PDWAA 835

Abt Associates Inc.
55 Wheeler Street, Cambridge, Massachusetts 02138
Telephone • Area 617-492-7100
TWX: 710-3201382

AAI #85-61

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# FINAL REPORT

## Rural Satellite Program: Evaluation Management Contract

Volume I: Findings, Conclusions, Recommendations

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Larry C. Kerpelman, Project Director

Report Authors:
Jonathan D. Hodgdon
Larry C. Kerpelman
Samiruz Zaman

Prepared for:

Dr. Clifford Block
Contract Technical Monitor
Rural Satellite Program
Agency for International Development
Department of State
S&T/ED, Room 609, SA-18
Washington, D.C. 20523

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|---|---|---|
| Larry Kerpelman<br>Contract Manager | Stephanie Y. Wilson<br>Quality Control Reviewer | Stephanie Y. Wilson<br>Management Reviewer |

## EXECUTIVE SUMMARY

The Rural Satellite Program was designed by the Agency for International Development to assess whether satellite communications can contribute, reliably and cost-effectively, to progress in rural areas of developing countries and to transfer a broad range of communications technologies to developing nations. The program encouraged the use of existing satellites to provide domestic communications for rural areas in the developing world, making telephone, radio, and other communications modalities available to support rural development activities.

Rural Satellite Program projects were implemented in Indonesia, the West Indies, and Peru. Only the first two projects were under the purview of this evaluation. The two projects were similar in design in many respects. Both linked island-situated campuses of university systems by satellite, microwave, and telephone line linkages with interactive audio-teleconferencing and related support equipment. In Indonesia, the campuses linked by SISDIKSAT (the Indonesian acronynm for its system) were members of the Eastern Island University Association and the Agricultural Institute at Bogor; in the Caribbean, the campuses linked by UWIDITE (the University of the West Indies Distance Teaching Experiment) were main campuses and extramural centers of the multination University of the West Indies.

The evaluation research and the findings were organized around six evaluation issues, as indicated below. This Executive Summary concludes with recommendations.

### System Use Patterns

Once system start-up was achieved, both projects relatively quickly began to use their systems to their full schedule capacity, implying that the Rural Satellite Program addressed a real demand in these developing countries. The two demonstrations studied here suggest that that demand exists in the educational sector and can be met by this technology.



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System uses in the two demonstrations evaluated were for undergraduate teaching, graduate teaching, university administration, system planning and scheduling, and system maintenance. Teaching was the major use in both demonstrations. There was a different mix, however, between the two demonstrations in terms of the type of teaching done: Indonesia focused on undergraduate teaching, while the University of the West Indies did more graduate level and inservice teaching on its system.

Audio-only distance teaching may be better suited to graduate and inservice teaching than to undergraduate teaching, we conclude. In both demonstrations, the face-to-face element that was missing appeared to be more of a problem for undergraduate students and their teachers than it was in the higher level courses. Our findings suggest that distance taught courses require a certain amount of organization, readiness, and preparedness that undergraduate students may be less inclined than graduate or professional students to give. The presence of a tutor in the distance taught classroom had a noticeably positive impact; tutor presence seemed to make the undergraduate students more focused and prepared, and students indicated that they learned more.

Moderate use of both systems was made for purposes of university administration and coordination. It is perhaps somewhat surprising that more use was not made of the systems for this purpose, given that the campuses involved are separated on different islands and by large geographical distances. In Indonesia, at least part of the lower than expected use for this purpose derived from the fact that the university Rektors did not seem to feel comfortable holding their periodic meetings over the system (although the Vice-Rektors did use the system extensively for administrative purposes). We found little use of the systems for exchanging research information.

With regard to system components, the audio component was by far the most heavily used, as planned. The facsimile equipment was used in a minor way in Indonesia.

Acceptance of the Technology

Initial expectations about the two communications systems were high. There was a good initial climate of receptivity: we found little

technology-shyness, and while there were some concerns among faculty and administrators as to how well the system would work, guarded optimism prevailed prior to start-up.

When the applications planning, management, and support were adequate, continued and increasing acceptance of the technology occurred, as, for example, among the Vice-Rektors and the Open University officials in Indonesia, or among conferees in reproductive medicine in the Caribbean. When such factors were not adequate -- as when course handouts were not distributed on time to the receiving distance teaching locations, the starting times of sessions were delayed, sessions were postponed, or teachers were not trained in proper distance teaching techniques -- users (and, quite likely, potential users) became disenchanted.

Administrators generally accepted the technology and used it appropriately. Interestingly, though, many administrators felt that a telecommunications system did not diminish their need, or provide a substitute, for face-to-face meetings. Faculty were particularly pleased by the capability provided them by the teaching system to reach students they would not have been able normally to reach. Teaching faculty also uniformly expressed the opinion that distance teaching required more preparation than traditional teaching and that less was covered than traditional teaching per unit of class time. While they did not necessarily express great enthusiasm for distance teaching as compared with traditional teaching, students were accepting of it and the technology which made it possible. They were particularly pleased by the capability the system gave them to hear viewpoints of students on campuses other than their own.

There was a consistently expressed sense of positive expectation toward the graphics component of the satellite systems which, when it worked well, seem to enhance appreciation of the system.

Student Learning

To the best of our ability to tell, student learning was not enhanced through distance teaching by satellite communications. At the same time, it did not appear to be diminished. While learning qua

learning may not have been enhanced, the satellite communication experience was a broadening one in itself. Students reacted positively to the experience of hearing the viewpoints of students on campuses other than their own.

We found that the following elements seemed to enhance student learning in the distance teaching situation: clear audio transmission and reception, timely distribution of printed material that supports the lectures, presence of tutors in the classroom, and attention to management and logistical support aspects so that class scheduling and technical equipment functioning can proceed without hindrance. We also found evidence (in Indonesia) that teaching techniques appropriate to the distance-teaching medium seemed to facilitate and enhance student learning. These appropriate teaching techniques are discussed in the immediately following section.

Appropriateness of Teaching Techniques

Quite clearly, there are adaptations that need to be made in distance teaching, and faculty need to be trained on them. Teaching faculty in the UWI system exhibited more of the appropriate teaching behaviors than did those in Indonesia. We suspect that this was due to the fact that more of the faculty that taught on the system at the former demonstration received training in this regard than did those at the latter demonstration. There may also be cultural differences which may account for greater adaptation to appropriate teaching techniques on the part of the Caribbean faculty.

Opinion as to what were the most appropriate and effective techniques to use in order to take full advantage of the technology was reasonably consistent. Faculty should lecture no more than 15 minutes without stopping for questions and answers; student discussion should be encouraged; faculty should receive training on the proper use of audio-visual and graphics equipment; students and faculty need to be taught proper microphone usage; lectures must be presented more slowly, deliberately, and precisely and should include more examples and repetition; classes should be longer in order to accommodate for the slower pace re



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quired in distance teaching; and, if regional or cross-national accents are a factor, that must be recognized (by surfacing it as an issue and reminding both students and faculty to speak clearly and distinctly).

Institutional Development

When appropriately supported, satellite communication systems can help to build institutions, forge linkages, and provide an additional means of outreach. Obversely, when not appropriately supported, a satellite network is not going to significantly promote institution building.

The University of the West Indies has been particularly active in developing and promoting a variety of programs which reach across the region -- the Certificate in Education Program and the JHPIEGO Reproductive Health Courses, for example. By seeing and promoting UWIDITE as a regional resource, the UWIDITE administrators have helped not only to build institutions and institutional linkages, but also to strengthen the UWIDITE system itself. The SISDIKSAT system has not been as active or successful in fostering institutional development of the Eastern Islands University Group, perhaps because the satellite communication system itself is still, at this point in time, not as far past its start-up phase. The new Open University of Indonesia has actively and productively used SISDIKSAT to help build that fledgling educational institution. Requests from other Indonesian agencies to use SISDIKSAT are not yet being honored, but the fact that they have been expressed suggests a potential for institution-building in that environment.

System Affordability

Our resource analysis of the two distance teaching demonstrations reached no firm conclusion as to the affordability of each satellite system to its member institutions. Overall, the UWIDITE network has lower costs than the SISDIKSAT network principally because of the lower cost for the leased telecommunications circuit. Annual costs are $130,000 in the Caribbean for a single channel versus $320,000 in Indonesia for a two-channel system. These costs equate to $24,000 per site in the Caribbean versus $30,000 per site in Indonesia. On a per-channel basis, however, lease costs for the two systems are not that far apart



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($130,000 for UWIDITE versus $160,000 for SISDIKSAT), and on a per student reached basis, the SISDIKSAT system cost is one-half the cost for UWIDITE ($375 vs. $750).

Both systems have total manpower requirements averaging 3 to 4 full-time equivalents per remote site and 9 to 10 full-time equivalents for project headquarters. The UWIDITE project, however, shows a more favorable mix of staff as it is currently managed entirely by local staff with many of the administrative duties performed by mid-level clerical staff. On the other hand, SISDIKSAT is currently managed with heavy expatriate consultant involvement, and with many of the administrative and clerical duties performed by senior level technical staff. And since the UWIDITE instructors are trained in the use of the classroom equipment, less continuous presence of system operators and technicians is required in the UWIDITE classrooms than in Indonesia, where instructors are not encouraged to handle the equipment. Since SISDIKSAT has thus far operated for fewer semesters than UWIDITE, it is conceivable that, as more experience is gained, it will require less expatriate consultant involvement and less involvement of senior technical staff in the future.

Finally, both systems presently make very little use of their most expensive component -- the graphics equipment. Future distance teaching applications could realize considerable savings in start-up costs (an estimated $24,000 per site excluding the software studio) and operational costs (an estimated $18,000 per site per year) by opting only for audio-conferencing applications over a single channel.

Recommendations

Our experience suggest that the likelihood of success of a telecommunications system in developing countries is increased dramatically by selecting a healthy host institution with adequate resources and in a favorable geopolitical climate, by locating satellite classrooms near other learning centers (such as the university library), by providing user friendly telecommunications equipment with proven reliability, and by seeing that strong local leadership is in place to manage the project. In addition, it should be recognized in the planning stages of such systems that network design, procurement, installation, and testing



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generally take much longer than expected. and the disparity between actual times and expected times can have negative effects on system start-up and operation.

Strong, well-placed, and committed in-country leadership for such projects is important for their effective and smooth implementation. Various elements of operation of such systems require continued and insightful management attention: overall policy direction, securing of local support funds, staff supervision, integration of the distance teaching courses with the institution's regular offerings, and publicity and promotion of the system.

The critical importance of timely user training in distance teaching techniques, course development, teleconference organization, and proper use of the telecommunications equipment also needs to be emphasized. Some orientation should be given not only to instructors but also to all other system users, including government and university officials, tutors, and students. To maximize the effectiveness of the training, the sessions should be conducted just prior to initial system use and should be held face-to-face if possible. Successful operation of a telecommunication system by its users rather than by system operators and technicians can only be accomplished with coordinated hands-on user training, with reliable telecommunications equipment and transmission lines, and with careful administrative monitoring and management of system use.

Another lesson learned from the demonstrations that relate to user training is the importance of classroom tutors to the overall learning process in distance taught courses. Both demonstrations revealed dramatic differences in such matters as student attendance and attentiveness and the timely availability of class lecture notes or handouts between classes with and classes without at least one tutor present in the classroom. Greater tutor involvement before and during operation of a distance educational network would appear to benefit such projects immeasurably.

In conclusion, the demand for higher education in developing countries is there; satellite communications systems can help to meet that demand. Not only can such systems broaden the educational opportunities

available to people who are isolated bv distance and oceans, but also they can provide a way for them to be exposed to the ideas and thoughts of others far from them. Faculty and administration, as well, can benefit by greater ease of access to their colleagues. The experience of the Indonesian and Caribbean distance teaching experiments points to the need for careful planning at the outset and continued management attention during operation for such systems to function effectively. The experience of the UWIDITE project at the University of the West Indies and, in certain respects, the SISDIKSAT project, provides evidence that a well-designed audio-conferencing system, managed well, can be used successfully and affordably for distance education in developing countries.

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## 1.0 THE RURAL SATELLITE PROGRAM AND ITS EVALUATION

This report describes the evaluation of the Rural Satellite Program (RSP) sponsored by the Agency for International Development (AID). Abt Associates Inc. (AAI), as the Evaluation Management Contractor (EMC) was responsible for developing evaluation plans, carrying out the summative evaluation, analyzing the data, and preparing this report. This report provides the results of the summative evaluation of the RSP at two demonstration locations (hereafter referred to as "demonstrations"). The major description of the Rural Satellite Program itself is embodied in a separate report being prepared by the Academy for Educational Development (AED), which served as the Applications Management Contractor (AMC). The AMC was responsible for assisting AID in the selection of countries to serve as demonstration locations, assisting the selected host country governments in procuring the hardware and developing applications for the RSP, and assisting them in starting and running the RSP and disseminating information about it. Hence, it is to the AMC report that the reader is referred for details of the system equipment, the software, and applications as they were implemented in the two demonstration countries.

In order to place the evaluation in context, however, a brief description of the RSP is needed. The following section provides that brief description. The objectives of the evaluation, as they evolved during the course of this contract, are then discussed, as are the constraints to the evaluation activities and the limitations of the findings. The final section of this chapter provides an overview and chronology of the evaluation activities.

### 1.1 The Rural Satellite Program in Brief

The Agency for International Development launched the Rural Satellite Program to assess whether satellite communications can contribute, reliably and cost-effectively, to progress in rural areas of developing countries and to transfer a broad range of communications



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technologies to developing nations. The program encouraged the use of existing satellites to provide domestic communications -- primarily of an audio nature -- for rural areas in the developing world, making telephone, radio, and other communications modalities available to support rural development activities.

The original purposes of the AID Rural Satellite Program were:

1. To develop and test models of how communication satellites can help provide information and services necessary for rural development.

2. To demonstrate to communication carriers and equipment suppliers the need for, the utility of, and the market for communications services in the rural areas of developing countries.

3. To help lower the cost of earth stations appropriate for LDC rural development use through demonstration of appropriate technology and application on a pilot scale, in anticipation of later large volume markets for operational systems.

4. To provide evidence of the benefits of rural telecommunications investments to international lending agencies investing in rural development.

5. To support the development of national capacities within LDCs to integrate telecommunications investment planning with sectoral programs for rural development in education, health, agriculture, or other rural development activities.[1]

These purposes were to be implemented in three to five demonstration countries over the course of the program, each demonstration slated to be of two years duration. As the program evolved, various constraints (primarily budgetary) served to limit both the scope of the overall program objectives (mainly in terms of the sectors served) and the number of demonstration countries in which the RSP would be implemented. Accordingly, the larger order evaluation objectives for this contract

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[1]Agency for International Development, Rural Satellite Program: Evaluation Managment Contract, Program Description (Appendix A), August 17, 1981.



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originally desired by AID representatives and developed by the EMC[1] were reduced somewhat in scope. The evaluation questions which emerged as the final ones are discussed in Section 1.2 below.

The program which evolved saw the RSP implemented in Indonesia and the West Indies. Project implementation also occurred in Peru, carried out by the Peruvian National Telecommunications Authority, but that demonstration project was not included as part of this Evaluation Management Contract. It was evaluated, instead, by Florida State University.

### 1.1.1 The Indonesia RSP in Brief

In Indonesia, the RSP linked by satellite 11 primarily agriculturally-oriented campuses of a loose confederation of educational institutions, the Eastern Islands University Group (known by its Indonesian initials BKS). The Indonesia RSP linked the BKS campuses with one another and with locations in Jakarta and Bogor, further to the west, through Indonesia's existing PALAPA satellite system. The Indonesia RSP, known by its Indonesian acronym, SISDIKSAT, had interactive audio-teleconferencing, facsimile, and audiographic capabilities.

The BKS campuses are located on islands spread over 1,600 miles of ocean east to west. Exhibit 1-1 provides a map of the relevant area of Indonesia and the participating institutions; Exhibit 1-2 provides a list of the institutions participating. The main office of the Indonesia RSP was located on the campus of Hasanuddin University in Ujung Pandang on the island of Sulawesi. There were 11 BKS campuses participating in the Indonesian RSP, 8 universities (one of which, Cendarawasih, had 2 campuses) and 2 teacher training institutions (or IKIPs). One of the former and one of the latter (Sam Ratalungi University and IKIP Manado) shared a distance teaching classroom, so there were in all 10 BKS classrooms. In addition, the Bogor Agricultural Institute (IPB) was connected to the system. Its preeminence as an agricultural graduate research institution made it a source of experts who could teach

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[1]Abt Associates Inc., Program Evaluation Plan Report. Cambridge, MA, October 1, 1981.



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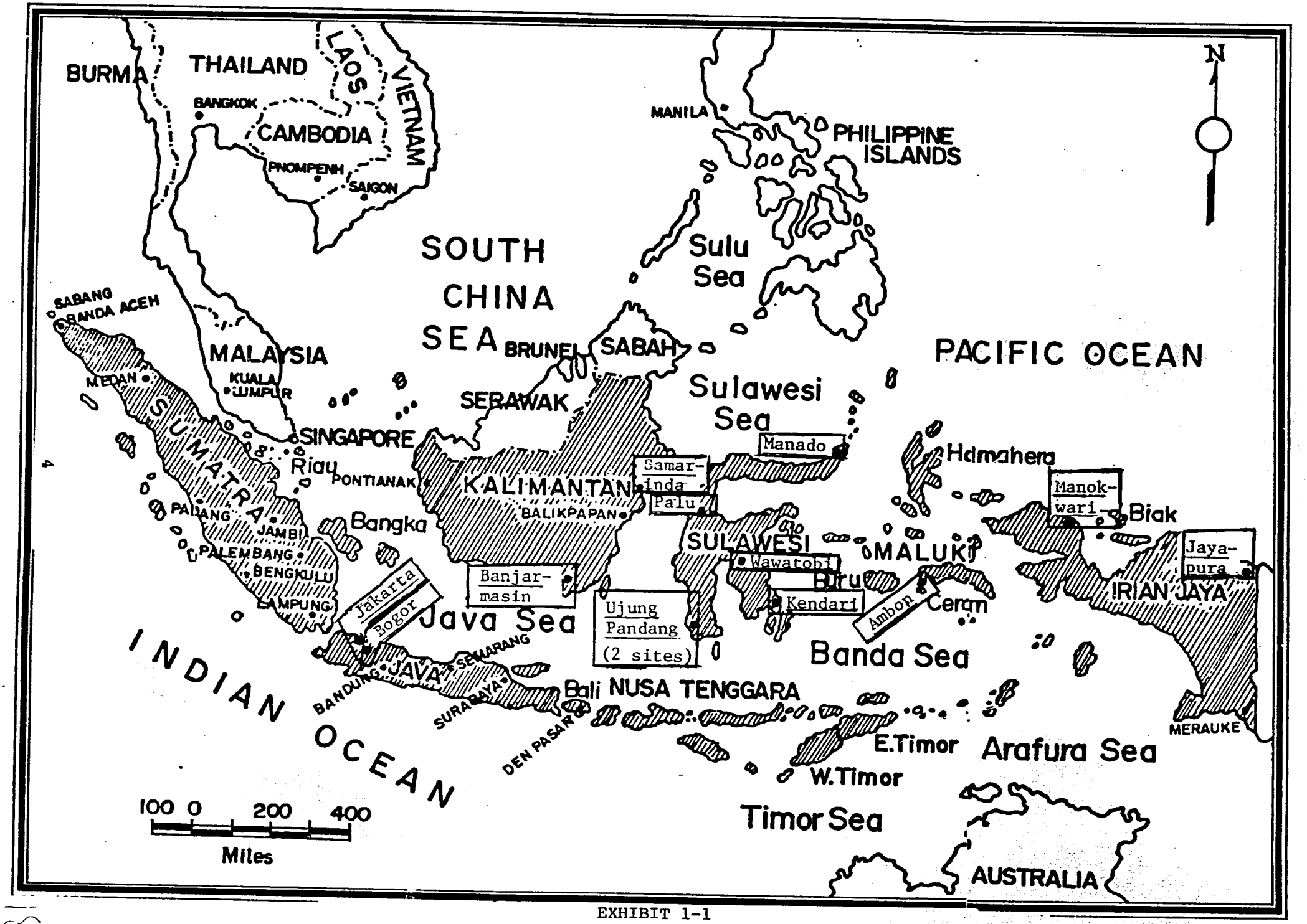


EXHIBIT 1-1

Map of Indonesia, Showing SISDIKSAT Locations, Boxed In.
(Full list of SISDIKSAT campuses is found in Exhibit 1-2).

**Exhibit 1-2**

**SISDIKSAT Sites**

| Location | | Name of Institution | Short Name |
|---|---|---|---|
| Ujung Pandang | | Hasanuddin University | UNHAS |
| Ujung Pandang | | *IKIP Ujung Pandang | IKIP/UP |
| Kendari | | Halu Oleo Univeristy | UNHALU |
| Wawotobi | | Remote classroom at remote earth station | ------ |
| Manado | one classroom shared by 2 institutions | Sam Ratulangi University | UNSRAT |
| | | *IKIP Manado | IKIP/M |
| Palu | | Tadu Lako University | UNTAD |
| Banjarmasin | | Lamburg Mangkurat University | UNLAM |
| Samarinda | | Mulawarman University | UNMUL |
| Ambon | | Pattimura University | UNPATTI |
| Jayapura | | Cenderawasih University | UNCEN/J |
| Manokwari | | Cenderawasih University (Agriculture Faculty) | UNCEN/M |
| Bogor | | **Institut Pertanian Bogor (Bogor Agricultural Institute) | IPB |
| Jakarta | | ***Dept. of Education & Culture, Directorate General of Higher Education | PDK/Jakarta |

* - IKIP is the Indonesian acronym for a teacher training institution.

** - Not part of BKS. Bogor was included in the system as a source of expert teaching to the BKS institutions.

*** - This site was also used as a receiving classroom in Jakarta for the Open University.

over the satellite system to the BKS institutions. Also, during the course of the RSP, IPB and Hasanuddin University signed an agreement for the former institution to provide graduate courses in agricultural subjects to both students and faculty at the latter institution. There was a satellite classroom installed in the offices of the Directorate General of Higher Education in Jakarta enabling it to participate in the system. This facility was used as an Open University classroom as well. Finally, a remote earth station and classroom were installed at Wawotobi as part of the system, although this site's operation did not start until after the EMC's evaluation activities were essentially completed.

The Indonesia system's telecommunications were meant to improve educational quality by fostering distance teaching, curriculum development, faculty upgrading, and exchange of administrative and research information. Because of their location hundreds, and in some cases thousands, of miles away from the "centers of excellence" concentrated in and around Jakarta (particularly the Agricultural Institute in Bogor), the eastern island university campuses tended to be out of the mainstream of agricultural development and education in Indonesia. Because of their island locations and the large distances from one to the other, travel to the various BKS campuses was not always convenient for faculty and administrators. In fact, faculty members, or "dosen," who were experts in their field would frequently travel to various campuses to present concentrated one- or two-week-long courses in their subject matter. This would not only be disruptive to a dosen's normal class schedule, but also to the class schedules of students who took the course on each campus, since they would drop their regular classes to attend the "flying dosen's" course. Further, because of the state of the Indonesian telecommunications infrastructure, communication among the campuses was also not always readily accomplished, so that, for example, administrators on the BKS campuses would feel the necessity to meet in person with their counterparts on other campuses to coordinate administrative affairs.



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The overriding concern of the Indonesian RSP was to improve the quality of education in the Eastern Islands. This concern was manifested in several objectives for the Indonesia RSP:

1. To maximize the limited resources (primarily skilled faculty) available to the Eastern Islands area in order to extend educational opportunities to students there. This objective aimed to increase student access to courses, make course offerings not normally available to students available, and increase the level of expertise of those teaching the courses.

2. To provide a stronger institutional base for cooperation, communication, and interchange among the Eastern Island institutions by either strengthening the BKS as an institutional device or through some other institution-building device. During the course of this project, the USAID Mission in Jakarta determined that the BKS was not realistically attuned to the structures of the participating institutions and their relationships to the provinces and ministries under which they operated, so efforts began to be placed to building that institutional support through means other than BKS.

3. To institutionalize the satellite program itself in Indonesia, so that its utility and life extended after AID funding and support were stopped.

Thus, SISDIKSAT aimed at expanding educational opportunity to students in the Eastern Islands, fostering closer communication and interchange among the 11 BKS universities and teacher training institutions; upgrading their course offerings by capitalizing on faculty strength (regardless of which campus that expertise was located on); upgrading of existing faculty and provision of additional training to tutors; exchanging of course, curriculum, administrative, and research information among university faculty and staff; and bringing to bear the intellectual resources of the Jakarta area. A major use that developed during the course of the project was that the RSP served as a communications network for the newly developing Open University of Indonesia. This "university without walls" used the RSP facilities to train over a hundred tutors who would serve in the Open University system.

### 1.1.2 The Carribbean RSP in Brief

In certain respects, the University of the West Indies RSP was similar to the Indonesia RSP. The University of the West Indies Distance Teaching Experiment (UWIDITE) also linked with one another distant, island-separated campuses by an existing (INTELSAT) satellite (albeit with extensive microwave linkages). The campuses were part of the University of the West Indies (UWI) system, a cross-national university system in the Caribbean (Exhibit 1-3 provides a map of the UWIDITE area and system). The main office of UWIDITE was located on the Mona campus of the University of the West Indies in Kingston, Jamaica.

The use of the teleconferencing system enabled UWI to use the specialized faculties at each of its three main campuses to fullest advantage. The university has grown to a system of eight faculties -- agriculture, arts and general studies, education, engineering, law, natural sciences, medicine, and social sciences. All three main campuses have strengths in some areas, with faculties in the remaining subject areas, although each offers different courses. The UWIDITE system allowed teaching to emanate from locations where there might be a particularly strong faculty, and it further fostered educational efficiency by enabling a course to be taught one time to many students rather than many times to fewer students per time. The UWIDITE system also had as one of its purposes an institution-building objective, viz., the strengthening of the University of the West Indies and closer cooperation among its participating governments. Finally, in terms of similarities, UWIDITE's telecommunications capabilities were similar in many respects to the interactive audio teleconferencing and audiographics capabilities of the Indonesian RSP.

On the other hand, the university system in which UWIDITE operated was in many respects different from that in the Indonesia situation. The University of the West Indies is a relatively well-developed university system, based upon the British model of higher education. It has a focus that is broader than agriculture. It had prior institutional experience with satellite communications.

