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NEW MODELS FOR DISTANCE EDUCATION IN THE DEVELOPING WORLD

Prepared by:
Karen Tietjen

AGENCY FOR INTERNATIONAL DEVELOPMENT
Bureau for Science and Technology
Office of Education

Dr. Clifford Block
Project Manager

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INTRODUCTION

In the United States, Canada, and Europe, the primary aim of distance education is to reach adult learners whose jobs preclude them from attending regular university or enrichment courses. However, in the developing world, distance education has acquired a new meaning. The inability to provide quality instruction and essential training is a recognized barrier to Third World development. For developing nations, distance education is a means of multiplying scarce professional resources to meet the rapidly expanding demand for higher education and professional training. Faced with shortages of trained teachers, inadequate communication and postal services, limited financial resources, and vast isolated and rural areas, the Third World has had to look beyond traditional distance education programs based on correspondence, print materials, and tutorials. Eight countries in three different regions of the world have turned to telecommunications for the solution.

Building on simple, interactive and inexpensive telephone technology, distance teaching projects in the West Indies, Indonesia, and Peru have developed audioconferencing networks to extend expert resources and expand educational opportunities to remote and rural areas. Under the AID Rural Satellite Program, these three pilot projects demonstrated that audioconferencing could reliably and affordably support distance education efforts in the Third World.

Today, the University of the West Indies Distance Teaching Experiment, the Indonesian Distance Education Satellite System, and the Peruvian Rural Communications Services Project include 25 conferencing sites and reach thousands of university students, teachers, doctors, nurses, health care workers, researchers, and extension agents. With improved skills, greater knowledge, and up-to-date information afforded by the teleconferences, they are, in turn, better able to do their jobs and support national development.

These successful distance education programs result from four years of research and experimentation. Each project offers practical lessons in the planning and implementation of audioconferencing programs, including network design and equipment selection, program management and software development, and training and technology transfer.

Focusing on higher education, this paper examines the development of audioconference-based distance instruction programs at the University of the West Indies and the Eastern Islands Universities Association in Indonesia to meet the challenges facing higher education in the Third World. It will address the similarities and differences of audioconferencing uses in two distinct areas of the world and explore the effectiveness of audioconferencing as an instructional tool.

THE ROLE OF TELECONFERENCING IN HIGHER, CONTINUING, AND PROFESSIONAL EDUCATION

Higher, or university-level, education has proved a fertile area for the use of telecommunications. The need for communications, staff development, and expert resources makes teleconferencing a particularly appropriate and flexible means of institutional support.

Higher education is the area in which telecommunications has made the most significant advances as an instructional support tool. Telephone-based systems allow for two-way communications. With the addition of special equipment, the telephone can be transformed into a **teleconferencing network** linking many groups of people at one time for multi-site, multi-participant meetings, conferences, and seminars. It facilitates dialogue, discussion, questions and answers, and permits immediate response to learner needs. Teleconferencing can thus provide an effective means of training, institutional outreach, and administration to rural areas. It also provides access to scarce educational resources and expertise often otherwise unavailable in many Third World areas. A teleconferencing network is equally well suited to the individual learner as to groups of students. It can be used to deliver entire courses to several university sites or one-time special sessions as part of an established local curriculum.

In addition to supporting basic undergraduate curricula, telephone-based systems are often crucial in extending graduate training opportunities which are extremely limited in the developing world and practically non-existent in rural areas.

The higher education area provides a ready constituency for distance programs. Both students and faculty are eager to obtain advanced degrees. Often, in fact, faculty members are compelled by governments to improve their skills either through existing academic programs or formalized skills upgrading programs. Researchers, isolated from adequate library facilities and from their professional colleagues, can employ a teleconferencing system to obtain information and keep in touch. In the academic environment, general information and "enrichment" seminars delivered over the telecommunications system meet enthusiastic responses. In Indonesia, a series of seminars on diverse topics attracted over 1,800 voluntary participants from all walks of university life.

Telecommunications systems also have become an efficient means of institutional management, administration, and coordination. In general, higher education institutions in the Third World belong to a national university system closely tied to the administrative and policy center of the ministry of education. Distance, remoteness, and lack of regular communications degrade the efficiency of such centralized systems. A teleconferencing system linking universities with the ministry office and each other can eliminate management bottlenecks and facilitate decision-making. The University Registry at the University of the West Indies holds weekly teleconferences.

Other university distance education projects, such as print-based correspondence courses, open university programs, etc., can benefit from a telecommunications system. In general, telephone-based systems are an effective and successful way to deliver education when:

- the instruction is relatively specialized and not easily accessible

- the number of learners is somewhat limited
- interaction is important to the learning process
- the students are motivated and are experienced learners
- face-to-face instruction is impossible, low quality, or too expensive
- highly skilled teachers are not readily available locally

Broadcasting systems, on the other hand, are cost-effective for teaching mass audiences. Telephone-based systems are not cost-effective for teaching mass audiences, but they have a definite place in more specialized learning situations because they allow discussions and responses to individual questions. This interactivity has long been recognized as an effective and essential teaching technique and forms the basis of most university instruction.

SISDIKSAT: THE INDONESIAN DISTANCE EDUCATION SATELLITE SYSTEM

BACKGROUND

Higher education in Indonesia is now facing a number of challenges that require innovative responses. Years of heavy investment in primary and secondary education have greatly increased the number of high school graduates. Each year over one-half million graduates compete for fewer than 110,000 openings at the 48 government-supported institutions of higher learning. The 550,000 "losers" must look for places at inferior private universities, wait for next year's exam to try again, or give up their goal of a college degree.

Combined with these demographic imperatives, Indonesia's rapid economic growth and expanding need for trained manpower have placed great pressure on the higher education system. Established universities lack the capacity and personnel to meet the demand for higher education. Recently created universities--located primarily in the outer islands--have even fewer resources, professional staff, and facilities to fulfill the nation's needs. Widely scattered across Indonesia's 5,000 inhabited islands, these newer universities face limitations of growth based on self-reliance.

Indonesia's higher education needs are many: to increase the capacities of existing institutions, to increase the quantity and quality of education, and to increase the equality of access to the nation's universities.

To accommodate the national need for skilled manpower, Indonesia's Ministry of Education estimates that it must double university enrollment by the turn of the century. This ambitious goal requires a massive staff development effort to recruit new teachers and upgrade the skills of the present faculty. Distance education strategies appear to provide a viable solution. In the early 1980s, the Directorate General for Higher Education (DGHE) began planning a print-based Open University and exploring other distance education options.

As Indonesia's population bubble was slowly working its way through the education system, Indonesia became the first country in the developing world to create its own satellite-based communications network. Launched in 1976, the Palapa A-1 was soon followed by two other satellites in the expanding system which has been crucial in linking the thousands of islands comprising the 3,000-mile-long Indonesia archipelago.

Although Indonesia was a pioneer in adopting satellite technology, it had done little to use its extensive satellite network for other than commercial services. Equipped with expensive satellites, expanding ground system, and a cadre of organized and well-trained technicians, Indonesia had not yet exploited this major resource to achieve its development objectives.

In 1982, with the initiation of the SISDIKSAT Distance Education Project, the resources of the Palapa telecommunications system were employed to meet the challenges of increasing the opportunities for and quality of university education in Indonesia.

DESCRIPTION

The SISDIKSAT Distance Education Project is designed to maximize the scarce professional and teaching resources of the Eastern Islands Universities Association (BKS).

A group of fairly new universities and teacher training colleges--some founded as recently as 1981--on the islands of Kalimantan, Sulawesi, Maluku, and Irian Jaya, the institutions of the BKS are confronted with numerous problems. Isolated by vast distances of ocean, each university must depend on its own limited resources to achieve the rapid development and growth required of Indonesia's higher education system. Alone, they can neither offer the quality of instruction and full curricula expected of universities nor are they able to serve the overwhelming number of students requesting admission. Multi-site communications are critical to their development.

Linking 12 remote universities spread over 900,000 square miles, with a telephone-based communications network, SISDIKSAT provides a mechanism for:

- sharing staff skills and specialized expertise to reach students with quality instruction;
- upgrading faculty knowledge and teaching skills to ensure that more trained instructors are available to the university system;
- redressing the imbalances among the universities by making available the resources of older, well-staffed institutions; and
- overcoming low productivity and inefficiency resulting from poor management and self-directed student learning.

Through its teleconferencing network, SISDIKSAT provides rarely available academic courses to university students and improves faculty knowledge and teaching skills through in-service training programs and seminars. Its effect is to make the expert resources of one university available to the others, thus multiplying each professional's outreach and impact. Within the 11 BKS universities participating in SISDIKSAT, each generally surpasses the others in an area of expertise. For example, UNMUL in Samarinda emphasizes forestry studies; UNPATTI in Ambon is developing its capacity in fisheries and shipbuilding; and UNHAS in Ujung Pandang, the oldest and largest university, serves as a regional resource center.

With agriculture as the major economic activity in the region, the universities have a strong agricultural orientation. Included in the SISDIKSAT network is the Java-based Bogor Agricultural Institute (IPB)--Indonesia's premier agricultural university--which serves as a "center of excellence."

Far removed from the policy- and decision-making headquarters in Jakarta and from each other, the universities of the BKS have depended on infrequent and costly travel for management meetings. Linking the universities with DGHE headquarters in Jakarta, SISDIKSAT facilitates administrative and institutional communications, allowing university and DGHE administrators to "meet" in teleconferences for discussion and coordination.

Focusing on university students, faculty, and administrators, SISDIKSAT's main activities are course sharing, enrichment seminars, training programs, information exchange, and message service.

In short, SISDIKSAT has two primary objectives:

- in the short range, to provide higher quality education so more qualified students are available to fill national manpower requirements;
- in the long range, to develop faculty capabilities so more trained teachers are available to meet the growing demand for higher education.

Institutional Placement

Direction and administrative responsibility of SISDIKSAT range over three levels: national, regional, and local. At the national level, overall direction for the SISDIKSAT Project was placed with the Ministry of Education's Directorate General of Higher Education. Classified as a "national project" which receives its funding from its national development budget, oversight for the Project was lodged with the Office of Academic Affairs, the planning and development arm of the DGHE. The initial aim was to experiment with the communications network in the eastern part of the nation; if successful, it would be expanded to cover other parts of the country and given permanent support in the DGHE's routine budget.

The DGHE was responsible for funding and negotiations with other national agencies--such as PERUMTEL, the telecommunications authority, and the Secretariat Kabinet, supervising customs clearance. Beyond financial and administrative support, the DGHE did not play a large role in SISDIKSAT direction and management, leaving that to the University Association.

