

PH/MA/696

51090

**THE UNIVERSITY OF THE WEST INDIES
DISTANCE TEACHING EXPERIMENT:
A CASE STUDY**

by:

Anna Stahmer

Gerald Lalor

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

Dr. Clifford Block

Project Manager

A Publication of the AID Rural Satellite Program

Produced by **THE ACADEMY FOR EDUCATIONAL DEVELOPMENT** under

Contract No. AID/DSFE-C-0081

January 1987

CONTENTS

INTRODUCTION	1
Background	2
UWI Structure	2
Demonstrations and Planning	3
Project Satellite	3
Caribbean Regional Communications Services Study	4
USAID Rural Satellite Program	4
DESCRIPTION OF UWIDITE	6
Objectives	6
Planning and Design	6
Implementation	7
Operations	8
Equipment	8
Organization	9
Staffing	9
Training	9
Administration	10
Funds and Budget	10
Software	11
Applications	12
Courses Leading to UWI Qualification	13
Courses Not Leading to UWI Qualification	13
Outreach Programs	13
Special Sessions	14
Results	15
ANALYSIS OF UWIDITE's PROGRESS	21
Reaching the Objectives	21
Meeting the Challenges	21
Organizational Structure	21
Educational Quality	22
Technical Performance	22
Development of a Support Base	24
Forging Common Goals	24
THE FUTURE OF UWIDITE	25
Network Expansion	25
Regional and Political Perceptions	25
Additional International Challenge for UWI	26
Prescriptions for Success	26
AID RURAL SATELLITE PROGRAM PUBLICATIONS	27
ACKNOWLEDGEMENTS	28

INTRODUCTION

The University of the West Indies (UWI) has operated a challenging and significant Distance Teaching Experiment (UWIDITE) since 1983. UWIDITE was the first project in the developing world to use telephone audioconferencing as a principal teaching method. It shows ways in which pressures on the services of higher education institutions can be met despite increasing budgetary constraints and demonstrates innovative approaches to respond to demands for professional and continuing education in much of the Caribbean. The project was conducted under the USAID Rural Satellite Program.

UWIDITE links the three university campuses in Jamaica (Mona), Barbados (Cave Hill), and Trinidad (St. Augustine) with three extramural centers in Dominica, St. Lucia, and Antigua (see map). The system connecting the six sites is a simple, single-channel audioconferencing network leased on a dedicated 24-hour basis from the responsible telephone companies. At each site a room is equipped with an audioconferencing convener set, including microphones and amplifiers. Additional equipment, such as slow-scan television, electrowriters, and computers were gradually added to the configuration.

The services offered over the network include tutorial support to first-year university students studying in their home country. Services include university credit programs, in particular in offering certificates for educational subjects, and continuing and professional education in health sciences, nutrition, and a variety of other disciplines.

UWIDITE's challenges included:

- the development of appropriate organizational structures under which distance education could effectively serve the university's audiences, including first-year students, professional and technical clients, specialized postgraduate learners as well as the administrative communications needs of the institution itself
- the maintenance of quality education in all its facets through quality course development, support services, and training
- the development, operation, and maintenance of audioconferencing services and associated technologies
- the need to develop a support base and constituency for the project over a relatively short time period during which external funding was available
- the consolidation of educational and communications policies and goals for a project which services the decentralized university with campuses on several island nations

These challenges to varying degrees are present in many developing countries. The UWIDITE case study thus should help others to assess, sample, choose, and test their own approaches. This case study describes the developments which led to UWIDITE, its operations, and some of the results. Although many of the issues related to the challenges which UWIDITE had to meet will be addressed in the descriptive sections of this report, a short analysis will bring these issues to the fore.

Background

The UWI case study is interesting for similar institutions in the developing world where the resources and expertise of a few centers of excellence must serve a large area with isolated learners and a diverse constituency. This service ranges from the provision of higher education or in-service training to active field work and project support (e.g., agricultural extension).

UWI was one of the first institutions in the developing world to experiment with the extension of its resources via satellite, using NASA's Applied Technology Satellites, the ATS-3 and ATS-6. It took UWI almost 10 years to get from the initial discussions and first steps of project development to a point at which a teleconferencing network became an important support tool for the university. Although the university plans to continue and gradually expand the network, many more islands need to be served and the system expanded for the network to support a larger portion of the university system. Present transmission costs in the region, not to mention the complexity of the politically "feasible" system, however, put expansion in the realm of long-range planning.

One particular fact which adds to the complexity of the UWI situation is unlikely to confront similar projects or university systems. Each campus and most extramural centers of UWI are not only on islands separated by hundreds of miles of water, they are also located in different countries. The project management has to deal with a multitude of international educational issues and policies, as well as with a diverse grouping of telephone carriers, telecommunications policies, and tariffs.

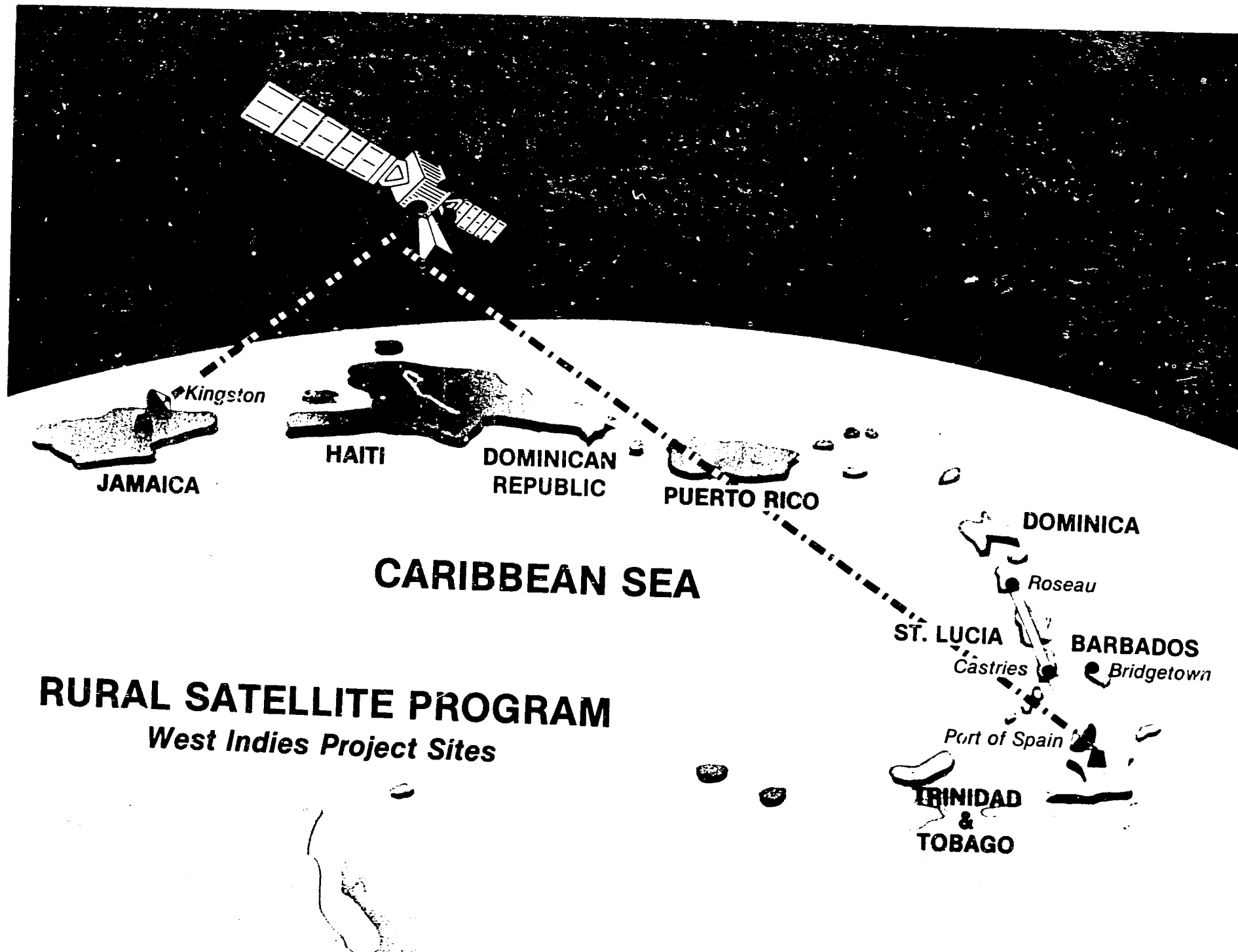
This report analyzes the following aspects involved in providing distance education services via satellite for the University of the West Indies.