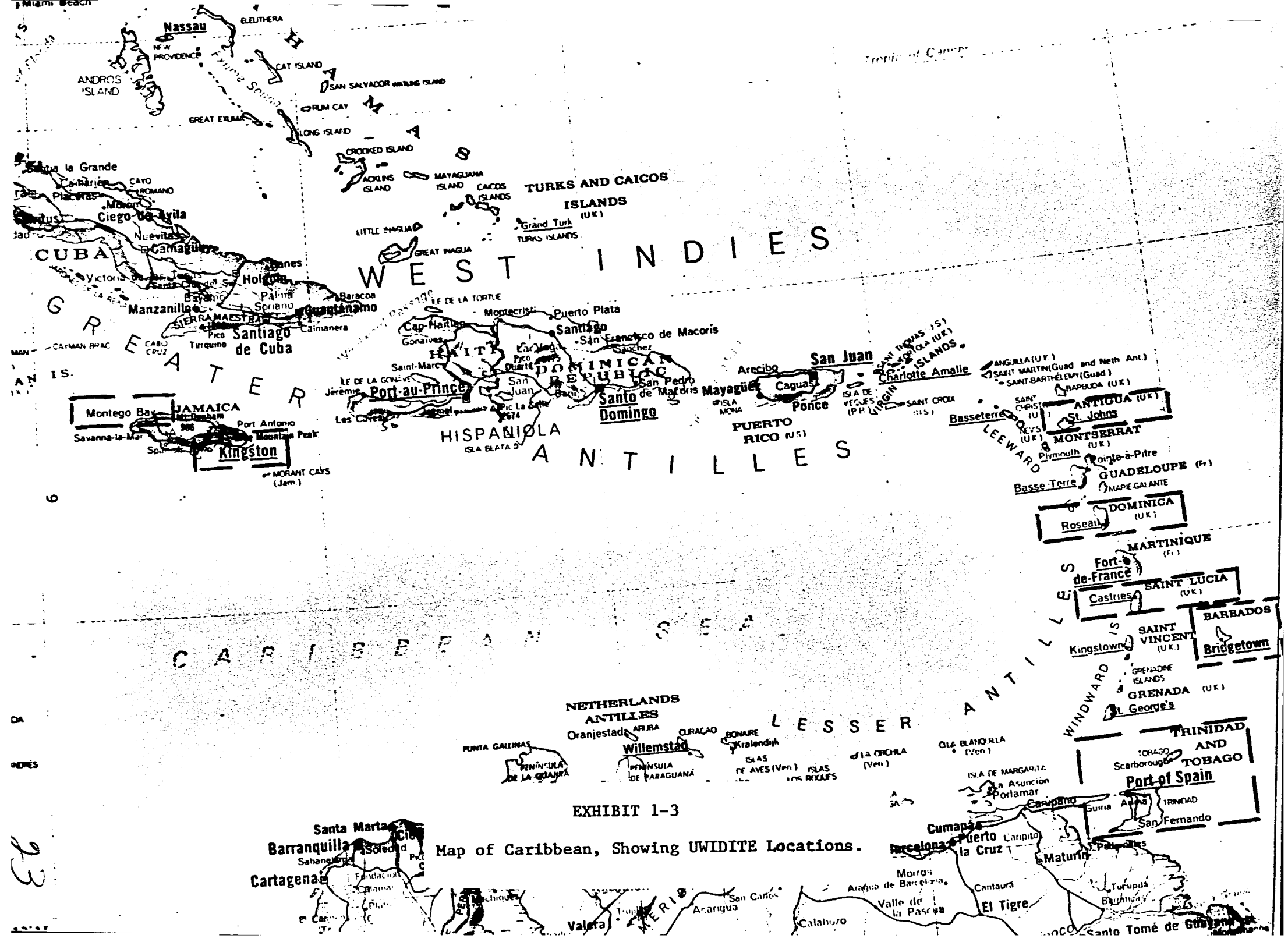


EXHIBIT 1-3

Map of Caribbean, Showing UWIDITE Locations.

One of the major purposes of the satellite linkage in UWIDITE was to provide greater efficiency to students in obtaining their education. The University of the West Indies has a system of qualifying examinations called "Challenge Exams", by means of which high school graduates on islands away from the main campuses (located at Mona (Kingston) Jamaica[1]; Cave Hill, Barbados; and St. Augustine, Trinidad) could qualify for university matriculation by taking Challenge examinations in various subjects. Challenge students could prepare for the examination by accessing study materials at extension centers on their home islands. These extension centers are resource centers which support students' studies for the Challenge examination. The so-called extramural centers were located in Dominica and in St. Lucia, with a center in Antigua joining the system in 1984. Through home study, and use of the extension center resources, students could obtain the necessary education to allow them to take the Challenge Exams which, if passed, would allow them to matriculate to the main campuses to complete their post-secondary education. The UWIDITE system provided active teaching, in contrast to passive resources, to the extension campuses, thus changing the nature of the education received by these so-called "Challenge" students.

There were also many non-Challenge courses offered through UWIDITE. These courses tended to be aimed at more advanced students than those in the Indonesia RSP, including in some instances graduate students and in-service training students (such as nurses and teachers). Finally, there was a greater level of familiarity within UWI with the application of satellite communications for educational purposes. In 1978, UWI conducted an eight-week experiment linking its campuses by satellite, and it followed up with a more limited demonstration a few years later.

[1]Another Jamaica campus -- at Montego Bay -- also joined the system in 1984.

## 1.2 Objectives of the Evaluation and Limitations of the Findings

The objectives that evolved for the evaluation as the RSP developed were embodied in six questions[1]:

1. How was the system used?
2. Did the participants accept the technology?
3. Did the students learn?
4. Did the teachers use teaching techniques appropriate for the system?
5. Did the system contribute to institutional development? If so, how?
6. Was the system affordable?

Most of these evaluation objectives addressed more than one program objective (described fully in Section 1.1 above). We provide here, for the reader's convenience, a "mapping" of the evaluation objectives against the program objectives (Exhibit 1-4).

Both the program objectives and the evaluation objectives became more constrained as the RSP unfolded. It is important to discuss the various constraints that were placed upon both the Rural Satellite Program and the evaluation thereof in order to understand fully the evaluation results that we subsequently present. One of the largest constraints from an evaluation standpoint was the fact that the RSP was instituted in only two countries (excluding Peru, which was not a part of this evaluation). This meant that there was not a range of countries and applications in which the workings of the Rural Satellite Program could be examined. In fact, by chance, the programs implemented in the two demonstrations were remarkably similar in that they used satellite communications to link separated island campuses of higher education systems, using a similar range of types of equipment. Consequently, it is difficult to generalize to all developing countries and to all potential satellite applications in all potential sectors on the basis of the applications in Indonesia and the Caribbean. Further, it is difficult

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[1]Agency for International Development, Rural Satellite Program: Evaluation Management Contract, Modification No. 3, September 23, 1983. The objectives as listed here are verbatim from the contract, but their sequence was changed in order to provide what we feel is a more logical order for their exposition in this report.

Exhibit 1-4

RSP Program and Evaluation Objectives

| Program Objectives | Evaluation Objectives: 1. How was the system used? | 2. Did the participants accept the technology? | 3. Did the students learn? | 4. Did the teachers use teaching techniques appropriate for the system? | 5. Did the system contribute to institutional development. If so, how? | 6. Was the system affordable? |
|---|---|---|---|---|---|---|
| 1. To develop and test models of how communication satellites can help provide information and services necessary for rural development. | X | | X | X | X | |
| 2. To demonstrate to communication carriers and equipment suppliers the need for, the utility of, and the market for communications services in the rural areas of developing countries. | X | X | X | X | | |
| 3. To help lower the cost of earth stations appropriate for LDC rural development use through demonstration of appropriate technology and application on a pilot scale, in anticipation of later large volume markets for operational systems. | | | | | | X |
| 4. To provide evidence of the benefits of rural telecommunications investments to international lending agencies investing in rural development. | X | X | X | | X | X |
| 5. To support the development of national capacities within LDCs to integrate telecommunications investment planning with sectoral programs for rural development in education, health, agriculture, or other rural development activities. | X | X | | X | X | |

to disentangle, on the basis of these two applications, how the successes and failures of each are or are not related to the particular applications, the educational systems, the cultures, the sociopolitical influences, and the administrations of the two countries and their university systems, since the number of countries is so small.

A second major constraint (both for the applications and the evaluation) was that, with one exception, long-term advisors and evaluators were not able to be present in the two countries which were the subject of this evaluation. The AMC had a long-term, resident field advisor during the entire course of the application in Indonesia, but had one only for one year in the West Indies. The UWI RSP developed with less ongoing input and technical assistance from the AMC, an experienced development communications organization. The EMC could not, for budgetary reasons, place a resident evaluation researcher in either demonstration. Thus, our evaluation was done primarily at "long distance" and through periodic, relatively short (four to five week) visits to each demonstration (in Indonesia, we did manage one three-month visit, our third and last one there). In between these visits, we had to rely essentially upon the host country personnel connected with the RSP to gather the required evaluation information. Operating at such long distances and time intervals, the evaluation was therefore dependent for much of its information on the cooperative efforts of host country personnel who, because of the other ongoing demands on their time, could not always be expected to give the collection of evaluation data their highest priority attention. We could not, for example, persuade the Indonesian RSP representatives to administer some of the data collection forms that had been developed and which were being administered at UWIDITE (e.g., network usage form, graphicwriter assessment form). Additionally, not having a resident evaluation coordinator meant that much of the day-to-day operation of the demonstrations could not be observed by us except during intermittent field visits.

Especially problematical for the evaluation was the gathering of information on two of the research objectives, namely those concerning student learning (Evaluation Objective 3) and system costs (Evaluation Objective 6). Student learning is ideally assessed by specially

administered learning tests given to two groups of students randomly assigned: one group assigned to courses by satellite and one group assigned to the same courses taught traditionally at the same time on the same campuses. It was impossible, for a variety of reasons, to do this, or to implement any number of quasi-experimental designs to address this issue, and it was recognized by all concerned that this evaluation question would have to be answered by measures and in a fashion that would be less than ideal. Addressing the question of system costs was hampered by the relative lack of cost "focus" of the two demonstrations. Located as they were within university systems -- which are generally recognized as having cost accounting systems that do not easily lend themselves to the tracking of labor effort and costs -- and being themselves embedded within a larger entity (the government) -- where cost tracking is often complex -- the problems faced in obtaining and interpreting RSP system cost data were large.

A final "complexity" ought to be mentioned, one which is inherent in evaluating large programs of this type for AID. That is that in instances of this type, AID recommends the program objectives and provides both technical assistance and financial support, but the Agency does not direct the host country government in either how to do the applications or in how to cooperate in their evaluation. There are often local sensibilities and political realities which cannot be confronted; consequently, how the RSP applications are played out and how the evaluation information is gathered is as much a function of the host country governments' predilections and concerns as it is the desires and directions of AID, the AMC, or the EMC. Thus, we, as the evaluators, had to give up some rigor and "niceties" of evaluation in order to accommodate the wishes and objectives held by the other actors in the RSP, with whom we were working. As a practical matter, that is entirely appropriate; from a "theoretical" standpoint, evaluation sometimes was hindered. Furthermore, AID often desires to see as much of the project and evaluation as possible taken over by host country personnel. That was the case with this evaluation as well, and we pushed this objective by having host country personnel assist in many aspects of the evaluation. To the extent that we involved local counterparts in developing data collection instruments, obtaining data, readying the data for analysis, and

so on, to that extent the evaluation was not completely in our control.

## 1.3 Overview and Chronology of the Evaluation

The RSP, as a project, was initiated in the Caribbean early in 1982, going "on-line" in a limited fashion early in 1983. The Indonesian RSP started with a letter of agreement being signed in June 1982, with project initiation occurring in February 1983 when the Government of Indonesia approved the AMC's field advisor. Installation of equipment was completed there in April 1984, and a startup semester of two courses was offered beginning in August 1984. Our planning for evaluation of the two demonstrations began in the latter part of 1982, and our first visit to the Caribbean occurred in November 1982. Our first field visit to Indonesia was approved for February 1984. Exhibit 1-5 shows, schematically, the main time lines for the project and evaluation activities.

In both demonstrations, a "multimodal" approach to gathering evaluation information was developed and applied over approximately two years. This approach consisted of obtaining data through:

- Questionnaires
- Interviews
- Observations
- Logs
- Archival records

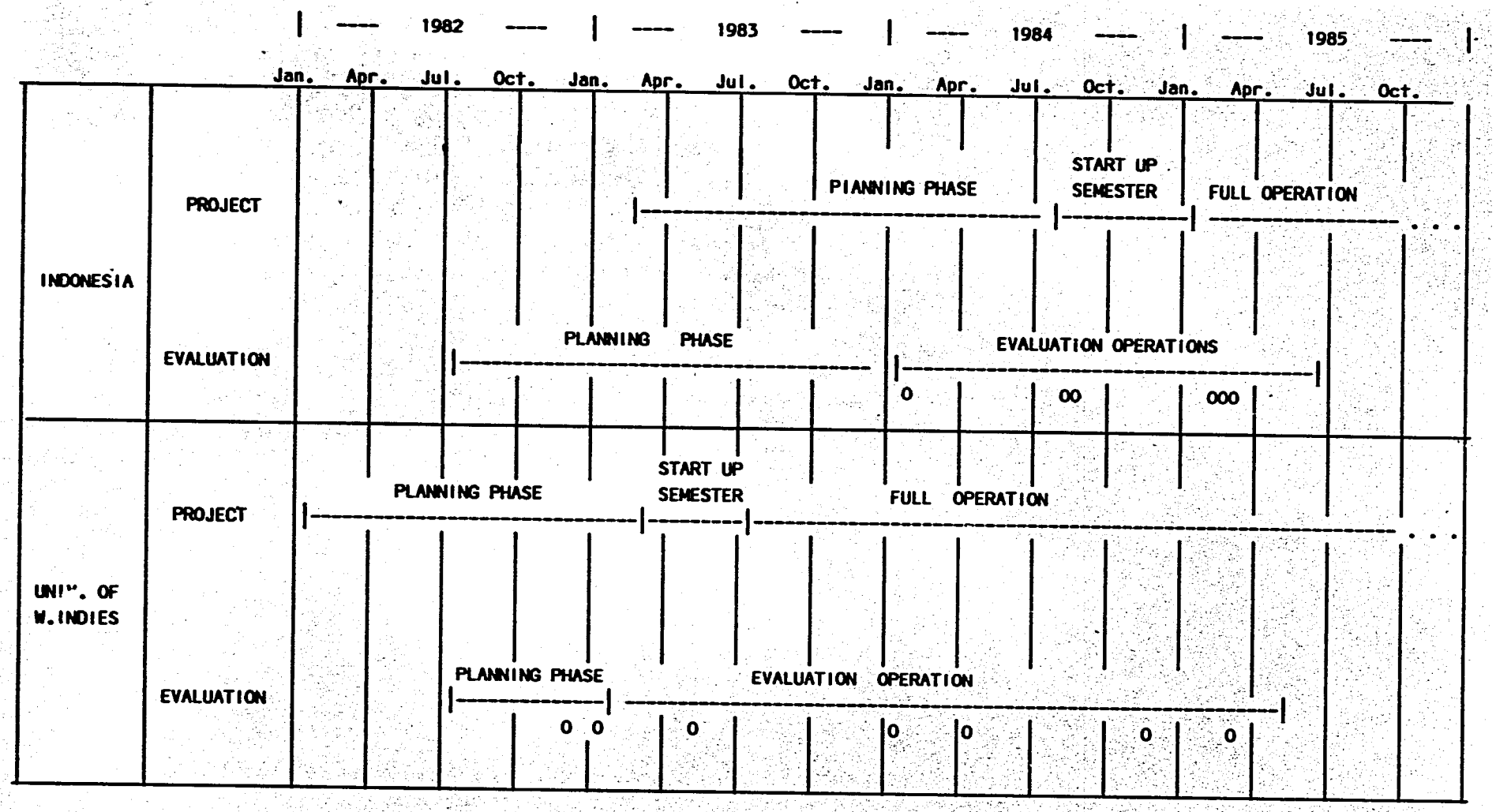
The following subsection discusses these data collection instruments, while succeeding subsections provide an overview of the methods of data collection and data preparation.

### 1.3.1 Evaluation Instruments

Written, self-administered questionnaires were developed for both demonstrations for periodic administration to students, faculty, and university administrators. The questionnaires were developed jointly by the AMC (for their formative evaluation purposes) and the EMC (for summative evaluation purposes). A special effort was made to develop questionnaire items that could be answered at both demonstrations so that a comparison of results could be made. Some questions were changed or eliminated unilaterally by the host country personnel, however, be-

EXHIBIT 1-5

Demonstration Project and Evaluation Timelines




0 = EVALUATION FIELD VISITS



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cause they judged some items either to be inappropriate to the setting or to make the questionnaires too long or difficult to answer. Thus, while a majority of the items developed for both demonstrations remained the same, there were not as many as originally planned, and comparability suffered slightly because of this.

The questionnaires were originally developed in English and, in the case of the University of the West Indies, administered in English. In the case of Indonesia, the English questionnaires were first discussed with bilingual host country personnel connected with SISDIKSAT. After revisions were worked out with this group, they translated the instruments into Bahasa Indonesia. The EMC then back-translated the instruments into English using the services of a bilingual expatriate Indonesian teacher of Bahasa Indonesia. After discussion of the translator's suggested changes among the EMC project staff, the translator then made further revisions to the questionnaires on the basis of the back-translation, and the instruments were retranslated into Bahasa Indonesia. The Indonesian SISDIKSAT personnel then pretested them on a small number of respondents and made some minor changes to them.

Interviews were developed for either face-to-face administration or for administration through the satellite system itself. As with the questionnaires, the interview respondents were students, faculty, and administrators at each demonstration who used the system. Additionally, attempts (not always successful) were made to obtain information from system non-users. The interviews were not as structured as the questionnaires, nor was there concern about making the interviews comparable between demonstrations. Rather, the concern was to develop unstructured interview guides which would set out the major topics of each interview -- tailored to both the location and the point of time in the project's life -- but which would also give the interviewees freer rein in answering questions and participating in discussion about the system.

Observations of both an informal and formal nature were carried out by the EMC project staff. Observations were made both of the session presenters (faculty, administrators), and the other session participants (students, other administrators). Observations occurred during the course of four-to-six week site visits that occurred periodically

over the course of the evaluation (except in Indonesia where, as indicated above, the last visit was for a period of three months). Observations were made of how planning was done to develop curricula, courses, and software for the system; how the students, faculty, and administrators used the system; their reactions to it; the technical quality of the system; how the system was administered and scheduled; how problems were reported and dealt with; and the extent and scope of system usage. In the West Indies, the observations were all of an informal nature. Observations in Indonesia were both informal and formal, the latter consisting of a quantified classroom observation checklist that was filled out periodically during classroom teaching on the system.

Self-administered logs of system usage and of system problems and repairs were developed for each demonstration. The former were to be filled out by the person responsible for administering each system session, the latter by either that person or the system technician. Again, in the case of Indonesia, these were translated into Bahasa Indonesia. In addition, written schedules of system usage, developed at each demonstration for internal purposes, were obtained periodically by the EMC.

Archival records were searched at each demonstration primarily to obtain information on the resources required to develop and operate each system. These data, supplemented by information obtained through interviews, were used for the system affordability analysis.

Appendices A and B reproduce all the evaluation data collection instruments used, respectively, in Indonesia and in the West Indies.[1]

### 1.3.2 Data Collection

In this subsection, we discuss the schedule and the course of the evaluation data collection process. For the reasons indicated in Section 1.2 above, the course of the data collection did not run as

[1]Because of their aggregate bulk, all appendices are contained in Volume II of this report.

smoothly as would be desirable, nor did it yield the kinds and amounts of data that would be considered optimal. Notwithstanding this, we did collect a large amount of useful and valuable data that yields a consistent and comprehensive picture of each demonstration.

Periodic questionnaire administration at UWIDITE was coordinated by the the UWI-based UWIDITE RSP coordinator. The questionnaires were sent out by her to the UWIDITE sites, where they were completed and then returned to her in Kingston, Jamaica. Questionnaire data collection was not as comprehensive in the case of Indonesia. For one thing, the satellite communications system there started later than it did in the West Indies -- as of the writing of this report, there has been only one semester of full system operation in Indonesia. For another, the Indonesia RSP personnel initially sent out an inadequate number (20) of questionnaires to each site and, while we were able to rectify that subsequently, the delay impaired data collection. Consequently, there is less questionnaire data for the Indonesia evaluation than for the Caribbean evaluation.

Administration of the interviews was done by the EMC's evaluation coordinator for each demonstration. The EMC's evaluation coordinator for Indonesia had prior working experience in Asia in both Islamic and non-Islamic cultures, but without specific experience in Indonesia. He took instruction in Bahasa Indonesia during the course of the project and, by its midpoint, was speaking it moderately well. The EMC's evaluation coordinator for the Caribbean had prior working experience in Barbados, and she had traveled extensively throughout the Caribbean. The interviews were conducted during the course of periodic visits to each demonstration by each EMC evaluation coordinator. Exhibit 1-6 shows the schedule and objectives of visits to Indonesia; Exhibit 1-7, the same for the Caribbean.

With regard to observations, in the West Indies, they were all done informally by the EMC's evaluation coordinator for that demonstration. In Indonesia, the informal observations were made by the EMC's evaluation coordinator there and by other EMC staff. The formal (check-

**Exhibit 1-6**

Evaluation Management Contractor Evaluation Field Visits to Indonesia

| Month/Year | Visit/Purpose | Sites Visited | EMC Staff Visitors |
|---|---|---|---|
| February 1984 | Familiarize SISDIKSAT participants with evaluation goals, obtain cooperation, observe system installation and training, discuss data collection instruments. | Ujung Pandang, Palu Manado, Jakarta | Indonesian Evaluation Coordinator, Senior Evaluation Specialist |
| August 1984 | Review status of applications, decide logistics of questionnaire data collection, finalize questionnaire translation, conduct system user interviews. | Ujung Pandang, Jakarta, Bogor | Indonesian Evaluation Coordinator, Project Director |
| March-May 1985 | Review of status of applications, and of data collection, conduct system user interviews, observe system classroom functioning, collect information relevant to affordability analysis | Ujung Pandang, Palu, Manado, Banjarmasin, Jayapura, Jakarta, Bogor | Indonesian Evaluation Coordinator |

**Exhibit 1-7**

Evaluation Management Contractor Evaluation Field Visits to the Caribbean

| Month/Year | Visit/Purpose | Sites Visited | EMC Staff Visitors |
|---|---|---|---|
| November 1982 | Initial fact finding. | Jamaica | Caribbean Evaluation Coordinator |
| December 1982 | Per Pro-Vice-Chancellor's invitation, meeting with UWIDITE administrators and presentation of the EMC's evaluation plans. | Jamaica | Caribbean Evaluation Coordinator |
| May 1983 | Participate in training, discuss revised evaluation plans, review UWIDITE MIS data, conduct interviews with participating faculty and administrators, investigate accessibility of cost data. | Jamaica, Barbados, Trinidad | Caribbean Evaluation Coordinator |
| January-February 1984 | Review status of applications and of data collection, observe system use, conduct interviews with UWIDITE administrators, coordinators, and students. | Jamaica, St. Lucia, Dominica, Trinidad | Caribbean Evaluation Coordinator |
| April 1984 | Review status of applications and of data collection, observe system use, conduct interviews with UWIDITE administrators, coordinators, and students. | Barbados, Jamaica | Caribbean Evaluation Coordinator |
| November 1984 | Establish questionnaire data coding procedures, conduct user interviews, observe system use. | Jamaica, St. Lucia, Dominica, Antigua | Caribbean Evaluation Coordinator |
| February-March 1985 | Review questionnaire data coding procedures, conduct user interviews, observe system use, collect information relevant to affordability analysis. | Barbados, Trinidad | Caribbean Evaluation Coordinator |

list) classroom observations were made by both the EMC evaluation coordinator and by paid, Indonesian research associates. Observations, both formal and informal, were made only during the course of the EMC's evaluation coordinator visits to each demonstration (see Exhibits 1-6 and 1-7).

The self-administered logs of system usage, system problems and repairs, and the system schedules were provided periodically by the UWIDITE RSP coordinator. In Indonesia, the system usage forms and the system problem and repair logs were not used by the host country RSP personnel. Rather, system schedules were provided periodically to the EMC. System status was summarized retrospectively every three months, and these reports of systems problems and repairs were also provided periodically to the EMC.

Archival records were searched by the EMC evaluation coordinator at each site, primarily to obtain information to be used in the affordability analysis. This information was supplemented by interviews with the appropriate administrative officials connected with each system. This data collection was done in conjunction with the last visit to each demonstration by the EMC's evaluation coordinators.

### 1.3.3 Data Preparation

In order to make the large amounts of data collected manageable and useful, the various kinds of data were, to one extent or another, "reduced" or "prepared" for analysis. In the case of the questionnaires, the completed UWI questionnaires were returned to the UWIDITE RSP coordinator. They were coded, under her supervision, by UWI students, using coding formats developed by the EMC. Coded questionnaires were periodically shipped in batches to the EMC, where the coding was checked and any further editing of the data performed. Training in the coding was given by the EMC's evaluation coordinator to the UWIDITE RSP coordinator, and the latter, in turn, trained the UWI students in proper coding of the questionnaires. The coded and edited questionnaire data were key entered into computer files for analysis. The questionnaires from the Indonesia demonstration were collected by the AMC's field advisor and sent to the EMC, where they were coded, key entered into computer files, cleaned, and analyzed.

The UWI interviews were examined by an EMC project staff member (not the EMC evaluation coordinator who administered them), and response categories to the open-ended interview questions were formulated. Response frequencies were developed for these interviews for analytical purposes. Formal coding was not done of the Indonesia interviews, since these were far less extensive than the UWI interviews due to the fact that only one semester of full system operation occurred in Indonesia as of the writing of this report.

