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AUTHOR Pisanty, Alejandro
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ABSTRACT

This paper begins with background on the National University of Mexico (UNAM) and its networks. Other distance education projects in Mexico are described, including projects of the Instituto Politecnico Nacional (IPN), the National Distance Education Program operated by the Secretary of Education, and the Instituto Tecnologico y de Estudios Superiores de Monterrey. The National Educational Videoconference Network--formed by uniting the UNAM and IPN networks and operating them cooperatively--is discussed. The decision-making process which gave birth to the videoconferencing system in Mexico is analyzed within the framework of the ACTIONS approach. Each of the ACTIONS factors (i.e., Access, Cost structure, Teaching and learning, Interactivity, Organization, Novelty, Speed) is considered according to the actual or projected needs and resources for technology implementation for distance education. An additional factor, self-correction, is proposed; this factor suggests that, in distance education projects, technologies that facilitate immediate identification and correction of errors should be considered. (DLS)

Mexico's National Educational Videoconferencing Network

Alejandro Pisanty
Computing Academic Services
National University of Mexico

Abstract

The Mexican network system for educational videoconference is described together with some major distance education projects in the country. Decision-making is emphasized, and analyzed in the Bates ACTIONS framework, to which a factor of self-correction is added. The main uses of the network are also shown.

Introduction

Interactive videoconference through compressed video has been expanding in Mexico in the last few years. A large part of the systems and networks are used for education and training.

UNAM, the National University of Mexico, has adopted videoconferencing for the last five years, as have some other public and private educational institutions. In 1997, the major networks were linked together into the National Educational Videoconference Network (Red Nacional de Videoconferencia para la Educación, RNVE).

In this paper, I will provide a succinct description of UNAM's capacities and its history of computing and networking, and build upon it a description of the RNVE. I will also provide an overview of the present usage of the most significant parts of the network.

The decision-making process which gave rise to building both UNAM's and the national networks will be described in the framework of the ACTIONS model of Bates,[1] and in the context of the availability and pricing of the system's components in Mexico. It should be highlighted from the start that in Mexico ISDN is not available, so that the main effort of the network is to provide switching service for the educational institutions' videoconferencing activities.

Near the end of the paper I propose to add a factor to the Bates model, a factor of self-correction which means that in distance education technology projects one should consider those technologies which facilitate the identification and possible correction of errors in contents or presentation instead of waiting for this to occur in later editions or releases of media.

It should be mentioned from the start that most of the activities supported by the network belong to type 3, "Independent study divisions of a conventional college or university," of Keegan.[2] Most of the paper is concerned with technology decisions and not with educational, pedagogic or other considerations, though they inform the decisions themselves and are mentioned in that context. Also, the technologies themselves are not described, as references are widely available.[3,4]

UNAM Networks

UNAM is the National University of Mexico, which is at the hub of the country's higher education system. This comprises 55 public universities, the National Polytechnic Institute (IPN) and approximately 130 Technical Institutes spread throughout the country. UNAM's student population is of 235,000, in which 120,000 high-school students are included. Many Mexican universities operate their own high schools.

Also, UNAM is a major research university covering most fields of knowledge, and is endowed with responsibilities which include holding several national collections, like the National Library, National Periodicals Collection, National Botanical Collection , etc. Its payroll is of 60,000, of which 10,000 are full-time academics.

The University operates facilities in all 32 federal states of Mexico and two in the United States, as well as one in Canada. It has more than 1,200 buildings, most of them in the main campus and other Greater Mexico City campuses. It therefore has had to develop a strong network for computers and telephones. At present 15,000 computers are hooked on tho the network; they include a Cray Y-MP and a 40-processor Origin 2000. The network's main campus backbone is the largest ATM implementation for education in Latin America.

UNAM is the institution which operated Latin America's first digital computer, in 1958. In the intervening 40 years, it has had to operate computers at a distance, at first through teletypes and dumb terminals, and growing to an up-to-date network. In 1989 UNAM adopted an all-TCP/IP approach for its networks, and Unix for nearly all of its main computers (a legacy system is still running and will be phased out in the next 12 months). This gave the institution an edge in using and ramping on to the Internet.

At present, the University operates approximately 1,500 kms of optical fiber on its own facilities, and rents capacity from the dominant telco in the country as well as from a few others. It has the largest Internet user base in the country, with 20,000 users in its central server and up to 80,000 universitywide, and 150 organizations downstream under cooperation agreements. The Internet is used strongly to support learning and teaching, and is intensively used in research.