- planning and trial processes, from initial idea(s) to an almost mature network
- technical system requirements and system configuration
- pitfalls of technology
- areas of application which are feasible, attractive, and successful (or not)
- organizational, structural, and staffing requirements
- training requirements
- requirements for materials support for courses, such as print materials and videotapes

In addition, the case study emphasizes the critical role that strong host-country leadership has to play in innovative and far-reaching technology transfer projects, as well as the necessity and requirements for internal resources to get such projects operating. In the absence of either, ingrained institutional traditions will prevent such projects from happening.

UWI Structure

The University of the West Indies is a regional institution with three campuses on Jamaica, Barbados, and Trinidad as well as several extramural centers in other member countries. At the graduate level there is a certain specialization of the different campuses. Trinidad focuses on agriculture and engineering, Jamaica on medicine, and Barbados on law. In addition, various institutes are associated with UWI, such as the Caribbean Research and Development Institute (CARDI) and the Caribbean Food and Nutrition Institute (CFNI). The extramural centers throughout the region provide a UWI



RURAL SATELLITE PROGRAM
West Indies Project Sites

presence; organize learning opportunities for adults; and provide facilities, counseling, and tutorial support for students who take "Challenge Examinations" for first-year and other university credits.*

The university campuses offer undergraduate, graduate, and postgraduate courses as well as professional certificates and diploma courses. For students from non-campus islands, participation in these programs traditionally requires relocation to campus islands. Alternatively, different faculties and institutes provide varying levels of outreach or "extension" activities for professional groups, private industries, and very importantly, for governments. For example, in agriculture UWI provides consulting, training, and program management services to ministries of agriculture. The regional and outreach mandate of UWI represents an ideal background for the UWIDITE type of project.

The university campuses are relatively independent with some underlying common functions. For example, the conditions of service but not salary levels are the same across campuses. The extramural centers are directed by resident tutors. All member nations contribute toward the cost of operation of the university; moreover, the Ministers of Education are members of the governing Councils, which gives them a strong influence in university affairs.

Demonstrations and Planning

The beginning of UWIDITE operations in mid-1983 was preceded by feasibility and planning studies as well as demonstration projects. One can roughly put the beginning of project activities in the year 1977, when the feasibility of satellite outreach by UWI was discussed. Two key activities took place prior to the initiation of UWIDITE in the summer of 1983.

Project Satellite

The University of the West Indies began investigations in 1978 into the use of telecommunications to extend its services in the region.

The first experiment, Project Satellite, which was conducted with partial assistance from USAID, linked the Jamaica and Barbados campuses by television via two NASA satellites for two months. The University Center in St. Lucia joined in for the final two weeks, during which two seminars (both centered in St. Lucia) were held. For one additional month there was an audio link supported by ATS-3 between Jamaica and Barbados, which the University of Miami joined frequently.

* A scheme instituted in 1978, whereby students in the non-campus territories can attend the first part of a B.Sc. degree in social sciences without having to attend classes on a campus. After having completed assigned readings, the student sits for a "Challenge Examination" to determine if he will gain campus admission to complete the second part of the degree.

Project Satellite televised various demonstrations, teleconferences, lectures, and outreach programs in medicine, agriculture, engineering, energy, and education. There were also two extraregional programs: an energy seminar with the Solar Energy Research Institute in Colorado, and a teleconference among participants in Jamaica, Barbados, and others across the Pacific Basin from California to New Zealand. Project Satellite raised understanding and awareness of satellite communications within UWI and the region. It also encountered institutional and policy problems. The use of an experimental NASA satellite required frequency clearance from participating governments. In one case, clearance was never granted; in another, after several months of experimentation it became clear that an extension would be difficult. It can be speculated that there was some reluctance to promote the use of a communications service which circumvented the local operating carriers.

The Project Satellite final report recommended a feasibility study for a permanent system. This recommendation led to the Caribbean Regional Communications Services Study (CARCOST).

Caribbean Regional Communications Services Study

CARCOST was funded by a grant of US\$ 330,000 from USAID and was conducted by UWI staff from the Jamaica campus with some external subcontracts. It examined the feasibility of a UWI communications network to be used for administration, distance teaching, and outreach programs. The study included demonstrations on slow-scan television and facsimile transmission of documents.

The CARCOST final report was issued in 1982. It recommended a five-year pilot project with particular emphasis on teaching for the Challenge Examinations, in-service teacher training, medical and agricultural applications, the supervision of postgraduate students, and university administration. The Caribbean Examinations Council and other regional bodies were also invited to consider using the system.

The report emphasized, however, that the proper use of teleconferencing techniques depends on the simultaneous development of other aspects of educational technology, e.g., the use of print media and graphics, audio, and audio-visual materials. The CARCOST recommendations received strong support from the Ministers of Education and Health.

USAID Rural Satellite Program

The role of the external donor and its priorities and approaches has long been recognized as profoundly affecting the overall technology transfer process. In the case of UWI, USAID was the most significant external donor in the development of UWIDITE. USAID provided financial support both for Project Satellite and for the CARCOST study. It was thus no surprise that a project would develop with UWI when funds and resources become available under USAID's Rural Satellite Program (RSP).