All the interviews entered into the evaluation analysis in another way, in that they were the main input into the trip reports which were written at the completion of each site visit. As much as the "formal" analysis of the interviews -- and perhaps moreso -- the "immediately after the fact" informal analysis and synthesis of the site visit interviews, as embodied in the trip reports, entered into the evaluation. These trip reports are provided in Appendices C and D of this document for Indonesia and the Caribbean, respectively.[1]

The informal observations at both demonstrations entered into the evaluation through the trip reports, as discussed above. The formal classroom observations that were conducted in Indonesia were summarized through collapsing the discrete observation classes into larger categories (e.g., system malfunctioning, classroom discussion), and the mean amount of time observed for each category for each session was used in the evaluation analysis.

The system usage and the fault and repair logs that were collected at the UWIDITE demonstration were, like the questionnaires, coded, edited, and entered into computer files for analysis. Because their number was smaller, the retrospective system reports periodically completed at the SISDIKSAT demonstration were used in a less quantitative way in the Indonesia evaluation; they were examined and used to round out the picture from the other data sources.

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[1]Because of their aggregate bulk, all appendices are contained in Volume II of this report.

The archival data (supplemented by interview information) on system resources were used for the analysis of system affordability. An attempt was made to reduce these data to common units of measurement (e.g., cost per course per semester) so as to analyze across courses, semester, sites, etc. using a common metric wherever feasible.

The two chapters which follow present the findings of our evaluation of, respectively, the Indonesian and the Caribbean Rural Satellite Projects. Each of these chapters is organized to address the six evaluation objectives as discussed in Section 1.2 above. In the final two chapters, we present, respectively, the conclusions we draw from the two demonstrations and a synthesis of the lessons learned.

## 2.0 THE INDONESIAN DISTANCE EDUCATION SATELLITE SYSTEM (SISDIKSAT)

In this chapter, the six evaluation questions listed in Section 1.2 are addressed in the context of the SISDIKSAT distance education project in Indonesia. Information presented and conclusions drawn in this chapter are based on one pilot semester of operation (Fall, 1984) of SISDIKSAT and one full semester of system activity (Spring, 1985). Due to the later startup and lengthier than expected shakedown period for the Indonesian satellite demonstration, we were only able to observe SISDIKSAT functioning as an audio-only teleconferencing network from Fall 1984 to the middle part of 1985. Many of the system problems described below may, therefore, reflect SISDIKSAT "growing pains" that may work themselves out in another semester or two.

### 2.1 System Use Patterns

By early 1984, the following equipment was installed at each of the satellite classroom locations in Indonesia:

Teaching Equipment

One Darome convener with two external speakers
Ten or more Darome microphones
One Burroughs facsimile machine (telecopier)
One Aregon graphics writer system with two external monitors and a modem[1]
One Akai stereo cassette deck (to support the graphics writer)

Network Equipment

Dantel network controller
Dantel gating system

Support Equipment

One complete six-hour auxiliary power system (batteries, inverter, battery charger, line voltage stabilizers, surge protector)

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[1]In addition, four of the sites (UNHAS, IKIP Ujung Pandang, IPB Bogor, and PDK Jakarta) received Aregon keyboards that enabled users to prepare and store visuals on tape for use in future lectures or seminars.

In keeping with the intention of the RSP, the basic system was an audio-only one. The fascimile equipment was meant to serve as an administrative backup and support unit for the transmission of written information. The audiographics equipment was added as an "extra" both to determine how well it worked under these classroom conditions and to provide a means of offering graphics teaching support ("electronic blackboard").

### 2.1.1 Fall 1984 Semester

Initial teaching applications of SISDIKSAT began in September 1984 with two courses, Statistics I and Food Science, offered via satellite to undergraduate students. Each course was delivered once a week for two hours per session. Many more courses were considered for distance teaching during the Fall 1984 semester, but few came to fruition. Total enrollments for the two courses are shown in Exhibit 2-1.

For the Statistics course, lecture materials were specially prepared for delivery via satellite. Food Science, on the other hand, made use of existing course handbooks. Statistics originated from IKIP Ujung Pandang and Food Science originated from UNSRAT Manado. Estimated daily attendance rates were 85% for Statistics I and 60% for Food Science, based upon observations and discussions with the system technicians.

Other uses of SISDIKSAT during September-December 1984 included system tests, message exchange, exchange of facsimile information, and conferences to arrange courses for the following semester. A monthly BKS Rektors' teleconference was initiated in October but was discontinued in November due to the Rektors' lack of interest in teleconferencing. They received a travel budget for face-to-face meetings, and they were apparently not inclined to give up this mode of interacting. Vice-Rektors, on the other hand, who did not receive meeting travel budgets, used the system for their meetings, specifically, to plan semester teaching activities and to plan the Rektors' monthly meetings.

### 2.1.2 Spring 1985 Semester

The first full semester of system activity began in March 1985 with twelve undergraduate courses plus two Open University tutor train-

**Exhibit 2-1**

**Student Enrollment by Campus**
**For the SISDIKSAT Fall 1984 Semester**

| CAMPUS | COURSE | |
|---|---|---|
| | Statistics I | Food Science |
| UNSRAT Manado | 50 | 28 |
| UNTAD Palu | 100 | 60 |
| UNCEN Jayapura | 20 | 30 |
| UNCEN Manokwari | 20 | 30 |
| IKIP Ujung Pandang | 40 | 25 |
| UNHAS Ujung Pandang | 0 | 12 |
| UNLAM Banjarmasin | 30 | 30 |
| Total Number of Students | 260 | 215 |

ing sessions offered each week during the Spring 1985 semester. Exhibit 2-2 shows the weekly system schedule for that semester. Since the Indonesian islands span three time zones, the two easternmost campuses, UNCEN - Manokwari and UNCEN - Jayapura, were given exclusive use of the satellite network during the early morning hours for administrative teleconferencing. Without SISDIKSAT, these two branches of the same university would have had to rely on ham radio, written, or face-to-face communications to conduct university business.

Exhibit 2-3 tracks undergraduate attendance for the first two months of the Spring 1985 semester. In the first month of the semester, 47% of the class sessions were cancelled. Most of these cancellations were due to the absence of the lecturer; others were due to the absence of students or to holidays. Only 4% of all sessions were cancelled due to technical problems. Student attendance for completed sessions averaged 390 total per week, or 65 students per class per week. In the second month of the semester, class cancellations seemed to stabilize at four per week, or 33%, of which 8% (of all sessions) were cancelled due to technical problems. Student attendance in this second month of the semester for completed sessions averaged 464 total per week, or 58 students per class per week.

Attendance is not normally taken in the Indonesian courses; the attendance figures discussed immediately above were taken by the EMC's Indonesian evaluation coordinator during his last trip. Consequently, we do not have normative attendance data for non-SISDIKSAT courses. Impressionistic evidence suggests that not much stress is placed on attendance qua attendance. We also know from our observations of the Indonesian system that dosen have extraordinary latitude in whether and when to hold classes, so it is not unusual for them -- even in traditional classes -- to cancel classes or simply not show up.

Several of the cancellations due to technical problems could have been avoided by more rapid response to initial reports of trouble on the part of Cibinong Earth Station and SISDIKSAT Headquarters technicians. For example, a system check conducted on a Saturday morning revealed a loss of transmitting capability at IPB Bogor. Since SISDIKSAT project staff could not diagnose the problem without assistance from



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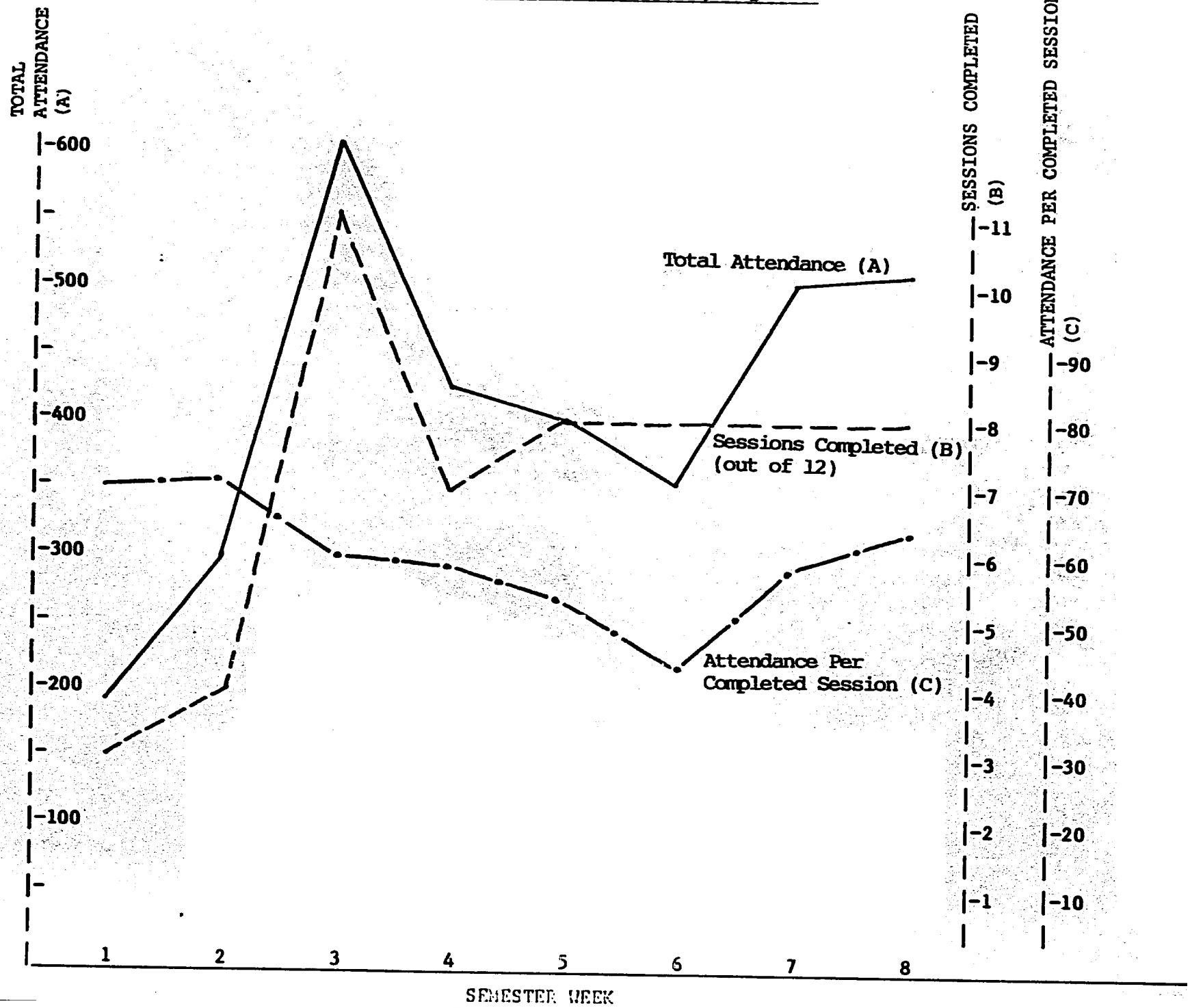
Exhibit 2-2

Network Schedule for
1985 Spring Semester
(Originating unit is shown in parentheses.)

| CENTRAL TIME | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| AM 6:00-6:30 | | | | | | |
| 6:30-7:00 | TELECONFERENCING ---- UNCEN SITES ONLY | | | | | |
| 7:00-7:30 | | | | | | |
| 7:30-8:00 | | | | | | |
| 8:00-8:30 | SYSTEM CHECK --- ALL SITES OUTSIDE JAVA | | | | | |
| 8:30-9:00 | | | | | | |
| 9:00-9:30 | | | | | | |
| 9:30-10:00 | HUMAN ECOLOGY (UNTAD) | FOOD SCIENCE (UNSRAT) | STATISTICS II (IKIP-UP) | EDUCATIONAL TECHNOLOGY (IKIP-UP) | BASIC SCIENCE (UNHAS) | RESOURCE ECONOMICS (UNLAM) |
| 10:00-10:30 | | | | | | |
| 10:30-11:00 | | | | | | |
| 11:00-11:30 | | | | | | |
| 11:30-12:00 | CATTLE BREEDING (IPB) | FISHING GEAR (IPB) | POULTRY PRODUCTION (IPB) | POULTRY SEMINAR (UNHAS) | LINGUISTICS INSTITUTE (SIL) | BASIC ECOLOGY (UNMUL) |
| PM 12:00-12:30 | | | | | | |
| 12:30-1:00 | | | | | | |
| 1:00-1:30 | | | | | | |
| 1:30-2:00 | MESSAGES AND SYSTEM CHECK -- ALL SITES | | | | | |
| 2:00-2:30 | | | | | | |
| 2:30-3:00 | | | | | | |
| 3:00-3:30 | BASIC FORESTRY (UNHAS) | OPEN UNIVERSITY (JARAKTA) | | OPEN UNIVERSITY (JARAKTA) | | LIFE SCIENCES (UNHAS) |
| 3:30-4:00 | | | | | | |
| 4:00-4:30 | | | | | | |
| 4:30-5:00 | | | | | | |
| 5:00-5:30 | | | | | | |
| 5:30-6:00 | | | | | | |

Exhibit 2-3

SISDIKSAT Attendance Spring 1985



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Cibinong, whose offices were closed on Saturday and Sunday, no attention was given to the problem until late Monday. One by one, all courses originating from IPB that week were cancelled with no advance notice given to dosen (teaching faculty), tutors, or students.

The distribution of students by course during the Spring 1985 semester is shown in Exhibit 2-4. More than 90% of total student attendance during the Spring 1985 semester came from only four sites: UNCEN-Manokwari (38%), UNSRAT-Manado (19%), IKIP-Ujung Pandang (18%), and UNTAD-Palu (16%). Three of these four sites (UNCEN-Manokwari, UNSRAT-Manado, and UNTAD-Palu) are truly rural locations, so it may be stated that the Rural Satellite Program was very successful in carrying out its objectives by bringing to many students at these sites teaching to which they might not otherwise have been exposed.

Based upon discussions with project staff and teaching faculty at various locations, the reasons for poor dosen attendance at classes included:

- Late notification. Many dosen were notified only days before that the semester would begin on March 18th, and some dosen were not notified until the week after their course was scheduled to start.

- No orientation. Although the semester began on March 18th, training and orientation to SISDIKSAT was not offered to the teaching faculty until March 29th.

- No substitute contacted. Many dosen cancelled their class to attend a meeting which they felt was more important. Few of these dosen made arrangements to have another lecturer take their place.

- Poor student attendance. Some dosen failed to lecture one week because of poor student attendance the week before.

Reasons for poor student attendance included:

- No notification. Some locations, such as UNCEN-Jayapura, did not invite their students to participate due to a lack of confidence in SISDIKSAT and a dissatisfaction with the absence of graphics (even thought the intent of the project was to focus upon audio communication). Most sites did not publicize SISDIKSAT effectively to dosen and students.

- Late notification. Since the SISDIKSAT semester began four to six weeks after most BKS universities began their normal academ-

**Exhibit 2-4**

**Student Distribution by Course, Spring 1985 Semester**

| | N | % |
|---|---|---|
| Statistics II | 150 | 25 |
| Basic Ecology | 150 | 25 |
| Poultry Production | 90 | 15 |
| Basic Science | 54 | 9 |
| Fishing Equipment | 36 | 6 |
| Cattle Breeding | 30 | 5 |
| Resource Economics | 30 | 5 |
| Food Science | 24 | 4 |
| Basic Forestry | 18 | 3 |
| Life Science | 12 | 2 |
| Teaching Techniques | 6 | 1 |
| Human Ecology | 5 | 1 |
| Total | 605 | 100 |



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ic semester, students typically did not have the necessary time slot available to attend a relevant SISDIKSAT course. Also, the SISDIKSAT schedule was not sent to local coordinators until early March.

- Inappropriate course sequencing. Many of the courses offered via SISDIKSAT during the Spring 1985 semester were not usually offered to students in the Spring at several BKS universities and were, therefore, not made available to the students at those locations. At Manokwari and Jayapura, for example, only half of the SISDIKSAT Spring courses were made available to the students since the remaining courses were usually offered in the Fall at the two UNCEN campuses.

- No lecture materials. For most of the SISDIKSAT courses, handouts and lecture modules were not distributed to the sites until the fourth week of classes. Combined with the absence of graphics, students found it very difficult to follow the lectures without written materials.

A two-day Eastern Islands Ocean Resources Seminar was held at UNHAS over the satellite network on March 28-29, 1985, but it was unsuccessful as a teleconference in that it did not use the interactive capability of the network. This was due to a failure of the Organizing Committee to inform the Governor, the UNHAS Rektor, and the Seminar Moderator that other sites were participating in the teleconference. On the second day, invited dosen from seven of the seminar locations did not return to the SISDIKSAT classrooms because they felt excluded from the proceedings due to the fact that the presenters at UNHAS did not acknowledge the presence of participants at the other sites. Further, the participants at the other sites were not given a copy of the seminar agenda. The failure to welcome and include participants from other sites dampened the enthusiasm of many local coordinators and senior dosen towards SISDIKSAT despite the good audio reception during the teleconference.

Several training sessions for SISDIKSAT personnel were held over the satellite network in the Spring 1985 semester, including Operator's Training (February 25-28) and a Course Instructor's Training (March 25-28). Unfortunately, only one head dosen and a handful of course tutors attended the latter training sessions due to late notification and, in some cases, lack of interest.



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Most of the problems noted above are not unusual in the case of innovative communication projects. The Peru evaluation interim report[1] notes that organizational problems, inexperience, and administrative habits contributed to similar startup problems.

Use of SISDIKSAT for administrative purposes by the BKS increased during the Spring 1985 semester as the universities prepared for the Rektors' Meeting in Jayapura in late May and, in late June, discussed and selected SISDIKSAT course offerings for the next two semesters.

Since February 19, 1985, the Open University of Indonesia used the system successfully to conduct tutor training at eight locations for four hours per week. Organizers of the sessions were very pleased with the satellite network, reporting 70 to 80 percent attendance rates among the approximately 150 tutors invited to participate. Few of these training sessions had to be cancelled for technical or other reasons.

The Summer Institute of Linguistics (SIL) also accessed the system once a week for program coordination and message exchange among their Jayapura, Ambon, and Jakarta locations.

Exhibit 2-5 summarizes SISDIKSAT system use during the period March - June 1985. Unlike the West Indies demonstration (see Chapter 3), undergraduate instruction is the major application of the Indonesian satellite network, consuming nearly 60% of the available system time on Channel A. Total student attendance in early 1985 averaged about the same as the total attendance for the pilot semester in 1984. The average attendance per course, however, dropped from approximately 200 to 50 students per session at all sites, due to low levels of participation from all but four of the SISDIKSAT locations. User acceptance of SISDIKSAT and the technical performance of the satellite network during this period are described in the following section.

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[1]Mayo, John K.; Cruz de Yanes, Martina; Heald, Gary R.; and Klees, Steven J. Peru Rural Communication Services Project: Interim Evaluation Report, Center for International Studies, Florida State University, July 1955, pp. vii, 43.

## Exhibit 2-5

System Use Summary
For SISDIKSAT Spring 1985 Semester

| | | |
|---|---|---|
| A. | Hours of Operation | 6AM - 5PM |
| B. | Applications | |
| | 1. Teaching - Undergraduate | 57% |
| | 2. Training - Graduate and In-service | 10% |
| | 3. University Administration/Coordination | 7% |
| | 4. System Planning/Scheduling | 7% |
| | 5. System Maintenance | 14% |
| | 6. Special Seminars and System Training | 5% |
| C. | Component Usage | |
| | 1. Audio | 99% |
| | 2. Graphics | 0% |
| | 3. Facsimile | 1% |
| D. | Mean Weekly Attendance | |
| | 1. Undergraduate | 427 |
| | 2. Graduate/Teachers | 116 |
| E. | Site Participation | |
| | 1. Heavy Users | UNCEN - Manokwari<br>UNSRAT - Manado<br>UNTAD - Palu<br>IKIP - Ujung Pandang |
| | 2. Moderate Users | UNCEN - Jayapura<br>UNHAS - Ujung Pandang<br>UNLAM - Banjarmasin |

## 2.2 Acceptance of the Technology

To examine the extent to which SISDIKSAT users (administrators, teaching faculty, and students) accepted the telecommunications system and liked using it for distance teaching or other purposes, the EMC solicited user opinions of SISDIKSAT before, during, and after their first extended experience with the system. Our conclusions are based upon interviews and on-site observations conducted during the Spring of 1984 (before the system went into operation), Fall of 1984, and the Spring of 1985 at the following locations: Ujung Pandang, Jakarta, Bogor, Manado, Palu, Banjarmasin, and Jayapura. Management preoccupation with SISDIKSAT technical performance and budget problems inhibited the successful distribution and tabulation of student questionnaires. Since full application of the system was not in place at the time of the interviews, the numbers of participating administrators and teaching faculty (hence, completed interviews) at these locations are too small to present the data in any meaningful tabular form.

### 2.2.1 Technical Performance of SISDIKSAT

We begin this section with an overview of the technical performance of SISDIKSAT during late 1984 and early 1985. Following system installation during February and March of 1984, numerous system-wide tests were performed to assess the working condition of each component of the satellite network. By the start of the Fall 1984 semester, most technical problems had been clearly identified, but many remained unresolved. Channel A, used for audio-conferencing, provided clear signal transmission about 65 percent of the time and chopped or noisy transmission about 35 percent of the time. Crosstalk and noise over Channel B limited its use. Defective modems, lightpens, and keyboards of the Aregon graphics units limited their use. Lack of confidence in Channel A, together with the absence of a SISDIKSAT Headquarters telephone and operating budget caused delays in the start of the Fall 1984 semester for SISDIKSAT and created confusion and uncertainty among dosen slated to teach over the system. Once classes began during this semester, however, only a few of the sessions were disrupted or cancelled due to technical problems.

During the month prior to the start of the Spring 1985 semester, the technical quality of Channel A was fair to poor and that of Channel B was poor. Channel A was plagued by noise and static on the lines, chopping of transmission from Palu and Samarinda, and frequent loss of transmitting capability at UNHAS, IPB Bogor, and UNCEN Jayapura. Channel B was, for the most part, unusable during this period, and transmissions over this line often caused crosstalk between the two channels.

During the first month of the Spring 1985 semester, however, the technical quality of Channel A was good and Channel B was fair to good. The dramatic improvement in both channels coincided with the end of the rainy season and also with the separation of the two channels by PERUMTEL (by replacing Channel B with a new channel not adjacent to Channel A on the PALAPA-B satellite). Crosstalk, noise, and loss of transmitting capabilities for the most part disappeared. Only the chopping of transmissions from Samarinda and Palu, caused perhaps by proximity to earth stations, persisted over the network.

For the remainder of the Spring 1985 semester, the technical quality of Channel A continued to be good and that of Channel B continued to be fair-to-good. A gating system was installed at all sites to enable those sites transmitting noise or static on a particular day to be identified and screened out from further interference with the system-wide audio reception. The effectiveness of these devices will not be fully known until the rainy months occur again and climatic disturbances are more frequent and varied. Soon after installation of the gating system, however, a deterioration in audio quality was observed from many sites. It was characterized by bursts of noise transmitted over the system whenever a user would depress or release the microphone switch (i.e., open or close a conversation), similar to the noises heard in conversations between Mission Control and the astronauts. These noise bursts did not interfere with course lectures or any other continuous transmissions, but they were a noticeable distraction during class discussions and teleconferences. Whether or not this new audio problem was caused by the opening and closing of gates at the transmitting sites remains to be tested.

P.T. Elektrindo Nusantara, a Jakarta-based electronics firm, monitored the network for two months at the request of the AMC and tentatively attributed most audio problems to a lack of user discipline. They pointed out that "The static crashes heard on the system are actually the audio output of the satellite receiving equipment when two stations attempt to use the channel at the same time, or when an interfering signal is present on the channel when a station talks" [1] Another AMC subcontractor, Teleconsult Inc., offers a further explanation for the failure of the network to provide state-of-the-art voice transmission: "The Darome Convener, loudspeakers, and microphones provide good quality sound with a bandwidth reproduction accurate to about 5,000 Hertz per second. However, the telephone cables and transmission through the multiplex and satellite do not allow this level of sound quality to pass. The cables from the classroom to the multiplex tend to limit the bandpass to below 3000 Hertz per second. This means that the quality of the lecturer's voice must be expected to be received much poorer at the students' classrooms than at the origin." [2]

The condition of the equipment in each classroom as of May 1985 is summarized in a series of site status reports found in the AMC's Project Progress Report for May 1985. Taken together, these reports show the SISDIKSAT network to be in the best working order since its installation, with only a few persistent technical problems: convener problems at PDK/Jakarta; graphics problems at Banjarmasin and Samarinda; and transmission problems at Samarinda and Palu.

Classroom facilities were also in good condition in 1985 with only a few exceptions. Proper lighting and maintenance was observed at all sites visited by the EMC evaluation coordinator. At least one air conditioner was observed in all classrooms except Bogor and Banjarmasin (because of its shaded location and the building construction, an air conditioner appears not to be needed at IPB Bogor). Generally, however,

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[1] SISDIKSAT Evaluation Interim Report, P.T. Elektrindo, 20 May 1985, p. 2.

[2] Tatlock, J. SISDIKSAT Technical Report, March 1985, pp. 7-8.



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the air conditioners are not used (perhaps for budgetary reasons), and temperatures above 80°F inside the classrooms are common, especially at Banjarmasin and Jayapura. Adequate soundproofing was observed at all sites visited except at Jayapura, where the two external speakers are not used due to sound reverberations. Power outages occur frequently at UNHAS project headquarters during the rainy months, but these have not hampered SISDIKSAT operations materially due to the low voltage required to recharge the system's battery packs.

### 2.2.2 Acceptance by Administrators

Rektors and Vice-Rektors who were interviewed prior to actual exposure to the SISDIKSAT network expressed guarded optimism about the project. Many voiced concerns about system maintenance and scheduling priorities. Others worried over the initial absence of video or graphics and/or the future affordability of the system. But all administrators interviewed recognized the need for improved communications and undergraduate instruction within the BKS, and most of them welcomed the distance teaching experiment. The only negative attitudes towards the project arose among administrators at two member universities, IKIP-Manado and UNHALU-Kendari; these sites were not initially designated to receive SISDIKSAT classroom equipment and technical support.

