preparation and support of the human network entails:

- *Orientation*. For the commitment to be on a solid basis, the schools that are tentatively selected as candidates are given a sensitization and orientation program regarding the virtual network, its potential and use. A set of experimental learning/teaching modules will be used to demonstrate the essence of the network.
- *Staff training.* Staff training is centered around the standards set for science and mathematics education, the teaching/learning program, and most importantly, the student learning modules and the corresponding teachers' guiding modules.
- *On-line access to resources*, including the teachers' guiding modules, teaching tips, chat-rooms with other teachers, and centers of science and mathematics education.

More specifically, the pilot phase of IVEN covers the following five components:

1. Blueprint of instructional activities.
2. Production and evaluation of teaching/learning modules.
3. Distribution of modules.
4. Application of modules in pilot schools.
5. Evaluation of the pilot program.

Status of the Project

The start-up stage has been completed. It involved the development of the institutional, financial, human, instructional and technical infrastructure. More specifically the following steps have been achieved:

- Agreement among participating countries on project design and on institutional and financial arrangements;
- Recruitment and training of production teams;
- Development of a collaborative web site for communication among production teams;
- Development of a restricted institutional web site that includes a clearinghouse of resources of science and math multimedia materials and web sites;
- Design of distributional network;
- Production of prototype multimedia teaching/learning modules; and,
- Processing of loans from the Inter American Development Bank to cover expenditure.

Countries are now ready to move into the development phase, which includes the following:

- Development of distributional web site;
- Production and testing of modules;
- Selection and equipping of pilot schools;
- Training of teachers in pilot schools; and,
- Evaluation of pilot program.