Essentially a regional project serving the eastern islands, SISDIKSAT falls under the umbrella of the Eastern Islands Universities Association (BKS). Project headquarters were placed at Hasanuddin University in South Sulawesi, the designated "hub" or resource center of the Association. Yet the BKS is in reality a loose coalition of the region's universities whose goal is to promote resource sharing as desired. Within the hierarchy of the higher education system, the BKS has no administrative power and only as much authority as delegated by its member institutions at the local level.

The individual universities are the true locus of power. Reporting directly to the DGHE (and not to the BKS), each university enjoys a high degree of autonomy and independence. In essence, SISDIKSAT must respond to both the needs and management imperatives of 11 different universities and rely on their ability to make timely decisions and reach consensus.

Support

A bi-national effort, SISDIKSAT received support from both USAID and the Government of Indonesia. While AID funds covered equipment, installation, and technical assistance costs, significant support was provided by the DGHE from its development budget. The overall budget for SISDIKSAT was allocated by the DGHE and then broken up into 13 different pieces: a DGHE budget to pay for telecommunications charges and Jakarta expenses; a project office budget to pay for program development, technical maintenance, and daily operations; and 11 site budgets to help pay for local staff and the daily operation of the classrooms. In addition, each site used local funds to pay for the furnishing of the classrooms and for staff and other costs. The SISDIKSAT central office had no direct control over any of the money spent at the local level. Guidelines for its

use were established, but although it was earmarked for SISDIKSAT activities, it fell completely under the control of the local university administration. With the conclusion of the Project Agreement in 1986, SISDIKSAT support is provided exclusively from the funds of the DGHE and its university allocations.

SISDIKSAT Management

SISDIKSAT is managed by a core staff at the central project office in Ujung Pandang with locally appointed staff at each site. With institutional leadership fragmented among the DGHE and universities, Project headquarters has become the heart of SISDIKSAT operations. The highly active SISDIKSAT staff has established a strong administrative, technical, and program management structure for coordinating central office and site activities.

Central project staff consists of three key members--the Project Administrator, Chief Technician, and Program Coordinator, their assistants, and a few support staff; local staff includes a Local Coordinator, Local Technician, and Local Operators. Appointed from local university faculty and staff, virtually all SISDIKSAT personnel work on a part-time basis. Although the management demands of the extensive SISDIKSAT network are many, it is impossible to assign full-time staff, given the existing shortage of university personnel in the region. Thus, in addition to their other duties, SISDIKSAT staff has assumed the heavy burden of managing a 13-site network spanning 2,500 miles and delivering over 15 courses each semester.

Staff responsibilities are divided along three lines: administration, technical operations, and program development.

The Project Administrator manages the scheduling of the activities on the SISDIKSAT network and the operation of the Project Office. The Administrator maintains close contact with the Local Coordinators. Usually senior faculty members, the Local Coordinators oversee all local SISDIKSAT activities, including supervision of the Local Technician and operators and management of the budget allotted to the site from the DGHE through the university. The Local Coordinators are critical in conducting program needs assessments, creating local interest and support, and serving a pivotal liaison between SISDIKSAT headquarters, local university staff, and the outside community.

The technical area is headed by a Chief Technician and Assistant Chief Technician stationed at the project office. Members of the engineering faculty and specialists in electronics, they supervise the overall operation and maintenance of the system, provide technical support and training to the local sites, and coordinate all work with PERUMTEL, the national telecommunications carrier.

At each site a Local Technician, a faculty member with either a degree or some experience in electronics, serves as main technical supervisor and maintenance expert. Also at each site are two to five Local Operators who are responsible for daily equipment operation.

The Program Coordinator is responsible for the development of presentations to be delivered over SISDIKSAT, including courses and seminars, for assistance to users, and for evaluation of the programming. The Program Coordinator works closely with Local Coordinators in assessing and coordinating site needs, with the universities' academic affairs committees in course and instructor selection, and with faculty members in

curricula adaptation, materials development, and teleconferencing techniques. Given the volume of courses, an attempt was made to recruit and train a team of course development experts, but funding support was insufficient.

A key position called for in the original Project Plan was that of Project Director. Designated as chief spokesperson and liaison officer for SISDIKSAT, the Project Director was to work closely with the various management levels in overseeing the Project and serve as SISDIKSAT advocate at the national level. Unfortunately, this critical post has remained unfilled since the early days of the Project. Its continued vacancy has in no way diminished the need for such a staff person and has served only to demonstrate how essential a senior-level project leader is in garnering support for an innovative project.

The fragmented nature of project direction has proved problematic throughout SISDIKSAT's history and at times has undermined project operations. Although the course development and delivery structures established by SISDIKSAT's central office are effective and the linkages forged with the local sites remain strong, SISDIKSAT suffers from its ambiguous position in the higher education system. A national project without national leadership, a regional project attached to a weak regional association with little authority and no resources, and a project without a director to bridge the management gaps, SISDIKSAT has fallen into a leadership vacuum.

In the absence of strong leadership at the national or regional levels, the dedicated Project staff have assumed these responsibilities. Yet, SISDIKSAT's mid-level staff lacks the official authority to compel full support and participation from the eastern island universities, as well as the professional stature to negotiate with top university officials. In the end, SISDIKSAT management has had to rely on voluntary cooperation and collaboration. Because most of the universities have been eager participants in the SISDIKSAT experiment, Project operations have moved ahead and kept pace with increasing demands for service. But this success may be tenuous. As more sites join the SISDIKSAT network and as more programs are added, it should become increasingly difficult to manage a multi-site communications network solely on the basis of good will. Management shortfalls will occur in course selection, scheduling, materials production, and in financial support.

SISDIKSAT has developed a sound internal management system which supports multiple programs and thousands of students each semester. It must find the proper "institutional" home to maintain its growing operations.

SISDIKSAT TECHNICAL NETWORK

With 15 sites, SISDIKSAT is the **largest teleconferencing network** in the developing world, connecting 12 widely separated and remote universities in the eastern islands of Indonesia, the Ministry of Education and Open University headquarters in Jakarta, and the agricultural institute in Bogor. Since SISDIKSAT began operations, four additional sites have joined the network.

A fully interactive communications system, SISDIKSAT utilizes the dedicated voice channels on the Palapa satellite and a four-wire ground telephone system. The most technically complex and ambitious of the three RSP teleconferencing networks, SISDIKSAT posed a real challenge for demonstrating the specialized use of satellite communications for development.

Electronic Classroom

The SISDIKSAT "electronic classroom" consists of an audioconferencing channel for two-way voice communications. A second channel is used for a number of purposes: graphics and hard copy transfer, private telephone conversations, and as a redundancy or back-up feature. Each site is also equipped with auxiliary power supply units.

The audioconferencing and network control equipment form the core of the electronic classroom, providing and regulating the basic interactive voice communications. Based on the "party line" principle, any site in the network can initiate communications and be heard by all other sites. Unlike a typical telephone conversation, however, only one person can speak at a time. Simultaneous conversation is not possible.

Each SISDIKSAT classroom, accommodating 40 to 80 students, is equipped with 12 microphones--one for every four students. At some sites where SISDIKSAT course attendance exceeds room capacity, technicians have jerry-rigged speakers in adjoining classrooms to broadcast lectures. Whereas the professor--or presenter--is provided with a lavaliere-style microphone to allow free movement, the students are equipped with unidirectional push-to-talk microphones designed to discourage the transmission of background noise and prevent inadvertent jamming of transmissions by leaving the microphones on after speaking.

The central piece of equipment in each classroom is the telephone terminal--or network control--box. Regulating the interface between the classroom equipment and the outside telecommunications system, this device performs a variety a variety of tasks: it sets signal levels to regulate transmission quality, provides "addressable" control for each piece of graphics equipment and a privacy feature excluding selected sites from the teleconference, and engages both channels for simultaneous transmission of voice and graphics.

In the planning stages, the Directorate and BKS members made it clear that graphics support for lectures was very important. A variety of new interactive graphics transmission systems using telephone lines had recently come on the market, although there had been little field experience with their application or use. As an experiment, each classroom was equipped with a facsimile machine and telewriter. And, as described above, a second satellite channel was incorporated into the network to allow for the simultaneous transmission of voice and graphics.

Given the great distances separating the universities, it is clear that physically moving paper to the sites presents a problem. Facsimile machines at each site facilitate the exchange of course notes, research articles, and administrative memoranda quickly and inexpensively. The SISDIKSAT facsimile system offers automatic, unattended reception, operates at slow (3-minute) speeds to overcome line noise, and uses plastic-coated paper to avoid jamming in the high humidity.

In Indonesia, blackboards are considered a major teaching tool. A graphics system--or telewriter--developed by the Open University in Britain was purchased to provide an "electronic blackboard" capability. Using a special "light pen," a professor can write or draw on a television screen; the image is digitized and sent over the communications network and displayed on a receiving monitor and on auxiliary display monitors strategically located in the classroom. A studio system allows for the creation of more elaborate "canned" graphic cassettes, pre-taped for later use.

Because of frequent power outages and unstable power supply at all of the Project sites, auxiliary power supply systems are located at each classroom to regulate power surges, stabilize incoming voltage, and provide emergency back-up power. The system consists of rechargeable batteries, battery charger, a DC/AC power inverter, and line voltage regulator.

Transmission System

Because Indonesia already owned a domestic satellite, there was no question of the means of transmission or of selection of a carrier; PERUMTEL had sole charge of the Indonesia telecommunications system. As interactive graphics transmission was part of the applications design, two transmission channels were required to allow simultaneous transmission. Given this requirement, the satellite architecture was a critical point for controlling costs.

Unlike most conferencing systems which use a terrestrial bridge to link multiple sites, SISDIKSAT uses the Palapa satellite itself as a bridge in a "loopback" or half-duplex design. Transmission at any one site goes up to the satellite and back down to all sites. This loopback design dramatically reduces the number of channels that need to be leased. Using a conventional terrestrial bridge design, the original SISDIKSAT network would have required 40 satellite channels, 2 channels per site; the loopback design option uses only four frequencies for the entire system, two channels in all. At about $190,000 per channel, the cost savings is very significant.

Although economically attractive, however, the loopback option had two disadvantages. Its use was largely untried and experimental, requiring the introduction of nonstandard procedures and equipment at each earth station which made PERUMTEL understandably hesitant to try the design. The use of the satellite as a bridge also makes the network more susceptible to noise. The satellite bridging plan allows only one site to transmit at a time; once in the transmission mode, no site can be interrupted.

All SISDIKSAT sites rely on the existing telephone system; access to the satellite is achieved through dedicated lines from the universities to the nearest earth station. The land lines and satellite capacity are leased on a 24-hour basis to ensure full-time circuit access, bypassing the noisy local telephone switches and controlling circuit quality.