In the Fall of 1984, university administrators gained hands-on experience with SISDIKSAT through a monthly Rektors' teleconference initiated in October. Rektors from most SISDIKSAT campuses attended the initial telesession; however, these monthly meetings were discontinued in November due to a lack of interest. The Rektors reported feeling uncomfortable speaking with one another in the absence of video and the absence of concrete agenda. They found it difficult and inconvenient to be at their respective classroom locations at a common time each month, and they reported finding that they had little to discuss. As noted above, however, the Rektors had a budget for travel to monthly face-to-face meetings, and perhaps for this, or for cultural reasons, they were disinclined to give up their face-to-face meetings to confer over the SISDIKSAT system.

The Vice-Rektors, on the other hand, became more active SISDIKSAT users in early 1985, accessing the system for planning the

annual BKS Rektors' meeting (in Jayapura in 1985) and for selecting and scheduling courses for the Fall 1985 Semester. They reported no difficulties in using the equipment; they felt that SISDIKSAT enabled them to make group decisions and handle inter-campus logistics more swiftly and accurately. Vice-Rektors at Jayapura and Manokwari reported additional administrative benefits beyond BKS decisionmaking. These two campuses are part of the same university, and since they have exclusive access to the satellite network during the early morning hours, administrative coordination is improved.

Other BKS officials and officials of the Directorate General for Higher Education reported sporadic use of SISDIKSAT for BKS planning, particularly between Jakarta and Ujung Pandang. They held favorable attitudes towards the system. Outside of the BKS, officials of the Open University of Indonesia and administrators of the Summer Institute for Linguistics were delighted with their respective organization's use of SISDIKSAT each week during the first half of 1985 and asserted that they would like greater access to the network in the future.

Our conclusion regarding the acceptance of the satellite technology by university administrators in Indonesia, therefore, is that SISDIKSAT is found to be an acceptable and desirable alternative to face-to-face, written, or telephone communications for all but the highest university administrators; namely, the BKS Rektors. Rektors do not perceive a need for more frequent (monthly or quarterly) meetings as would be feasible on the System. Further, they feel that face-to-face contact for meetings among Rektors is essential. Vice-Rektors find the system acceptable for their purposes, and even greater acceptance of SISDIKSAT was found among officials and administrators of the Open University of Indonesia who feel that the technology is well-suited to their tutor-oriented regional approach to education.

### 2.2.3 Acceptance by Teaching Faculty

The teaching staff for each of the courses offered via satellite in Indonesia typically consists of one lead dosen who gives most of the lectures, one or two assistant dosen who prepare lecture materials and give a few of the lectures, and one or two tutors per classroom who

distribute lecture materials and examinations and monitor student participation. Between August 1984 and May 1985, Abt Associates' evaluation staff conducted interviews with eleven lead dosen, five assistant dosen, and four classroom tutors for SISDIKSAT courses. Since the actual courses offered via satellite in 1984 and 1985 differed somewhat from the courses that were expected to be delivered through SISDIKSAT, some of the teaching faculty we interviewed prior to the start of each semester have not yet become project participants.

Prior to system implementation, the "climate of receptivity" towards SISDIKSAT among teaching faculty may be described as having been uniformly positive. The dosen looked forward to the opportunity to deliver their lectures to larger groups of students and to share the responsibilities of course delivery with colleagues from other BKS campuses. All of the dosen interviewed said they volunteered to be SISDIKSAT "guinea pigs" and were aware of the technical uncertainties involved in distance teaching.

Systematic training was offered by the AMC to faculty members on skills germane to distance teaching over the system. Training in course-writing was given by the AMC at several of the participating campuses; faculty were also flown to Ujung Pandang to participate in centralized course-writing seminars. Twenty-seven dosen were trained in techniques of distance teaching, but of that number, only three ultimately taught over the system within the year following the training. One of these three -- the dosen who taught Statistics over the system -- also received intensive training by the AMC in the United States. Distance teaching training was also provided over the system, although the dosen attendance at that was disappointing. All dosen who taught over the system developed new materials for their distance-taught course, and all but two lead dosen had submitted these materials to SISDIKSAT headquarters as requested for duplication and distribution.

Initial concerns expressed by faculty members prior to the start of the semester revolved around SISDIKSAT headquarters: problems communicating with the project staff (who were without a telephone until early 1985); delays in the course selection process; lack of training

and familiarization with the equipment; and technical problems with Channel B (graphics). None of the faculty anticipated problems at the outset in recruiting students and distributing lecture materials.

With only two courses being taught during the Fall 1984 semester (Food Science and Statistics I), the project staff in Ujung Pandang were able to provide adequate technical and administrative support to the teaching faculty throughout the semester, and the positive attitudes of these faculty members towards SISDIKSAT carried over to the end of the semester. Comparing teaching via satellite versus teaching face-to-face, the dosen stated that they spent more time over the course of the semester both preparing and delivering SISDIKSAT lectures while covering less material. They attributed the lower level of coverage to the need to speak slowly, carefully, and with frequent repetition during telesessions. Both instructors felt comfortable using the equipment and reported only one or two class cancellations due to technical problems. One of the instructors preferred to lecture with students from his own campus in front of him so that he received immediate feedback as to whether or not he was lecturing too fast, causing confusion, etc. The other instructor preferred to lecture with no students present in front of him. Both cited the absence of visual feedback, graphics, and the opportunity to present in-class demonstrations or laboratory sessions as the principal disadvantages of SISDIKSAT instruction in Fall 1984, along with a dependence on the technical quality of the network. Despite these shortcomings, the teaching staff for both courses found distance teaching to be pleasant and rewarding, and they volunteered to teach via satellite again in 1985. One teacher, however, felt that his students could not follow the Statistics I lectures adequately without graphics and, subsequently, he withheld his students from enrolling in Statistics II via satellite for the following semester.

In contrast to the positive experience with SISDIKSAT among teaching faculty in Fall 1984, many of the dosen who participated in the project during the Spring 1985 semester became alienated from SISDIKSAT midway through the semester. They found their initiation to distance teaching to be an unpleasant and frustrating experience. Five of the twelve lead dosen turned over their lecturing duties to one or more assistants in April or May and, by so doing, cut short their participa-



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tion in the experiment. As noted above, the extensive latitude Indonesian dosen have in attending or calling off classes, or even part or whole courses, is not unusual in that context. As described more fully in Section 2.1.2, reasons for the loss of enthusiasm towards SISDIKSAT among instructors and tutors in the Spring of 1985 concerned management problems rather than technical problems with the system. Without course handouts distributed to each location, without graphics and adequate training in distance teaching techniques, and without sufficient numbers of students in attendance, the teaching faculty lost much of their motivation to deliver the SISDIKSAT courses each week. Their frustration was reflected in their interview responses, their repeated complaints to SISDIKSAT headquarters about the late distribution of lecture materials, and their poor attendance during the latter half of the semester.

For those few courses for which proper training and management support was provided in the Spring 1985 semester, however, the dosen retained or even increased their positive perceptions of SISDIKSAT. These applications included the Open University tutorials from Jakarta, Statistics II from Ujung Pandang (taught by the U.S.-trained dosen), and Poultry Production from Bogor (taught by a dosen who received distance teaching training). Participants in the bi-weekly Open University tutorials all attended a general orientation session in February to acquaint them with SISDIKSAT and with telesession procedures. Each guest lecturer received assistance and instructions from the Open University Coordinator in Jakarta, and each session was moderated by a senior SISDIKSAT project staff member in Ujung Pandang. Lecture materials were sent out two weeks in advance of each telesession and distributed by regional assistants. Such was the success of the Spring 1985 Open University tutor training program and its acceptance by the teaching faculty that the Open University formally requested an additional time slot in the SISDIKSAT weekly schedule for the Fall 1985 semester. Likewise, the Statistics II and Poultry Production classes were well-prepared, well-attended, and well-received by most participants. The instructors for these courses, being specially trained in distance-teaching techniques, felt comfortable with the equipment and telesession procedures.



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In light of the above, our conclusion as to teaching faculty acceptance of SISDIKSAT in 1984 and 1985 is that wherever proper training and administrative support was provided for course delivery, the teaching faculty retained positive attitudes towards the satellite project and accepted the technology. In ten of the fifteen teaching applications of SISDIKSAT observed in 1984 and early 1985, however, dosen perceived their training and administrative support to be inadequate. The teaching faculty for these courses lost interest in the project midway through the semester and appeared unlikely to volunteer to teach on the system again. Many of these faculty members said they understood and sympathized with the project staff in Ujung Pandang who were unable to provide proper support due to funding delays and budget constraints. Their concern, however, was with the success of their course rather than pinpointing the source of the problems.

### 2.2.4 Acceptance by Students

Student users of SISDIKSAT included undergraduates (primarily), graduate students, and Open University tutors who received instruction via satellite in 1984 or 1985. Prior to implementation of the system, Abt Associates' evaluation staff held several group interviews with students in Palu, Manado, and Ujung Pandang to test their initial receptivity to distance-taught courses. The students expressed considerable interest in the experiment and asked many questions about how the classes would be conducted, how the equipment worked, how to enroll, etc. None of the students indicated any objections or reluctance to participate in SISDIKSAT courses.

Before describing student acceptance of the distance teaching experiment, some discussion of the normal undergraduate class situation in the Eastern Island institutions is in order. In traditional classes, there is generally little interaction between students and faculty. In general, graphics are little used, other than the traditional blackboard. All of this also needs to be placed in the larger context of access, as well. There is greater demand for university level education in the eastern part of Indonesia than the supply of adequately trained faculty can meet.

Students who attended the Fall 1984 Statistics I and Food Science courses responded favorably to questions about SISDIKSAT in group interviews and on self-administered forms given towards the end of the semester by the course instructors.[1] About 85% of the Statistics I students and 72% of the Food Science students surveyed felt that the classes were interesting, and more than half of the students said that they would be willing to use SISDIKSAT again for a similar course. The more positive attitudes and higher daily attendance rates among Statistics students compared with those of Food Science students seems to be linked to differences in lecturing style, materials preparation, and dosen-tutor interaction. Several of the Statistics I students were actually junior dosen who were auditing the classes for their own continuing education. Group interviews revealed that many students, particularly in Jayapura, found the Statistics I textbook to be overly complex. Students in both courses offered in Fall 1984 felt that the absence of functioning graphics equipment was disappointing (even though, it must be recalled, the system was meant primarily as an audio-only system).

The lead dosen for Statistics delivered all of the lectures himself, paused for questions every 15 minutes or so, used handout materials especially prepared for distance teaching, and met separately with tutors (via SISDIKSAT) for at least one-half hour before each class. The lead dosen for Food Science, however, delivered only about 40% of the lectures himself, paused for questions only after 30 to 45 minutes, used an existing textbook, and did not confer separately with the tutors from each location.

Student opinion of the SISDIKSAT system, and their participation in it, was elicited through questionnaires distributed to the 175 students in the Statistics I and Food Science courses during the Fall 1984 semester. The results, summarized in Exhibit 2-6, indicate that the majority of the students found the system equipment easy to use and the

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[1]These forms were based upon the Summary Student Assessment form developed by Abt Associates Inc.

**Exhibit 2-6**

**Student Opinion of SISDIKSAT**
**Fall 1984 Semester**

| Item | Percentage Agreeing or Strongly Agreeing* |
|---|---|
| Equipment Easy to Use | 58.9 |
| Physical Layout of Classrooom Facilitated Course | 85.4 |
| System Performs Adequately for Course | 45.6 |
| SISDIKSAT Inhibits Student Spontaneity | 40.5 |
| Personal Contact with Participants at Other Locations Achieved | 51.7 |
| Participate More in SISDIKSAT Class Than in Face-to-Face Class | 14.3 |

* N = 175, consisting of 151 trom Statistics I course and 24 from Food Science Course.

classroom layout satisfactory. Forty-five percent reckoned the technical quality of the system as adequate. A sizable minority (forty percent) felt that the system inhibited spontaneity, and only a small minority indicated that they participated more in a SISDIKSAT class than in a traditional class. About half the students felt that personal contact with other locations was achieved through the system.

Student acceptance of SISDIKSAT during the Spring 1985 semester may be described as high among Open University tutors and Statistics II students (including graduate students and junior dosen), and moderate to low among students for all other courses. The Open University tutors commented that SISDIKSAT enabled them to interact directly with the authors of their teaching manuals or textbooks in Jakarta and to obtain clarifications before using them in correspondence courses with undergraduate students. Very few of these tutors mentioned the absence of graphics as a major problem with the system, and only one session was conducted without the relevant handout materials being received in advance by the tutors. All of the Open University telesessions began promptly at 1:30 p.m. (Jakarta time) with about 75% of the tutors in attendance. Statistics II students held similarly favorable opinions of SISDIKSAT. The Statistics sessions were well-attended each Wednesday morning. Many students missed the first 20 minutes or so of each class, however, due to scheduling conflicts and the distance from other classrooms to the SISDIKSAT classroom.

For most of the other courses, student attendance was poor (for reasons listed in Section 2.1.2), and the attentiveness of students in the classroom was observed (by our on-site observer) to be low, especially among groups of 40 or more students. Comments from students interviewed indicated that many of them had difficulty following the lectures without handout materials or graphics, and many also thought the lectures were boring (although how the "boredom" factor compares with traditional classes, we do not know). Neither students nor tutors for these courses had any idea whether or not an exam would be given at the end of the semester, and most of the students said they came to the SISDIKSAT classes at the request of their local tutor. On the other hand, the students said that they enjoyed hearing questions from class-



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mates on other islands, and they were noticeably more attentive during question and answer periods. Most of the students, particularly the males, showed no reluctance towards using the microphones to ask questions, and they were disappointed if a class had to be cancelled because of a dosen no-show.

To summarize student acceptance of SISDIKSAT, data from on-site observation, group interviews, and self-administered questionnaires suggest that student attitudes were more favorable towards the system during the Fall 1984 semester than during the following (Spring 1985) semester, due primarily to the more timely delivery of the lectures and the lecture materials in the Fall semester. Attentiveness to the lectures was noticeably higher among students who were tutors, graduate students, or junior dosen rather than undergraduates. The quality of the audio was rarely cited as a weakness of the system by student users.

## 2.3 Student Learning

In this section, we discuss classroom attendance, student attentiveness and participation, and dosen/tutor/student opinions expressed in informal interviews in Indonesia as indicators of the learning effectiveness of SISDIKSAT, since our investigation into the impact of telecommunications on student learning in Indonesia was hindered by the absence of student grades and passing ratios during the trial SISDIKSAT semesters. These data are rounded out by questionnaire data from 183 students in the Spring 1985 semester.

### 2.3.1 Fall 1984 Semester

In early 1985, many of the dosen, tutors, and students who participated in the Food Science or Statistics I courses from the previous SISDIKSAT semester were interviewed regarding their experiences with the distance teaching experiment. When asked whether they felt that the SISDIKSAT students learned more, less, or about the same amount as students taught face-to-face, all of the Food Science participants and about half of the Statistics I participants felt that the students taught via satellite learned less than the students taught face-to-face. The other half of the Statistics I participants thought that about the same amount of learning took place in the two teaching environments for

Statistics. The reasons given for less learning via satellite were the absence of graphics, the need for extra repetition, the unavailability of the dosen outside of the classroom (office hours), and students' inability to conduct laboratory demonstrations or field trips. Problems with the audio reception and class cancellations due to technical problems were rarely mentioned as reasons for learning shortfalls with the SISDIKSAT network for the Fall 1984 semester. Although none of the participants perceived greater amounts of learning to have occurred with SISDIKSAT, several tutors for Statistics I thought that SISDIKSAT students would learn more than other students once the full system (with graphics) became operational. Students likewise did not feel that they learned as much in their distance-taught course as they would have in traditional Food Science or Statistics courses, but they nevertheless enjoyed being the first SISDIKSAT students. It should also be noted that many of these students would not have received instruction in these courses at all, or at least at the level of faculty expertise provided, were it not for SISDIKSAT.

The interview opinions are consistent with the observations of Abt Associates' part-time local research associate who reported higher student attendance, attentiveness, and participation levels for Statistics I than for the Food Science course. It appears, therefore, that for the Fall 1984 semester, students for Statistics I may have learned slightly less via satellite than in face-to-face instructional settings, and Food Science students may have learned much less in the SISDIKSAT course than in conventionally-taught courses.

### 2.3.2 Spring 1985 Semester

Although no standardized exams were given in either of the first two SISDIKSAT semesters to measure student learning, the on-site presence during the Spring semester of the EMC's evaluation coordinator allows us to provide a more complete picture of student learning for the Spring 1985 semester than for the preceding one. First of all, learning cannot take place if instruction does not take place. Overall, 36% of the Spring 1985 SISDIKSAT classes were cancelled during the first eight weeks of the semester. Exhibit 2-7 displays class cancellations by

**Exhibit 2-7**

**SISDIKSAT Classes Cancelled by Course**
**For Weeks 1 to 8 of the Spring 1985 Semester**

| COURSE TITLE | PERCENTAGE OF CLASSES CANCELLED |
|---|---|
| Human Ecology | 75 |
| Basic Forestry | 75 |
| Life Sciences | 63 |
| Basic Science | 50 |
| Resource Economics | 50 |
| Basic Ecology | 38 |
| Teaching Technology | 38 |
| Cattle Breeding | 25 |
| Fishing Equipment | 25 |
| Poultry Production | 13 |
| Food Science | 13 |
| Statistics II | 0 |
| Open University Tutorials | 0 |
| Mean | 36 |

individual course and reveals important variation in the frequency with which the different courses held successful sessions via satellite during March and April of 1985.

For those five courses for which at least half of the sessions were cancelled during the first two months of the semester, it is safe to conclude that students in these courses learned considerably less via satellite than in the traditional face-to-face setting -- particularly since the lecture materials for these courses also were not distributed to the students during this period.

At the other end of the spectrum, none of the Statistics II and Open University sessions were cancelled, and the students for these two applications received their written materials in advance of most of the sessions during Weeks 1 to 8 of the semester. The Open University tutors reported that without SISDIKSAT, they would have had no opportunity to interact with the authors of their teaching manuals. For this reason, the Open University coordinators and tutors felt that the "students" for this course learned more via SISDIKSAT than they would have without the satellite network. Our observations of the lively exchange of questions and discussion that characterized each Open University session would tend to support this conclusion. The students for Statistics II also engaged in frequent question and answer sessions and seemed to suffer less from the absence of graphics than was the case of the Statistics I students in the preceding semester. The Statistics II students included junior dosen and graduate students, all of whom agreed that the quality of instruction delivered for this course via satellite was not available on their own campus (excluding, of course, IKIP-U.P. participants where the course originated). Taken together, our observations and information pertaining to the Statistics II course suggest that students for this course learned at least as much via SISDIKSAT as they would have in face-to-face sessions on their own campuses.

For the remaining five courses, the evidence of student learning is less obvious. We believe, however, that the students for these courses may have learned less via SISDIKSAT than via conventional classroom instruction because each two-hour session yielded only one hour of instruction, with nearly 30 minutes consumed by organizational delays.

The teaching faculty for these course expressed concerns midway through the SISDIKSAT semester about being able to cover the same amount of material that they were accustomed to covering in prior semesters without SISDIKSAT. Administrative problems prevented the lecture materials for these courses from being distributed to the students at each site in a timely manner and probably further interfered with student learning.

## 2.4 Appropriateness of the Teaching Techniques

In examining the extent to which teaching faculty in Indonesia used techniques that were appropriate for distance teaching over the SISDIKSAT network, we looked for the following ten dosen behaviors:

1) Timely distribution of lecture materials
2) Timely attendance by the lead dosen
3) Proper use of the microphones
4) Coordination between dosen and tutors
5) Short lecture intervals before pausing for questions
6) Use of questions directed to the students
7) Use of the graphics equipment (if available)
8) Use of guest lecturers (trained on the system)
9) Use of a short break for local discussion
10) Proper backup procedures for audio problems

These behaviors are generally accepted and recommended in distance-teaching guidebooks for holding student interest and maximizing student learning. Since Abt Associates maintained a periodic on-site presence during both the Fall 1984 and Spring 1985 semesters, we were able to categorize each SISDIKSAT lecturer according to the appropriateness of his or her distance teaching techniques based upon the above criteria.

### 2.4.1 Fall 1984 Semester

During the trial SISDIKSAT semester, our on-site staff observed several lectures for both Statistics I and Food Science. The lecturer for Statistics exhibited six of the ten appropriate teaching behaviors on these occasions, while the lecture for Food Science exhibited only three of these behaviors. Since the graphics equipment was not available for use in 1984 and guest lecturers in Statistics are scarce in Indonesia (two of the remaining "appropriateness" criteria), we conclude that the teaching faculty for Statistics I used appropriate teaching techniques with the SISDIKSAT network. Again, we note that this faculty



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member received the most extensive training in distance teaching techniques of all those who taught over the system. The lead dosen for Food Science tended to lecture for long periods without a break, turned over most of the teaching duties to another dosen who was not trained in the proper use of the system, and did not hold separate meetings with the tutors to coordinate course activities. Based upon interview comments and our in-class observations, we conclude that the Food Science dosen did not use appropriate techniques for distance teaching during the Fall 1984 semester.

### 2.4.2 Spring 1985 Semester

Between March and May of 1985, Abt Associates' staff observed 30 lectures from 12 different courses using the Classroom Observation Form shown in Appendix A. The information obtained from these forms is summarized in Exhibit 2-8. Forty percent of the observed lectures were cancelled, usually because the dosen was not present to deliver the lecture. One-fourth of the observed class cancellations (3 out of 12) were due to technical problems with the satellite system. The remaining 18 classroom observations of completed sessions show that, on average, the SISDIKSAT students received about one hour of lecture during each two-hour class. Another half an hour was taken up by question and answer sessions, with the remaining time consumed by technical problems, preliminary roll calls and reviews, and local discussion.[1]

On average, the dosen lectured for 21 minutes uninterrupted; however, closer inspection of the Classroom Observation Forms revealed three basic patterns of instruction:

> Pattern A: Alternating 15-20 minutes of lecture with 10-15 minutes of questions and answers for a total of about 55 minutes of lecture and 45 minutes of questions and answers or discussion. This pattern worked well in

[1]Although we recorded number and time of student questions by site, we do not report this information because the questioning was limited by the dosen (e.g., only 2 questions from each site were allowed in order to keep the class time within limits). We observed that more students wanted to ask questions than there was time for.

**Exhibit 2-8**

**Summary Data from the Classroom Observation Form for the Spring 1985 Semester**

| Classroom Activities | |
|---|---|
| Total Number of Minutes Per Session: (Completed Sessions Only) | 120 |
| Mean Number of Minutes for: | |
| Lecturing | 62 |
| Questions & Answers | 28 |
| Technical Problems | 12 |
| Scanning/Roll Call | 9 |
| Preliminary Reviews | 5 |
| Local Discussion | 4 |
| Mean Lecture Interval (min.) | 21 |

| Teaching Behaviors | |
|---|---|
| Number of Appropriate Teaching Behaviors Exhibited (out of 10) by: | |
| Open University dosen | 8 |
| Statistics II dosen | 7 |
| Fishing Equipment dosen | 5 |
| Poultry Production dosen | 4 |
| All other dosen | 3 or fewer |

| Session Data | |
|---|---|
| Total Number of Observed Sessions: | 30 |
| No. of Completed Sessions: | 18 |
| No. of Cancelled Sessions: | 12 |
| Cancellations due to Dosen No-Shows: | 6 |
| Cancellations due to Student No-shows: | 3 |
| Cancellations due to Technical Problems: | 3 |

the SISDIKSAT environment and was typically used by instructors for the Open University and Statistics II sessions.

Pattern B: About 35 minutes of lecture followed by 25 minutes or so of questions and answers, finishing with another 35 minutes of lecture. This pattern worked fairly well, particularly for large classes with many participating sites, and was most often used by lecturers in Poultry Production and Fishing Equipment.

Pattern C: About 100 minutes of lecture interrupted for only five to ten minutes to check the audio reception. This pattern, exhibited by lecturers in Food Science and Basic Ecology, was not well-received by either students or tutors since it afforded little or no time for discussion or questions and seemed to cause mental fatigue.

In terms of the ten desirable teaching behaviors, the dosen from the Open University and from IKIP-Ujung Pandang (for Statistics II) made effective use of the satellite system for distance teaching, exhibiting eight and seven of the appropriate teaching behaviors, respectively. Two of the teaching teams from Bogor (for Poultry Production and Fishing Equipment) exhibited half of the appropriate behaviors, while all of the remaining dosen exhibited three or fewer of the ten behaviors.

Only the Open University made use of guest lecturers and only the dosen for the Fishing Equipment course actually directed questions to the students. Two of the courses, Fishing Equipment and Resource Economics, used the graphics during at least one lecture. Most of the dosen lectured too close to the microphone, while others directed their voice downwards towards their notes. Few of the dosen instructed their students and tutors in the proper use of the microphones. It should be pointed out that problems in project and university management and budget problems prevented more of the dosen from receiving proper training in the use of SISDIKSAT, from distributing dosen profiles and lecture modules to their students, from showing up on time (many did not know when they were scheduled to teach), and from receiving adequate numbers of students (due to errors in scheduling and lack of publicity). There was an inverse relationship between appropriate teaching behaviors and class cancellations: the four courses in which the dosen exhibited the highest number of appropriate teaching behaviors (as seen in the middle section of Exhibit 2-8), were also the courses with the lowest percent-

age of class cancellations (as seen on Exhibit 2-7). The findings on student acceptance (discussed in Section 2.2.4) suggest a further link between appropriate teaching behaviors and self-reported student learning and acceptance of the technology.

We also have student questionnaire data from the Spring 1985 Semester which we can use to examine the relationship between distance teaching patterns and student behavior and perceptions. These questionnaire data were collected from 183 students in eight of the courses, two courses (48 students) where the dosen exhibited Teaching Pattern A (the most appropriate distance teaching pattern), two courses (51 students) with dosen exhibiting Teaching Pattern B (less appropriate), and four courses (84 students) where the dosen exhibited Pattern C (the least appropriate distance teaching pattern). The students' responses to the questionnaire items are broken out by teaching pattern to which they were exposed and are shown in Exhibit 2-9. These data indicate that, for most items, the students exposed to the more appropriate teaching behavior responded in the expected favorable direction. Students in the classes with the more appropriate teaching patterns were significantly more likely to indicate that activities took place before lecturing began, the system performed adequately for the course, and personal contact with participants at the other class locations was achieved, and they were significantly less likely to report that they preferred face-to-face instruction and that they preferred not to take another SISDIKSAT course.