Beginning in the late 1960s USAID demonstrated its commitment to exploring satellite technology to assist and accelerate development programs in education, health, and rural development. A series of far-reaching studies was conducted. Results and processes of U.S. domestic experimental satellite programs were analyzed and discussed at workshops with developing country participants. A global satellite demonstration

program was conducted in the mid-1970s which provided short-term demonstrations of satellite applications in many countries. In a parallel vein, USAID also sponsored television- and radio-based research projects, demonstrating and evaluating these services for development purposes.

The RSP, initiated in 1980 by the U.S. Agency for International Development, is part of this long-term commitment by the Agency to demonstrate and explore the usefulness and effectiveness of communications technologies in the development process. The primary focus of RSP was to demonstrate affordable satellite technology in support of rural development. One of the RSP projects, in Peru, established a rural telephone service for small settlements and agricultural and health field workers. Another project in Indonesia linked 11 university campuses to share faculty resources and to upgrade teaching at new and understaffed campuses.

For the planning, design, and implementation phases of UWIDITE, the organizational structure of the RSP is of particular note. AID contracted the Academy for Educational Development (AED) to undertake the applications management of the program, including the hardware and systems design aspects of RSP. An independent contractor, Abt Associates of Cambridge, Massachusetts, received the evaluation contract. AED was based in Washington, D.C., where RSP staff were working simultaneously on the development of other similar pilot projects. Telephone discussions, visits, and courier services constituted the main connection between UWI and AED in the early phase until a field advisor was stationed in Jamaica.

DESCRIPTION OF UWIDITE

Objectives

The objectives of the RSP in the West Indies were to demonstrate the educational applications of satellite services, to promote the use of appropriate technologies, to provide evidence of benefits of investments in the education sector, and to support national capacities in this field. The following are the general goals of the UWI project:

- to demonstrate that a sufficient level of demand exists to support an operational system
- to create within UWI an interest toward meeting identified needs by teleconferencing techniques so that the institution would incorporate these as part of its ongoing activities
- to establish a core of experience and of experienced workers to allow the efficient design, staffing, and implementation of an operational system for distance teaching and outreach
- to develop mechanisms and expertise for the production of educational materials, e.g. print, audio, and audio-visual materials

Planning and Design

In the spring of 1981, AID and UWI initiated a series of discussions into the possibility of conducting a Rural Satellite Project with UWI. An initial plan developed in October 1981 called for a 10-site project, using NASA's ATS-3 satellite, that would allow the three main campuses of UWI (Mona, Jamaica; Cave Hill, Barbados; and St. Augustine, Trinidad) to provide distance teaching and administrative activities to extension campuses throughout the Caribbean. The distance teaching activities would be directed primarily at programs such as the Challenge Examinations and in-service teacher training. It was understood that this project would be used to help develop an operational telecommunications system for UWI.

A subsequent review indicated that there were insufficient funds available for a 10-site project. Further inquiry also raised serious questions about using the ATS-3, given the uncertainty of its continued operation, the expense of acquiring earth stations that would be suitable for UWI requirements, and uncertainties of obtaining frequency clearances for this network from the different governments.

A series of technical and applications reviews were undertaken in Jamaica and Washington during the fall and early winter of 1981-82. The technical reviews included a series of different network scenarios. In addition to the ATS-3 option, other options that were evaluated included the use of INTELSAT services, the lease of U.S. domestic transponder capacity, and the lease of channel capacity on the existing national and international facilities. The INTELSAT option was not practical at the time because it would require the purchase of additional earth stations, which in the long term might make

financial sense but would be too costly for the period of the project. The lease of capacity from higher-powered U.S. domestic satellites, albeit allowing for somewhat less expensive earth stations, did not appear feasible because of international regulatory implications.

The most practical approach was the lease of existing capacity regardless of the method of transmission. It was understood that such a system would be subject to technical and operational conditions of the telephone companies in the region. The lease of dedicated, conditioned lines was intended to overcome some of the potential problems. The advantage of this approach was that UWI would be able to build a strong base of expertise in telecommunications-based distance education programs as well as to build support throughout the region for such service. Telecommunications regulations and technological developments are expected to change in favor of institutions and applications such as those represented by UWIDITE. UWI will therefore be in the position of a knowledgeable participant in future satellite service developments.

In late January 1982, the final points of the project agreement were clarified, and it was signed. The project at that point included the university's main campuses (Jamaica, Barbados, and Trinidad), as well as St. Lucia and Dominica. Montego Bay Hospital in Jamaica was later linked to the network, and Antigua was added in September 1984.

During the planning and design process a series of problems developed regarding the technical design aspects. The three-pronged communications between the carriers, UWI, and RSP at times resulted in misunderstandings and crossed signals. Nevertheless, valuable experience was gained through resolution among the parties.

Responsibilities for project activities as laid out in the project agreement were identified as follows: AID provided a grant to UWI providing funds for project management, for fielding different categories of project staff at all five sites, for some room modifications, for faculty honoraria, and for some materials development. The applications management (AED) responsibility was identified as providing a field advisor, technical assistance, training, system engineering, installation supervision, and payment for the leased lines over a period of approximately two years. Abt Associates was charged with summative evaluation.

Implementation

Changes in system architecture, negotiations with carriers, and slow customs clearance lengthened the system design and procurement activities from originally anticipated schedules to a one-year effort, with installation beginning in January 1983.

In July 1982, RSP posted a field advisor in Jamaica for a one-year appointment. The function of a field advisor never had the full support of UWI project management. Nevertheless, the advisor's activities provided a valuable link between RSP and UWI, facilitating many matters such as faculty training, technical and operational training during installation, the development of an operation procedures manual, and assistance in the design of two courses. Formative evaluation procedures and data-gathering instruments were jointly developed by RSP, UWI, and Abt Associates.

During the implementation process it was expected that a major portion of network use would go toward the Challenge Examinations. Two years later there was significant and growing demand for certificate, diploma, and other professional upgrading courses.

Operations

Equipment

The UWIDITE network uses the commercial carriers in the region. There are presently six dedicated teleconferencing rooms, each capable of seating about 20 people, although the preferred number is much smaller. Each campus and extramural center has a teleconferencing room connected to the appropriate international gateway via leased four-wire telephone lines. Jamaica is linked to the Eastern Caribbean countries via INTELSAT, and the Eastern Caribbean countries are linked by microwave, UHF, and tropospheric scatter. St. Lucia is the central distribution point in the network. Montego Bay Hospital (Jamaica) has joined the network in a limited way for special programs.

At each site the audio equipment consists of six microphones and two speakers, a convener, a telephone handset, and termination equipment which provides switching capabilities for the peripherals and should allow a private line capability for two or more sites, although this has never worked. For the discussion of confidential matters each campus has purchased a scrambler, but only two sites can be used at a time.

UWIDITE is also reasonably well equipped with facilities for the transmission of visual images and writing. Each site has a slow-scan television set and a telewriter for on-line use. Additional equipment now being considered includes facsimile. Microcomputers have been tested between campuses with good success.

The various local and international carriers--Barbados Telephone Company, Jamaica Telephone Company, Trinidad and Tobago Telephone Company, Cable and Wireless, JAMINTEL, TEXTEL, and Barbados External Communication Limited--are responsible for the maintenance and performance of the communications channels. The original audio equipment was installed through RSP during February and March 1983. All the other equipment has been installed by the university.