Although a government agency, the Ministry of Education was initially treated by PERUMTEL, also a national agency, as any commercial customer--as the circuit charges indicate. Furthermore, SISDIKSAT's dedicated multi-site configuration was without precedent; PERUMTEL figured the charges on a distance basis, resulting in the same high tariffs for long distance service prevailing throughout Indonesia. It appears, however, that the Ministry of Education will soon request and receive a payment waiver.

Typical of the Rural Satellite Program projects, the technical management of the SISDIKSAT network is shared by the user, SISDIKSAT, and the telecommunications company, PERUMTEL. The high level of cooperation and collaboration achieved between the two parties is a model for future projects. Viewing the Project as an opportunity to experiment with possible commercial service options, PERUMTEL has proved a supportive partner in this innovative effort. In charge of all "outside plant" operations, i.e., local and long distance transmission service, PERUMTEL nevertheless has been willing to

accommodate the new equipment at its earth stations and follow new procedures required by the network design. It has assigned a management team to the project, laid new cable as required, and tracked and minimized noise problems through corrective maintenance.

Although considerable, due to the extent and complexity of equipment, SISDIKSAT's technical responsibilities are limited to the operation and maintenance of the electronic classrooms. Central maintenance and repair facilities are located at SISDIKSAT headquarters under the direction of the Chief Technician and his assistant. Mainly managing technical operations over the network itself, the two technicians direct local technicians in routine maintenance tasks, such as level setting, conducting initial diagnostic testing, and advising repair procedures. Regular refresher training for the Local Technicians is also presented over the network.

Much of the first-line repair strategy is based on component swap-out, with the damaged parts returned to the central office for repair or shipment to specialized commercial repair shops. The preventive maintenance plan calls for a semester visit to all sites, but this is often prevented by budget shortfalls and travel is predicated on emergency trouble-shooting.

Network Performance

Not surprisingly for an innovative undertaking, the SISDIKSAT network experienced many initial disappointments.

First were the frustrations arising from the unrealistic expectation that technical design, procurement, and installation could be expeditiously accomplished over a nine-month period. In actuality, putting the technical network in place took almost twice as long, with final burn-in completed in August 1984, nearly a year and a half after start-up.

Second, and of more critical importance, noise on the network increased to an alarming degree as installation progressed. When all 11 sites were linked into the network, periods of high-quality transmission would be interrupted by loud bursts of noise which would last for seconds, minutes, and sometimes even hours. The cause of the noise was traced to either poorly grounded or damaged local (i.e., terrestrial) lines or to storm interference with improperly shielded lines. Because of the party-line design and satellite bridging, line noise originating at one site can be automatically passed to all other sites. Whatever or wherever the source, the effect was often deafening and certainly inhibited teleconferencing.

To prevent cumulative line noise, a "gating" system was designed and placed at the classrooms and central telephone exchanges at each site. A signal from the transmitting classroom closes the transmit circuits at the other end of the local telephone line thus preventing the transmission of line noise and other localized disturbances to the entire network. In areas where electrical storms are frequent and local lines are normally poor, this device has improved greatly the audio quality throughout the system.

With the installation of the "gates" and regularizing of operations, the technical system has achieved near-perfect performance, far surpassing commercial telephone service. **Only 2.3 percent of SISDIKSAT program activities have been cancelled because of technical problems since mid-1985; only 2.7 percent of network time experienced any**

technical difficulties. However, this 98 percent technical reliability record of the audio capacity does not extend to the graphics transmissions.

Although the facsimile component works well for point-to-point transmissions, the Aregon telewriting system has been a major disappointment. To date, it has never operated on a multi-site basis with any regularity or frequency. Malfunctions have ranged from the light pens to the modems to the focus potentiometers in the monitors. Its poor performance results from several factors: overly complex design, susceptibility to climatic conditions, demanding technical oversight, and extreme sensitivity to line noise--a virtual given of the Indonesian telephone system. Because of its unreliability and inability to function on a multi-site basis, its function has never been incorporated into regular SISDIKSAT activities, with apparently no ill-effect on the network's instructional effectiveness--contrary to earlier claims that blackboards were an indispensable teaching aid.

A final "technical" problem remains unresolved: the issue of technical management.

Although technical training and extensive spare parts have been provided, logistics and manpower continue to be a problem. Getting a failed piece of equipment to SISDIKSAT headquarters takes coordination and money, and after reaching Project headquarters, repair takes time and skills that are at a premium. The SISDIKSAT technical staff has proved very able in assimilating new knowledge and has developed many innovations and technical adaptations to suit local conditions, but more than sophisticated technical skill and knowledge are needed. The technical system requires vigilant management and a small, but full-time cadre of technicians to ensure that all equipment at each of the 13 sites is in good operating order.

At present, SISDIKSAT continues to operate with part-time staff and limited funds.

SISDIKSAT PROGRAMS AND ACTIVITIES

In October 1984 SISDIKSAT initiated a trial semester offering two courses; it is currently completing its sixth semester with a regular schedule of 15 courses. **To date it has delivered 75 undergraduate courses, developed 35 new courses, and reaches over 3,500 students each semester.** Use extends beyond normal course delivery to other activities, including training, faculty seminars, and administrative conferences and to other user groups. The Open University uses SISDIKSAT for regular in-service training for its local tutors in the eastern islands and for administrative communication with its provincial offices. The Directorate General of Primary and Secondary Education is now launching in-service training for its teachers. Other groups such as the Summer Institute of Linguistics and the Bogor Graduate Agriculture Program use the system for weekly management meetings.

Program Development and Delivery

SISDIKSAT emphasizes primarily a three-pronged course exchange program among its members. SISDIKSAT develops course materials in the national language, delivers courses for at least two semesters to meet the short-term needs of its members, and works with junior faculty so that they can teach the courses in the future without SISDIKSAT. This strategy ensures the greatest impact on the institutional capacity of the SISDIKSAT universities. SISDIKSAT's goal is to deliver a course once, revise it, teach it

again, and then move on to other courses with the confidence that the local tutors could now teach the course locally--using the system only for occasional support from the master teachers.

In developing programs, SISDIKSAT's objective is to serve the largest number of common needs of the universities and to make the most of available resources. The SISDIKSAT program development process is a straightforward procedure based on negotiation and collaboration.

First, a needs assessment is conducted via a written survey and discussions with the sites. Questionnaires are sent to the university rector and his staff asking that they both identify the courses needs and the courses the institution is willing to offer. SISDIKSAT collates the responses, identifies the 25 most requested courses, and prepares a list of those courses the universities have offered to teach.

Second, meeting over the network, the academic deans select 10-15 courses for the semester based on need and resource availability. The general guideline calls for a minimum of 2-3 sites following a course. No site has yet participated in all courses; no course has yet been taken by all sites. At the same time, course development teams are identified, with emphasis being placed on seniority and educational level.

Finally, SISDIKSAT staff works with the three-person course team to prepare the course for distance teaching. Initially, course development guides are sent to the team with information on adapting existing course materials and developing new material such as study guides and visual aids. This is followed by training sessions in teleconferencing techniques held over the network. SISDIKSAT reproduces the materials and distributes them to the participating sites.

SISDIKSAT's original intention was to focus on materials adaptation for the distance medium; however, it was discovered that few materials existed or were in Bahasa Indonesia. Plans for study guides often give way to the need for basic textbooks. SISDIKSAT course materials have been very well received and are often used in non-SISDIKSAT courses. In fact, materials are so important in the resource-scarce region that 63 percent of SISDIKSAT's faculty seminar participants have indicated that their attendance is predicated on the distribution of handouts.

To establish guidelines for materials development, SISDIKSAT has developed a series of handbooks, as well as a few prototype courses. For example, an extensive textbook series and student study guide (with week-by-week instruction for students and local tutors, study questions and problems, and supplementary notes) were developed for a statistics course. To demonstrate how a course with a practicum component should be taught, a range of materials was prepared for a poultry production course: a textbook, a reference text, a slide series, practicum exercises for local use, and a student workbook.

In general, the course development process has worked well. Occasionally, the most qualified professor identified to teach a course is not the best teacher, despite his seniority. More often, materials do not always follow the prescribed SISDIKSAT format and are prepared late. Finally, without direct access to a central budget, SISDIKSAT often experiences difficulties in paying course presenters.

The SISDIKSAT schedule is almost fully booked from 8:00 a.m. to 5:00 p.m. for courses and conferences. In actuality, network use starts two hours earlier with administrative conferencing among the three universities in the eastern time zone and continues into the evening with specially requested courses and Open University use.

Each site has appointed 2-5 operators to staff the electronic classroom throughout the day. At those sites participating in additional programming, the operator works into the evening.

The course team (master teachers) shares the instructional responsibilities over the system (generally 100 minutes per week), while local tutors (often junior lecturers in the course subject) at each receiving site supervise students, lead local discussions, administer and correct tests, and generally serve as the arms and eyes of the distant master teachers.

Each course consists of a two-and-one-half hour session on the SISDIKSAT network once a week plus any additional activities assigned by the local tutor. Of this time, approximately 100 minutes are reserved for instruction, 20 minutes for start-up and breaks, and 30 minutes for a tutors' meeting.

Course delivery is highly interactive, with 10-20 minutes of lecture punctuated by questions and discussion. In addition, students are asked at least once in the semester to evaluate the course. Based on their comments, the master teachers revise the course and materials for subsequent semesters.

The use of SISDIKSAT courses is highly individualized by each university. Although often the only means of receiving a course, SISDIKSAT courses are sometimes used as supplements to existing courses. For example, a master teacher who teaches the same course on his own campus may require his students to attend portions of the SISDIKSAT course as well; in many cases, students voluntarily audit courses to augment their learning. Use of SISDIKSAT courses are generally left to the discretion of the local tutor, including additional assignments, and preparing and administering of exams. The majority of tutors (63%) held at least seven meetings outside SISDIKSAT time, and only 17 percent used the master teacher's exam unchanged. Course credit and grades are not assigned by SISDIKSAT, but are determined by the local universities.

Programs

The main SISDIKSAT activity is the **course-sharing** among the sites: nine universities and two teacher training colleges in eastern Indonesia and the Agriculture Institute at Bogor, Java.

After the technical problems decreased in late 1984, SISDIKSAT decided to test the quality and reliability of the system by offering two courses (statistics and food science) in an experimental semester to determine if the system was ready to be used intensively for programming. When both of these courses ran without any major technical problems, a full semester of 12 courses was begun in February 1985. The number of courses was increased to 15 for the second semester of 1985. This was believed to be the optimum number of courses that could be offered during regular class times, given the need to have system time available for other uses. In fact, 17 courses were actually delivered because Cenderawasih University of Irian Jaya, in great need of law courses, paid for the development and delivery of two courses on criminal and agrarian law during the evening hours when the system was not otherwise in use.