## 2.5 Institutional Development

With Indonesia's Eastern Islands University Association (BKS) spread over more than 1,600 miles of ocean east to west, a secondary objective of the Rural Satellite Program beyond improving the opportunities for agricultural education was to strengthen the institutional development of the Eastern Islands higher education institutions through improvements in administrative efficiency, faculty upgrading, faculty outreach, and curriculum and student performance standardization. A more cohesive BKS would, it was initially felt, be more likely to obtain and focus the necessary resources to continue and expand the activities

Exhibit 2-9

Student Behavior and Perceptions by Teaching Pattern
Spring 1985 Semester

| Percentage Within Each Teaching Pattern Reporting: | No. Responding | Teaching Pattern (% Reporting Within Each) | | | Mean | Kendall's Tau B |
|---|---|---|---|---|---|---|
| | | A (Most Appropriate) | B (Less Appropriate) | C (Least Appropriate) | | |
| Received Instruction in Using Equipment | 183 | 67 | 35 | 59 | 55 | .01 |
| Activities Took Place in Class Before Lecturing Began | 176 | 62 | 60 | 27 | 45 | .30*** |
| Prefer Face-to-Face Instruction | 180 | 30 | 31 | 55 | 42 | .23*** |
| System Performs Adequately for Course | 181 | 71 | 71 | 56 | 64 | .15* |
| SISDIKSAT Inhibits Student Spontaneity | 179 | 40 | 45 | 58 | 49 | .07 |
| Personal Contact with Participants at Other Locations Achieved | 179 | 47 | 45 | 32 | 40 | .20** |
| Prefer Not to Take Another SISDIKSAT Course | 177 | 32 | 49 | 55 | 43 | .24*** |

* $p < .05$.
** $p < .01$.
*** $p < .001$.



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of the satellite project beyond 1985. In this section, we examine the extent to which the institutional capabilities of the BKS and its institutions and other user organizations have been enhanced through the implementation of SISDIKSAT. Other user organizations include the Open University of Indonesia (U.T.), the Bogor Agricultural Institute (IPB), and the Directorate General of Higher Education (DG/HE).

### 2.5.1 The Eastern Islands University Association (BKS)

Our evaluation finds variable impact of the satellite project in Indonesia on the institutional development of the BKS following its first year of trial applications (August 1984 to August 1985). As described in Section 2.1, SISDIKSAT is rarely used for BKS administration, and at least half of the project sites (university campuses) are not highly active users of the satellite network. The BKS continues to be unable to obtain adequate leadership and funding for the annual operation of SISDIKSAT from the Office of the Directorate General for Higher Education, and there is little evidence thus far to suggest that the BKS is well-prepared to continue and expand the activities of the project beyond the AID support period. Several Rektors and senior BKS officials have yet to visit their own satellite classrooms, and the mood of many BKS officials, including its Chairman, towards the future of the BKS appears to be uncertain. As noted in Section 1.1 above, the USAID Mission in Jakarta decided that the BKS would not serve as a viable vehicle for building institutional support and has begun to examine alternative structures to strengthen higher education in this area.

Interviews with senior university and BKS officials conducted in April and May of 1985 reveal that much of the enthusiasm that was generated towards the project and towards the BKS as an institution in 1982 and 1983 began to erode in 1984 with the termination of a major AID-funded Washington State University project aimed at developing standardized textbooks and videotapes for use in the classrooms of all BKS universities. Without the continuous financial support, technical guidance, and organizational momentum provided by the AID/WSU field team, the BKS members seemed to lose their sense of purpose and urgency. Furthermore, along with repeated delays in SISDIKSAT project implementation there were changes in the leadership of the BKS and several

member universities. By the time SISDIKSAT was ready to serve the administrative needs of the BKS in the Fall of 1984, the university officials no longer perceived any immediate need to communicate with each other and were content to discuss their common concerns face-to-face at the annual Rektors' meeting. While some universities marketed SISDIKSAT effectively in their faculty recruitment process, their actual use of the satellite system for administration and outreach was limited. Some standardization of course teaching materials across BKS sites has been promoted successfully by the WSU and RSP projects; however, the equally important standardization of tests and other performance measures has not occurred.

While SISDIKSAT may not have served to "save" the BKS as a viable institution-building device, that does not mean that SISDIKSAT itself has not contributed to institution-building in the Eastern Islands region. The satellite system served this purpose primarily through providing the opportunity for faculty upgrading. Through SISDIKSAT training, dosen were upgraded in their teaching techniques. They were also upgraded in the level of their substantive knowledge by being able to sit in on lectures and courses provided by expert senior teachers. Many junior dosen sat in on the Statistics courses offered and on the courses taught by better trained faculty on other campuses. A seminar in Poultry was provided on the system specifically for junior dosen. Of additional importance with regard to institution-building is the fact that SISDIKSAT has expanded the opportunity for higher education, or provided it at a higher level than previously available, in the Eastern Islands region. Both through SISDIKSAT-related courses and through the Open University's use of the satellite system, more students could be reached and the level of expertise to which they were exposed was greater than would have been the case without the Rural Satellite Program.

### 2.5.2 Other Organizational Users

Despite receiving only limited access to SISDIKSAT in early 1985 (four hours per week), the Open University of Indonesia appears to have increased their institutional capabilities through the satellite system moreso than the BKS. Both U.T. officials and tutors feel that contact between coordinators and course experts in Jakarta and the U.T. tutors

in those remote locations with satellite classrooms has been greatly improved through SISDIKSAT. As a result of this success, the U.T. would like to expand their use of the existing network and ultimately provide similar services to tutors located on islands such as Sumatra not currently served by SISDIKSAT.

The U.T. officials and coordinators believe that SISDIKSAT expands the outreach of the Open University throughout the Eastern Islands and increases their ability to offer standardized instruction together with standardized tests. The U.T. staff are more confident that those tutors who have had the opportunity to receive direct instructions or clarifications from course authors in Jakarta are following correct teaching procedures than they are about those tutors who are unable to attend SISDIKSAT tutorials. While tutor training will remain the primary interest of the Open University in using SISDIKSAT, the U.T. officials and program coordinators would like to explore other applications of the satellite network, such as U.T. administration, in the near future. Despite recent reductions in the annual operating budget of the Open University, U.T. officials in Jakarta believe that they are still in a good financial position to assume full or shared responsibility for the SISDIKSAT project in 1986.

Other potential user organizations -- including CARE, the National Family Planning Agency (BKKBN), and the National Transmigration Authority (Transmigrassi) -- have requested access to SISDIKSAT for their own administration and outreach activities, but these requests have been put off by project headquarters' staff until primary SISDIKSAT operations (undergraduate course applications) have stabilized. Other institutions involved in planning the satellite project include the Ministry of Education and Culture, the Ministry of Communications, the Bogor Agricultural Institute, and PERUMTEL, the owner and manager of Indonesia's PALAPA satellite system. According to most officials, the impact of SISDIKSAT on these institutions has included some technical enrichment of PERUMTEL technicians and operators and improved faculty outreach at IPB.

## 2.6 System Affordability

The final evaluation question addressed in this chapter pertains to the affordability of SISDIKSAT to the Government of Indonesia. As discussed in Chapter 1, we adopted a resource-based approach to cost analysis of the satellite project due to instabilities and ambiguities in data on staff compensation, shared costs, and university recordkeeping. Our objective in this section is to portray as accurately as possible the start-up and operational resources required for a typical site to participate in the telecommunications network for a full academic semester. To estimate the total resources required system-wide, these local resource requirements must be multiplied by the total number of sites and/or the total number of courses, and then added to the central resources needed to manage the system.

We have allocated resources across three major categories of project activity: project administration, teleconference preparation, and teleconference delivery. Project administration activities include staff recruitment, training, and supervision along with system planning, budgeting, and scheduling. Teleconference preparation includes dosen training, course materials development and distribution, and preparation of weekly lectures. Lastly, teleconference delivery includes activities relating to system installation and maintenance in addition to actual class sessions. Local resource requirements were estimated by averaging data for three SISDIKSAT sites: UNSRAT Manado, UNCEN Jayapura, and UNLAM Banjarmasin. The remainder of this chapter presents and describes the estimated staffing, facilities and equipment, and support requirements of the SISDIKSAT network.

### 2.6.1 Staffing

During interviews with project staff, administrators, and teaching faculty, we asked each project participant to estimate the number of hours he or she spent per week during the Spring 1985 semester performing each of the SISDIKSAT activities described above. We also asked the respondents to provide retrospective estimates of their project time during system start-up in 1984. These estimates were combined with data from on-site observation, aggregated within occupational categories, and (where appropriate) averaged across sites. The results are shown in Ex-

hibit 2-10 for the start-up period (1984) and in Exhibit 2-11 for the operational period (1985) in units of person-hours per week. The person-hours required for system training are included under Project Administration for management training, under Teleconference Preparation for course development training, and under Teleconference Delivery for technical training and training in distance teaching techniques.

Not surprisingly, SISDIKSAT staffing levels show a shift away from activities relating to teleconference delivery (primarily system installation) during the start-up period toward project management and software development in 1985. During system start-up, project participants reportedly spent most of their SISDIKSAT time (60%) completing system installation, conducting system tests, and using the network. In the 1985 operational period, however, the project staff spent more of their time (61%) administering the project and preparing teleconferences than actually delivering the teleconferences or maintaining the system. The day-to-day management of SISDIKSAT in early 1985 continued to rely heavily on expatriate advisors for input and advice despite an overall reduction -- by almost half -- of the amount of consultant time contributed to the project since the system start-up period. A more appropriate staffing level for future SISDIKSAT semesters is being sought so that the dependence on consultants can be reduced. One way to do this would be to add another full-time project manager (i.e., reverse the 22 hours and 66 hours shown for managers and consultants under Project Administration).

The total person-hours shown at the bottom of Exhibit 2-11 represents the estimated weekly staffing level required to operate SISDIKSAT with only one remote site and one course application. The staffing levels for local project staff and university administrative staff must be multiplied by the total number of sites to obtain the staffing requirements for all project staff. Faculty and tutor staffing must be multiplied by the number of courses as well. For ten remote sites and ten course applications, the projected staffing requirement would be 1760 person-hours, or 44 full-time equivalents (FTEs) per week (if all sites participated in all courses). Of this total, about one-fourth (10.5 FTE's) would be needed to manage the project in Ujung

**Exhibit 2-10**
**Estimated SISDIKSAT Staffing Requirements for System Start-up**
**(Nonrecurring Costs In Person-Hours per Week)**

| | Project Administration | Teleconference Preparation | Teleconference Delivery* | TOTAL | Per |
|---|---|---|---|---|---|
| **A. Central Project Staff** | | | | | |
| 1. Managers | 25 | 26 | 28 | 63 | System |
| 2. Engineers | 0 | 0 | 70 | 70 | " |
| 3. Operators | 6 | 12 | 42 | 60 | " |
| 4. Clerk/Typists | 40 | 15 | 25 | 80 | " |
| 5. Consultants** | 40 | 35 | 85 | 160 | " |
| **B. Local Project Staff** | | | | | |
| 1. Coordinator | 6 | 2 | 12 | 20 | Site |
| 2. Technician | 0 | 0 | 30 | 30 | " |
| 3. Operators | 0 | 0 | 40 | 40 | " |
| 4. Clerk/Typists | 5 | 0 | 5 | 10 | " |
| **C. University Staff** | | | | | |
| 1. Administrators | 3 | 1 | 2 | 6 | Site |
| 2. Adm. Assistants | 2 | 2 | 1 | 5 | " |
| 3. Instructors | 0 | 6 | 2 | 8 | Course |
| 4. Tutors | 0 | 3 | 2 | 6 | Site per Course |
| Total Hours*** | 127 hrs. | 102 hrs. | 342 hrs. | 571 hrs. | |
| Percent of Time | 22 % | 18 % | 60 % | 100 % | |

* Includes system installation.
** Primarily expatriate field advisors.
*** Total hours reflect only one remote site and one course application.

Exhibit 2-11

**Estimated SISDIKSAT Staffing Requirements for System Operations**
(Recurring Costs In Person-Hours Per Week)

| | Project Administration | Teleconference Preparation | Teleconference Delivery | TOTAL | Per |
|---|---|---|---|---|---|
| **A. Central Project Staff** | | | | | |
| 1. Managers | 22 | 19 | 12 | 53 | System |
| 2. Engineers | 10 | 0 | 25 | 35 | " |
| 3. Operators | 12 | 24 | 84 | 120 | " |
| 4. Clerk/Typists | 70 | 40 | 10 | 120 | " |
| 5. Consultants* | 66 | 11 | 15 | 92 | " |
| **B. Local Project Staff** | | | | | |
| 1. Coordinator | 3 | 3 | 6 | 12 | Site |
| 2. Technician | 0 | 0 | 20 | 20 | " |
| 3. Operators | 8 | 6 | 26 | 40 | " |
| 4. Clerk/Typists | 5 | 5 | 0 | 10 | " |
| **C. University Staff** | | | | | |
| 1. Administrators | 2 | 1 | 1 | 4 | Site |
| 2. Adm. Assistants | 1 | 2 | 0 | 2 | " |
| 3. Instructors | 0 | 4 | 2 | 6 | Course |
| 4. Tutors | 0 | 2 | 2 | 4 | Site per Course |
| Total Hours** | 199 hrs. | 117 hrs | 201 hrs. | 517 hrs. | |
| Percent of Time | 39 % | 22 % | 39 % | 100 % | |

* Primarily expatriate field advisors.
** Total hours reflect only one remote site and one course application.

Pandang, leaving approximately 3-1/3 FTEs per semester at each of the remote locations. Since the mix of staffing at each location includes project managers, technicians, operators, typists, administrators, instructors, and tutors, it would be inaccurate to state that SISDIKSAT can be operated successfully by only three full-time staff per site. Those sites considered to be heavy users of the system may have two secretaries and a dozen or more tutors and instructors who assist in the project; whereas sites with little or no student participation such as IPB Bogor might need only a local coordinator and a system operator to monitor SISDIKSAT on a part-time basis. Since most university staff in Indonesia hold other jobs to supplement their income and work at lower levels of efficiency than university staff in other countries, SISDIKSAT may be characterized moreso than UWIDITE by large numbers of participants contributing small amounts of time to the project.

### 2.6.2 Equipment and Facilities

Under this category, we include SISDIKSAT facilities, equipment, and supplies. Most of these items represent one-time (start-up) bulk purchases that are best described in dollar amounts, the replacement costs of which are based on the life expectancy of each piece of equipment. Equipment costs do not include the costs of shipping which we consider to be support costs. In most cases, actual costs are supplied; in others, SISDIKSAT project staff have provided estimates based on their own recollections or projections.

Exhibits 2-12 and 2-13 summarize the equipment and facilities requirements for the start-up and operation, respectively of Indonesian distance teaching network. Those items listed under the column labelled "Teleconference Delivery" apply to individual remote sites and must be multiplied by the number of classrooms (and by the number of courses, for course materials) to determine the total equipment and facilities requirements for the system. The requirements for classroom space are about the same (900 to 1000 square feet) at all locations, except that the SISDIKSAT Headquarters in Ujung Pandang (the floor plan of which is shown in Exhibit 2-14) requires five times the office space needed at the remote locations. And, although existing structures were used for the satellite headquarters and individual classrooms, the renovations of



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Exhibit 2-12

**Estimated SISDIKSAT Equipment and Facilities Requirements for System Start-up**
(Nonrecurring Costs)

| | Project Administration (Main RSP Office at UNHAS) | Teleconference Preparation | Teleconference Delivery (per site) | Unit |
|---|---|---|---|---|
| **A. Facilities** | | | | |
| 1. Office Space | 3,000 | | 600 | Square Feet |
| 2. Classroom Space | 1,000 | | 900 | Square Feet |
| 3. Renovations (Cooling, Lighting Soundproofing) | 9,000 | | 2,500 | U.S. Dollars |
| **B. Equipment (excludes shipping costs)** | (spares) | | | |
| 1. Audio | 1,645 | | 4,530 | U.S. Dollars |
| 2. Graphics | 15,369 | 27.000* | 8,160 | " |
| 3. Facsimile | 6,040 | | 2,995 | " |
| 4. Network | 11,986 | | 8,812 | " |
| 5. Support | 668 | | 3,544 | " |
| 6. Office | 5,200 | | | " |
| 7. Classroom | | | 2,000 | " |
| **C. Supplies**** | | | | |
| 1. Audio | 2,500 | | | U.S. Dollars |
| 2. Graphics | 1,667 | 6,000* | 200 | " |
| 3. Facsimile | 5,779 | | 500 | " |
| 4. Network | 8,858 | | | " |
| 5. Support | 8,201 | | 500 | " |
| 6. Office | 4,500 | | | " |
| 7. Course Materials*** | | | 1 | U.S. Dollar Per Student Per Course |

* Costs for the software studio equipment and supplies.
** Expendables supplied at project start.
*** Cost billed to each remote site.

Exhibit 2-13

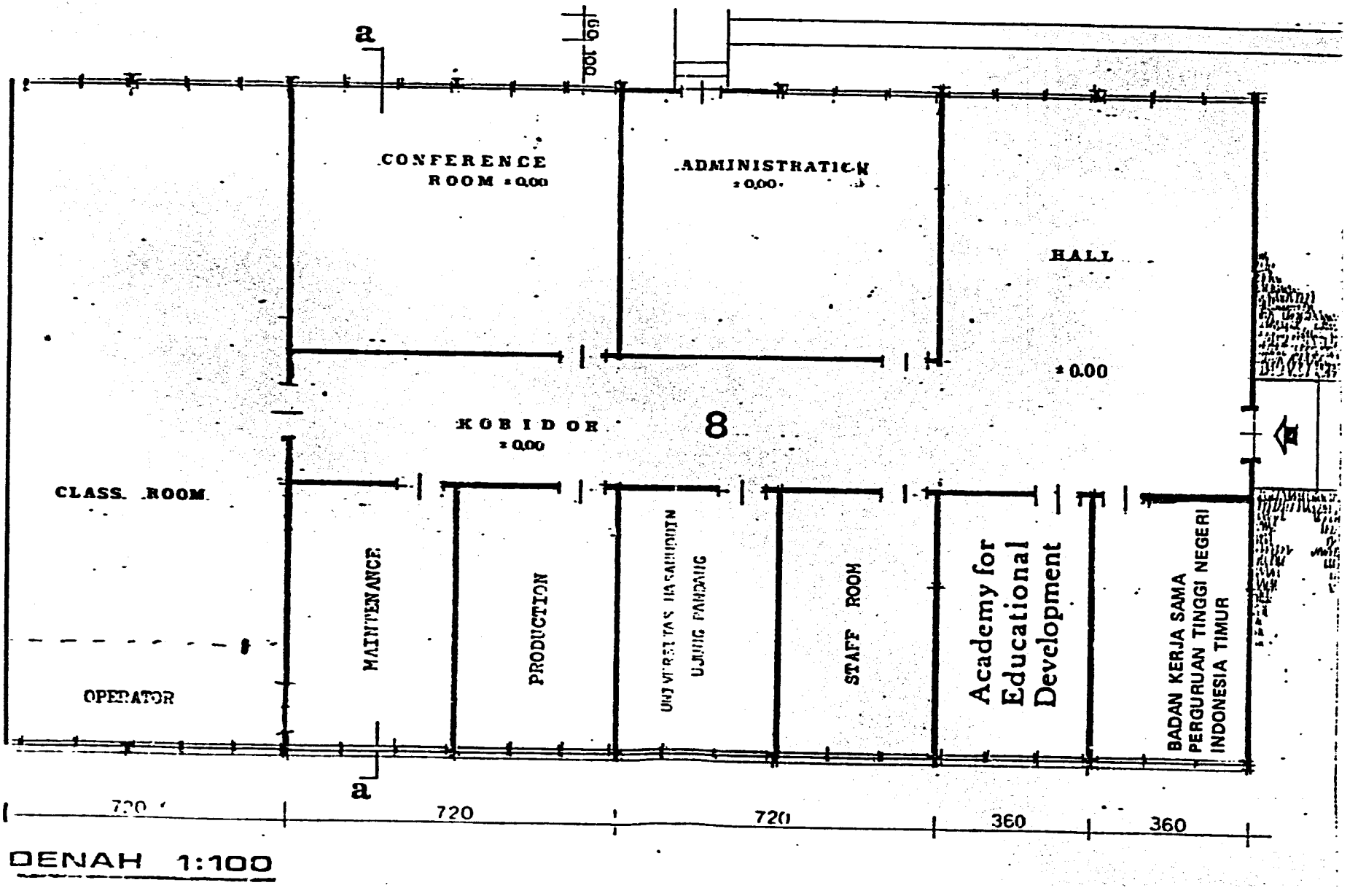
**Estimated SISDIKSAT Equipment and Facilities Requirements for System Operation***
(Recurring Costs Per Semester)

| | Project Administration (Main RSP Office at UNHAS) | Teleconference Preparation | Teleconference Delivery | Unit (per site) |
|---|---|---|---|---|
| A. Facilities | | | | |
| 1. Upkeep | 450 | | 125 | U.S. Dollars |
| B. Equipment | | | | |
| 1. Audio | 82 | | 226 | " |
| 2. Graphics | 1,537 | 2,700 | 816 | " |
| 3. Facsimile | 302 | | 150 | " |
| 4. Network | 600 | | 440 | " |
| 5. Support | 33 | | 178 | " |
| 6. Office | 260 | | | " |
| 7. Classroom | | | 100 | " |
| C. Supplies | | | | |
| 1. Audio | 417 | | | " |
| 2. Graphics | 278 | 1,000 | 20 | " |
| 3. Facsimile | 963 | | 83 | " |
| 4. Network | 1,476 | | | " |
| 5. Support | 1,367 | | 83 | " |
| 6. Office | 750 | | | " |
| 7. Course Materials** | | | 1 | U.S. Dollar Per Student Per Course |

* Assumes 10 year replacement costs for facilities and audio equipment, 5 year replacement costs for graphics equipment, and 3 year replacement costs for supplies.

** Cost billed to each remote site.

**Exhibit 2-14: Floor Plan for SISDIKSAT Headquarters**



these buildings to provide adequate cooling, lighting, and soundproofing were, in many instances, extensive. Exhibit 2-12 suggests that the cost to add another site to the SISDIKSAT network would be about $31,000 for equipment and supplies, plus shipping and renovation costs.

Exhibit 2-13 includes average facilities and equipment costs per semester, assuming that replacements are required every ten years for facilities and audio equipment, every five years for the graphics equipment, and every three years for supplies. With this information, we can estimate the ongoing annual materials requirements for SISDIKSAT to cost $77,000, of which $28,000 would be budgeted for facilities and audio equipment, $25,000 for graphics equipment, and $24,000 for course materials and system supplies. We should note that the costs for course materials and, to some extent, for additional microphones would increase as the number of students increase. We have assumed class sizes of 40 students per site in estimating annual materials requirements for SISDAKSAT.

### 2.6.3 Support

Support required for the installation, operation, and maintenance of SISDIKSAT includes transportation, conventional communications, computer services, and customs clearance. The estimated start-up and operational support requirements of SISDIKSAT for a single semester are shown in Exhibits 2-15 and 2-16, respectively. These data are based upon project records, annual budget requests, and on-site observations. Those items listed under the heading "Teleconference Preparation" represent the support required for each individual course; those items listed under "Teleconference Delivery" represent the support required for each individual site. These entries must be multiplied by the total number of courses or sites, as appropriate, to obtain the system-wide start-up and operational support requirements. Those support requirements listed under the first heading, "Project Administration", typically represent travel and other interchange between project headquarters in Ujung Pandang and project sponsors in Jakarta and Washington.

Transportation support, including shipping and delivery, shows the most dramatic reduction from the start-up period to the operational period. The installation process required a three-step shipping proce-

## Exhibit 2-15

**Estimated SISDIKSAT Support Requirements for System Start-up**
(Nonrecurring Costs Per Semester)

| | Project Administration (Main RSP Office of UWHAS) | Teleconference Preparation | Teleconference Delivery* (per course) | Units (per site) |
|---|---|---|---|---|
| **A. Transportation** | | | | |
| 1. Air Travel | 10 | 2 | 4 | Round trips |
| 2. Per Diem | 25 | 6 | 12 | Person Days |
| 3. Ground Transport | 25 | 6 | 12 | Person Days |
| 4. Shipping/Delivery | | | 10 | Percent of Equipment |
| **B. Communication** | | | | |
| 1. Telephone | 48 | | | Long Distance Calls |
| 2. Telex/Cable | 16 | 2 | 3 | Transmissions |
| 3. Satellite Access | 160,000** | | | U.S. Dollars |
| **C. Other** | | | | |
| 1. Computer | | | | U.S. Dollars |
| 2. Maintenance | 10 | | 10 | Person Days |
| 3. Publications/Graphics | | 100 | | U.S. Dollars |
| 4. Customs Clearance | | | 10 | Percent of Equipment |

* Includes system installation.
** We have chosen to classify one semester's satellite access costs as a nonrecurring startup cost.

## Exhibit 2-16

**Estimated SISDIKSAT Support Requirements for System Operation**
(Recurring Costs Per Semester)

| | Project Administration (Main RSP Office at UNHAS) | Teleconference Preparation (per course) | Teleconference Delivery (per site) | Units |
|---|---|---|---|---|
| **A. Transportation** | | | | |
| 1. Air Travel | 5 | 1 | 1 | Round trips |
| 2. Per Diem | 10 | 2 | 2 | Person Days |
| 3. Ground Transport | 10 | 2 | 2 | Person Days |
| 4. Shipping/Delivery | 1 | 5 | 1 | 10 Kg. Boxes |
| **B. Communication** | | | | |
| 1. Telephone | 32 | | 1 | Long Distance Calls |
| 2. Telex/Cable | 6 | 1 | 1 | Transmissions |
| 3. Satellite Access | 160,000 | | | U.S. Dollars |
| **C. Other** | | | | |
| 1. Computer | | 500* | | U.S. Dollars |
| 2. Maintenance | 10 | | 10 | Person Days |
| 3. Publications/Graphics | | 100 | | U.S. Dollars |

* Supports MIS activities.

dure from the U.S. to Jakarta to Ujung Pandang and finally to each site, and it further required a three-day visit to each site by a four-person installation team. During the operational period, air travel and shipping requirements were reduced to, on average, a handful of trips between Ujung Pandang and Jakarta, one round trip per course for dosen training, one brief trip to each site for system maintenance, one shipment of spare parts to each site, and one shipment of course materials (per course) to each participating site.