Most equipment maintenance activities were initially based in Barbados, because it is in easy distance to most project sites, except Jamaica. In early 1984, UWIDITE hired a project technician, based in Jamaica, who assumed overall responsibility for UWI's equipment. The carriers continue to have responsibility for the transmission system. For basic system check-out, initial diagnosis, and trouble shooting, a technician is being paid a retainer at each island. If major problems develop, the equipment is shipped to Jamaica for swap-out, repair, etc.

Operationally, anyone at any site is able to talk to and be heard by people at all of the other sites. The system is fully two-way, although restricted by half-duplex operation. Network discipline is required to allow a site to question any other site and to receive and answer without noise or interference. This discipline is usually established by the lecturer or conference chairperson.

The transmission system consists of a single telephone line, requiring certain operational procedures between the sites when a presenter switches between voice or slow-scan TV or other types of transmission. Only one type of signal can be sent at any given time. Although somewhat cumbersome, this method is reasonably satisfactory, in view of the lower costs involved by leasing only a single channel.

Organization

The Vice-Chancellor has appointed an Advisory Committee, which serves as a conduit for information and feedback between the university and the project, advises on the structure and content of the programs, and will contribute to the evaluation and planning of subsequent operational services.

The Advisory Committee, chaired by the Pro-Vice-Chancellor who also is the Project Director, is comprised of deans of faculties, representatives of the administration of each of the campuses, the planning unit, the extramural department, and the bursary. The committee meets at least twice a year. The network is used, as necessary, for consultations between meetings.

The Project Director in Jamaica and the two coordinators for the other campuses are Pro-Vice Chancellors of the university and thus tie the project to the senior administrative levels of UWI. The non-campus sites are the responsibility of the local resident tutors. The project office is located on the Jamaica campus and is presently staffed with two Project Officers, a Technical Officer, and support staff.

One Project Officer is responsible for the coordination of all aspects of the project (e.g., scheduling, technical coordination, administrative arrangements for educational programs, training, production of materials, public relations, and developmental planning). The other Project Officer assists in the above but has specific responsibility for the science programs, including carrying out the majority of the teaching and examining. The Technical Officer is responsible for maintenance of equipment, installation of new equipment, and the development of systems.

Staffing

The actual staffing pattern is different from that envisaged in the early project plans. Basically, there are fewer paid organizational and technical personnel at the different sites than was anticipated. The following staffing exists (including a large percentage of support staff):

Jamaica	Seven full time and five part time
Barbados	One full time and six part time
Trinidad	Four part time
St. Lucia	Three part time
Dominica	One full time and one part time
Antigua	Three part time

The difference in staffing patterns reflects the fact that Jamaica is the seat of the project management and that salaries are very much lower there. The numbers reflect core staff only and do not include all of the teaching staff and faculty who prepare and present courses. Their inclusion would increase the number of part-timers significantly.

Training

During implementation it was hoped to provide short-term, intensive, tailored training programs for staff and faculty in Jamaica and the United States. Project demands and local circumstances were the basis for major revisions in this plan. In 1983

a short orientation visit of the Project Officer to similar projects was organized. Conference attendance of some teaching staff was supported, and relatively short (a few hours) introductory and informational sessions for other faculty were conducted. Most of these activities took place in Jamaica. The technical supervisor based in Barbados was trained on the audioconferencing equipment and bridging equipment during factory testing of the telephone technical equipment and through participation in project installation.

After the initial training activities leading to project initiation, several university staff members visited distance teaching centers in various countries to obtain information on methodology, equipment, programs, and teleconferencing networks. Many training programs and seminars were carried out locally, some using teleconferencing. This training is now a continuous offering of the project office and includes orientation to teleconferencing facilities and procedures and also academic matters, such as methods of distance teaching, curricula, preparation of materials, and evaluation of programs. Typically, a general introductory training session for users is held every two months. Faculty or presenters can request training as they feel necessary, which is usually the case at the beginning of a course. The Project Officers are in the process of designing a more in-depth training package.

Administration

The project office in Jamaica handles most administrative and logistical matters related to project operation, maintenance, and the development of courses or sessions. Here the schedules are established, master logs are kept, faulty equipment repaired, and system checks conducted. In addition, the Jamaica office provides user training, including advice on software development, arranging for printing of support materials, and graphics design support. An important function, at least initially, of the office also was the promotion of UWIDITE within the university and within the region. The project office also administers and reviews the formative evaluation procedures.

Many courses have an individual coordinator at the different sites. A faculty that is an active UWIDITE user usually has a staff person who coordinates or administers its activities, e.g., in health education and nutrition. This person's duties can include the conduct of local discussion groups, materials distribution, or negotiations with governments to obtain staff release time to attend the sessions. Reimbursement or remuneration of these coordinators varies between courses and among islands.

Funds and Budget

The two main sources of funds for the project are the university itself and participating governments, and for the first four years, USAID. Other donors or agencies have supported the project with equipment, financing, or donations, and through financial support of specific courses or sessions. Typically, a donor will sponsor a program, e.g., on disaster preparedness, and reimburse UWIDITE for system use as well as the other services rendered while preparing and organizing the session. This type of arrangement could well develop into a viable future financial source for UWIDITE. The bulk of UWIDITE programs, however, at present are supported from within UWI.

Major funding sources are summarized below:

- facilities, furnishings, remodeling through country governments and UWI
- project office staff, faculty, honoraria, technical contracts, operating costs through UWI and UWI/AID grant
- system planning, basic audioconferencing and telephone terminal equipment, power generation, etc. through AED/AID contract
- training through AED/AID and UWI/AID grant
- through a mix of equipment donations and financial contributions, electrowriting equipment (European Development Fund), slow-scan video equipment (Colorado Video), and computers (IBM)
- release time, travel, honoraria of participants through participating country institutions
- line lease costs through AED/AID contract and USAID/Barbados
- support for specific program and course initiatives from a Johns Hopkins University/AID contract as well as the ILO, CARICOM, CASTME, PAHO, and CFNI
- evaluation work through a separate AID contract

Software

Development Process: Applications development is the prime responsibility of the two Project Officers in Jamaica or the coordinators at the campuses, and of the resident tutors at the extramural centers. One of the Project Officers has the particular responsibility to work with faculty and other presenters in all aspects of software development. This software development specialist has taught courses over the system and has obtained additional experience through summer courses in aspects of distance education, including instructional design, materials preparation, pacing, and the development of learning support activities for distance education students. The software development process, albeit targeted to the particular needs of remote/distant learners, has produced some excellent course and study materials. In some cases, students who attend a course on-campus which is also available through UWIDITE will purchase UWIDITE materials for their own use.