In principle, SISDIKSAT courses are taught for two semesters, then temporarily "retired" from the roster on the theory that local lecturers would be able to teach the course, the network could be used for new programs, and the process repeated with a

multiplier effect. In practice, however, certain basic undergraduate courses--such as statistics--are so popular that they have been continuously repeated, attracting such large audiences that now even universities with appropriate teaching capabilities use SISDIKSAT and no longer offer the course locally.

Originally, it was thought that the most rational focus of the distance courses would be at the graduate level; but the demand for undergraduate education has been so great that the majority of SISDIKSAT courses are for the undergraduate.

Teacher training and faculty development are important goals of the SISDIKSAT project. The original implementation plan called for the system to be used in support of an ongoing national faculty development program called Akte Lima. This program sought to improve the skills of junior faculty members through a mandatory program that utilized print materials on different content areas and pedagogical topics and local classes arranged at the discretion of each institution. Unfortunately, SISDIKSAT investigations found that the Akte Lima program itself was weak and therefore would be inappropriate to present in a distance teaching format.

In conjunction with its course-sharing program, however, SISDIKSAT was able to develop a **staff upgrading program.** Aimed at the local tutors designated to monitor the SISDIKSAT courses, SISDIKSAT has incorporated a teacher-training component into each course session. At the beginning of the semester, a series of meetings between the master teachers and local tutors takes place to discuss materials development, course content, and organization. During the semester an extra 30 minutes are added to each course's time slot to allow the master teachers and local tutors to review the material, address any tutor or student problems, and preview the coming week's lesson. This gives the local tutors due opportunity to ask questions that improve their own knowledge.

To a great extent the courses themselves serve a major training function. In addition to the mandatory presence of the tutor, many local lecturers and junior faculty audit the course.

Seminars are also used to provide isolated faculty members with new information in their fields and opportunities for scholarly discussions with their peers. Originally, SISDIKSAT began its seminar program by broadcasting face-to-face seminars that were held in Ujung Pandang. Subsequent seminars were arranged at faculty requests, and today SISDIKSAT presents a seminar series based on recently completed doctoral and master's research. These seminars have proved tremendously successful; the 1986 series, arranged for the semester break, attracted over 1,800 (voluntary) participants with 99 percent asking for additional programs. SISDIKSAT has definitely identified a strongly felt need of the faculty in the region and, based on attendance records, also of personnel from the agriculture and health sectors.

Indonesia's Open University uses SISDIKSAT to deliver a **training program** for its local tutors in the eastern islands. Beginning with four hours per week and progressing to 10 hours per week in 1986, tutors for specific courses meet for two-hour sessions with the Open University's course writers to discuss materials and content.

A third major activity of SISDIKSAT is **administrative conferencing.** Faculty members at IPB and UNHAS use the system for the coordination of a joint graduate program where students studied at both campuses. The Summer Institute of Linguistics uses the system for weekly staff meetings between team members at five of the SISDIKSAT locations. SISDIKSAT takes advantage of the fact that it spans three time zones to

allocate early morning time to Cenderawasih University for communication between its main campus at Jayapura and its agricultural campus at Manokwari over 500 miles away. They were able to use SISDIKSAT for inter-campus communications from 7:00 a.m. until 8:30 a.m.

A crucial use of the system was for the operation of SISDIKSAT itself. The administrative staff used the system for communications with the Local Coordinators, Jakarta officials, and course development teams and to track the shipment of materials to all of the sites. The programming staff used the system for meetings with academic rectors and deans for setting up the course-sharing program and for orientation programs for materials developers, teachers, tutors, and students. The technical staff used the system for training programs for Local Technicians and Operators and for conducting system tests and maintenance functions.

Although many SISDIKSAT uses and applications have not turned out as originally envisaged, the member universities and SISDIKSAT have adapted the network to their particular needs and made it theirs.

ATTENDANCE, USAGE, PARTICIPATION, AND EFFECTIVENESS*

Between October 1984 and December 1986, sixty undergraduate courses were presented over the SISDIKSAT network. **SISDIKSAT was able to deliver about 83 percent of the scheduled class sessions, a record slightly above the average for face-to-face courses.** Less than 3 percent of the cancellations resulted from technical failures; the remainder were caused by failures in the "human system." Teacher absence accounted for the majority (71%) of class cancellations. Many Indonesian faculty members do not place a high priority on holding the mandatory 12-16 classes per semester, although SISDIKSAT teachers appear more faithful in attending their distance courses.

Student absence was mainly confined to the first weeks of the semester, primarily as a result of the slightly different academic calendars in effect at the universities.

Student attendance fluctuated from week to week because of the general lack of emphasis on attendance in the university system and the irregular attendance of some local classes that used the SISDIKSAT courses as a supplemental activity. The average weekly attendance for a single course ran from 470 for a mandatory freshman course to only 20 for a more specialized course. The average weekly attendance for all courses during the first three regular semesters ran from 1,200 to 2,500 students. **The most recent figures show average attendance approaching the all-time high of 3,500 students,** at about 3,200-3,300 a semester.

By 1986 the average operational SISDIKSAT week was 68 hours; 52.5 hours (77%) were programmed in advance. Primary usage of the network is for course delivery: about 36 percent of network time is devoted to this activity. Optimum use, based on a scheduled 100 minute/class, calls for 45 percent of network prime time. Cancellation of classes and failure of teachers to fully utilize the allotted time accounts for the lower figure. There is also a shortfall in the utilization of the half-hour per class designated

* Based on data from 1984/85 and 1985/86.

for tutor meetings. In 1986, 21 percent of the classes used this additional time. Even though there is usually more than one tutor per course per site, 65 percent of the local tutors indicated they attended every class.

Official university business, meetings, and official messages constitute 27 percent of network use, while SISDIKSAT internal administration, technical management, and training sessions use 19 percent of network time. Finally, 7 percent of network time is used for private message transfer, with "silence" or unscheduled transmissions accounting for the remaining 17 percent.

Most universities sent a substantial number of students to SISDIKSAT courses, but highest attendance is credited to the most isolated, the most distant, and the youngest institutions. The two eastern-most campuses account for nearly one-third of the SISDIKSAT students. These two campuses also regularly use off-hour system time for administration and "purchase" special courses for evening presentation, basically using SISDIKSAT over a 12-13 hour period per day.

In general, the lowest and weakest attendance occurs at the largest and best-staffed institutions in the SISDIKSAT network. Not surprisingly, they view themselves as sources of expertise and course presenters, rather than needful recipients. Indeed, the other universities are eager to receive courses originating from these sources, and they are always well attended. Evidence indicates, therefore, that SISDIKSAT is useful and convenient for the larger universities; it is essential to the smaller and remote campuses.

User acceptance, attitudes, and assessment of the effectiveness of the SISDIKSAT network are overwhelmingly positive. Over the course of two semesters, over 3,000 students, local tutors, master teachers, and seminar participants have been surveyed about their experience with SISDIKSAT. Because course use differed from university to university, exams not standardized, and grades issued locally, SISDIKSAT effectiveness can be judged by participant assessment.

Eighty-five percent of SISDIKSAT's undergraduates found the distance courses to be well organized and presented, with sufficient time for participation, and over 81 percent thought that SISDIKSAT teachers were as good or better than their local instructor. Both the teachers and tutors seem to agree: 83 percent of the tutors felt the courses met the needs of the universities, while nearly 80 percent of the master teachers indicated the content of the SISDIKSAT courses was more complete than their regular classes, although preparation was more demanding. A few of the master teachers expressed concern that they could not cover as much material as they were accustomed to because the SISDIKSAT courses attracted a wide range of students from a variety of academic orientations. For example, the statistics professor found that in addition to his regular students from mathematics departments he was teaching students from agriculture and science departments without a comparable grounding in the subject area. His teaching pace altered accordingly.

Study and print materials played a large role in successful course delivery. Both students (80%) and local tutors (97%) found the materials as good or better than regular materials. Local tutors indicated they would use the materials in their face-to-face courses as resource references for students (75%), a guide for their own courses (51%), or as main reading for their own course (21%). Ninety-six percent of the seminar participants responded that handouts made presentations more effective; without handouts only 37 percent were certain they would attend.

The interactive nature of the SISDIKSAT network introduced a feature rarely employed in face-to-face university classes in Indonesia, namely two-way communication and discussion. In training sessions, SISDIKSAT teachers were encouraged to break lectures with time for question and answer periods. Surveys of SISDIKSAT classes show a striking difference:

- SISDIKSAT classes were more interactive; 97 percent of distance classes allowed time for students to speak, compared with 55 percent of regular classes.
- SISDIKSAT classes devoted a larger percentage of class time to student discussion; 12 percent of distance class time was spent in student discussion, compared with 6 percent in regular classes.
- SISDIKSAT classes used more class time for student-teacher discussions; distance classes averaged 31.6 minutes compared with 4 minutes in regular classes.

Such interaction, therefore, involved a significant change in teacher behavior. Yet, 95 percent of the master teachers were comfortable teaching over the network. Students, too, were comfortable with the interactive format: 56 percent indicated they had used a microphone and almost 7 percent said they used it every class. In fact, the students indicated that, protected by the network's anonymity, they were more likely to ask questions than in the professor's presence.

The interaction was meaningful. Eighty-five percent of student interaction took the form of substantive questions. For every 8 minutes of questions, there were 23 minutes of teacher response.

And the interaction was valuable. Seventy-four percent of the students said they learned from the questions and discussion; an equal number said they would not reduce the interaction.

Sixty-seven percent of SISDIKSAT students said they learned as much or more from the distance courses as from their regular courses. More telling, 95 percent of their local tutors felt the students learned as much (35%) or more (65%). Because the local tutor was generally the course instructor in the absence of SISDIKSAT, this response is all the more striking in view of its self-judgment implications.

Yet despite these highly positive responses--that SISDIKSAT teachers and materials were as good or better, that courses were well run, that greater interaction was beneficial--both students and tutors expressed a continued preference for locally taught courses. Only 20 percent of students preferred taking a course via satellite.

This ambiguity results from several factors. First, there is the natural human preference for face-to-face interaction--particularly strong among Indonesians. Also, occasional technical problems and poor soundproofing in some classrooms may have annoyed some students. There are probably also some students who are not very interested in high quality instructors and materials. They may prefer a locally produced 50-page text to a SISDIKSAT-produced 300-page text. Objectively, the students are saying that the satellite courses are very good; emotionally, they are saying that they still feel more comfortable with their regular system.

This response is one indication that audioconferencing programs may be more appreciated by more mature learners who have clearly identified learning needs and recognize

the value of outside expertise. Such people are more likely to look beyond the delivery system and base their opinions on the value of the information they receive. Upperclassmen, graduate students, and, especially, professional people may be a more responsive audience for this type of system.