The SISDAKSAT project staff relied more heavily on telex services for communication during the start-up period primarily due to the absence of a telephone at project headquarters until late 1984. The single most costly resource requirement for both operational and start-up periods is the cost to lease two satellite channels from PERUMTEL, currently priced at about $320,000 per year, or $80,000 per channel per semester. This cost appears to be arbitrary and negotiable. Other services, such as computer charges, building maintenance, and electricity costs, represent areas where the local universities could reduce system overhead by contributing resources to the satellite project.

The SISDIKSAT resource requirements summarized in Exhibits 2-10 to 2-16 show that the costs to operate the satellite network each semester or each calendar year are far less than the costs to install and debug the network. We estimate the total annual operating costs for SISDIKSAT to be $400,000 for facilities, equipment, and supplies, plus staffing costs (honoraria, per diem, air fares, etc.) associated with 44 full-time equivalents. A major cost item affecting the affordability of SISDIKSAT to the BKS and the Government of Indonesia appears to be the cost of the leased lines for Channel A and Channel B, which has remained fixed through the start-up and operational periods. If this cost can be negotiated downward with PERUMTEL in the near future, or if SISDIKSAT should become a one-channel network similar to UWIDITE, it is more likely that the BKS, whose operating budget is considerably less than that of UWI, can afford to operate SISDIKSAT with assistance from the Directorate General of Higher Education.



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Also, to the extent that SISDIKSAT is able to reach larger numbers of students while reducing BKS travel costs (incurred by approximately 50 faculty each semester who teach part-time at other locations), the operating costs of the system become progressively more affordable. It the current system were to reach progressively greater numbers of students, the per student incremental costs would undoubtedly decline (particularly if relatively inexpensive receive-only classrooms were added). At the time of our evaluation, SISDIKSAT appeared to have no effect on BKS travel budgets but had already increased BKS student outreach. Undoubtedly, these trade-offs will be important considerations in the AID and GOI discussions and decisions concerning the future of the SISDIKSAT network in Indonesia.



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## 3.0 THE UNIVERSITY OF THE WEST INDIES DISTANCE TEACHING EXPERIMENT (UWIDITE)

The University of the West Indies Distance Teaching Experiment was commissioned to link the three main campus territories (Jamaica's Mona Campus, Barbados, and Trinidad) and the two extension centers (St. Lucia and Dominica) via a telecommunication network. Subsequently, Antiqua and Jamaica's Montego Bay campus were added. The system was expected to provide the opportunity for teaching, training, teleconferencing, and outreach across the boundaries of several nations of diverse political character and differing levels of development which are part of the University of the West Indies. The following sections examine the various usage patterns of UWIDITE and how it has been received, in accordance with the six evaluation questions.

The University of the West Indies Distance Teaching Experiment both started and reached a full level of operation earlier than did Indonesia's SISDIKSAT. Therefore, we have a larger amount of data upon which to base our evaluation of UWIDITE. Information presented and conclusions drawn in this chapter are based upon observations, interviews, and questionnaire responses obtained during the course of the several semesters of operation which have thus far occurred for UWIDITE.

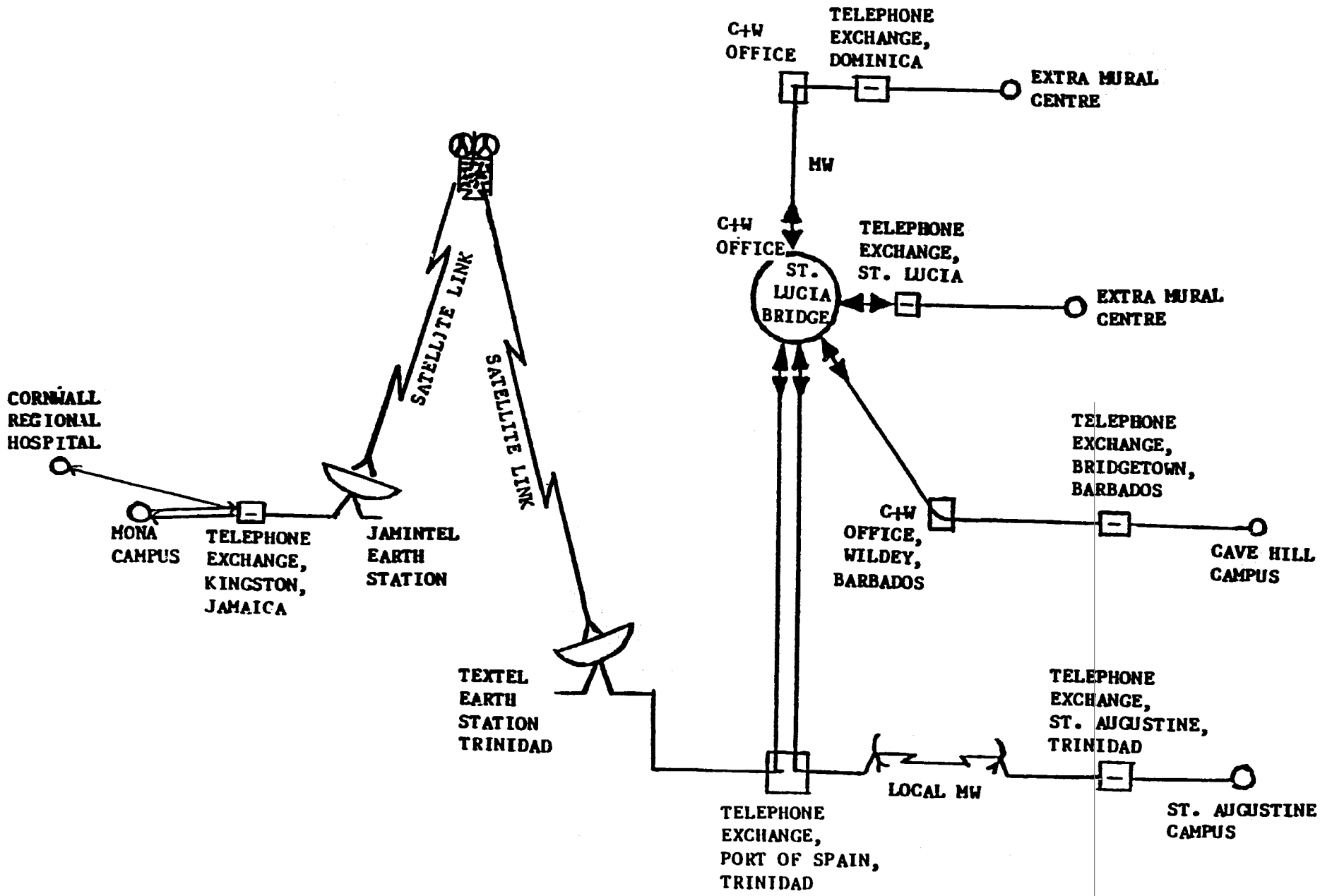
### 3.1 System Use Patterns

The UWIDITE system became active on March 7, 1983, with the connection between Jamaica and Trinidad being provided through Canada. A more direct circuit between Jamaica and Trinidad came on line in June of the same year. Exhibit 3-1 shows a schematic of the UWIDITE system. As can be seen, this system has fewer satellite linkages, and more terrestrial linkages, than the Indonesian network. The UWIDITE telecommunications system differs from the Indonesia one in other respects: it operates over a single channel (for the most part, a leased microwave circuit), uses slow-scan TV instead of facsimile equipment, and uses a different telewriter system for its audiographics capability.

The equipment provided for each UWIDITE site initially was audio only. As UWIDITE progressed, additional equipment was obtained. Much

Exhibit 3-1

Schematic of the UWIDITE System



of the equipment other than the audio equipment (e.g., slow-scan video, privacy scramblers, microcomputers) was not provided by AID but rather was obtained -- often as donations or loans from the manufacturers -- by UWIDITE independently. The following types of equipment were available for use in each UWIDITE site:

Teaching Equipment

1 Darome convener with 2 external speakers
6 Darome microphones (Shure microphones at Mona)
1 Optel telewriter with monitor
1 Colorado Video slow-scan TV equipment (camera, monitor, control box)
1 Panasonic ½ inch videocassette recorder and NEC monitor
1 IBM PC microcomputer

Network Equipment

Pulsecom network controller
Privacy scamblers

Support Equipment

Standby generator (except at Dominica, Barbados, St. Lucia and Trinidad)
Standby battery packs (at St. Lucia and Trinidad)

In late 1982, prior to system startup, various UWIDITE project personnel received training in the United States by the AMC. Among those trained were the UWIDITE project manager, the UWIDITE technical coordinator, and one faculty member. During the same period (i.e., prior to actual system startup), extensive in-country training was provided by the AMC's resident field advisor in the Caribbean. A training course on teleconferencing and interactive distance education was provided to students, two faculty workshops were conducted for faculty on distance teaching and support techniques, and a regional workshop for faculty and administrators on use of the network and guidelines for its operation were held. After system installation, during the first half of 1983, various training courses and workshops on material design and teleconferencing techniques were run by the AMC's field advisor both over the system and at each site.

In the subsections below, we provide an overview of the usage patterns for the UWIDITE project by discussing, in turn, the initial

"shakedown" period from January to June 1983 and then each succeeding academic year (1983-84, 1984-85) in turn. Because we have the opportunity to see how UWIDITE developed over time, some of the descriptive data which follow for the two separate academic years are combined into single tables for comparison purposes.

### 3.1.1 First Semester (Early 1983) Experience

A sample one-month schedule for the UWIDITE system in its first semester of operation is shown in Exhibit 3-2. That shows that the initial uses of the system were for a course in training for trainers of child care programs, Challenge Exam tutorials, and training in distance teaching.

The Regional Preschool Child Development Center's eight-week training module (February - April, 1983) for trainers of pre-school personnel was one of the major uses of the system in that semester. Twenty-one participants from Barbados, Jamaica, Dominica, and St. Lucia attended the sessions. Participants' attitudes toward this first training use of UWIDITE were generally negative: they felt that they were obligated to attend, their time was not used wisely, and instructors did not change their teaching techniques to accommodate the telecommunications aspect of the teaching. Differences in inter-island accents and in levels of experience of the trainees contributed further to the negative feelings regarding this first extended use of the system. Most of the trainees in Barbados agreed that they would participate in a similar program under improved circumstances, however.

The Challenge Exam Tutorials for accounting, sociology, and economics also began in March 1983. Because the academic year was well under way, instruction in these courses over UWIDITE did not diverge greatly from already established classroom procedures.

Approximately 10 hours of Challenge Accounting were taught over the system from Mona to seven St. Luciens and five Dominicans. The St. Luciens were familiar with the American system of accounting and the Dominicans with the British system, which necessitated longer explanations of concepts. Technical difficulties with the telecommunication system presented additional major problems (described further in Section 3.2, below).

Exhibit 3-2

UWIDITE Network Schedule During First Operational Semester (Spring 1983)

| Date | | JA. TIME | Department | Sites |
|---|---|---|---|---|
| February | 23 | 1:00-3:00 p.m. | R.P.C.D.C.* "Training for Trainers of Day Care Workers. | Bds./St.L./D/Ja. |
| | 24 | 5:00-6:00 p.m. | Accounting Tutorial | Ja./St.L./D |
| | 28 | 2:00-4:00 p.m. | Nuclear Centre | Ja./Bds. |
| March | 2 | 1:00-3:00 p.m. | R.P.C.D.C. | Bds./St.L./D/Ja. |
| | 7 | 6:15-7:00 p.m. | Accounting | Ja./St.L./D |
| | 8 | 12:30-1:30 p.m. | Maths | Ja./T/Dad. (Bds. unable to participate.) |
| | 9 | 1:00-3:00 | R.P.C.D.C. | Ja./St.L./D (Bds. unable to participate.) |
| | 14 | 6:15-7:00 p.m. | Accounting | Ja./St.L./D (Bds. unable to participate.) |
| | 16 | 1:00-3:00 p.m. | R.P.C.D.C. | Ja./St.L./D/Bds. |
| | 21 | 6:00-7:00 p.m. | Sociology Tutorial | T'Dad./St. L. |
| | 24 | 9:00-11:00 a.m. | UWIDITE Coordination | Ja./St.L./D/Bds./T'dad. |
| | 25 | 9:00-10:00 a.m. | UWIDITE Technicians | St.L./D/Bds. |
| | 28 | 9:00-10-30 a.m. | UWIDITE Training in Distance Teaching | Ja./Bds./T'dad. |
| | | 6:15-7:00 p.m. | Accounting | St.L./D/Ja. |
| | 29 | 9:00-10:30 a.m. | UWIDITE Training | Ja./Bds./T'dad. |
| | | 2:30-4:00 p.m. | CASTME Science Project | Ja./T'dad./D/St.L. |
| | | 6:00-7:00 p.m. | Economics Tutorials | Bds./D/St. |
| | 30 | 6:00-7:00 p.m. | Sociology | T'dad./St.L./D |
| | 31 | 9:00-10:30 a.m. | UWIDITE | Ja./Bds./T'dad./D/St.L. |
| | | 6:15-7:15 p.m. | Sociology | T'dad./D/St.L. |

* Regional Pre-School Child Development Center



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Approximately 11 hours of Challenge Sociology tutorial sessions were provided to 14 St. Luciens and 5 Dominicans in the semester. Difference in the level of preparedness for the two groups and the cancellation of the last two very important sessions due to technical difficulties were very disheartening for the participants.

Also in that first semester, Challenge Economics was taught in 13 1-1½ hour sessions from Barbados to 5 Dominicans and 6 St. Luciens by four instructors. Good teaching techniques and active responses from the students yielded positive reactions by the students. Out of eight students interviewed after one of those classes, two indicated that the system was a better than average teaching device, three said it was average, and three others considered it as a below average teaching device.

### 3.1.2 1983-84 Academic Year

Use of the system in the 1983-1984 academic year increased quite a bit. Beginning in that academic year, the UWIDITE network began to be used Monday through Saturday, with Saturday being used for teleconference by those who could not be accommodated on other days and for those who preferred Saturdays. Exhibit 3-3 shows a typical weekly schedule for the latter part of that academic year. Exhibit 3-4 shows a quarter-by-quarter breakdown of hours of system usage during that academic year and the succeeding academic year. These data show that, in the 1983-1984 academic year the system was used for a total of 970 hours, with usage almost doubling between the first quarter and second quarter until the expected decrease during the summer. Teaching uses amounted to fully 55 percent of the UWIDITE network usage, with UWIDITE administration and coordination and other, non-UWIDITE university uses each amounting to 22 percent each of the network use during that academic year.

The courses taught and number of students reached, by site, for the two academic years are shown in Exhibit 3-5. Exhibit 3-6 summarizes the number of students reached in courses by the UWIDITE system in the two academic years, while Exhibit 3-7 summarizes the number of students reached by "outreach", or extension, programs in the 1983-1984 academic year (enrollment data for outreach programs in the 1984-1985 academic year are unavailable).

Exhibit 3-3

Network Schedule for
Week of May 13, 1984

| | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
|---|---|---|---|---|---|---|
| 9:00-9:30 | Administrative Usage | Administrative Usage | Administrative Usage | Administrative Usage | Administrative Usage | TELECONFERENCES |
| 9:30-10:00 | | | Seismic Research | | | |
| 10:00-10:30 | | | | | | |
| 10:30-11:00 | | | | | | |
| 11:00-11:30 | Messages and System Check | Messages and System Check | Messages and System Check | Messages and System Check | Messages and System Check | |
| 11:30-12:00 | | | | | | |
| 12:00-12:30 | | | UWIDITE Technicians | UWIDITE Technicians | | |
| 12:30-1:00 | Caribbean Lexiography Project | | | | | |
| 1:00-1:30 | | | | | | |
| 1:30-2:00 | | Open for Administration | | | | |
| 2:00-2:30 | | | | | | |
| 2:30-3:00 | JHPIEGO | | | | | |
| 3:00-3:30 | Nurses | | | | | |
| 3:30-4:00 | | | | | | |
| 4:00-4:30 | | | | Certificate in Education | Certificate in Education | |
| 4:30-5:00 | CASTME | JHPIEGO | CASTME | | | |
| 5:00-5:30 | | | | Teachers of Reading | Teachers of Hearing Impaired | |
| 5:30-6:00 | | Physicians | | | Certificate in Education | |
| 6:00-6:30 | Accounting | History of Caribbean | Sociology | Economics | | |
| 6:30-7:00 | | | | | Teachers of Reading | |
| 7:00-7:30 | | | | | History of the Caribbean (make-up session) | |
| 7:30-8:00 | | Law | Law | Law | | |
| 8:00-8:30 | | | | | | |
| 8:30-9:00 | | | | | | |



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**Exhibit 3-4**

UWIDITE Usage Hours, 1983-1984 and 1984-1985 Academic Years

| Academic Year/ Quarter | Teaching Uses | Non-Teaching Uses | | | Total Hours |
|---|---|---|---|---|---|
| | | UWIDITE (Admin. & Coord.) | Other | (No. depts.) | |
| 1983-1984 | | | | | |
| Oct.-Dec. | 80 | 40 | 43 | (23) | 163 |
| Jan.-Mar. | 175 | 70 | 60 | (34) | 305 |
| Apr.-Jun. | 199 | 40 | 50 | (31) | 289 |
| Jul. Sep.* | 80 | 65 | 68 | (25) | 213 |
| TOTAL | 534 | 215 | 221 | | 970 |
| 1984-1985 | | | | | |
| Oct.-Dec. | 242 | 40 | 25 | (12) | 307 |
| Jan.-Mar. | 285 | 62 | 64 | (22) | 411 |
| Apr.-Jun. | 260 | 70 | 81 | (32) | 411 |
| Jul.-Sep.*‡ | 90 | 50 | 50 | (NA) | 190 |
| TOTAL | 877 | 222 | 220 | | 1,319 |

* Summer vacation period.
‡ Data approximate.

Exhibit 3-5

Number of Students by Site

| COURSE/OUTREACH | Origin of Teaching | Month & Year Begun | Duration | Jamaica M | Jamaica MB | Barbados | Trinidad | Dominica | St.Lucia | Antigua | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1983-1984 ACADEMIC YEAR** | | | | | | | | | | | |
| SOCIAL SCIENCES (Challenge) | | | | | | | | | | | |
| Introduction to Sociology | Trinidad | Oct. 83 | 1 year | 3 | - | - | 3 | 14 | 10 | - | 30 |
| Introduction to Accounting | Jamaica | Oct. 83 | 1 year | 5 | - | - | 1 | 3 | 14 | - | 23 |
| Elements of Economics | Cave Hill | Oct. 83 | 1 year | 4 | - | - | 4 | 11 | 13 | - | 32 |
| ARTS AND GENERAL STUDIES (Challenge) | | | | | | | | | | | |
| History of the Caribbean | Cave Hill | Oct. 83 | 1 year | - | - | - | 3 | 3 | 8 | - | 14 |
| CERTIFICATE IN EDUCATION | | | | | | | | | | | |
| Teachers of Reading | Jamaica | Oct. 83 | 15 months | 12 | - | 4 | - | 5 | 6 | - | 27 |
| Teachers of the Hearing Impaired | Jamaica | Oct. 83 | 15 months | 6 | - | - | 5 | 3 | 5 | - | 19 |
| JHPIEGO | | | | | | | | | | | |
| Reproductive Health-Doctors | All sites | Feb. 84 | 3 months | 13 | 6 | 12 | 10 | 10 | 9 | - | 60 |
| Reproductive Health-Nurses | All sites | Feb. 84 | 3 months | 12 | 7 | 12 | 12 | 12 | 10 | - | 65 |
| CASTME (Outreach Program) | | | | | | | | | | | |
| Technicians Upgrading | Jamaica | Sep. 83 | 6 months | 11 | - | 12 | - | 7 | 5 | - | 35 |
| Technicians Upgrading | Jamaica | Mar. 84 | 6 months | Not Ascertained | | | | | | | |
| CFNI (Outreach Program) | | | | | | | | | | | |
| Nutrition for Community Workers | J,T,D,SL. | Aug. 84 | 2 months | 5 | 5 | - | 5 | 6 | 6 | - | 27 |
| **1984-1985 ACADEMIC YEAR** | | | | | | | | | | | |
| SOCIAL SCIENCES (Challenge) | | | | | | | | | | | |
| Introduction to Sociology | Trinidad | Oct. 84 | 1 year | 9 | - | 6 | 2 | 13 | 16 | 13 | 59 |
| Introduction to Accounting | Jamaica | Oct. 84 | 1 year | 9 | - | 7 | - | 4 | 15 | 18 | 53 |
| Elements of Economics | Cave Hill | Oct. 84 | 1 year | 9 | - | 8 | 1 | 13 | 17 | 9 | 57 |
| Mathematics and Statistics | Cave Hill | Oct. 84 | 1 year | 9 | - | 3 | - | 14 | 19 | 11 | 56 |
| ARTS AND GENERAL STUDIES (Challenge) | | | | | | | | | | | |
| History of the Caribbean | Trinidad | Oct. 84 | 1 year | - | - | 2 | 1 | 2 | 10 | - | 15 |
| CERTIFICATE IN PUBLIC ADMIN. | | | | | | | | | | | |
| Personnel Management and Industrial Relations | Jamaica | Oct. 84 | 1 year | - | - | - | - | 6 | 7 | 7 | 20 |
| CERTIFICATE IN EDUCATION | | | | | | | | | | | |
| Teachers of Reading | Jamaica | Oct. 84 | 15 months | 9 | - | 4 | 5 | 5 | 5 | 2 | 30 |
| Teachers of the Hearing Impaired | Jamaica | Oct. 84 | 15 months | 6 | - | 4 | 6 | 1 | 1 | - | 18 |
| Teachers of Mathematics | Jamaica | Oct. 84 | 15 months | 3 | - | 4 | 10 | 4 | 7 | 5 | 33 |
| JHPIEGO | | | | | | | | | | | |
| Reproductive Health-Doctors | All sites | Sep. 84 | 3 months | 11 | 8 | 6 | 7 | - | 7 | 8 | 47 |
| Reproductive Health-Nurses | All sites | Nov. 84 | 3 months | 11 | 5 | 10 | 10 | 12 | 10 | 10 | 68 |
| LAW TUTORIALS | J,T,B. | Mar. 85 | 1 month | Not Ascertained | | | | | | | |
| CASTME (Outreach Program) | | | | | | | | | | | |
| Technicians Upgrading | Jamaica | Oct. 84 | 6 months | Not Ascertained | | | | | | | |

**Exhibit 3-6**

**Number of Students for Courses by Academic Year**

| Academic Year | No. Courses* | Site | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | Jam.-Mona | Jam.-Mo.Bay | Barbados | Trinidad | Dominica | St. Lucia | Antigua | |
| 83-84 | 8 | 55 | 13 | 28 | 38 | 61 | 75 | -- | 270 |
| 84-85 | 11 | 76 | 13 | 54 | 42 | 74 | 114 | 83 | 456 |

* Originating sites were Jamaica, Barbados, and Trinidad

**Exhibit 3-7**

**Number of Students for Outreach Programs for 1983-1984 Academic Year (Enrollment Data for 1 Program in 1984-1985 Not Available)**

| Academic Year | No. Courses* | Site | | | | | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| | | Jam.-Mona | Jam.-Mo.Bay | Barbados | Trinidad | Dominica | St. Lucia | Antigua | |
| 83-84 | 2 | 16 | 5 | 12 | 5 | 13 | 11 | -- | 62 |

* Originating site was Jamaica.

In the 1983-1984 academic year, UWIDITE Challenge tutorials in Accounting, Sociology, Economics, and History of the Caribbean were offered over the UWIDITE system. A total of 99 students, or slightly over one-third of all students reached by UWIDITE that academic year, registered for these tutorials. The Certificates in Education programs for both Teachers of Reading and Teachers of the Hearing Impaired enrolled 37 students in the 1983-84 academic year.

The Secondary School Laboratory Technicians and Teacher Upgrading courses, sponsored by the Commonwealth Association of Science Technology and Mathematics Educators (CASTME), were conducted sequentially during the 1983-84 academic year. Enrollment in the first of these was 35 students.

Under the Johns Hopkins Program in International Education in Gynecology and Obstetrics (JHPIEGO), two courses were offered to physicians and senior nurses to upgrade the quality of reproductive health services in the region, with a third offered in the 1984-85 academic year. These courses had 125 physicians and nurses enrolled during the 1983-84 academic year.

Examples of administrative topics discussed during the teleconferences held via UWIDITE during that year were:

- UWI examinations and schedules
- Student admissions
- University restructuring
- Student affairs (registrar and his counterparts)
- Library acquisition, cataloging
- Public health and hospital administration
- Exchange of agricultural extension information
- Solicitation of information to include in the regional Agricultural Extension Newsletter
- WIGUT (West Indies Group of University Teachers) logistics

In addition to teaching, and administrative uses, the system also supported a few research uses. Among these were uses by the Seismic Research Unit and consultation between a professor of anthropology

on one island and students at a "dig" on another. There were also occasional teleconferences for special events and celebrations. This seemed to add a personal component to the system and also gave a more visible demonstration of the applicability of satellite communications to those who might otherwise not be familiar with the system. For example, when the JHPIEGO program began, a welcoming ceremony was held over the system at which local dignitaries were invited to speak.

### 3.1.3 1984-85 Academic Year

There was a further increase in system use during the academic year 1984-85, compared with the 1983-84 year (See Exhibit 3-4). Total usage for the 1984-1985 academic year was 1319 hours, compared with 970 hours for the year earlier, an increase in total usage of 36%. In general, teaching uses increased by 64% over the year earlier period, while non-teaching uses remained virtually at the same level as the year earlier. Another way of characterizing usage changes is to state that in the 1984-1985 academic year, teaching use assumed a larger proportion of system usage time, increasing to 66 percent from the 55 percent of the 1983-1984 academic year.

Three new courses -- the Teaching of Mathematics in the Certificates in Education Program, a Challenge Mathematics and Statistics tutorial, and Personnel Management and Industrial Relations -- were introduced in the 1984-85 academic year. Courses reached more students in this academic year than in the prior one (456 vs. 270, as shown in Exhibit 3-6). New sites, Montego Bay (Jamaica) and Antigua, were also added to the network.

In addition, monthly consultations among the UWIDITE sites were held both for obstetricians and gynecologists and cardiologists who focus on patient management and referrals. The cardiologists considered the UWIDITE system to be a major breakthrough for case consultation, diagnosis, and case follow-up. The slow-scan television transmission that came on line then was sufficiently clear for diagnostic uses.