UNAM has had an Open University subsystem since 1972, for a few of its courses of study. No telecommunications technology was introduced for the operation of this system until it began being reconsidered around 1994–5. At this time, the Open University Subsystem (SUA) started offering TV courses in some fields of continuing education.

In 1994–5 the then President of the University started a more aggressive Distance Education program. This was based on three basic technologies, television, the Internet and interactive videoconference, and supported, as it still does, a variety of educational approaches. The program in its origin emphasized continuing education and has now been extended to other educational levels and types. Its geographical distribution was to be supported through offices operated by the UNAM Alumni Associations, active in approximately 40 cities in Mexico. This proposition has grown very slowly, due to the insufficient funding structure of the associations.

Starting in 1997, the President of UNAM has formalized the instances for distance and open education, grouping them in the CUAED organization. CUAED is a normative organization, which promotes open, continuing and distance education projected from the schools and institutes of the University. The most active unit of CUAED in the production of distance education is PUEL, the Online University Program.

Our unit, DGSCA, is in charge of computing academic services and the operation of all UNAM networks. It operates the videoconference network described in this paper, as well as supporting all Internet operations of the university. DGSCA supports a Web site where a detailed, updated description of the network is described.[5]

Relevant Distance-Education Projects in Mexico

In this section I will describe some other distance education projects in Mexico, relevant to the present paper. They will provide context, and an opportunity to further explain the prevailing situation.

The Instituto Politécnico Nacional (IPN) is a federal institution, dedicated to higher education in more-technical fields of study. It is closely tied to Cinvestav, a major research institute with a wide choice of disciplines. IPN has several centers located throughout the country, with a varying combination of basic and applied research, and some level of teaching mostly in continuing education.

IPN operates an open-television channel, Canal 11, in Mexico City, which is rebroadcast in some other cities. Canal 11 is a cultural and public-service channel, not unlike the US's PBS in outlook and programming, which has some contribution to distance education but has a strong policy not to participate directly in educational projects. This channel gives IPN a great capacity in television production in general.

IPN has established its own videoconference network in approximately 20 classrooms. About half of these are in Mexico City and the others in the IPN centers in the country. They are connected among themselves mostly with 256 kbps links, most of which are microwave. The network has a star topology, with a single multipoint unit in Mexico City. The distance-education project itself comprises mostly continuing education and in fact the whole system is operated by the Continuing Education Directorate.

An important difference between this network and the one of UNAM should be highlighted at this point. IPN operates its own facilities in the country, whereas the network of VC classrooms connected to UNAM is a mixture of its own facilities (in the cities of Querétaro, Cuernavaca, as well as San Antonio, Texas, Hull, Quebec, and the ones in process in Ensenada and Morelia) and of allied institutions (universities in the states of Veracruz, Colima, Nuevo León, Quintana Roo, Chihuahua, Sonora, Sinaloa, Durango, and others). Thus IPN can operate its network under its own full authority whereas UNAM has some classrooms under full control and the others are operated on an interinstitutional cooperation basis.

Another important difference is that the UNAM network has a point of presence in the United States (in San Antonio, Texas). There, it operates a multipoint unit whose ISDN

capabilities allow it to connect to networks the whole world over, and it actively uses three different classrooms.

The National Distance Education Program is operated by the Secretary (Ministry) of Education, SEP, and has as its basic tools the Red Edusat (Edusat Network), Red Escolar (School Network), and a videoconference linkage.

Edusat is a satellite TV network, further broadcast by open television and cable in some cities. Its most important and long-standing project is Telesecundaria (Tele-JuniorHigh), which has operated for more than 30 years with significant success. It has access to 14,000 schools throughout the country. Its model combines F2F activities with remote input through specially designed and produced TV programming. Part of its contents is also used in some countries in Central America.

The Red Escolar (School Network) project is run for the Secretary of Education by ILCE, a multinational institution under contract to the Mexican federal government for this and other projects. Red Escolar is a complex, emerging network, which will eventually give access to the Internet to up to 130,000 schools.