The overwhelmingly positive evaluation results from data collected from 846 of the seminar participants seem to support this idea. **Ninety-nine percent of those participants found the seminars "very useful" and requested more. Over 92 percent found them "very interesting."** Similar high percentages were positive about the supporting materials, degree of interaction, and format of the programs. Additional positive feedback has come from the Open University tutors getting in-service training over the system and from SISDIKSAT tutors. **From a skills upgrading standpoint, the local tutors have indicated SISDIKSAT courses have increased their understanding of the subject matter (81%), their ability to design and teach similar courses (86%), and their teaching skills (51%).**

Is there a demand for SISDIKSAT? The volume of students, the number of courses, and the growing user base of SISDIKSAT show that there is, and that it effectively answers needs of remote and isolated universities for information and instruction.

Over 13,000 people in the eastern islands have benefited from SISDIKSAT's programs and services. Convinced of SISDIKSAT's value, three additional institutions have joined the network with their own funds. Most classrooms have been expanded to accommodate more participants. And, more importantly, in a time of drastically reduced budgets, the Ministry of Education continues to fund SISDIKSAT without AID assistance. Moreover, it has proposed replication of the network for the western islands in a World Bank loan proposal.

The problems of Indonesia's higher education system are not easy ones. SISDIKSAT has provided a blueprint for a realistic solution to expanding the educational resource base.

UWIDITE: UNIVERSITY OF THE WEST INDIES DISTANCE TEACHING EXPERIMENT

BACKGROUND

The countries of the English-speaking Caribbean are typical of most island nations--physical isolation, small populations, narrow or single-product economies. Likewise, they share many of the same problems that stem from these characteristics--vulnerability to world market trends, insufficient scale of demand to justify and sustain investments in basic services, and steady attrition of trained manpower to more prosperous locations.

Sharing a common heritage as former British colonies, the 17 countries of the English-speaking Caribbean have often pooled their resources to create regional organizations to serve their small-scale, but urgent needs. The University of the West Indies typifies this collaboration.

Supported by 14 Caribbean nations, the University of the West Indies (UWI) is a multi-site institution comprising three campuses--Jamaica, Barbados, and Trinidad--and 11 university centers in the other member countries. Originally founded in Jamaica as a small elite residential college serving the British West Indies, UWI now serves over 10,000 students, 8 percent at the postgraduate level. UWI not only has expanded geographically but also has increased its program offerings as well. Today it consists of eight faculties with each campus loosely specializing at the graduate level. Trinidad focuses on agriculture and engineering, Barbados on law, and Jamaica on medicine. In addition, various institutes are associated with the University, such as the Caribbean Food and Nutrition Institute and the Caribbean Agricultural Research Institute, as well as the University medical facilities.

UWI is characterized by a strong outreach mandate. Of the 4.5 million people in the region served by UWI, less than 1 percent of the labor force are university graduates. The University thus feels a strong need to increase its capacity to provide education, training, and support social services in the region.

In addition to its undergraduate and postgraduate courses, UWI offers professional certification, diploma, and enrichment courses for the adult learner. The various UWI faculties and associated institutes provide "extension" programs for professional groups, industry, and government. For example, UWI at Trinidad provides expertise, training, and management services to the ministries of agriculture throughout the region. By necessity, participants must either reside in or travel to the campus islands.

It is the University or "extramural" centers in the non-campus territories that typify UWI's commitment to its regional and outreach mandate. As centers of culture and learning in the smaller islands, these extramural centers organize educational programs, provide limited classroom and library facilities and academic counseling, and offer tutorial support for students who sit "challenge exams" for university credits. They provide liaison and feedback among the University, member governments, and the communities. Each center is generally staffed by a single university tutor, and its limited range of courses and services are occasionally enhanced by visiting lecturers and staff from the main campuses.

With the worsening economic situation of the Caribbean region, the costs of course delivery and student tuition and maintenance have risen considerably. As more demands are made for faculty and services, UWI has sought ways of improving its services to its constituents in the non-campus territories and maintaining the quality and diversity of instruction of the campuses.

In 1978, UWI looked to telecommunications as a means of meeting the region's pressing demands for education. Project Satellite, a two-month experiment using NASA's experimental ATS-3 and ATS-6 satellites for video- and audio-conferencing for lectures and seminars, provided a model for the use of telecommunications for extension and outreach activities. The interest and enthusiasm generated by the experiment led to the University of the West Indies Distance Training Experiment (UWIDITE) project four years later.

DESCRIPTION

The University of the West Indies Distance Teaching Experiment was the first RSP pilot project to initiate operations--in March 1983--making it **the first full-scale telephone-based conferencing system in the developing world.** UWIDITE links seven sites in six countries with a teleconferencing network: the UWI campuses at Mona (Jamaica), Cave Hill (Barbados), and St. Augustine (Trinidad); a satellite campus at Montego Bay (Jamaica); and extramural centers at St. Lucia, Dominica, and Antigua. UWIDITE provides a means of aggregating and responding to the "small-scale" national demands for training and information--which separately cannot support conventional educational strategies.

Similar to SISDIKSAT in Indonesia, UWIDITE seeks to strengthen the capabilities and complete the academic programs of the three main campuses through resource and course sharing. For example, the second and third year law courses taught exclusively at Barbados are offered through UWIDITE to the other campuses.

Unlike SISDIKSAT, however, UWIDITE's primary focus is not on undergraduate education or faculty upgrading, nor must it meet the staggering demand for higher education that SISDIKSAT faces. Instead, UWIDITE must serve small groups of people in isolated locations who require information and training often quite different from traditional university curricula. UWIDITE is designed to reflect the University's strong emphasis on outreach and in-service training.

UWIDITE offers a diversity of programs that reach beyond the academic community; many of its programs are aimed at the adult learner. UWIDITE "students" range from the aspiring undergraduate seeking admission to a main campus to the high school science teacher, midwife, community worker, and cardiologist desiring additional professional training and certification.

Taking full advantage of the "centers of excellence" at Jamaica, Trinidad, and Barbados, UWIDITE makes campus programs available to the non-campus territories. It extends the University's outreach capability by providing the extramural centers access to the extensive academic, continuing education and extension courses, and upgrades the center's capabilities through expanded tutorial, cultural, and enrichment programs. The UWIDITE user is no longer faced with the dilemma of leaving career and family to obtain additional training.

In summary, UWIDITE serves to:

- strengthen existing academic programs at the main campuses.
- improve the effectiveness of the extramural centers.
- allow students to pursue educational opportunities in their home islands.
- provide a means of communication and interaction to reduce professional isolation and attrition to population centers.
- augment the effectiveness of basic service personnel through improved training.

INSTITUTIONAL PLACEMENT, SUPPORT, AND PROGRAM MANAGEMENT

Institutional Placement and Support

UWIDITE direction and management responsibility is lodged with the office of the Pro Vice Chancellor at the Jamaica campus; the Pro Vice Chancellor serves as project director and has general oversight of UWIDITE. In charge of special projects and development programs system-wide, the Pro Vice Chancellor plays a major role in central university planning and administration. On a personal level, the Pro Vice Chancellor brings a high level of interest and actual experience to the project; previously, he had been instrumental in organizing Project Satellite and the subsequent studies which led to the creation of UWIDITE.

As a "special" or experimental project, UWIDITE's initial operations were supported almost exclusively by USAID through its technical assistance contract and a grant to the University. Under these two mechanisms, the technical network was designed, purchased, and installed; the project structure planned and UWIDITE staff trained; and recurring operational costs--such as leased lines, staff salaries, and faculty honoraria--met. Direct UWI and local government contributions included the classroom facilities. With the scheduled termination of AID support in 1985, the University has assumed full financial responsibility for UWIDITE operations.

Since project start-up, however, UWIDITE has attracted further support from other donor agencies (EDF, PAHO, ILO, etc.), corporations (IBM, Colorado Video), and other AID-funded projects in the form of additional equipment and program sponsorship. In addition to central University support, "sponsorship" or charges to organizations using the network may well present a viable financial support base.

UWIDITE Management

Project headquarters are based at the Mona campus in Jamaica. Management tasks are filled by a full-time core staff with local representatives at each site, similar to SISDIKSAT. While the Project Director is responsible for liaison with the campuses, local governments, telecommunications authorities, and the community, the project officers and staff are in charge of day-to-day operations, program development, and site coordination. Central management responsibilities include:

- operation and maintenance of the "electronic classroom."
- program scheduling and registration.
- materials production and distribution.

- software and materials development (in conjunction with course presenters).
- monitoring and formative evaluation.
- user training.

In addition to these routine tasks, at the outset of the project the staff had to devote considerable effort to public relations--in order to introduce UWIDITE's services to the University and community.

Core staff includes a chief project officer, a project officer primarily in charge of science programs, an administrative assistant, and two clerical and one janitorial staff. Although the original staff plan called for a full-time technical director to oversee equipment installation and maintenance, equipment use training, and expanded network planning, UWIDITE has been unable to permanently staff this position. Skilled technicians willing to work for faculty-level salaries have proved hard to attract and difficult to retain. As an interim measure, UWIDITE relies on the part-time assistance of the Jamaica campus electronics department.

At the extramural centers, UWIDITE activities are managed by the appointed local coordinator, usually the resident tutor, and center support staff in addition to their regular duties. At the Trinidad and Barbados campuses, general oversight responsibility rests with the Pro Vice Chancellors, who, in turn, designate from their staffs a local coordinator and support staff (often part-time assistance from campus students). Each site has made provision for part-time technician support, calling on technically trained (or inclined) faculty members or the local telephone company.

In all, UWIDITE activities are carried out by a full-time staff of seven and a part-time staff of approximately eighteen. Augmenting the UWIDITE management staff are, of course, the faculty who prepare courses and teach over the network, the local tutors who monitor student classroom performance, and coordinators of ongoing UWIDITE programs. For example, faculties using the network frequently, such as the Caribbean Food and Nutrition Institute, usually appoint their own UWIDITE program coordinator.

The UWIDITE Advisory Committee is another important component of the management system. Chaired by the project director, the Committee provides policy guidance and direction and serves as a bridge between university affairs and project operations. Membership includes the three Pro Vice Chancellors, faculty deans, the director of the extramural department, the University bursar, campus librarians, and representatives from each campus administration. The Committee meets twice a year to review UWIDITE operations and plan subsequent service offerings.