Regularly scheduled administrative teleconferences were held during the year for the library, the Registrar and Campus Secretaries, Caribbean lexicographers, and the Seismic Research Unit. Additional

courses and seminars in the field of agriculture, health, and family welfare were also being planned. The Regional Preschool Child Development Center also conducted monthly workshops via the system.

Exhibit 3-8 shows a typical weekly schedule for early in the academic year.

## 3.2 Acceptance of the Technology

Acceptance of any technology by its intended users or beneficiaries can be seen as a function of the need or demand for the services the technology is sought to provide, the effectiveness of the technology in delivering the product, the complexity of the technology, and the cost. Growing usage of the UWIDITE network, as described in Section 3.1 above, leaves little doubt as to the demand for education and extension services that telecommunications could address in the Caribbean. This section examines the UWIDITE system in terms of user acceptance of it and users' comfort in using the various types of system equipment. We begin by first providing an overview of UWIDITE technical performance.

### 3.2.1 Technical Performance of UWIDITE

The EMC observed various problems with the technical performance of the teleconferencing lines and equipment during several visits to the UWIDITE sites. In mid-1983, the system users often experienced technical problems associated with tropospheric scatter between 10 a.m. and 12 noon. Although a site can troubleshoot by disconnecting itself, it was difficult to locate the source of technical malfunctions in the transmission lines because the telephone company and the Cable and Wireless tended to designate each other as the source of the problems.

Recurring problems in the telephone line in Trinidad and Barbados often interrupted service for several days until an alternative arrangement was made. On top of that, Trinidad had frequent power outages during 1983. A back-up generator was installed in the St. Augustine campus and another generator was ordered for St. Lucia.

Barbados had recurring problems with resonance in the lines which results in muffling of high pitched tones. An automatic voice adjuster and installation of a scrambler was expected to alleviate this problem.

Exhibit 3-8

UWIDITE Schedule: October 29 Through November 2, 1984
(Eastern Caribbean Times)

| | Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|---|
| 10:00 | SYSTEM CHECK (all sites) | SYSTEM CHECK (all sites) | SYSTEM CHECK (all sites) | SYSTEM CHECK (all sites) | SYSTEM CHECK (all sites) |
| 10:30 | | | | MESSAGES (all sites) | |
| 11:00 | MESSAGES (all sites) | MESSAGES (all sites) | MESSAGES (all sites) | | MESSAGES (all sites) |
| 11:30 | | | | UWIDITE | |
| 12:00 | CARIBBEAN LEXICOGRAPHY PROJECT (B,T) | | | COORDINATORS | |
| 12:30 | | | | | |
| 1:00 | RECISTRY (M, B, T) | | | MEETING | |
| 1:30 | | | | (M,A,D,S,B,T) | |
| 2:00 | CASTME LAB TECHNICIANS UPGRADING (all sites) | JHPIEGO CONTINUING EDUCATION IN REPRODUCTIVE HEALTH FOR NURSES (all sites) | | | |
| 2:30 | | | | OBSTETRICS AND GYNECOLOGY FOR UNDERGRADUATES (M,B,T) | |
| 3:00 | | | CASTME LAB TECHNICIANS UPGRADING (all sites) | | |
| 3:30 | CERTIFICATE IN EDUCATION: CURRICULUM DEVELOPMENT (M,A,D,S,B,T) | CERTIFICATE IN EDUCATION TEACHERS OF THE HEARING IMPAIRED (M,A,D,S,B,T) | | JHPIEGO CONTINUING EDUCATION IN REPRODUCTIVE HEALTH FOR PHYSICIANS (all sites) | CERTIFICATE IN EDUCATION TEACHERS OF (M,A,D,S,B,T) |
| 4:00 | | | CERTIFICATE IN EDUCATION: TEACHERS OF READING (M,A,D,S,B,T) | | |
| 4:30 | | | | | |
| 5:00 | CERTIFICATE IN EDUCATION: PSYCHOLOGY (M,A,D,S,B,T) | PERSONNEL MANAGEMENT AND INDUSTRIAL RELATIONS (M,A,D,S) | | | B.Sc. PART I HISTORY OF THE CARIBBEAN (all sites) |
| 5:30 | | | | | |
| 6:00 | B.Sc. PART I ACCOUNTING (M,A,D,S,B,T) | B.Sc. PART I MATHEMATICS AND STATISTICS (M,A,D,S,B,T) | B.Sc. PART I ECONOMICS (M,A,D,S,B,T) | B.Sc. PART I SOCIOLOGY (M,A,D,S,B,T) | |
| 6:30 | | | | | |
| 7:00 | | | | | |
| 7:30 | | | | | |
| 8:00 | | | | | |
| 8:30 | | | | | |
| 9:00 | | | | | |

M - Mona, Jamaica
D - Dominica
A - Antigua
B - Barbados
S - St. Lucia
T - Trinidad
MB - Montego Bay, Jamaica



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Several UWI administrators felt that the recurrent problems were the result of the hybrid system that is currently used to link the participating islands. If the network had its own satellite communication system, like Mexico, Peru, Venezuela, and Indonesia, there would be fewer problems, these administrators felt.

In an October 1984 visit, the evaluation contractor found the slow-scan television system and the telewriters manifesting problems which were being resolved. In Dominica, the slow-scan picture was broken up by the printing of every other line. In Barbados, radio interference was causing diagonal lines in the picture, and also the picture in and from Barbados lacked contrast.

Between the period January 1984 and November 1984, 42 Fault Report and Repair Logs were submitted,[1] for which the repair person indicated the source of the problem in 37 instances. The frequency of the problems reported during this period is summarized in Exhibit 3-9. That exhibit reveals that almost half (18) the reported problems were attributable to the international connection, one-fifth (7) were attributable to the local telephone lines, and the rest were scattered among the various pieces of equipment. These data indicate that the majority of the problems reported during this period were not with the UWIDITE equipment but rather with the lines connecting the equipment.

### 3.2.2 Acceptance by Administrators

Abt Associates' Caribbean evaluation coordinator carried out in-depth interviews with 14 members of the administrative staff from various units which have used the network. Their reported uses of the system is provided in Exhibit 3-10. All of the administrators who used the system felt that the system was appropriate for the job, they accomplished their objectives, and they planned to continue using it in the future. Those who opted not to use the system offered logistic inconvenience, greater convenience of the telephone, and not being used to the system as their reasons for not using UWIDITE. Almost 40 percent of

[1]These probably do not represent all system problems during that period; we suspect that many problems were reported by word of mouth and dealt with without a written record being made.

**Exhibit 3-9**

**Identification of Reported Faults in UWIDITE System**
**January - November 1984 (N = 37)**

| | |
|---|---|
| **Fault in Lines** | |
| Local Telephone Lines | 7 |
| International Connection | 18 |
| **Fault in Cables or Interconnections** | |
| Telephone Handset and Network Controller | 2 |
| Convener and Speaker | 2 |
| Microphone | 3 |
| Slowscan Video | 0 |
| Telewriter | 0 |
| **Fault in End Equipment** | |
| Telephone Handset and Network Controller | 0 |
| Convener and Speaker | 2 |
| Microphone | 2 |
| Slowscan Video | 0 |
| Telewriter | 0 |
| Other Equipment | 1 |

**Exhibit 3-10**

**Administrator Uses of the UWIDITE System**

| ITEM | PERCENTAGE REPORTING USE (N=14) |
|---|---|
| Administrative information | 85.7 |
| Research information | 15.4 |
| Curriculum information | 9.7 |
| Exam information | 30.1 |
| Program planning | 7.7 |
| Professional enhancement | 7.7 |
| Staff appointments | 16.4 |
| Information on students and and supervisors | 16.4 |

those interviewed believed that they were making less frequent use of mail and telephone service as a result of using UWIDITE. However, a great majority of the administrators (84.3 percent) believed that the system had not diminished their need for face-to-face meetings, a finding similar to that for Indonesia. Twelve out of 13 administrators who expressed an opinion were satisfied with the appropriateness and accessibility of the UWIDITE system and believed it improved administrative effectiveness, while all of those interviewed were satisfied with the overall usefulness of the system, and 11 were satisfied with the system's reliability.

Questionnaire responses of 106 individuals who used UWIDITE teleconferences for administrative purposes (both organizers and participants) revealed that 98.5 percent considered the equipment easy to use, 81.2 percent considered the system's technical quality adequate for meetings, 95.6 percent believed the objectives of the conference were satisfied, 95.8 percent felt the sessions were useful, and 95.1 percent actively participated in discussions (see Exhibit 3-11).

The same individuals rated the performance of various aspects of the system, as summarized in Exhibit 3-12. These data reveal that good-to-excellent ratings were given to the audio equipment by 77.6 percent of the respondents, to the slow scan video equipment performance by 70.0 percent of the respondents, and the telewriter performance by 80.0 percent of the administrator respondents.

### 3.2.3 Acceptance by Teaching Faculty

Due to the low number of completed survey questionnaires from the instructors, we rely for our findings here primarily on interviews conducted by the EMC Carribbean evaluation coordinator of 17 members of the faculty who participated in the UWIDITE project. Exhibit 3-13 summarizes the results of the faculty interviews.

Of the teachers interviewed, 82.0 percent had positive expectations about the system before using it, with the remainder having neither positive nor negative expectations. Those teachers who had positive expectations construed the technology as challenging and interesting and believed that it had great potential to address a real need.

**Exhibit 3-11**

UWIDITE System Acceptance
Ratings by Administrators (N=106)

| ITEM | PERCENTAGE STRONGLY AGREEING | PERCENTAGE AGREEING | PERCENTAGE DISAGREEING OR STRONGLY DISAGREEING |
|---|---|---|---|
| Equipment Easy to Use | 38.5 | 60.0 | 1.5 |
| Technical Quality Adequate for Meeting | 14.2 | 67.0 | 18.8 |
| Session Useful | 38.9 | 56.9 | 4.2 |
| Objectives Achieved | 21.3 | 74.3 | 4.4 |
| Participated in Discussion | 95.1 | 0.0 | 4.9 |

**Exhibit 3-12**

UWIDITE System Performance Ratings
by Administrators (N = 106)

| Equipment | Percentage Reporting Performance as: | | | |
|---|---|---|---|---|
| | Excellent | Good | Fair | Poor |
| Audio Equipment Performance | 19.4 | 58.2 | 16.4 | 6.0 |
| Slowscan Video Performance | 35.0 | 35.0 | 5.0 | 25.0 |
| Telewriter Performance | 0.0 | 80.0 | 0.0 | 20.0 |

**Exhibit 3-13**

**UWIDITE System Acceptance Ratings by Teaching Faculty**

| ITEM | PERCENTAGE AGREEING (N=17) |
|---|---|
| Positive Expectations about System Prior to Use | 82.0 |
| Comfortable Teaching on System | 93.7 |
| Prefer Face-to-Face Teaching | 80.0 |
| 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 Might Otherwise be Unable to Afford It | 50.0 |
| Face-to-Face Contact Very Important | 33.3 |
| Lack of Learning Facilities in Smaller Territories a Problem | 26.6 |

Although most of the faculty interviewed believed in what the system could do, and 93.7 percent felt comfortable about teaching on the system, 80.0 percent still preferred face-to-face teaching to teaching over the UWIDITE system, with the remainder being unable to decide. Familiarity with traditional teaching methods was offered as the main reason for the preference for face-to-face teaching.

A majority of the faculty interviewed (68.7 percent) felt that teaching over the UWIDITE system took more time to prepare for than traditional teaching did. Over half (53.1 percent) believed less material was covered in teaching through the system than in traditional teaching. Seventy-five percent thought distance teaching was more demanding.

Asked about the major advantage of UWIDITE, the modal response from faculty (57.0 percent) was that UWIDITE provided quality education to people who otherwise would not have the opportunity. Among the disadvantages, lack of face-to-face contact (33.3 percent) and lack of other learning facilities (such as libraries) in smaller territories (26.6 percent) were mentioned most frequently by the teachers. The UWIDITE system was viewed not as a means of replacing, or even substituting to a small extent, the role of face-to-face teaching but as an alternative to face-to-face teaching for areas where that was not heretofore possible (such as the extension centers). They believed that the system may not be as efficient as face-to-face teaching but might come close to it and, further, that it opened up the possibility of greater inter-island interaction.

### 3.2.4 Acceptance by Students

The students might be expected to receive the greatest direct impact from the UWIDITE project. We obtained 146 completed Periodic Student Assessment (PSA) forms (distributed during distance-taught courses), 192 completed Summary Student Assessment (SSA) forms (distributed at the end of courses), and 45 student interviews (conducted at various points in time). Some of the questions asked are similar in both the PSA and SSA. Even though either instrument would have given us similar results, due to similar responses, we used the SSA for our analysis in most cases because of the larger sample size for this instrument.

Exhibit 3-14 displays some of the more pertinent findings. Generally students found the equipment in the UWIDITE system easy to use and not intimidating. Almost all students (92.1 percent) found the equipment comfortable to use and considered it effective for class presentation. Only 17.6 percent felt that the equipment came in the way of learning. The fact that a course was distance taught influenced only a few students to take it (20.0 percent).

Regarding interaction over the network, most students (94.4 percent) felt that normal interaction with and between the other sites took place over the system. With regard to their own participation, more than half of the students (59.2 percent) mentioned that they themselves participated all or most of the time in distance-taught sessions (although we do not have a comparison assessment of their participation in traditional classes).

Almost all students (98.4 percent) who completed the questionnaires reported attending the distance-taught classes regularly. Most of the students surveyed found the classes to be interesting and suggested that more courses should be taught over the system (89.3 and 87.4 percent respectively). More than a third (40.3 percent) found it harder to concentrate in UWIDITE than in face-to-face classes.

Students from graduate, in-service training, and special courses responded to the UWIDITE system more favorably than the students from the undergraduate tutorials (Challenge program). As shown in Exhibit 3-15, in almost all categories considered, a greater proportion of students in the former courses responded in ways suggesting greater acceptability than their undergraduate counterparts. Only on the question of interaction in class do the more advanced students appear to have responded less favorably from the undergraduates. A most interesting difference is observed in the question of preference. A large majority of the undergraduate students (74.2 percent) preferred face-to-face teaching over distance teaching, whereas only a minority of the students in graduate, in-service training, and special courses (47.5 percent) did. It should be noted, in this regard, that the students taking the Challenge tutorials had, for the most part, no prior university-level classroom experience. Their "intimidation" by the system may be partially accounted for by their "intimidation" by university-level courses.



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**Exhibit 3-14**

**UWIDITE System Acceptance Ratings by Students**

| ITEM | PERCENTAGE AGREEING (N=192) |
|---|---|
| Equipment Comfortable To Use | 92.1 |
| Equipment Hinders Learning | 17.6 |
| Other Sites Interacted All or Most of the Time Over the Network | 94.4 |
| Respondent Interacted All or Most of the Time Over the Network | 59.2 |
| Attended Distance Taught Class All or Most of the Time | 98.4 |
| Classes Are Interesting | 89.3 |
| More Courses Should be Taught Over the System | 87.4 |
| Prefer Face-to-Face Teaching to Distance Teaching | 51.2 |
| Harder to Concentrate Than With Face-to-Face Teaching | 40.3 |

**Exhibit 3-15**

**UWIDITE System Acceptance Ratings by Undergraduate Students and Other Students**

| ITEM | PERCENTAGE AGREEING | |
|---|---|---|
| | Students of Undergraduate Courses (N=30) | Students of Other Courses (N=140) |
| Equipment Comforable to Use | 86.2 | 93.2 |
| Equipment Hinders Learning | 43.3 | 12.1 |
| Other Sites Interacted All or Most of the Time Over the Network | 89.7 | 95.4 |
| Respondent Interacted All or Most of the Time Over the Network | 67.8 | 57.4 |
| Attended Distance Taught Class All or Most of the Time | 90.6 | 100.0 |
| Classes Are Interesting | 81.8 | 91.2 |
| More Courses Should be Taught Over the System | 67.8 | 91.6 |
| Prefer Face-to-Face Teaching to Distance Teaching | 74.2 | 47.5 |
| Harder to Concentrate Than With Face-to-Face Teaching | 54.5 | 38.1 |

In interviews with 45 students, when asked to compare UWIDITE with conventional courses, only a few (12.2 percent) found UWIDITE more interesting, while a greater proportion (48.8 percent) found the conventional courses more interesting (the remainder had no opinion). Again it should be noted, however, that most of these students had experience with high school level classroom courses, but this was their first experience with both university-level and distance-taught courses

But the interviews also revealed that 33.3 percent of the students interviewed felt comfortable asking questions after getting used to the system, while 44.4 percent were comfortable right from the beginning. Ten students (22.2 percent) were not at ease with the system. When asked to compare their perception of the amount of student interaction in UWIDITE versus traditionally taught courses (which in their case meant high school classroom courses), more than half the students (62.5 percent) thought interaction was higher in the latter.

The presence of tutors in the classes and the provision of printed materials before the sessions began had an important impact in terms of the students' acceptability of the system. Exhibit 3-16 shows the results, across several important variables, when tutors were present in the distance taught class vs. when they were not. Major differences in student interaction, use of equipment, and preferences can be seen when we divide our data this way. The presence of a tutor is associated with more interaction. Students' preference for face-to-face teaching compared with UWIDITE teaching is much lower with a tutor present in the UWIDITE course (35.6 percent) than when one is not (72.9 percent). With a tutor present, there is less of a problem in concentration (27.1 percent vs. 56.7 percent), and a smaller percentage of students felt that the equipment hindered their learning (13.7 percent versus 21.9 percent). Examination of the other findings in Exhibit 3-16 reveals that in every other remaining instance, the presence of a tutor had a positive impact.

Timely distribution of printed material and handouts also was associated with positive impacts on the students. More than twice the percentage of students reported on the Periodic Student Assessment that their interaction in the telesession was high to very high and more than

Exhibit 3-16

UWIDITE System Acceptance Ratings
by Students as Related to Tutor Presence

| ITEM | PERCENTAGE AGREEMENT WITH TUTOR PRESENT (N=109) | PERCENTAGE AGREEMENT WITHOUT TUTOR (N=77) |
|---|---|---|
| Equipment Comfortable to Use | 94.7 | 90.1 |
| Equipment Hinders Learning | 13.7 | 21.9 |
| Other Sites Interacted All or Most of the Time Over the Network | 77.8 | 60.4 |
| 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 Taught Over the System | 90.8 | 80.9 |
| Prefer Face-to-Face Teaching to Distance Teaching | 35.6 | 72.9 |
| Harder to Concentrate Than With Face-to-Face Teaching | 27.1 | 56.7 |

twice the percentage reported that their preparation was high to very high, when they had received printed materials on time (Exhibit 3-17).

## 3.3 Student Learning

In this section, we analyze both direct measures of student learning performance and the expressed opinions of students and the faculty as to the learning effectiveness of the UWIDITE experience. The direct measures consist of Challenge examination results from academic years 1979-1980 through 1984-1985, that is, pre-UWIDITE and post-UWIDITE. The opinion data is based on 16 interviews of UWIDITE teaching faculty and 192 Summary Student Assessment forms completed by UWIDITE students.

### 3.3.1 Challenge Examination Results

Before discussing the Challenge examination results, their shortcomings as measures of the effectiveness of satellite communications on student learning should be examined. Before UWIDITE, students who wished to take the Challenge examinations (high school graduates) prepared for them by accessing reading materials and study guides at resource centers on their home islands. Students in the pre-UWIDITE era who prepared for Challenge examinations did not attend University level classes. With the inception of UWIDITE, Challenge students were provided, through the system, Challenge tutorials distance-taught by University faculty. Consequently, the post-UWIDITE Challenge variable is "confounded" by the fact that it is composed of two separate elements: exposure to University level courses, and distance teaching via satellite. Thus, when comparing post-UWIDITE and pre-UWIDITE Challenge Examination results, we are not able to separate out the effects of exposure to University-level classroom experience from distance teaching over the UWIDITE system.

With this caveat in mind, we turn to analysis of the findings on Challenge examinations. Exhibit 3-18 shows the results of the Challenge Examinations by course by academic year. In order to compare pre-UWIDITE Challenge results with post-UWIDITE results, we have aggregated, in Exhibit 3-19, the yearly Challenge Examination data into pre-UWIDITE (academic years 1979-1980 through 1981-1982) and post-UWIDITE (academic

Exhibit 3-17

UWIDITE System Acceptance Ratings by Students as Related to Dissemination of Printed Materials

| | PERCENTAGE AGREEMENT, WITH PRINTED MATERIALS DISSEMINATED (N=79) | PERCENTAGE AGREEMENT, WITH PRINTED MATERIALS NOT DISSEMINATED (N=62) |
|---|---|---|
| Respondent Interaction Was High to Very High | 67.1 | 31.5 |
| Respondent Preparation Was High to Very High | 63.8 | 25.5 |

Exhibit 3-18
Challenge Examination Results

| Academic Year | Accounting (MS106) | | | Sociology (Sy103) | | | Economics (EC101) | | | Hist. of Caribbean(M100) | | | Math & Statis. (EC104) | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Regis-stered | Took Exam | Passed | Regis-stered | Took Exam | Passed | Regis-stered | Took Exam | Passed | Regis-stered | Took Exam | Passed | Regis-stered | Took Exam | Passed | Regis-stered | Took Exam | Passed |
| 1979-1980 | 15 | 12 | 5 | 17 | 16 | 10 | 12 | 7 | 5 | No Exam | | | No Exam | | | 44 | 35 | 20 |
| 1980-1981 | 28 | 24 | 13 | 32 | 20 | 19 | 50 | 36 | 27 | 14 | 9 | 3 | 13 | 10 | 6 | 137 | 99 | 68 |
| 1981-1982 | 45 | 32 | 16 | 43 | 36 | 17 | 44 | 31 | 17 | 12 | 12 | 11 | 19 | 17 | 12 | 163 | 128 | 73 |
| 1982-1983* | 55 | 42 | 28 | 50 | 28 | 20 | 58 | 35 | 23 | No Exam | | | No Exam | | | 163 | 105 | 71 |
| 1983-1984 | 23 | 19 | 14 | 31 | 12 | 8 | 32 | 20 | 5 | 14 | 8 | 6 | No Exam | | | 100 | 59 | 33 |
| 1984-1985 | 41 | 36 | 24 | 48 | 36 | 17 | 55 | 46 | 25 | 14 | 8 | 5 | 47 | 34 | 19 | 205 | 160 | 90 |

| Academic Year | Percentage Passing of Those Who: | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Accounting (MS106) | | Sociology (Sy103) | | Economics (EC101) | | Hist. of Caribbean(M100) | | Math & Statis. (EC104) | | TOTAL | |
| | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam |
| 1979-1980 | 33 | 42 | 57 | 63 | 42 | 71 | No Exam | | No Exam | | 45 | 57 |
| 1980-1981 | 46 | 54 | 59 | 95 | 54 | 75 | 21 | 33 | 46 | 60 | 50 | 69 |
| 1981-1982 | 36 | 50 | 40 | 47 | 39 | 55 | 92 | 92 | 63 | 71 | 45 | 57 |
| 1982-1983* | 51 | 67 | 40 | 71 | 40 | 66 | No Exam | | No Exam | | 44 | 68 |
| 1983-1984 | 61 | 74 | 26 | 67 | 16 | 25 | 43 | 75 | No Exam | | 33 | 56 |
| 1984-1985 | 59 | 67 | 35 | 47 | 45 | 54 | 36 | 63 | 40 | 56 | 44 | 56 |

Note - "Passed" includes those who passed at the Supplemental Exam
* - Challenge tutorials for these courses began to be taught over the system in the latter part of the academic year (March 1983)

Exhibit 3-19

Comparison of Challenge Examination Results
Pre-UWIDITE and Post-UWIDITE

| Period | Percentage Passing of Those Who: | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Accounting (MS106) | | Sociology (Sy103) | | Economics (EC101) | | Hist. of Caribbean(M100) | | Math & Statis. (EC104) | | TOTAL | |
| | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam | Registered | Took Exam |
| Pre-UWIDITE (1979-1980, 1980-1981, 1981-1982) | 39 | 50 | 50 | 64 | 46 | 66 | 54 | 67 | 56 | 67 | 47 | 61 |
| Post-UWIDITE (1983-1984, 1984-1985) | 59 | 69 | 32 | 52 | 34 | 45 | 39 | 69 | 40 | 56 | 40 | 56 |

Note: Academic Year 1982-1983 excluded because Challenge Tutorials began to be taught over the system in the latter part of the year (March 1983).

years 1983-1984 and 1984-1985) periods.[1] Results for academic year 1982-1983 were dropped since that was a "mixed year", i.e., Challenge tutorials began to be taught over the system in the latter part of the academic year (March 1983).

We assume that a desired aim of the University system is to increase the proportion of Challenge students (out of those who register for Challenge) who take the examination and who pass it. The results shown in Exhibit 3-19 indicate that this aim was met for one subject (Accounting). For another subject (History of the Caribbean), there was no increase pre-to post-UWIDITE between percentage of students registering for the examination who passed it, but there was a marginal increase in the percentage of students who took the examination who passed it. For the other three Challenge subjects for which there were pre- and post- UWIDITE data, there was no increase in the proportion of students passing Challenge Examinations who either registered for them or who took them. For the body of data as a whole, -- i.e., aggregated across all courses -- the desired increase did not occur.

### 3.3.2 Faculty Opinion

Turning to the participants' views of the learning experience, about one-third of the teaching faculty interviewed (37.5 percent) believed that students under the UWIDITE program learned less than the students under traditional face-to-face teaching. Virtually the same percentage of students surveyed also felt they learned less (see Exhibit 3-20 below). These faculty perceptions are apparently veridical given the student learning data discussed above. A similar proportion of the faculty expressed the opinion that there was no difference between the two teaching techniques, while 6.3 percent opined that they learned more, and 18.8 percent could not decide. When those who felt students

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[1] Unfortunately -- for purposes of evaluation of the impacts on student learning -- in the post-UWIDITE academic years no students studied for the Challenge Examination in the 5 subjects in the "traditional", or pre-UWIDITE manner. Thus, we could not compare, within the same year, students exposed to distance-taught Challenge tutorials with those exposed to the resource center mode of Challenge study.

learned less were asked about the reasons for this, they suggested as the prominent ones the coverage of less material per unit of classroom time, the lack of face-to-face contact, the inability of UWIDITE students to obtain guidance from the lecturer after class, and inability of faculty to provide laboratory demonstrations and hold office hours over the system. On the other hand, many faculty felt that the UWIDITE students benefited from the interaction with students on other islands throughout the region. As one teacher said, the UWIDITE program encourages independent thinking because one does not depend solely on the teacher for information and ideas.