Different working approaches to software development are employed, depending on the course or program to be offered. If the course is based on a UWI on-campus program, existing materials are reviewed and reworked to accommodate the fact that students will have to complete a large amount of the reading and assignments in independent study with limited access to advice. For new courses or programs the process also includes the development of a syllabus. The network requires re-thinking of traditional-style presentations to allow the most effective transmission of knowledge. Courses with laboratory components or which use visualizations of concepts require particular attention and often include videotapes, graphs, etc., as well as arrangements locally which allow learners to practice and explore. In most cases the syllabus and examinations for on-campus courses are used when UWIDITE carries the same course.

Identification/Coordination: After a course series or a single event has been identified for UWIDITE application, the project office discusses it with the presenter(s) or initiator(s). Participating sites have to be identified. In some cases negotiations have to be carried out with government ministries or authorities in different countries to obtain

release time, travel support, or other necessary action. Furthermore, in professional education courses, ministries or agencies in each country often appoint the participants as well as a local coordinator for the course.

Increasingly, the courses offered are in the area of professional training and upgrading and often result from requests by member countries. In those instances faculty or experts are asked to present a course or session especially designed to fulfill this need. Content specification takes place through conferences with the "clients." Often travel funds are not available to make personal site explorations, to meet prospective participants, etc.

After course content and different modules have been identified, the Project Officers are available on request to assist in the writing and production of support and study materials. In addition, the project office staff will work with the presenter to develop appropriate conferencing techniques as well as materials and approaches to the use of slow-scan television and electrowriting equipment.

This arrangement works very satisfactorily in Jamaica because of easy access to the project office. For presenters at other islands, support largely is available only through audioconferencing. The production and dissemination of support materials from one central place makes administrative, logistical, and budgetary sense; however, this tends also to decrease the substantive role of the other campuses. The predominance of Jamaica faculty participation compared with others in the overall project is an outcome of this arrangement.

Student Learning Support: Participant activities vary widely depending on the course or session. Usually, however, there are self-study materials and some student-organized local discussions before and after UWIDITE sessions. Quite a few programs involve participants as occasional presenters, thus stimulating independent study. In some of the courses the UWIDITE sessions are adjuncts to the usual, ongoing student activities which involve local tutorials. In courses which involve practical work and follow-up, the attempt is made to provide visual information by videotapes as well as through locally supervised practical activities.

Applications

After project initiation from April to August 1983, during which time 169 hours of successful conferencing were conducted, the following figures emerge for the time period September 1983 through March 1985:

Time Period	Total Hours	Average Hours Per Month
September-December 1983	258	64.5
January-December 1984	1,200	101.7
January-March 1985	411	137.0

Scheduling segments of time on the network is becoming a problem because of the increasing number of programs. Although the afternoon hours are most popular because

of their convenience to working adults, earlier and less convenient time slots may have to be used.

Four general types of programs have been presented:

Courses Leading to UWI Qualification

Certificates of Education are offered for teachers of the hearing impaired, teachers of reading, and teachers of mathematics. These full-time certification programs require one academic year. The in-service UWIDITE courses are 15 months duration.

Five courses are required to complete the first year of the B.Sc. degree (social sciences). UWIDITE now offers Elements of Economics, Introduction to Sociology, Statistics, Introduction to Accounting, and History of the Caribbean. The set can be completed in two years and will then allow entry into the second year of the B.Sc. degree in the Faculty of Social Sciences.

The Certificate in Public Administration program consists of five compulsory courses selected from a choice of eight. Of these eight, Elements of Economics, Introduction to Accounting, and History of the Caribbean are alternatives as one compulsory subject. In addition to the compulsory subjects, students must select another subject from a choice of seven. Of these, UWIDITE offers one, Personnel Management and Industrial Relations.

Law tutorials are offered three times per week for one month to first-year Challenge Examination students. The Law Faculty plans to make the law tutorials a permanent feature and has considered the use of UWIDITE for a full first-year program.

Courses Not Leading to UWI Qualification

The only course of this type is a program in Continuing Medical Education in Reproductive Health. The course was first presented to doctors and senior nurses by resource persons at all the sites over two periods. In addition, consultations and refresher courses for undergraduate and postgraduate students are offered in this discipline.

Outreach Programs

Outreach is a very important function carried out over the UWIDITE network. Listed below are examples of this aspect of UWIDITE use:

- Secondary School Science Laboratory Technicians Course (CASTME): This in-service course provides knowledge and skills that will allow technicians to better support laboratory activities in the schools. A Certificate of Participation is awarded.
- Nutrition for Community Workers: UWIDITE in collaboration with the Caribbean Food and Nutrition Institute mounted an eight-hour per week, two-month course for community workers in the fields of agriculture, education, health, and community development. The course updates food and nutrition concepts, creates awareness of nutrition problems and measures to overcome them, and strengthens skills in working effectively with the community to promote good nutrition. The course was repeated in May 1985.

- **Principles of Training for Day Care Personnel:** This is a 20-hour course designed to increase the skills of the trainers and potential trainers in planning and conducting local training programs for various categories of day care and pre-school workers. The report on the program states: "The presentation of the training module via UWIDITE was interesting and worthwhile to plan future training programs involving the use of the system." The materials produced for this course are being used in other programs.

- **Radiation Protection:** A brief program was offered for radiologists and radiographers. It examined the properties of ionizing radiation and its effects on surveillance methods and safety. The course was conducted by an expert from the International Atomic Energy Commission.

- **FARMTECH '85:** Speakers from a week-long agricultural symposium in Jamaica (FARMTECH '85) repeated their presentations over UWIDITE. Participation and attendance at all sites were very active.

- **Cardiology Consultations:** The Cardiology Group of the University Hospital of the West Indies, consisting of consultants from the Departments of Surgery, Anaesthetics and Intensive Care, Medicine, and Child Health, and technologists from the Electrocardiogram and Radiology Departments, holds monthly consultations of 1-1/2 hours on the first Friday of each month. Slow-scan television is used for transmitting ECGs and x-rays.

- **Psychiatry Course:** The Department of Psychiatry held a course in approaches to mental health problems for general practitioners in January 1984. One-hour sessions were held twice weekly over a period of three months.

- **Integrated Pest Management:** This was an intensive in-service course held for agricultural extension officers, public health inspectors, and commercial pest controllers in early 1985. The course covered such areas as the recognition and identification of pests, the effects of pests on crop production and health, and methods of pest control.

- **Microcomputers and Their Applications:** This course was held in mid-1985.

Special Sessions

The teleconferencing system is also used to conduct special sessions. These are usually one-time events or programs held over short periods of time that are not directly related to university education and serve a more general purpose. For example, university boards and committees use the network to hold meetings. Professional and academic information exchange within departments and among faculty has occurred over the network. Meetings regarding university administrative matters have been held. Medical consultations on patient management and case histories have been conducted.

Units which use the network for general purposes include the Registry; the Bursary; the Library; the Departments of Agriculture, Anaesthetics, Seismic Research, Mathematics, Obstetrics and Gynaecology, and Health; the Caribbean Lexicography Project; the Commonwealth Caribbean Medical Research Council; the Regional Pre-school Child Development Center; and the Planning and Management Project.