Generally speaking, UWIDITE has enjoyed relatively smooth management and administrative operations from the outset of the project, in large part because of the institutional structure of the University itself. Unlike its Indonesian counterpart, UWIDITE serves and is part of a single institution--albeit an international and multi-site one. It benefits from the standardized procedures and policies governing the university system--from uniform semester schedules, class hours, and grading practices to routine coordination meetings, budgetary guidelines, and faculty terms of service. Furthermore, UWIDITE operates under the aegis of an established division within the University structure and, through its Advisory Committee, is well integrated into University activities. Its association with and the advocacy of senior administrative personnel with decision-making authority have ensured that UWIDITE receive due consideration in the planning and budgeting processes. Regular presentations to the University Council, whose membership includes ministers of education, on UWIDITE activities give the project high

visibility at the governmental level. Finally, the University has been able to appoint and support a full-time staff to the full-time job of running the UWIDITE network.

UWIDITE TELECONFERENCING NETWORK

Past experience with Project Satellite had demonstrated to the University the benefits of interactive teleconferencing; further studies--primarily the AID-funded Caribbean Regional Communications Study--recommended the use of a two-way communications system rather than a broadcast one, given the need for the relatively isolated populations to communicate directly with one another.

The UWIDITE technical system currently links seven sites in a simple, single-channel teleconferencing network using dedicated lines leased for full-time service from the regional telecommunications carriers. An eighth site--Grenada--will soon be added to the network.

Electronic Classroom

At each site a classroom has been furnished with basic audioconferencing equipment--microphones, convener, and loudspeakers--and the network control equipment which provides switching capability and signal level adjustments. Each classroom seats approximately 20 people, reflecting the relatively small size of the UWI constituency as well as its desire to limit class sizes.

Although initial planning studies did not identify the need for an interactive graphics capability, the University has gradually added graphics equipment to supplement the voice communications system. Through donor and corporate contributions, slow-scan video, telewriting, and microcomputer equipment has been purchased for each site. Because the present network is based on a cost-saving, single-channel design, only one signal can be transmitted at a time. Unlike the two-channel SISDIKSAT network, audio and graphics transmissions cannot be heard and viewed simultaneously. The use of the on-line graphics capability eliminates the voice capability and necessitates that the operator switch between the equipment as required.

In addition to the above on-line equipment, the University has provided stand-alone equipment for off-line use. A video recorder and monitor, cassette player, and x-ray light box (for medical conferencing) augment the electronic classroom.

Finally, each campus has purchased a scrambler to ensure the confidentiality of sensitive discussions, although its effectiveness is limited to two sites at a time.

The UWIDITE network is designed as a large "party line," with each site able to initiate conferences, talk to, and be heard by every other site in the system. This is accomplished by using a telecommunications bridge (i.e., a device for electronically balancing and mixing multiple incoming signals) located in St. Lucia. A dialing system with a privacy feature, enabling the selected participation of sites and exclusion of other sites, is incorporated into the design. Although the network is fully interactive, its half-duplex operation requires slight, one-second delays in transmissions to avoid "crashing" noise on the system. Users must pace their transmissions accordingly.

Transmission System

Three options were considered for the UWIDITE transmission system: leased service on INTELSAT, use of the ATS-3 on an "experimental" basis, and leased private lines on existing terrestrial and satellite systems from the various carriers serving the region. INTELSAT service proved too costly, requiring both the purchase of multiple earth stations and the lease of quarter-transponders (800-1,200 channels), far in excess of the network's one-channel design. Although initially promising, the ATS-3 option was eventually dismissed because of inconsistent transmission quality, uncertain longevity, and competition with national emergency services.

The final option--using the existing telecommunications capacity--proved the most cost-effective and practical approach, given the experimental, albeit promising, project. Thus, the UWIDITE transmission system uses a combination of satellite, microwave, and troposcatter services from several telecommunications authorities.

By eschewing a satellite-based system, UWI knowingly sacrificed the higher transmission quality associated with the technology and became dependent on the technical and operational quality of the regional services. Quality control is provided, however, by the lease of "conditioned" (i.e., improved and repaired) lines dedicated to UWIDITE on a 24-hour basis.

The system currently links Jamaica with Trinidad via the INTELSAT Flight 4 satellite and then by microwave to St. Lucia, the hub of the system where the network bridge is placed. From there the signal is distributed to Dominica and Antigua via microwave and to Barbados via troposcatter. In all, the UWIDITE network relies on the services of eight individual commercial carriers: the local carriers responsible for the ground links between the UWIDITE classrooms and international gateways and the international carriers for the space segments between countries.

Technical management of the network is divided between the University and the commercial carriers, with UWIDITE responsible for the "electronic classroom" and the telecommunications carriers for the space segment. As discussed above, central technical management activities are based at UWIDITE headquarters in Jamaica. Local technicians at the other sites, however, are instrumental in first-line diagnosis, troubleshooting, and repair. If a problem exceeds their capabilities and locally available resources, it is referred to the technical director, and the damaged equipment is sent to Jamaica for replacement or repair.

Operation, maintenance, and quality control of the leased lines fall to the commercial carriers, as well as the interface between local and international transmissions. Although responsibilities are well delineated, resolution of technical problems requires a collaborative effort among UWIDITE, the local telephone companies, and the international carriers in order to isolate the failure. Initially, this complex structure caused confusion and frustration as UWIDITE management had to sift through different telecommunications policies, tariffs, and procedures, but as the carriers grew more familiar with UWIDITE equipment and service requirements, they became more willing to work closely with the UWIDITE network and classroom equipment. In fact, in the non-campus territories it is often the local telephone company technician who doubles as the UWIDITE technician.

Although many of the transmission service providers are private businesses with no national obligations, the University has been successful in obtaining a 20 percent discount in UWIDITE line charges.

Network Performance

Once system architecture was established, design, procurement, and installation was accomplished relatively swiftly between July 1982 and February 1983. Delays were occasioned primarily by non-technical reasons--uncertain shipment schedules, dilatory customs clearance, and difficulty in completing contracts with the several carriers.

Since the opening teleconference in March 1983, UWIDITE has operated successfully with few major problems. **Its technical reliability is estimated at 90 percent.** The most significant problems are in the transmission system. Although network audio quality compares favorably with the regional telephone service, service disruptions have occasionally eliminated participation of certain sites. The weakest links are the telephone land lines in Jamaica and Trinidad. Along with Barbados, which pairs its telephone cables with other utility cables, these sites are often guilty of "dumping" noise or crosstalk into the network. Although the carriers have instituted regular monthly system-wide checks, it appears that the most likely solution is to add a "gating" system similar to that used in Indonesia at the offending sites.

The basic audioconferencing equipment performs well. Unidirectional microphones were refitted with goosenecks to accommodate UWIDITE users, and some of the push-to-talk switches were replaced. The network control's privacy function, a supplementary feature, unfortunately has never worked, but it is not essential to network performance.

UWIDITE's success with the various graphics equipment has been mixed. Its experience with the telewriters (although of different manufacturers) has been similar to that of SISDIKSAT. Problems with the modems, breakage of light pens, and malfunctioning boards have contributed to a highly unreliable, and ultimately unusable, service. The microcomputers proved promising for non-interactive record and message transfer during experiments, but their utility is undermined by frequent minor signal disturbances and power fluctuation resulting in errors from which the software cannot recover.

The slow-scan equipment has performed most reliably and forms the bulwark of the UWIDITE graphics system. Although its efficacy for text transmission is limited, the slow scan's capability to transmit pictures has become an integral part of UWIDITE's heavy slate of medical programs. Coupled with the x-ray light viewer, the slow scan plays an important role in distance diagnosis and treatment.

The UWIDITE audioconferencing system works reliably and supports a full schedule; UWIDITE continues to experiment with graphics equipment to find the best system suited to its requirements. Most significantly, UWIDITE continues to adapt, redesign, and add hardware to the original system as the project expands and new needs arise.

After four years of operation, the UWIDITE network has gained the credibility, experience, and "critical mass" of demand which makes review and reexamination of the transmission system feasible. With new sites requesting admission to the network and with lease service from U.S. domestic satellites available, a network based on small earth stations may prove both more reliable and cost-effective.

UWIDITE PROGRAMS AND ACTIVITIES

As the UWIDITE network became operational in mid-term, the period between March and August 1983 served as a trial period, allowing both UWIDITE staff and users to familiarize themselves with teleconferencing operations, uses, and requirements. The UWIDITE staff made good use of this time: over 169 hours of network time were used to orient and train faculty in teleconferencing techniques and materials development, mount a variety of experimental programs and seminars, and to develop procedures for program delivery and system maintenance.

In September 1984, UWIDITE was well prepared to begin its first official academic semester. Since that time,* it has served **over 2,000 users** and presented approximately **5,385 hours of programming.**

Program Development

The UWIDITE program development process is a collaborative one involving the efforts of UWIDITE's project officers, course presenters, participants, national governments and the University. Although initially program offerings were more or less dictated by the Challenge Exam curricula and the initiatives of UWIDITE staff, today program and course selection are based on request. For example, when a key lecturer at the Caribbean Institute for Mass Communication relocated to Barbados, UWIDITE enabled her to complete her teaching duties. Increasingly, UWIDITE programs provide in-service training and are the result of requests from the member governments or regional service organizations. These applications often involve negotiations with the individual countries to obtain participant release time or even participant selection.

After a potential course or program has been identified, UWIDITE staff must ascertain the specific needs and interest at the participating sites, secure the faculty presenter or expert to teach the course, and assist in content specification with the client and expert. Because staff travel funds are limited, many of these activities are conducted long distance over the network.

In the course of program development, the project officers work with presenters to introduce them to the principles of distance teaching, teleconferencing techniques, and equipment use. If a course selected for UWIDITE is already part of the University curriculum, it is adapted to modules suitable for teleconferencing, with an emphasis on independent reading and assignments. If it is a new program, both a syllabus and support materials are developed. To date, credit courses are taken from existing UWI curricula to avoid the arduous process of academic scrutiny required for certification.

Support materials--study guides, lecture notes, diagrams, and visuals--are an important part of the UWIDITE system. As the UWIDITE student's contact time with the instructor is necessarily limited and much of his study must be pursued independently, support materials are indispensable. After course content is determined, UWIDITE contracts the presenter to prepare course booklets or study guides. UWIDITE provides

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* Through December 1986.

the authors with graphics and typing assistance and later produce and distribute copies to the sites. At the extramural sites where library facilities are limited and textbooks scarce, the UWIDITE materials are often the only resources available. That this process has produced several excellent study guides is attested to by the purchase of UWIDITE materials by non-UWIDITE students following face-to-face campus courses.

UWIDITE itself has taken the lessons of materials development to heart, and prepared a series of teleconferencing guides for distance teachers and students alike, addressing basic equipment operation, teleconferencing techniques, and materials development. Unfortunately, timely delivery of materials remains a problem. Dependent on uncertain and expensive transport services, an estimated 10 percent of the materials arrive at the sites late.