Red Escolar operates on a mixed, layered platform. Some schools, which are properly connected through permanent data links, have full access to the Internet. Some others operate through modems and telephone lines. Finally, a large number of schools will only have access to Internet contents broadcast to them by satellite, in a down-only link to a combination TV decoder-modem. This layer structure is required due to the weakness and unevenness of telephone coverage in the country. Mexico has approximately 11 telephone lines per 100 inhabitants, and actual coverage ranges from 22 in Mexico City to 4 in Chiapas.

Red Escolar is now past the pilot stage and has already achieved remarkable success in the few hundred schools now operating. It has introduced varied teaching methodologies to make use of computers and networks. It is mostly collaborative learning, with either a Learning Circles approach or large, cooperative projects like the study of butterfly migrations over large territories. In this case, the collaboration of students took place not only in Mexico but also comprised children in the US and Canada.

Red Escolar faces great challenges and is bound to achieve well in most or all of them. It attracts support from teachers, families and decision-makers in the federal states of Mexico, so that it is able to find some financing to add to the one it has in the federal government.

Several federal states in Mexico have, or have had, other distance education projects with significant success. Among these are Veracruz's TeleBachillerato (TeleHighSchool), and computer network projects in the states of Nuevo León, Tlaxcala, Aguascalientes, Guanajuato and others. These last ones are more oriented to the use of the Internet and grow upon previous projects which have brought computers and networks into the classroom in a successful way.

As a result of this work, a large number of educators and decision makers in Mexico are committed to the use of IT in education, and to a set of varying models for distance education. Among others, videoconferencing has become extremely attractive for those projects where synchronous, person-to-person interaction adds particular value, as happens

in our country in continuing education, graduate seminars, teacher training, and related types of work.

A separate analysis must be made of the distance-education projects of the Instituto Tecnológico y de Estudios Superiores de Monterrey, ITESM, more popularly known as Monterrey Tech. This private institution has also a high-school system as well as undergraduate and graduate schools. It operates in 26 campuses with a total of around 80,000 students. Decision making is centralized, residing mostly in the original city of ITESM, Monterrey.

ITESM has had a succession of distance education projects. It started with a satellite television system, with proprietary encoding, directed to all 26 campuses and with uplink capability in four of them. In its first incarnation it was aimed at the graduate education of ITESM professors, who were in a rapid process of obtaining graduate degrees as a part of ITESM's accreditation process before United States accrediting bodies. Then, it was aimed also at undergraduate students and lectures were delivered over this system for semester-long courses. The interaction beteween students in different sites, and between students and their teachers, was limited, supported as it was by the asymmetric links of telephone, fax and electronic mail.

ITESM then created its Virtual University, a combination of television and mostly Internet tools for teaching, which in its first stages concentrated in graduate courses in education, still directed mostly at its own teachers but already open to a more general population, and in continuing education and certificate courses. The ITESM Virtual University has students in several places abroad, particularly Central and South America.

In the upcoming months, ITESM will start operating its online education project. In it, each student will be required to use a portable (notebook) computer to access lecture material, exercises, homework, discussions, etc. A large number of network nodes is being installed in ITESM facilities, in order for students to have continuing access to these materials. The whole system will be supported by a Lotus Notes and Learning Space Infrastructure. In the order of 80 Notes servers, running Windows NT, are in operation.

The Notes implementation holds 30,000 users at present. One of the stated purposes of this use of technology is to allow some teachers to work with up to 400 students in a distributed class. The way this is expected to work is through collaborative learning, which is expected to ease the teacher's workload by substituting with peer discussions among students.

A videoconference network is being installed by ITESM as a complement to these efforts, and is available on demand for collaboration projects with other institutions, by ISDN calls through the United States.

The National Educational Videoconference Network

The National Educational Videoconference Network in Mexico was formed essentially by uniting the networks centered in UNAM and IPN, as well as those connected to either institution, and operating them cooperatively.

UNAM has its classrooms in several points in Greater Mexico City, in Querétaro, Cuernavaca, and San Antonio Texas. Facilities will soon operate in Morelia, Ensenada and Hemosillo. Its multipoint units in Mexico City are connected to IPN's one also in Mexico City through an E1 fiber-optic linkage rented from the Telmex telephone company.

IPN has facilities also in several points of Mexico City, as well as the cities of Tijuana, Tampico, Reynosa, Culiacán, Morelia, Guadalajara, Oaxaca, Cancún and Mérida. The facility in Reynosa is operated cooperatively with the Mexican Petroleum Institute (IMP).