Results

The following tables summarize some of the key findings of the evaluation:

1. UWIDITE Network Usage by Purpose, Academic Years 1983-84 and 1984-85

Purpose	<u>1983-84</u> Percentage of System Time	<u>1984-85</u> Percentage of System Time
Teaching:	43.6	60.4
Challenge Courses	8.7	17.3
Certificates in Education Programs	7.0	20.3
Laboratory Technician and Teacher Upgrading	8.7	7.2
Reproductive Health Courses	10.0	11.8
Other Short-term Programs	9.2	3.8
University Administration/Coordination	9.0	15.4
UWIDITE Planning/Scheduling	47.0	24.1
UWIDITE System Maintenance	0.4	0.1

As the table shows, teaching applications of the network increased in the 1984-85 academic year to well over half of all system usage, and planning and scheduling decreased by over 20 percent of total network use.

2. UWIDITE System Participation Rates by Site, Academic Years 1983-84 and 1984-85

Site	<u>1983-84</u> Percentage of System Time	<u>1984-85</u> Percentage of System Time
Jamaica	26.8	19.5
Barbados	12.0	11.8
Trinidad	13.0	9.2
St. Lucia	25.9	25.0
Dominica	22.3	16.3
Antigua	0	18.2

3. Students Enrolled in UWIDITE Courses by Site, Academic Years 1983-84 and 1984-85

Site	1983-84* Number of Students Enrolled	1984-85** Number of Students Enrolled
Jamaica (Mona)	55	76
Jamaica (Montego Bay)	13	13
Barbados	28	54
Trinidad	38	42
Dominica	61	74
St. Lucia	75	114
Antigua	--	83
TOTAL	270	456

* Number of courses = 8.

** Number of courses = 11.

The number of students enrolled in the more formal UWI courses and continuing education sessions during academic year 1984-85 increased by 38 percent over the previous academic year (excluding Antigua, which participated only in the latter academic year). For medical consultations, outreach programs, or regional conferences the number of participants obviously are very different, with some conferences bringing together over 100 people at a single session.

4. UWIDITE System Acceptance

a. Ratings by Administrators

Item	Percentage Strongly Agreeing	Percentage Agreeing
Equipment easy to use	38.5	60.0
Technical quality adequate for meeting	14.2	67.0
Session useful	38.9	56.9
Objectives achieved	21.3	74.3

b. Ratings by Teaching Faculty

Item	Percentage Agreeing
Positive expectations about system prior to use	82.0
Comfortable teaching on system	93.7
UWIDITE teaching takes more preparation time	68.7
UWIDITE teaching covers less material	53.1
UWIDITE teaching more demanding	75.0
UWIDITE provides quality education to people who otherwise might be unable to afford it	50.0

c. Ratings by Students

Item	Percentage Agreeing
Equipment comfortable to use	92.1
Equipment hinders learning	17.6
Interacted all or most of the time	59.2
Attended class all or most of the time	98.4
Classes are interesting	89.3
More courses should be taught over the system	87.4

The evaluation found a higher acceptance of the system by participants in professional or graduate education sessions than by undergraduates.

5. The Role of Support Materials

The evaluation found that the presence of a local tutor and the availability of print materials and handouts positively affected student acceptance of the system.

a. UWIDITE Acceptance Ratings by Students as Related to Tutor Presence

Item	Percentage Agreement With Tutor Present	Percentage Agreement Without Tutor Present
Equipment comfortable to use	94.7	90.1
Equipment hinders learning	13.7	21.9
Respondent interacted all or most of the time over the network	73.6	40.8
Attended distance-taught class all or most of the time	100.0	95.9
Classes are interesting	91.0	87.3
More courses should be held over the system	90.8	80.9
Prefer face-to-face teaching	35.6	72.9
Harder to concentrate than with face-to-face teaching	27.1	56.7

b. Student Participation as Related to Dissemination of Print Materials

Student Participation	Percentage Agreement (Materials Disseminated)	Percentage Agreement (Materials Not Disseminated)
Interaction high to very high	67.1	31.5
Preparation high to very high	63.8	25.5

6. Student Learning

No direct measure of student learning was available for the evaluation, and the following information is thus based on opinions of faculty and students.

Over 35 percent of the faculty thought that students in UWIDITE sessions learned as much as in traditional on-campus classes. The same proportion said that students learned less. Many faculty believed that the UWIDITE students benefited from the interaction with other students throughout the region because it encourages independent thinking. Two-thirds of the students indicated that UWIDITE was an effective learning medium and

that they learned a great deal. The following table summarizes student self-reported learning effectiveness.

Item	Percentage Reporting*
UWIDITE is an effective medium for learning	
• for specific courses	66.6
• for all courses	28.9
Learned from the course	
• a great deal	68.2
• some	27.3
• not very much	4.5
Compared with conventional courses, UWIDITE students**	
• learned more	12.5
• learned less	32.5
• learned as much	55.0
Compared with conventional courses, UWIDITE students**	
• learned more efficiently	10.0
• learned less efficiently	40.0
• learned as efficiently	45.0
Compared with conventional courses, UWIDITE courses**	
• covered more material	26.3
• covered less material	26.3
• covered as much	42.1

* Items may not add to 100% because some students answered "Don't know."

** For many courses and participants the option of a conventional course often is not available.

The evaluation also found a positive relationship between self-reported learning effectiveness and tutor presence:

Item	Percentage Agreeing (with Tutor)	Percentage Agreeing (without Tutor)
Learned more through UWIDITE	39.2	11.9
Attended classes		
• All the time	73.3	58.7
• Most of the time	26.7	37.3
Equipment hindered learning	13.7	21.9

7. Teaching Techniques

An interactive delivery system requires new teaching techniques, which were promoted by the UWIDITE office with the following results.

**UWIDITE Faculty Self-Reported Information on
Appropriateness of Teaching Techniques**

Item	Percentage Reporting
Received training on teaching techniques	70.6
Received training on course development	35.3
Tried techniques taught in training	50.0
Lectured for no more than 15 minutes without break	76.5
Provided students with introductory package	76.5

The feedback from sample respondents regarding teaching techniques revealed that the best approach to teaching over the system is to hold a conversation rather than a formal lecture and that the provision of study materials for students is very important.

ANALYSIS OF UWIDITE's PROGRESS

The success of UWIDITE can be documented at various levels, through statements of support from participants, active financial support by donors and programs, and through policies at the national and regional levels.