Course Delivery

UWIDITE operates five days a week, Monday through Friday, between 10:00 a.m. and 8:30 p.m., during the term; evening hours, Saturdays, and term breaks are available for special programs and conferences. Approximately six hours of network time is scheduled daily for academic and in-service programs, with time reserved for UWIDITE coordination and "ad hoc" conferences. Competition for afternoon and evening timeslots has increased with the growth of in-service programming. As part of the University system, UWIDITE adheres to academic schedules and presents its programs according to the University quarter system, although UWIDITE course completion may require two to four terms.

Course delivery generally replicates standard University procedures: registration occurs locally and is logged with UWIDITE and central University administration, local tutors monitor class attendance, distribute materials, clarify assignments, lead "off-line" discussion groups, and generally serve as a point of contact for the student. Exams are sat locally and transmitted to the instructor for grading. Certificates of Participation are issued by UWIDITE in conjunction with the sponsoring institution or faculty.

The course development and delivery system has worked efficiently and depends heavily on centralized full-time UWIDITE management. Based in Jamaica for organizational and economic reasons (salaries are significantly lower there), it is natural that UWIDITE staff turn to local faculties, institutions, and experts for assistance. This has resulted, not surprisingly, in the bias toward the Jamaica campus as the "center of excellence," thus reducing the substantive input of the other campuses to the outreach effort. As UWIDITE grows and new services and courses are added, however, it is inevitable that the unique resources of the other campuses be brought to bear on UWIDITE programming. Organizationally, the Barbados campus recently assumed greater responsibility for the eastern Caribbean states through the new Office of University Services.

Programs

The wide diversity of programs in the UWIDITE schedule reflects, in part, the broad spectrum of needs UWIDITE must address and, in part, its mission to experiment with many applications to best ascertain ultimate UWIDITE services. Essentially, UWIDITE supports three types of programs:

- **extension studies** or credit courses leading to formal university certification;
- **extramural studies** or non-credit continuing, professional or in-service training resulting in a certification of participation; and
- **outreach services** or special seminars, consultations, meetings, or conferences supporting basic services in the region.

Extension Studies permit the UWI student to follow university courses for credit toward a degree, as with the Challenge Exams, or a diploma, as with the Certificate of Education program, without matriculating into a campus-based program.

The Challenge Exam Scheme, initiated in 1978, was readily adaptable to the new UWIDITE project. Already a distance education effort, the Challenge Exams allowed suitably qualified students in non-campus territories to pursue the first part of a bachelor of science degree in the social sciences without leaving their home islands. Armed with a syllabus, booklist, and access to the extramural center library, the student followed the course through independent study and sat for the "challenge exam." Students who complete four of the five first-year courses in a maximum of three years are eligible for admission to Part II of the program on campus. Although of benefit to the student and University alike, Challenge Exam Scheme experienced a high degree of student failure and attrition.

UWIDITE enabled the University to extend tutorials to the students to support them in their studies. UWIDITE presents five first-year courses over the network, four of which comprise the core "Challenge" Program. In principle, it is possible for the UWIDITE student to attend the requisite courses, sit for exams, and matriculate into a campus-based program in two years. In the 1983-84 academic year, 105 students participated in the UWIDITE program; in 1984-85, 222 students enrolled. Attendance has continued to increase in the succeeding terms. In St. Lucia, Antigua, and Dominica, the attrition rate has been reduced to 15 percent and the pass rate increased to 70 percent.

Although the Challenge Exam Scheme was originally intended for the non-campus countries, students from campus countries can now participate in the UWIDITE program. Indeed, it appears that the program will be offered only through UWIDITE.

Other programs have been added to the UWIDITE Challenge Exam Scheme: first-year law tutorials and Certificate of Public Administration, both of which use the first-year social sciences courses.

Aimed at the working professional, the Certificate of Education program for primary and secondary school teachers provides further training and skills upgrading for graduates of the region's Teacher Training Colleges. The resulting UWI Faculty of Education certification is generally recognized as means of job advancement. The UWIDITE program has offered course series in four different specialties: teaching of reading, of the hearing impaired, of mathematics, and of integrated science. Typically, a course series requires one year study in Jamaica; through UWIDITE the program can be completed in 15 months at the network sites. Between 1983 and 1985, nearly 180 teachers enrolled in the program; in 1986, 77 awards were made. In the short time that UWIDITE has supported the program, it has been able to double the University's annual number of certificate awards.

Other credit programs offered through UWIDITE include courses from the Department of Geology, the Caribbean Institute of Mass Communications, and an undergraduate review program in obstetrics and gynecology.

Extramural Studies form the basis of UWIDITE's in-service training and continuing education effort. UWIDITE's broad constituency is reflected in the varied program offerings, ranging from laboratory management and labor administration to reproductive health and pest management. The individual programs themselves differ in length: some for as little as eight hours, others lasting up to six months. Many of the programs are repeated regularly or are ongoing.

The UWIDITE programs provide direct support to government and public service personnel, enabling them to do their jobs better. Most of the programs are instigated and sponsored by regional institutions, professional organizations, and donor agencies. For example, a 10-week emergency health management course was funded by the Pan American Health Organization (PAHO); a training course for school science technicians was supported by the Commonwealth Foundation; and a fertility management course was financed by the Johns Hopkins Program for International Education in Gynecology (JHPIEGO), an AID-funded project.

The health sector has been particularly active in its use of the UWIDITE system. The University itself, through its Faculty of Medical Sciences in Jamaica, Queen Elizabeth Hospital in Barbados, and its Mount Hope Medical Complex in Trinidad, plays a major role in the training of medical personnel and health care delivery in the region. UWIDITE supports a number of its programs.

A major activity was the JHPIEGO Fertility Management program to provide postgraduate-level training for doctors and nurses in reproductive health and family planning. Started in February 1984, the 24-hour course has been repeated six times and has attracted between 60 and 70 participants per session. To date, nearly 300 nurses and 200 doctors have been trained over UWIDITE.

The Caribbean Food and Nutrition Institute developed a 24-hour course for community workers in agriculture, education, health, and development aimed at strengthening their ability to promote good nutrition practices. The program is repeated annually; over 100 community workers have been reached.

In addition to professional training, UWIDITE facilitated patient care. Monthly conferences have been held by interdisciplinary groups in fertility management and cardiology to discuss case presentations, consult on diagnosis and treatment, and determine patient transfer to major hospitals. In 1985 the first Caribbean Cardiology Conference was organized and conducted entirely by teleconference. Over 100 people in six countries participated.

That UWIDITE provides an important service to the region is evidenced by the large number of service requests from public organizations and their willingness to assume course expenditure by their reliance on the network itself. The Caribbean Labor Administration Center (CLAC) not only designed and mounted a 36-hour course on labor administration, but it also flew participants from five non-UWIDITE sites to the nearest electronic classroom each week. In three months, the CLAC reached 41 officials--nearly 20 percent of its outreach effort over the previous seven years.

Grenada will soon join the UWIDITE system, largely through the generosity of Project Hope, which is convinced of the value of the UWIDITE medical programs in improving local skills and reducing medical professional attrition from the small island.

Outreach Programs are the final component of the UWIDITE education program. Classified as one-time or very short-term programs, UWIDITE's outreach activities encompass social service support, cultural exchange, and enrichment programs. For example, during the past three summer terms, UWIDITE has presented a program on Caribbean art forms--uniting the region's local artists and authors with participants at the seven sites to share their work and explore the creative development process. Through the local Science Teacher's Association, UWIDITE conducted two "science quizzes" for national teams of students under 15 years of age. FARMTECH '85, a seminar/exhibition on agricultural technology held in Jamaica, was extended to the other islands as agricultural scientists presented their papers and led discussions over the network.

UWIDITE is also used for administrative conferences in support of University operations specifically in:

- examinations and examination schedules
- student admissions
- student affairs
- administration of the library system
- meetings of University boards and committees

The University Registry holds weekly teleconferences to coordinate activities and expedite decisions of the three campus secretariats. Eighty-four members of the University Senate convened a meeting over the UWIDITE network, saving thousands of dollars in travel costs.

The libraries, faculties and departments, public relations unit, staff unions, and undergraduate guild have all made substantial use of the UWIDITE communications network.

USAGE, USERS, PARTICIPATION, AND EFFECTIVENESS

During its first four years, basic patterns of usage have emerged:*

- 60 percent of UWIDITE usage is devoted to teaching, 15 percent to university administration, and 25 percent to internal UWIDITE management and training. Not surprisingly, teaching and administrative usage has increased and internal management decreased over the years of operation.

- Most UWIDITE "students" (82.2%) are between the ages of 26 and 40 years, with the preponderance (38%) falling in the 31-35 year old category--a period when both family and career pressures normally make it difficult to pursue additional training.

- The number of participants in the various UWIDITE courses and programs differs dramatically from the 30 undergraduates in a Challenge Exam course, to the 60 nurses in the fertility management course, to the 100 cardiologists at the annual conference. In general, each program averages about 30 registrants with 6-10 at each site.

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* Based on survey data for 1983/84 and 1984/85.

- As expected, the extramural centers at Dominica, Antigua, and St. Lucia have proven the most eager users of the UWIDITE network, accounting for 62 percent of network use. Jamaica follows at 16.7 percent, Barbados at 11.8 percent, and Trinidad at 9.2 percent. The high number of Jamaican participants is explained not by the presence of UWIDITE headquarters on campus, but by their enthusiasm for the Certificate of Education program, which originated in Jamaica and is held in high regard there. Continuing problems with the line quality in Trinidad has most likely discouraged some participants on that island.

- Twice as many programs originate from Jamaica as from the other two campuses, again because of its Faculty of Education's role as originator of the Certificate of Education program. The Challenge Exam courses, including the law tutorials and certificate of public administration course, are equally divided--with two courses presented by each campus. The UWIDITE health programs are multi-site in origin; even the extramural sites of St. Lucia and Dominica have served as sources for presentations for the nutrition and undergraduate review programs.

Students (92%), teachers (95%), and administrators (99%) have found the audioconferencing system easy to use. Whereas 75 percent of UWIDITE's teachers find distance teaching more demanding in lesson and materials preparation, their efforts apparently are successful because 80 percent of their students find UWIDITE courses interesting and 98 percent attend regularly. Interaction between student and presenter is high; 60 percent of UWIDITE students have actively participated in discussions over the system, despite some complaints that regional accents--not transmission quality--inhibit understanding. In fact, 87 percent would like to take more UWIDITE courses.

Sixty-eight percent of the students believe they learn as much or more and cover the same amount of material in UWIDITE courses as in traditional, face-to-face classes. Yet, like Indonesia's SISDIKSAT students, the majority (74%) would prefer to have the professor in front of them. This preference apparently has little to do with student-professor communication as UWIDITE students report an above average level of interactivity, and only 33 percent of the teachers themselves think that face-to-face contact is important to learning.