Both UNAM and IPN are connected to the networks operated by the national oil company, PEMEX, and IMP. The connection again is established to the multipoint units of these two networks in Mexico City. PEMEX and IMP operate videoconference facilities in Mexico City, Salamanca, Poza Rica, Minatitlán, Coatzacoalcos, Villahermosa and Ciudad del Carmen. Most of these facilities are associated with the oil industry in the Gulf of Mexico coastal region. They are both meeting rooms and classrooms; it should be noted that IMP is the largest professional training organization in the country.

UNAM's network reaches further out into the country through its alliances. These are with:

- Red del Noroeste (Northwest Network): multipoint in Ciudad Juárez, facilities in Ciudad Juárez, Chihuahua, Hermosillo, Ciudad Obregón, Durango, La Paz and two rooms in Sinaloa. There is a cross-border link to El Paso, operated through ISDN on demand.

- Universidad Veracruzana: multipoint in Xalapa, facilities in Xalapa, Poza Rica, Veracruz, Córdoba-Orizaba, and Coatzacoalcos.

- Universidad de Colima: single facility in Colima.

- Universidad de Quintana Roo: single facility in Chetumal (in the network, this is the only satellite link, operating at 112 Kbps).

- Universidad de Nuevo León: multipoint and three facilities in Monterrey.

- Universidad Autónoma de Tamaulipas: multipoint in Ciudad Victoria, facilities in Ciudad Victoria, Tampico, Reynosa, Ciudad Mante, Nuevo Laredo and Matamoros. It has a cross-border link, ISDN, to Edinburgh, Texas.

The institutions in the network operate their videoconferencing systems at transmission rates of 256, 384, 768 and 2,048 Kbps. The multipoint units are programmed accordingly for each event. In some cases, and starting in 1998, we have been operating a multipoint unit which can handle different bit rates in a single event, thus making access easier and the events more attractive.

The educational projects supported by the network are varied, according not only to the participating institutions but also to each of their subunits as well as to third-party projects. Consequently, a variety of educational approaches are supported, from traditional lectures to collaborative learning.

The responsibility for the contents, quality, assessment and certification in each educational project belong to the "owning" or generating institution and subunit. The operators of the network act only in recommending solutions to each of these problems. They also are proactive in attracting participants and in training lecturers, teaching assistants and students in the use of videoconferencing, and in its combination with other techniques for distant education and distant learning.

Decision-Making Analysis

The decision-making process which gave birth to the videoconferencing system in Mexico can be analyzed in several different frameworks. For the purposes of this paper, the ACTIONS approach of Bates (ref.1) has been appropriate. In the rest of this section specific reasoning behind the establishing of the network will be discussed in this framework, which will at the same time be used to consider the alternatives considered along the process, and which in many cases coexist and are also used in educational projects.

The reader should recall that the approach of Bates uses ACTIONS as an acronym for Access, Cost structure, Teaching and Learning, Interactivity, Organization, Novelty and Speed of development and deployment. Each of this factors is considered, according to the actual or projected needs and resources for specific instances of technology implementation of distance education.

Access

Access has been a primary consideration in distance-education projects in Mexico. For many years, in fact, it has been dominant, particularly in the K–12 levels. As a result, some of the longest-standing projects are TV based. The prime example, which has already been mentioned in this paper, is the Telesecundaria (TeleJuniorHigh). In Telesecundaria, grades 7–9 are taught in rural and barrio settings, in single-class schools where all grades attend the same classroom at the same time. Television input is combined with hands-on exercises, face-to-face lectures, explanations and discussions, and other teacher-led activities, with all three grades taking turns.

The Edusat satellite television broadcast system, using Mexican geostationary satellites, provides the up- and downlinks of Telesecundaria and other training programs, and is available part-time for other educational projects. In particular, UNAM has been broadcasting continuing-education courses for some years now. The experience is good, with small groups in a few cities in the country. Each course has an attendance of a few dozen students. Although television has been chosen for its easy, cheap, and widespread access, it has not brought in as many students as the access factor alone would make possible. Besides access to receivers being cheap, the satellite link is available at no cost for this project since, as described elsewhere in this paper, the Edusat network is federally operated and subsidized.

The VC networks were established in spite of the fact that this technology qualifies low in respect to access, since students have to actually attend a physical facility and there are comparatively few of these. However, for the educational projects using VC in Mexico, access is a less-significant factor, since, due to their content and educational level, they are

directed more to urban, educated populations which can manage with minor effort to access the VC classrooms in their cities.