Reaching the Objectives

UWIDITE is accomplishing its stated objectives:

- There is significant demand for the teleconferencing services. It shows in the tight scheduling required, including Saturdays, to accommodate requests; in the development of new projects and proposals for service use; in the requests to repeat programs by those organizations that have used the service; in the requests from extramural centers for new or additional services; and in the explorations by centers which are not served as to how they can become network sites.
- There are increasing indications that faculties and affiliated organizations and programs regard UWIDITE as a viable structure and service to strengthen regional activities and domestic development. This is particularly evidenced in financial and programmatic support by external donors and regional institutions for projects which use UWIDITE as an outreach tool. As well, carriers have begun to allow a special tariff for UWIDITE, a further indication of its institutionalization.
- A core of skilled technical, operational, and programmatic expertise has been developed within UWI, in particular at the Jamaica campus. Local and regional carriers can comfortably operate the existing service and even expand operations.
- Mechanisms for educational materials, or total learning systems, development have been put in place. This facet, however, could improve with additional support at Barbados and Trinidad, where activities in this area were limited because of financial considerations which concentrated this aspect on Jamaica.
- UWIDITE has become a permanent service with a place in the regular UWI budget. A proposal to include additional centers and countries is being considered. The complexity of such an undertaking is evident. Budget constraints make it difficult to assume new line charges and purchase new equipment; however, some interesting financing models have developed with external projects and donors sponsoring UWI faculties, institutes, and other regional organizations in effect to buy into the UWIDITE service.

Meeting the Challenges

Organizational Structure

The organizational structure chosen by UWI for its distance education activities has worked well, especially in Jamaica. The presence of a project office with responsibility for program development and instructional design support has been effective in mobilizing the Jamaican faculties and institutes.

More problematic has been the active involvement of the other two campuses, where core support activities were absorbed through existing staff and resources. Because a duplication of the Jamaica offices at the other campuses was outside the budgetary parameters, however, no other option was realistically available. Expansion of the network and services to other sites and in additional subject areas, however, should include the provision of support to the other campuses so that their expertise can be tapped more directly, in particular in the more specialized graduate, postgraduate, and outreach programming. Overall, however, the approach that was implemented may well have been the best workable solution for the initial project; future initiatives incorporating more active participation of all sites can build on this approach.

Expansion of services probably will require a stronger institutionalization at the extramural centers of the work associated with UWIDITE. It may be necessary to create a staff function dedicated to such integration. In addition, instructor compensation and support must be regularized with the university structure so that UWIDITE is a fully integrated part of faculty activities.

Educational Quality

UWIDITE-delivered qualification courses follow the same syllabus, use the same examinations as the same courses offered on-campus, and are subject to the same quality-review processes. UWIDITE offers instructional assistance to teachers, and many instructors have asked for materials developed for UWIDITE as an aid in using a new educational delivery method. Students enrolled in some on-campus courses have purchased course materials developed for UWIDITE to complement their on-campus instruction. UWIDITE course materials are often revised in response to feedback from presenters and participants.

Course materials, lecture notes, videotapes and other support materials are very important for remote learners, and their preparation is continuously encouraged by the project office. At the same time, the logistics associated with their distribution often has been a bottleneck.

The fact that the delivery method for the programs is interactive has helped to elevate the level of quality. Participants can question to clarify points not understood. This, in turn, gives the instructor feedback as to his or her method of presentation.

Within the context of quality one must understand that it is difficult to establish a comparative basis. For many participants the alternative to UWIDITE-based learning is limited to independent study, for which few learning packages are available; to travel and relocation, which is a costly and often unrealistic option; or to faculty travel to learning sites, which typically consists of short, intensive activities. Given these options and feedback from participants and instructors, the UWIDITE services offer a viable, quality service.

Technical Performance

The technical aspects of the project initially presented as many issues as anticipated and required more resources than expected. Although some problems remain, the overall technical performance after the "burn-in" period has been satisfactory and ably supports full-time use of the network.

In the planning and implementation phase, the task was to develop a network which involved many national and international carriers as well as a diversity of transmission systems and significant variance in the performance of the different links. The conditioning of these links and their networking into a regional conferencing system was a difficult, but ultimately successful, task. In addition, the fact that the telephone terminal equipment and other components were U.S. standards and would be under the control of the university, not the carriers, added complexity.

Operationally, the large number of authorities involved in making the system work resulted in a division of responsibility which took a long time to overcome. It often required the combined efforts of all carriers involved to detect and overcome a problem. A problem could also be with UWI's equipment, and an additional set of technical parameters and expertise had to be introduced. The addition of a full-time technical staff person at UWIDITE has helped to regularize the situation and facilitate the handling of technical problems.

The classroom equipment performed satisfactorily. Some of the microphone equipment wore out prematurely, but the UWIDITE technician redesigned the most heavily used facilities in Jamaica to suit specific UWIDITE uses and requirements. All sites had to overcome acoustic problems in the classrooms.

With the gradual addition of on-line equipment to visually support sessions, new complexities emerged. Slow-scan TV, electrowriters, and computers (at the campuses only) required special interfaces as well as new equipment configurations to integrate them into a "visual sphere" for students and instructors alike. A console integrating the different components was designed for the Jamaica classroom and is being duplicated or adapted for the other sites.

Both students and instructors anxiously awaited the visual equipment, and expectations ran high. Problems with the equipment, however, caused many instructors to discontinue using electronic visuals, and they again prepared and mailed handouts as necessary. A lecture that is complemented by electronically transmitted visual aids becomes an inadequate and ineffective presentation when there is a malfunction in the visual component. A particular problem in the widely scattered system was when a fault at one site made the system inoperative for all others because an instructor could not effectively use the support for illustrations, even if only one of the reception units was inoperative.

The slow-scan equipment was relatively reliable. Instructors were quite interested in using it to highlight and illustrate points, even though quality transmission of images at times required specially prepared pages (i.e., large lettering). Instructors look forward to the day when reliable equipment performance can be expected continuously.

The electrowriter performance was more problematic and has required significant efforts by the Technical Officer. Teachers and students alike see an instructional value in this type of support tool, allowing spontaneous visual interaction. It appears, however, that the slow-scan technology can transmit almost the same information, although when used ad hoc as part of a session it is somewhat more difficult to use than electrowriters.

Computer networking for messages and administrative matters has been tested with mixed results among the three campuses. This feature can ultimately open network time for more instruction because it could be used during off-hours for administrative purposes. In addition to the computer network, the three campuses also were equipped with a privacy function which would allow private telephone conversations between any of

these sites. This feature never became satisfactorily reliable. The campuses also installed scrambling equipment to allow for confidential discussions among campuses regarding such issues as grades or budgets. This feature performs satisfactorily.

The use and performance of the educational support technologies have been somewhat impeded technically as well as operationally because they share a single channel with the audioconferencing service. It is difficult to test if the transmissions work, because no voice line is available during visual transmission, and all participating sites have to be alert to switch back and forth between the channels. The costs for a second channel, however, do not make this option feasible. Technical features which allow simultaneous use of a single channel by voice and graphics are more desirable.

Development of a Support Base

The demands made on the UWIDITE schedule reflect the support the service has received within the academic faculties, administration, affiliated institutes, and some outside agencies. Participants cover a broad spectrum of UWI's constituents and policymakers. This support, outside Jamaica, is particularly strong at the extramural centers and from the governments of smaller islands. The two other campuses have not been as active as they might have been and probably will require additional resources to fully be able to bring their expertise into the network.

Throughout the project, and beginning with the regional communications services study, UWI has been careful to integrate senior government policymakers into the development process and to demonstrate the service in senior policy activities, such as university Senate meetings. Presentations to the university Council regularly include UWIDITE updates and briefings, resulting in an allocation for the triannual budget.