This preference is significantly reduced by three factors: student "maturity," tutor presence, and materials. Students in the graduate- or professional-level UWIDITE programs are more comfortable with distance learning--only 47 percent of UWIDITE's adult learners express preference for the conventional classroom.

Local tutor presence lowers conventional course preference even more dramatically to 35 percent. Although tutors can contribute little in subject knowledge, their presence in the electronic classroom encourages interaction, discussion, concentration, and attendance. Today, nearly all (98%) of UWIDITE courses use local tutors.

The provision of materials also has a positive impact on learner preference. The majority of students believed that both interaction and class preparation was higher when materials accompanied the lecture.

Although UWIDITE students may not have learned better than their classmates in traditional classrooms (UWIDITE's pass/fail rate is comparable to that of regular courses), more students learn. Enrollment in both the Challenge Exam and the Certificate of Education programs has increased, and to date a striking 8 percent of all Certificates of Education awarded over a 30-year period have been to UWIDITE students.

Can a teleconferencing network provide significant support to a regional institution? UWIDITE is the first experiment in the developing world to provide education and training via an interactive telecommunications network. Furthermore, it does so across national boundaries.

Initial enthusiasm on the part of students and teachers participating in UWIDITE and on the part of University administration to undertake an innovative experiment has been followed by a significant regional demand for UWIDITE services. Already tightly scheduled to accommodate teleconferencing activities, UWIDITE continues to receive new proposals for programs and requests for services. It has been readily adopted by regional and development organizations, governments, and by UWI faculties and administrators alike.

The participating extramural centers ask for expanded services; non-participating member countries are clamoring for admittance to the network. Since its inception, UWIDITE has already added two sites and will soon add two more.

More importantly, UWIDITE has developed a sound support base. At University Council direction, funds are routinely allocated for UWIDITE operation in the annual University budget. Regional institutions and donor agencies contribute to its operation through user charges. The regional long distance telecommunications carrier has reduced UWIDITE's tariffs and provides additional technical maintenance services. And currently, the University and member governments are exploring options for system expansion.

UWIDITE has enabled the University, affiliated institutes, and governmental associations to reach students and professionals in the non-campus countries with quality instruction, to support development and outreach programs, and to strengthen local service delivery. It has received recognition for its services throughout the region. In 1984, UWIDITE won the Gleaner Honor Award for its **". . . most dramatic impact on the quality and improvement of life not only in Jamaica but the entire Caribbean, enhancing the education of the people of the region."**

LESSONS LEARNED

The Rural Satellite Program promotes an innovative idea; its pilot projects were the first efforts in testing the technology and methodology developed under the Program. Establishing a distance education network requires tremendous effort; establishing a distance education program in the developing world, where the vicissitudes and vagaries of climate, environment, and infrastructure make daily life a challenge, at times approaches the overwhelming. Over the past five years, a tremendous amount has been learned about the planning and implementation of telephone-based projects, from the minutia of equipment procurement and technical design to the grander theories of distance education and development. The basic tenets about the need for strong institutional support, sound management, and dynamic leadership still stand. The following are just a few of the lessons from the AID Rural Satellite Program.

TECHNICAL

1. Everything takes more time than you think it will. The planning of such a system, purchase of equipment, shipping, testing, installation, and initial shake-down period can take several years. The basis of a sound technical plan is an accurate initial baseline survey of the existing telecommunications system. Pay particular attention to the quality and stability of your local lines. The 44,600 miles up to the satellite and back probably will be less of a problem than the last mile of cable that links your classroom to the satellite network.

2. In choosing your equipment, start simple and make it more complex only if you have the staff, time, money, and skill to support it. The capabilities of the equipment, of course, should correspond to the needs of the activities and staff who will be using it. One of main technical problems of the RSP was with the highly complex and delicate graphics system that experienced hardware problems, interference from poor quality lines, and lack of proper maintenance and operation procedures. When you start with a highly sophisticated system, you also create high expectations among prospective users. Problems with a secondary but glamorous piece of equipment can create a negative attitude toward the entire system, even if the basic audioconferencing system is functioning well. The idea of teaching with a solely audio system worries instructors; initial planning surveys will find most teachers stressing the absolute need for graphics equipment. These statements should not be taken at face value. Close observation of regular face-to-face teaching methods should be made. It could reveal that visual and printed materials are not a fixture of regular teaching practices--as in Indonesia--and the need for graphics is not as immediate as perceived.

3. Technology-based projects like the RSP generally start off with the good intentions of avoiding the trap of concentrating on the hardware at the expense of the software. When the inevitable problems occur during testing and installation, all attention becomes riveted on "getting the thing to work," and less priority is given to the actual activities that will be undertaken when the system does work. It is also unfortunate that funding is often more easily found for the purchase of new equipment than for the operation, maintenance, and repair of existing equipment. There is a very real need for ongoing support of the technical system. As the foundation of the programming activities, the equipment's reliable performance is essential. Economizing in this area can cause fundamental problems. RSP's technical systems require more manpower than spare parts, a

requirement more easily met in the developing world. More technical personnel have supported SISDIKSAT than UWIDITE, with the result that the SISDIKSAT system provides higher quality and more reliable service to its constituency--a fact which could ultimately determine which project experiences a greater longevity.

PLANNING

4. Accurately assess the stages of growth and maturity of the user institutions before creating an implementation plan. A major challenge of the Indonesia Project was to reconcile the actual educational practices of the universities with the requirements of distance education. Do not assume that the basic pedagogical methods of higher education in the developed world are in place in the developing world. In Indonesia, particularly, we found ourselves grappling with such basics as getting the instructors to come to class regularly, determining if they have ever developed a curriculum for their face-to-face classes, and ascertaining whether textbooks actually existed and if they were in a language the students could understand before we could focus on the more "esoteric" needs of distance education such as course adaptation, study guide development, and interactive teaching techniques.

5. Do not assume that an existing institution or association of institutions implies common needs among its members. The 10 universities in the eastern islands of Indonesia may share geographic location, but the variations in the levels of maturity, development goals, and basic course needs are considerable. This makes programming difficult to put together and can undermine the project's effectiveness and economy. Remember that one of the advantages of satellite communications is that distance does not matter.

6. Do not assume standard administration practices or structure are present at all participating institutions. A continuing management problem for SISDIKSAT has been the lack of standardization among the universities, which causes conflicts regarding semester start-up and testing. Furthermore, the management needs of the distance teaching program may not be congruent with management practices of the institutions. For example, remuneration for course development in Indonesia is predicated on the production of textbooks or modules; SISDIKSAT requires study guides. It has been difficult to convince the course teams to produce study guides when compensation depends on textbook development.

IMPLEMENTATION

7. Although telecommunications can provide a reliable link between members of a group, it does not solve any existing problems of the coordination and organization of that group. It is a major task for SISDIKSAT to get 10 institutions to agree on programming. SISDIKSAT provides 15 sites with communications services, but it does not have any direct control over any of the sites to ensure that the entire system functions as planned. A strong organization is needed at the center of the network to coordinate, mediate, and implement the the proper policies and procedures that will ensure a smooth-working, highly efficient telecommunications network. This requires officially mandated authority, strong and competent leadership, and--very important--readily accessible budget.

8. The introduction of an innovative system does not automatically mean that the users will adopt innovative ways of utilizing such a system. You have to make a major effort to get users to take advantage of the new capabilities and limitations facing them. You have to work for incremental change. Faculty members who have been lecturing for years will not immediately see that it is more effective if periods of 10 to 15 minutes of lecture are interspersed with interactive periods that involve the students. Providing users with a telewriting/graphics capability does not automatically ensure that they will use it or use it well. There must be personnel trained in interactive audioconferencing who are available to work with users of the systems, and gradually get them to expand and improve the ways in which they use the system's capabilities.

9. The "traditional," appropriate methods of distance teaching, i.e., frequent pauses for questions and answers, student discussion, etc., called for as essential to any distance education scheme may not be appropriate or effective for all audiences. Recent research in Indonesia shows that bright, energetic instructors fitting the proper distance teacher model do indeed evoke very positive response from the more mature or sophisticated users, such as faculty members or graduate students; however, the disadvantaged undergraduate with little subject knowledge and isolated in a rural area has shown decided preference for the slower-paced, methodical and--to us--plodding instructor. This is not to say that SISDIKSAT is not appropriate for undergraduate education, but we must not assume that the accepted distance teaching practices developed in the United States are always effective for Third World use.

AID RURAL SATELLITE PROGRAM PUBLICATIONS

This report is one of a monograph series, "Telecommunications and Rural Development," prepared for the AID Rural Satellite Program by the Academy for Educational Development, including:

- **An Overview of the AID Rural Satellite Program**, Tietjen, K.
- **The Design and Installation of Rural Telecommunications Networks: Lessons from Three Projects**, Goldschmidt, D., Tietjen, K., and Shaw, W. D.
- **Distance Education via Satellite: A Case Study of the Indonesian Distance Education Satellite System**, Shaw, W. D.
- **An Analysis of the Costs and Revenues of Rural Telecommunications Systems**, Goldschmidt, D.
- **A Handbook for Planning Telecommunications Support Projects**, Tietjen, K.
- **Training for Technology Transfer in Telecommunications Support Projects**, Tietjen, K.

Also included in the series is a report prepared by Florida State University:

- **An Evaluation of the Peru Rural Communications Services Project**, Mayo, J., Heald, G., Klees, S., and Cruz, M.

Other Rural Satellite Program reports available are:

- **Telecommunications Services for Agriculture and Rural Development: Experiences of the AID Rural Satellite Program**, Stahmer, A.
- **Telecommunications Services for Health Care: Experiences of the AID Rural Satellite Program**, Stahmer, A.
- **Peru Rural Communications Services Project: Final Field Report**, Medrano, L.
- **The University of the West Indies Distance Teaching Experiment: A Case Study**, Stahmer, A., and Lalor, G.
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Copies may be obtained from:

Dr. Clifford Block
United States Agency for International Development
Bureau for Science and Technology
Office of Education
Washington, D.C. 20523
U.S.A.

(703) 235-9006

Ms. Karen Tietjen
AID Rural Satellite Program
Academy for Educational Development
1255 23rd Street, N.W.
Suite 400
Washington, D.C. 20037
U.S.A.

(202) 862-1900

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Karen Tietjen, Director
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Willard Shaw
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Iip A. Arief
Abd. Muis Ba'dulu
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M. Lawele
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Yan Pieter Karafir
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L. A. Sinsuw

UWIDITE—West Indies

Gerald Lalor
Christine Marrett
Diana Grant
Keith Hunte
Max Richards
Marilyn Floissac
Roy Braithwaite
Elizabeth Campbell
E. R. Waldron
Christine Craig
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