The third major technology considered in this paper, the Internet, had a relatively low accessibility five years ago, and was considered as complementary. At the time, access to the Internet was mainly possible in higher-education campuses, and in that sense was not dramatically better than other alternatives. At present, there are some 400,000 Internet users in Mexico, many of them away from educational institutions, and the access equation begins to favor the Internet. Not surprisingly, online education projects are arising.

Cost Structure

Cost, and more emphatically cost structure, is a very significant factor in the reality of distance-education work. In the case of the networks under discussion in this paper, it is of course an important, though not dominating, one.

With collaborators along time, I have done a cost structure analysis for technologies for education in several projects. We[6] have added emphasis to the Bates model in that the cost structure analysis must consider separately the costs to the emitter and to the receiver before any decision is made related to technology adoption for distance-education.

For the case in point, the cost structures of television, videoconference and the Internet are considered.

Fixed costs for the emmitter in television are by far the largest figure. Setting up and operating a television emmitter is extremely expensive. In the Edusat network already mentioned, this is factored out of the equation by the fact that it is government-operated. The federal government owned the satellites used in this project, until 1997 when they were privatized. However, by law, the government still has free use of some of the transponders, among others for educational purposes (I strongly believe that this is a law with positive effects, a simile of which should be adopted at least in developing countries). Therefore the expense of using the scarce good which is a band in the electromagnetic spectrum over the country is already paid.

Educational projects using TV in these conditions still have steep operational costs for producing their programs. However, in cases as Telesecundaria, the cost is well justified given that it is a federal expense, and it is spread out to at least 14,000 schools and at least an order of magnitude more students. Of course, the factor that makes television a particularly attractive technology in projects which reach out to a geographically disperse, economically challenged population, is that the cost to the receiver is near zero.

In contrast, the cost to the receiving station in VC is high, both in investment and in recurring expenses. In Mexico this is particularly acute since the digital data links required to operate are expensive (an E1 link reaching out more than 600 km can cost 120,000 USD in its first year, and 100,000 USD/yr afterwards). The cost of these links is partially well justified, in that if they are properly configured and used they can also carry data and voice traffic. In fact, only 4 to 6 E0s (256 to 384 Kbps) are fractioned for VC activity, in the most usual setup.

Further in this cost analysis, the receiving station in VC is such one only in some of the projects for which it is used. For other projects it becomes the emmitter. This balances out the cost structure equations pretty neatly, especially for undergraduate, graduate, and continuing education. It will be seen further on in the paper that the disadvantages brought by the cost structure are compensated by the increased success of VC DE processes due to their improved interactivity and other factors.

Finally, the cost structure of the Internet should be also mentioned. In Mexico, this cost structure is gradually approaching that of the United States. This means that both emmitter and receiver costs, be they fixed or current, are way below those of VC. In fact, increasingly the Internet is used as a part of VC-based DE projects, and a wide body of experience has accrued in the management and use of electronic discussions and other online resources.

Teaching and Learning

This is the what and the what for of DE projects. It should come first on any list of decision factors, and it is only the simplicity of the acronym that sets it here.

In the VC network in Mexico, a variety of educational approaches are used, as decided by the originators and participants in different projects. However, most of them are geared to those teaching and learning that are particularly facilitated by vivid dialogue among adults, and therefore concentrate mostly in postsecondary education.

This factor alone has been crucial in the success of VC as compared to television in this educational level.

Interactivity

Interactivity is a controversial factor in distance education. Schools of thought as well as bodies of experiment stand at odds in discussing its importance and effect. The most successful of the courses and academic activities held in our network add to Bates' statement that "learners need to interact both with the learning material, and with tutors and instructors, and other students, in order to learn effectively."

The VC network adds to TV an interactivity among participants which goes a long way in delivering the full value of face-to-face interaction, synchronously and with all the metaverbal components short of actual touch. This may be further understood in the taxonomy of Aleem.[7] It adds this value to computer-mediated-communications (CMC), although these partially compensate by their asynchronicity, which is useful in other contexts within DE projects, and by the precision of the communications for which they allow when they are well written and use precise quotation either from sources or from the participants statements.