Outside the educational community, the carriers were another set of constituents brought into the overall process. They are now well aware of UWIDITE's requirements and are willing to make special efforts to maintain the service. The reduction of long distance tariffs by one carrier two years after project implementation is an indication of support. UWI can be expected to get a positive hearing in future discussions with the carriers, and its requirements will be considered in future service developments.

Forging Common Goals

The most challenging and at the same time least tangible effort of UWIDITE was the forging of common goals and policies among member states, various university interests, and the carriers. A system like UWIDITE requires such common goals not only on paper but also expressed in concrete action. Without a communications network it is often hard to detect or easy to overlook that stated goals are not being acted upon. A communications network, when lying idle, will bring this issue immediately to the fore. In terms of participation, UWIDITE has achieved broad-based support of its goals. Network time is used to a significant degree for its intended purposes, and the different sites participate regularly.

Network activities originated by the three campuses show that the Jamaica campus is significantly more active than the other two. Various reasons for this were cited in earlier sections in the analysis. It appears, however, that over the long term, with network and service expansion, more active participation of those campuses will be essential to ensure that the Caribbean region benefits fully from UWIDITE and UWI.

THE FUTURE OF UWIDITE

Network Expansion

As distance teaching gains recognition throughout the Caribbean, more and more countries are clamoring to be included in the UWIDITE network. In particular, the Western Caribbean has so far been excluded from the system. As more sites are added, the network will become more unwieldy and expensive. A solution may be the use of independent small ground stations accessing a suitable satellite. Funds for this improvement have not been identified nor is the necessary clearance by the telecommunications authorities certain. Much groundwork still needs to be accomplished.

The present availability of a single audio channel limits the flexibility for the use of the graphics equipment. Ways need to be found for effective multiplexing or, ultimately, a second channel needs to be established.

Another important matter for the future is the extension to other sites and extra-mural centers within the same countries. Even in small countries like Dominica, the populations outside the capital cannot participate in regular programs because of unreliable domestic telephone services. Road travel can be very difficult, take hours, and be costly.

Regional and Political Perceptions

UWIDITE has had a valuable impact in the Caribbean. It has won acceptance among politicians as a valuable experiment on which they pin many hopes. With the recent restructuring of the University of the West Indies, UWIDITE has become an even more valuable asset. The UWI Council and participating governments will provide continuing assistance because UWIDITE is increasingly seen as a means of improving the educational status of the smaller countries and as a means of maintaining the regional character of the university.

Among its accomplishments, UWIDITE has:

- provided a new training option when, for reasons of scale or otherwise, other options are uneconomical
- increased the quantity and quality of outreach, consultations, and services that the university and other regional institutions can provide
- improved many aspects of the university's administration and other operations
- provided a significant amount of educational material which has been prepared at very low cost to the students

Within the university UWIDITE also is gaining more acceptance. The following quotation from a letter confirming arrangements for the cardiology teleconferences gives one view of UWIDITE:

The decision [to hold the teleconferences] was made because it was felt that this would be the most cost-effective method of reviewing patients presented with heart disease in the various territories throughout the Caribbean. Patients will be presented at these conferences and a decision will be made about their management . . . This will . . . reduce the costs of telephone calls between the referring doctors . . . [prevent patients unnecessarily to be sent for surgery to Jamaica]. It is hoped that when the Montego Bay facility is properly established patients from that area of the island can also be reviewed via this system . . . It is hoped that the physicians in the territories not presently supplied by this facility may even find it possible to travel to the islands with the facilities for presentation of their problem cases.

Additional International Challenge for UWI

While UWIDITE is struggling with and developing its long-term strategy and budget, developments in North America could challenge part of the very premise of UWIDITE. Whereas UWIDITE does not have the money to establish a satellite-based extensive network to serve many different learner needs, such services are being offered increasingly in North America, where a potentially large student base and the technology infrastructures exist. These programs can be received in most parts of the Caribbean. Therefore, it may become more convenient for residents in the region to participate in a program originating in North America than participate in UWI programs. This area of potential competition would largely be in graduate and professional programs and be television based. It is these subject areas, however, that make up a large percentage of UWIDITE's services, and their erosion would be harmful to the institutions.

Prescriptions for Success

Many factors contributed to the success that UWIDITE experiences today. As more needs are identified in the Caribbean region and if UWIDITE moves to accommodate them, many of the foundations upon which UWIDITE is based and the principles which guided its development to its present success will be useful in the future. These include:

- senior project leadership and the strategic involvement of government policy-makers
- the initial use of relatively simple technologies with a gradual introduction of more complex components
- the requirement for only minimal administrative adjustments and for limited physical changes at participating sites
- the integration of new capabilities into existing institutional practices
- the development of programs that address the real needs among residents of the islands, especially in the areas of professional upgrading and outreach activities.

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 in Indonesia**, 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**
- **Telecommunications Services for Health Care: Experiences of the AID Rural Satellite Program**
- **Peru Rural Communications Services Project: Final Field Report**

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

Acknowledgements

The following individuals are among the many who have contributed to the success of the AID Rural Satellite Program:

Agency for International Development

Bureau for Science and Technology

Office of Education

Clifford Block

Peter Spain

Robert Schenkkan

Lawrence Frymire

Office of Energy

Shirley Toth

Bureau for Latin America and Caribbean

Office of Development Resources

Richard Martin

Academy for Educational Development

Karen Tietjen

Willard Shaw

Hugh Orozco

Luis Medrano

Michael Calvano

John Tatlock

Sandra Lauffer

Anna Stahmer

Douglas Goldschmidt

Frank Dall

Jay Miller

Peter Boynton

Florida State University

John Mayo

Gary Heald

Steven Klees

Martha Cruz

Diefla Pramono

NASA—Lewis Research Center

William Bifano

Richard DeLombard

Anthony Ratajczak

Abt Associates

Larry Kerpelman

John Hodgdon

Elaine Mason

Institute for Telecommunication Sciences

Peter McManamon

Ray Jennings

SISDIKSAT—Indonesia

Sidharta Pramoetadi

Hasyah Haneng

Tahir Ali

Rajab Johari

Rhiza Sadjad

I. G. N. Agung

Purwadi Harto

Soedarko

Bambang Riady Oemar

Iip A. Arief

Abd. Muis Ba'dulu

Musyi Amal

M. Lawele

Mirhanuddin

Yan Pieter Karafir

K. W. Timboeleng

F. Manuhutu

Zainuddin

Soedarto

Emir A. Siregar

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

Sadie Campbell

Edith Allen

Tony Walling

Keith Manison

Marlene Hamilton

ENTEL—Peru

Angel Velasquez

Felipe Yanes

Hector Cossio

Jorge Cisneros

Isabel Candia

Mildred Casanave

Margot Ruis

Victor Torres

Alippio Quincho

Ruth Cardenas

Gladys Infante

Angela Campos

Lili Aguila

Carmen Reategui

Cesar Arias