It would seem, though this is still open for quantitative study, that the differences in interpersonal relations observed in Mexico as compared to the United States favor VC in contrast to television and CMC. This arises from a higher need of trust, of more closely knit relationships, than are observed in business practice and in education in both countries. This would bias the interactivity discussion, in our culture, in favor of more person-to-person

interaction and less in favor of either written communication, person-to-learning-material, or independent, personal, individual, distributed and isolated study.

Organization

The organization for distance learning and distance education in Mexico has complexities of its own. The rules and bylaws of educational institutions may be firmly anchored in conventions, as they are in many other countries. However there is much less trust in the system as compared to the rest of North America. Therefore, issues such as student assessment, grading and certification rise high. Enrolment is a major issue in Mexico for undergraduate education, since there is strong competition for admissions; therefore most projects are aimed either to registered students of each institution, or to continuing education or extension where admissions are more flexible.

The way we have been using the VC network has a very practical approach to organization. The Network itself is seen as a medium only. Each institution and subunit makes many of its own decisions in this regard. Thus, some are detailed and strict in the student authentication process, and either have staff of their own or allied institutions identify the students. Other rely more on trust and eventually the possibility of having witnesses testify should an auditing process ensue, and have actually performed graduate degree examinations through the VC system as happened recently in a connection between Mazatlán (where a temporary VC room was established) and Mexico City.

This lightweight approach for the network itself supports UNAM's CUAED as a promoting and norm-emitting body, as well as IPN's DEC organization for continuing education, in a frictionless fashion. It equally accommodates other institutions. The combination with other media and technologies, as well as support by other services like libraries or publications, are also decided upon by the participating institutions. The agreements among them can reach all the way to cross-accreditation. Of course, the distance-education organization itself is more complex than the Network's, which is based on cooperation agreements among peers to operate, route and switch, and is continually evolving as it grows and is formalized.

Novelty

The novelty factor has played in favor of VC in many cases, though it still brings out resistance and mistrust by academics in the country. Many professors and teachers are immediately convinced of the possibilities of VC through its vivid, powerful interaction capability which is unseen to many of them. In contrast, the novelty factor plays against television, of which many academics are wary as they consider (rightly or not) that students will have a passive attitude before it, and also because of failed experiments in educational television in Mexico which took place in 1975–1977.

We have documented the value of the novelty effect in interviews and field observations. It also applies to the Internet. However, many teachers are wary of using it immediately for a factor to be described in the next subsection.

Speed

The speed with which one is able to develop and start operating a distance education project may be decisive in many contexts. Continuing education provides a good example in this sense, since new subject matter and even full sets of certificate courses may need be provided in short notice and with continual updating.

This factor plays against recorded, professionally produced video and TV broadcasts, as well as against some uses of the Internet, particularly interactive courses over the Web. Both sets of products require a long, thoughtful process to produce rich media, and are relatively inflexible in face of the need for updating.

In contrast, live television broadcasts and videoconferencing may take little to no time for deployment, if their participants already have the prerequisite preparation. In cases of urgency (response to an epidemic or epizootic, of which we have had a striking instance in Mexico in 1995), a TV broadcast can be prepared within days, notice given to the specialists interested in most of the country, and an actual educational broadcast take place with dramatic effect (on the incidence of avian influenza, in the case in point).

"Factor Eight": Self-Correction

This speed of development, the synchronicity of the interaction between specialists or stakeholders in a given project, and the symmetry of the videoconference system, give it what I would almost propose to be Factor 8, Self-correction. Recorded video, recorded audio, CD-ROMs, why, even books, share one defect: they are not self-correcting. A mistake, error, misconception, wrong programming, defective imaging, etc., once recorded, may stay forever. The cost of updating these media, such as making a new edition of a book or a new release of software, may be prohibitive, and even then, upgrades and updates may never be incorporated into copies that are already in use.

However, live interaction with specialists or other knowledgeable, attentive persons allows for errors or inconsistencies to be noticed and pointed immediately, all the more so if a symmetric interaction medium flattens the social bias of the interaction. With some luck, the deficiency may be corrected in the same event, either by the lecturer or equivalent, or by other members of the audience; otherwise, it will be noted by all participants and corrected off-line or in the next event in a series.

It should be noted, though without further expansion here, that evaluation and assessment, both of courses and of learning in individual students, are coupled with the self-correction factor.[8]

Notes

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Address: DGSCA-UNAM
Av. Universidad 3000
04510 México DF
México
Email: apisan@servidor.unam.mx

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