### 3.3.3 Student Opinion

As Exhibit 3-20 shows, two-thirds of the students indicated that UWIDITE was an effective medium of learning for specific courses, and almost a third felt that it was effective for all courses. Over two-thirds (68.2 percent) of the students believed that they learned a great deal from their UWIDITE course, with another 27.3 percent believing they learned something. When asked to compare UWIDITE with conventional courses, a majority of the students (55.0 percent) said that they have learned as much from the UWIDITE courses as conventional courses, one-third of the students reported learning less via UWIDITE, and 12.5 percent believed they learned more in UWIDITE courses. In terms of learning efficiency, the results were similar. Forty-five percent indicated that they learned as efficiently in UWIDITE courses as in conventional courses, 40 percent felt less efficiently, and 10 percent believed they learned more efficiently in the UWIDITE setting. With regard to the amount of material covered, 42.1 percent of the students opined that UWIDITE courses covered as much as traditional courses, 26.3 percent less (this being about half the proportion of faculty who felt this way), and 26.3 percent more.

In interviews with students, we asked other questions which might help explain how to improve learning in the UWIDITE setting. Fully 71.4 percent of the students reported that difficulty hearing the other sites on the system impeded learning, while slightly over half (51.1 percent) reported that difficulty understanding the accents of faculty and students at the other sites impeded learning. Attention to

**Exhibit 3-20**

**UWIDITE Student Self-Reported Learning Effectiveness**

| ITEM | PERCENTAGE REPORTING* (N=45) |
|---|---|
| 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 to conventional course UWIDITE students | |
| • learned more | 12.5 |
| • learned less | 32.5 |
| • learned as much | 55.0 |
| Compared to 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 |

May not add to 100% within items due to students answering "Don't Know".

improving audio transmission and reception, as well as some attention to "acclimatizing" participants to the accents at other sites, may well improve the conditions for learning in the UWIDITE system. Faculty suggested that more time was needed than in conventional classes to cover the same amount of material.

The presence of tutors in the classes again also seemed to have important positive impacts on differences in students' perceived learning in the UWIDITE setting. When we break out our Summary Student Assessment form data by UWIDITE classes with and without tutors or supervisors, a greater proportion of students in UWIDITE classes with tutors felt that they learned more in UWIDITE classes than did students in UWIDITE classes without tutors, attendance was reported as better, and equipment presented less of a problem (see Exhibit 3-21).

In summary, both the teaching faculty and the students believed that the students learned a fair amount through the UWIDITE system but not as much as they otherwise would have learned from the conventional method. The presence of tutors, however, seemed to make that difference less salient, i.e., tutor presence appeared to serve to alert students and make the classes more effective.

## 3.4 Appropriateness of the Teaching Techniques

In the absence of controlled observations of various teaching techniques practiced by the teachers and quantification of the results thereof, we evaluated the appropriateness of the teaching techniques used for distance teaching by assessing adherence to teaching guidelines. For our analysis, we presumed that the guidelines provided to the faculty for teaching over the system constitute a set of appropriate teaching techniques, and we therefore analyze variations from them. We also discuss how well these guidelines were transmitted to the faculty for effective implementation. Finally, we examine the opinions of teachers and students with regard to the different techniques used and the ones they identified as yielding better results.

**Exhibit 3-21**

**UWIDITE Student Self-Reported Learning Effectiveness as Related to Tutor Presence**

| ITEM | PERCENTAGE AGREEING, WITH TUTOR PRESENT (N=109) | PERCENTATGE AGREEING, WITHOUT TUTOR (N=77) |
|---|---|---|
| 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 process | 13.7 | 21.9 |

### 3.4.1 Faculty Opinion

Guidelines provided to the faculty by the project office of UWIDITE recommended that the teachers should not solely lecture as in conventional teaching but involve students in discussions more. They were advised not to speak for more than fifteen minutes at a time without stopping to elicit feedback or call for questions, and to use printed materials as much as possible. Seventy percent of the teaching faculty interviewed said that they received training on teaching techniques to be used for UWIDITE courses (see Exhibit 3-22). Fifty percent of the teachers interviewed (8 out of 16) reported trying the techniques taught in training, meaning that two-thirds of those who reported being trained (12) used the techniques covered in their training. For example, 76.5 percent of those interviewed reported lecturing in UWIDITE classes for no more than 15 minutes without a break. The same percentage also reported providing students with an introductory package to the course.

Although our sample is rather small to draw any concrete inferences from, we can observe that teaching over the network is a new concept and is quite different from conventional face-to-face teaching. Even though the faculty have experience in teaching the relevant subjects, they must be introduced to the system and the appropriate method of teaching over the system. While most (70.6 percent) of the UWIDITE teaching staff interviewed received training prior to teaching a class over the system, a sizable minority did not. This lack of training may have been reflected in less than optimum use of audio-visual and supplementary materials for class presentation. As discussed in Section 3.4.2, Student Opinion, below, less than half the faculty were reported as having used the slow-scan television effectively to support teaching after it was introduced in the 1984-85 academic year. All the faculty that the EMC's evaluation coordinator interviewed felt that assistance was required to operate the slow-scan equipment; this assistance was not normally available because a system operator was not usually present at the UWIDITE site classes.

Exhibit 3-22

UWIDITE Faculty Self-Reported Information on Appropriateness of Teaching Techniques

| ITEM | PERCENTAGE REPORTING (N=17) |
|---|---|
| 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 |

Our interviews revealed that 82.4 percent of the responding faculty reported using different teaching techniques for UWIDITE teaching as compared with traditional teaching. Asked what modifications they made in their teaching style, no specific pattern emerged (due to the small sample, 11 respondents), but the general pattern of responses seemed to indicate that the best approach to teaching over the system is to hold a conversation rather than a formatted lecture. The following specific modifications to their teaching style were made by the faculty responding to this issue: two respondents said that more effort must be made to involve students and encourage participation, three said that lecture content must include more explanation, repetition, and examples; one indicated that speaking style must be slow, deliberate and precise; and three felt that their language must be less structured and formal.

During the course of various trips by the EMC's evaluation coordinator to UWIDITE sites, faculty discussed various relevant issues in informal conversations. These issues deserve further examination here. Lecture periods over the UWIDITE system often involve use of several types of equipment and material. There has to be proper coordination so that all the elements are available and ready at the right time to be effectively used, faculty indicated. The distribution of materials from teachers to students has been a problem, and reading materials and books have not been regularly available at the extension centers. By contrast, the CASTME and JHPIEGO courses have no textbooks and, in both cases, the provision of printed materials occurred in a timely fashion and contributed to a better integration of all the course elements.

Distance teaching has to be performed within the technical limitations of the equipment and technology, on the one hand, and should exploit the technology to its fullest, on the other hand. The lecturers and students have to know the proper way of using the various types of equipment in order to obtain the best results. Some students and teachers were observed in our field visits speaking to the microphone incorrectly or moving away from it when speaking. Over and above these human factor problems, the technical quality of transmission and reception

were often not ideal, thus further detracting from optimal communication. The slow-scan television and telewriter are not yet trouble-free, and the teachers are making only limited use of these types of equipment.[1]

Finally, many faculty members felt that the UWIDITE classes were too short. One hour was not considered enough to cover the material, leave some time for questions, and deal with equipment issues. Faculty members suggested that classes be extended to 1½ hours.

### 3.4.2 Student Opinion

On the whole, the students were quite satisfied with the way the courses were taught over the UWIDITE system, reporting that the courses were much in line with their expectations, as revealed in the Summary Student Assessments. In all but one of the categories examined (see Exhibit 3-23), students' satisfaction and their perception of the appropriateness of the teaching techniques had increased from the earlier to the later academic year, suggesting that, with greater system familiarity, faculty adapt their teaching techniques to it (albeit slowly) over time. Interviews with 45 students confirmed that most of those responding to the issue (34 out of 40, or 80 percent) felt that their teachers made appropriate use of the distance teaching medium.

When we break out student interview responses by their ratings of the appropriateness of the teaching techniques to which they were exposed, however, we find, in general, that students did not give significantly better ratings to the UWIDITE courses in which the teachers exhibited appropriate teaching techniques as compared with the courses in which they did not. Exhibit 3-24 indicates that UWIDITE students in classes that they felt were being taught using the medium appropriately were not any more inclined to rate UWIDITE classes (as compared with conventional classes) as better, fostering more efficient learning, or

[1] Although it must be remembered that AID intended the RSP to use primarily the audio medium.

Exhibit 3-23

UWIDITE Student-Reported Information on Appropriateness of the Teaching Techniques

| ITEM | PERCENTAGE REPORTING IN: Academic Year 1983-1984 (N=168) | Academic Year 1984-1985 (N=24) | PERCENTAGE REPORTING, TOTAL 1983-1985 (N=192) |
|---|---|---|---|
| Class Presentation Well Organized | 89.1 | 100.0 | 90.5 |
| Classes Interesting | 88.6 | 95.7 | 89.5 |
| Teachers Encouraged Interaction | 95.0 | 95.7 | 95.1 |
| Enough Time for Interaction | 77.8 | 83.3 | 78.5 |
| Required Materials Readily Available | 60.4 | 63.1 | 60.7 |
| Classes Used Tutor | 53.4 | 95.7 | 58.7 |
| A/V and Supplementary Materials Usesd Effectively for Class Presentation | 92.0 | 69.2 | 87.2 |
| Slow-Scan Television Used Effectively to Support Teaching | NA | 42.9 | 42.9 (N=24) |

**Exhibit 3-24**

**Students' Ratings of UWIDITE Classes**
**(As compared with Conventional Classes)**
**As a Function of Appropriateness of the UWIDITE Teaching Techniques**

| UWIDITE vs. Conventional Classes | Teaching Technique Rated: Appropriate[1] (N=34) | Not Appropriate[2] (N=6) | Chi-Square[3] |
|---|---|---|---|
| UWIDITE Classes Rated: | | | |
| Better | 5 | 0 | |
| Same | 15 | 2 | 1.759 |
| Worse | 14 | 4 | |
| Learning Efficiency in UWIDITE Classes Rated: | | | |
| Better | 4 | 0 | |
| Same | 19 | 1 | 5.588 |
| Worse | 11 | 5 | |
| Amount of Learning in UWIDITE Classes Rated: | | | |
| Better | 4 | 1 | |
| Same | 18 | 3 | 0.113 |
| Worse | 12 | 2 | |

1 "Teachers made good use of the medium."
2 "Teachers did not make good use of the medium."
3 Each Chi-Square has df = 2, and each is not significant.

fostering more learning. These findings diverge from those of Indonesia, but the small numbers in the UWIDITE instance here is perhaps at least a contributory factor to the lack of significant differences.

The one exception to the general positive trend of high, and increasing, levels of appropriateness of teaching techniques (from the students' perspective) concerned the use of audiovisuals and may be explained by problems with the slow-scan television. In the 1983-84 academic year, slow-scan television was not available. During that year a large proportion (92.0 percent) of the students believed that audiovisual and supplementary materials were used effectively by the teachers for class presentation. This proportion fell to 69.2 percent after slow-scan television started being used in the following academic year. In the 1984-85 year, less than half (42.9 percent) of the students felt that slow-scan television was used effectively to support teaching. Technical problems with the equipment since its introduction may be blamed for this low level of both usage and satisfaction. Again, it must be borne in mind that the system was conceived of by AID as an audio-only systems, so dissatisfaction with the slow-scan video (added by UWI) represented dissatisfaction with a component that was not originally meant to be part of the system.

Several issues were brought up by UWIDITE students in interviews that may shed light on how best to adapt teaching techniques to distance teaching. Students felt that printed materials are more important for UWIDITE courses than for conventional courses. It is therefore of paramount importance that the materials reach them before the relevant telesession takes place and that the teachers make more reference to the printed units in the class. Sometimes the slow-scan television is used to display the printed materials that have not reached the students, thereby wasting valuable class time while the material is appearing on the screen.

Many students felt that the course tutors should be available to answer questions, address their issues, and clarify points made on the system. Local tutors should, they felt, monitor UWIDITE classes so that they can model their clarifications, assignments, tests, and additional instruction on the direction taken by the UWIDITE lecturer.

Students complained about a lack of periodic testing to provide feedback on progress and also that some lecturers tended to forget them at times. They believed that teachers should interrupt their lectures more often to ask questions or interact, and by so doing would make the students more attentive. Students also felt that one hour is not enough for UWIDITE lectures and that the class time should be extended.

Because the UWIDITE covers several soverign territories, handling of the question and answer sessions by the teacher sometimes may have political overtones. Some students reported feeling uncomfortable when lecturers called for a response by territory. Students felt that much was at stake if they did not produce the right answer, and they feared making their respective territories look bad. On the other hand, some students felt frightened when they were called upon individually. But students who were more used to the system said that interaction comes quite naturally as one becomes used to the tutor, the other students, and the system itself.

## 3.5 Institutional Development

Satellite telecommunications can have an impact upon institutions which, in their turn, may have extra-institutional social impacts. Several institutions are likely to be effected by the satellite program in the West Indies, but the University of the West Indies is the one which is likely to receive the major benefit: consequently, our analysis concentrates on the institutional impact on the University. We examine the impact of the satellite communication program on the UWI as an institution by assessing the concerns and opinions of various UWIDITE users and participants. We also make an attempt to explore institutional changes and their implications.

### 3.5.1 Administrators' Opinion

Administrators used the UWIDITE system for a number of reasons, and all but 2 of the 14 interviewed were satisfied with the appropriateness of the system for administrative purposes. A large majority (84.6 percent) felt that UWIDITE had a positive impact on the university. Although some of the administrators felt that it was too early to say in

detail how the system has affected the university, many others agreed that UWIDITE increased the efficiency of the university, increased its outreach, and opened up contact with more people.

The administrators felt that the better communication and more effective coordination made possible by UWIDITE had improved administrative effectiveness. Most (84.6 percent) of the administrators interviewed stated that UWIDITE served to enhance intercampus cooperation through improved ease of intercampus consultation and more interaction among UWI administrators. At the same time that the UWIDITE system has increased efficiency and speed (by increasing the ability to communicate with other sites), UWIDITE has also increased the workload of the administrators, they reported.

Beyond the University of the West Indies, another positive effect of UWIDITE is the increased interaction among the user institutions. The Ministries of Education has been instrumental in recruiting participants and sponsoring them for the Certificate in Education program, and in some cases for the CASTME courses. Feedback on the progress and problems of these full time teachers and laboratory assistants to the ministries has resulted in several changes already. Relations between Cable and Wireless have improved over the years. Project officials have visited Cable and Wireless headquarters whenever they were in that region. Future plans for the network continue to include the addition of Grenada, a site in Tobago, and a second site in Trinidad. The UWIDITE project also enhanced the interaction between the Ministries of Communication of the participating countries.

### 3.5.2 Faculty Opinion

All of the 17 faculty interviewed opined that UWIDITE had a positive impact on the university system, and that the technology had great potential for the Caribbean. A third of them said that the university had expanded its base, was now able to provide community and outreach service to smaller territories, and more people outside of the university are interested in it. In their opinion, improved communication has resulted in more interaction and better flow of information both within and outside of the university. The faculty interviewed believed that they are in a position to have a better understanding of mutual issues

and concerns. Many of the teachers mentioned that the greatest contribution of UWIDITE was the satisfaction they derived from teaching students who otherwise could not afford being taught directly by them, and the benefit the students derived from this.

The restructuring of the UWI and expansion of the UWIDITE activities have necessitated the use of additional staff. The faculty and staff often found themselves in a position of divided responsibilities. A course coordinator stated that his primary responsibility was to students within his campus and that he therefore did not have the time needed to prepare materials for non-campus students. This view, however, was not widely echoed by other faculty.

With the implementation of UWIDITE, an issue that has arisen among faculty that has potential institutional implications is the relationship between UWIDITE teachers and the UWIDITE project itself. The relevant issue raised was how independent UWIDITE should be from UWI. A related issue raised was what difference in course content should be allowed between UWIDITE courses and non-UWIDITE courses. Because of the difference in both teaching techniques, and in the number of campuses involved in the two types of teaching, some content difference may be expected to occur, but how widely variant course content differences should be allowed to be remains an open question. For example, much of the time in a two-hour lecture in Family Law via satellite we observed in April 1984 was spent explaining and discussing the differences among the Caribbean island nations in marriage and divorce laws. In one-campus, traditional classroom instruction, less time would have been so spent, and more would have been spent on family law particular to the government of the nation in which that campus was located. The question has implications with respect to preparedness and employability of students graduating from courses provided under the two different settings.

### 3.5.3 Student Opinion

Only 2 students of the 45 interviewed felt that the UWIDITE system had no impact of any kind on the University of the West Indies. The rest believed that UWIDITE had a positive impact on the University. Among the positive impacts most frequently cited was that more students could now receive a university education than before. Improved outreach

and greater interaction with other islands were the other more commonly cited impacts reported by the students. Some of the students indicated that the UWIDITE system gave them a chance to remain on their own island and pursue their own goals. They also tended to believe that, in the long run, the system would result in a more even distribution of qualified personnel over all the islands. Sixty-nine percent of those interviewed responded that the system had a positive impact on their future plans. A majority (55.5 percent) of the students interviewed were planning to go on for further studies, although the extent to which UWIDITE influenced this is impossible to ascertain. The system does seem to have positively affected students' attitudes towards learning, new technology, and the career possibilities they see for themselves.

With greater interaction and use of the UWIDITE system by several professions also comes sharing of limited facilities and therefore some conflicts. For example, participants of the courses for Teachers of Reading, having registered and started their courses, wanted to use the campus library. But they were not officially considered to be UWI students and therefore were denied access. Later on, it was resolved in the participants' favor. Students in the UWIDITE Social Science Challenge tutorials felt that they were UWI students working on their Part I degree requirements. They did not want to apply to the university after fulfilling their Part I degree requirement via the UWIDITE. They felt that, at that point, the university should have regarded them as UWI students. This issue has not been resolved as yet. Although these isolated institutional issues do not suggest any trend, in the long run they will have to be addressed.

Overall, in the students' opinion, UWIDITE had a favorable impact on the University. As stated by an enthusiastic student: "The University, through the UWIDITE system, is addressing the needs of the countries it serves, and it's serving the people from their homelands at manageable cost." There were many others who supported this view.

## 3.6 System Affordability

Data from interviews, university records, and on-site observation pertaining to UWIDITE operating costs were obtained from three

sites to examine the affordability of UWIDITE to the University of the West Indies. The three sites for which cost-related data were provided are Jamaica, Barbados, and Antigua. As in Chapter 2, we have attempted to separate system start-up requirements from operational requirements, and we have averaged the data across the sites to estimate the resources required for a typical site to participate in the satellite network for a full semester. As before, we have also allocated resources across the three categories of project activity defined in Section 2.6: project administration, teleconference preparation, and teleconference delivery. In the remainder of this chapter, we describe the staffing, facilities and equipment, and support required to operate the UWIDITE distance teaching network.

### 3.6.1 Staffing

During the final visit of the EMC to UWIDITE campuses in May 1985, project participants at three locations were asked to estimate the number of hours they spent per week managing the UWIDITE project, preparing UWIDITE telesessions, and participating in teleconferences or related activities. They were also asked to provide similar estimates of their time during the system start-up period in 1983. Their responses were combined with on-site observations, aggregated within occupational categories, and averaged across sites to yield the estimates shown in Exhibit 3-25 for system start-up and Exhibit 3-26 for system operation. These figures represent the number of person-hours per week of various types of staff needed to set up and operate the UWIDITE system with one remote site and one course application. The person-hours required for system training are included under Project Administration for management training, under Teleconference Preparation for course development training, and under Teleconference Delivery for technical training and training in distance teaching techniques.

As we observed in the Indonesian demonstration, staff resources for the UWIDITE project shifted between the time of system start-up in 1983 and normal system operation in 1985. The shift was in the direction of project administration and teleconference preparation and away from activities relating to teleconference delivery, particularly system installation. About half (49 percent) of UWIDITE's current staff re-

## Exhibit 3-25

**Estimated UWIDITE Staffing Requirements for System Start-up**
(Nonrecurring Costs In Person-Hours Per Week)

| | Project Administration | Teleconference Preparation | Teleconference Delivery* | Total | Per |
|---|---|---|---|---|---|
| **A. Central Project Staff** | | | | | |
| 1. Managers | 59 | 23 | 35 | 117 | System |
| 2. Engineers | 0 | 0 | 42 | 42 | " |
| 3. Operators | 0 | 8 | 32 | 40 | " |
| 4. Clerk/Typists | 65 | 10 | 24 | 89 | " |
| 5. Consultants** | 1 | 12 | 20 | 33 | " |
| **B. Local Project Staff** | | | | | |
| 1. Coordinator | 15 | 5 | 8 | 28 | Site |
| 2. Technician | 0 | 0 | 20 | 20 | " |
| 3. Operators | 0 | 0 | 25 | 25 | " |
| 4. Clerk/Typists | 3 | 5 | 5 | 13 | " |
| **C. University Staff** | | | | | |
| 1. Administrators | 5 | 0 | 2 | 7 | Site |
| 2. Adm. Assistants | 11 | 2 | 3 | 16 | " |
| 3. Instructors | 0 | 18 | 2 | 20 | Course |
| 4. Tutors | 0 | 3 | 2 | 5 | Site per Course |
| Total Hours*** | 159 hrs. | 86 hrs. | 210 hrs. | 455 hrs. | |
| Percent of Time | 35 % | 19 % | 46 % | 100 % | |

* Includes system installation.
** Primarily expatriate field advisors.
*** Total hours reflect only one remote site and one course application.

Exhibit 3-26

**Estimated UWIDITE Staffing Requirements for System Operations**
(Recurring Costs In Person-Hours Per Week)

| | Project Administration | Teleconference Preparation | Teleconference Delivery | Total | Per |
|---|---|---|---|---|---|
| A. Central Project Staff | | | | | |
| 1. Managers | 70 | 15 | 9 | 94 | System |
| 2. Engineers | 10 | 2 | 23 | 35 | " |
| 3. Operators | 0 | 0 | 28 | 28 | " |
| 4. Clerk/Typists | 114 | 82 | 12 | 212 | " |
| 5. Consultants* | 6 | 0 | 1 | 7 | " |
| B. Local Project Staff | | | | | |
| 1. Coordinator | 5 | 3 | 4 | 12 | Site |
| 2. Technician | 0 | 0 | 2 | 2 | " |
| 3. Operators | 0 | 0 | 24 | 24 | " |
| 4. Clerk/Typists | 12 | 5 | 4 | 21 | " |
| C. University Staff | | | | | |
| 1. Administrators | 2 | 2 | 1 | 5 | Site |
| 2. Adm. Assistants | 8 | 3 | 2 | 13 | " |
| 3. Instructors | 0 | 6 | 2 | 8 | Course |
| 4. Tutors | 0 | 3 | 2 | 5 | Site per Course |
| Total Hours** | 227 hrs. | 121 hrs. | 114 hrs. | 462 hrs. | |
| Percent of Time | 49 % | 26 % | 25 % | 100 % | |

* Primarily local advisors.
** Total hours reflect only one remote site and one course application.

sources are devoted to administration of the project with the remaining time divided evenly between teleconference preparation and delivery. Unlike the staffing levels for the Indonesian project (see Exhibits 2-10 and 2-11), however, the UWIDITE project is currently managed almost entirely by local project staff with little assistance from consultants other than a 12 member advisory committee which meets twice a year to discuss UWIDITE plans and schedules. The UWIDITE project staff benefit from having a longer organizational history, greater institutional support, and a more clearly defined project organization than the SISDIKSAT project staff in Indonesia.

The staffing levels shown for local project staff and university administrative staff must be multiplied by the total number of sites to obtain system-wide staffing requirements. Likewise, faculty staffing levels must be multiplied by the number of courses, and tutor person-hours must be multiplied by both the number of courses and participating sites. For ten remote sites and ten course applications, the total staff resources required to operate UWIDITE (if all sites participated in all courses) would be 1726 person-hours, or 43 full-time equivalents (FTEs) per week, about the same as the staffing requirements for the Indonesian satellite project. The mix of staff, however, would lean more toward administrative assistants and clerical staff in the West Indies than was the case in Indonesia. In the latter case, managers, technicians, and operators were frequently observed performing clerical duties. In its current configuration of six remote sites and eight course applications, the total estimated staffing level associated with UWIDITE is 1142 person-hours per week, or 28.5 FTEs, about one-third (9.4 FTEs) of which would be needed to manage the project from Jamaica. The remaining staff resources amount to approximately 3 full-time equivalents per site per semester. The somewhat lower manpower requirements at the UWIDITE remote sites compared with the SISDIKSAT remote sites reflects less continuous monitoring of telesessions by system operators and technicians at the UWIDITE locations. Unlike in Indonesia, teaching faculty in the West Indies are shown how to use the UWIDITE equipment in the absence of system operators, and they frequently operate it without assistance.

### 3.6.2 Equipment and Facilities

Exhibits 3-27 and 3-28 present the facilities, equipment, and supplies required to set up and operate the UWIDITE project based on actual expenditures and estimates from project managers. Facilities and equipment entries listed under start-up costs in Exhibit 3-27 are combined with equipment life expectancies to estimate replacement costs in Exhibit 3-28. Items listed under the heading "Teleconference Delivery" represent costs per individual site and must be multiplied by the number of classrooms (and by the number of courses, for course materials) to obtain the total materials requirements for teleconference delivery.

The current building configurations for the UWIDITE system are considerably smaller than the corresponding office and classroom space used for the Indonesian demonstration (see Exhibit 2-12). Exhibit 3-29 shows the floor plan for UWIDITE Headquarters in Kingston. Since UWI class sizes are generally much smaller than BKS (Indonesia) class sizes, the smaller classroom sizes present few problems to our analysis. Most administrators feel that the classrooms are operating at full capacity, however, and the lack of office space at Cave Hill continues to pose problems for the UWIDITE project staff in Barbados. Future additions to the UWIDITE network should, therefore, allow more office and classroom space to anticipate increases in user demand. Most locations also performed major renovations to their designated UWIDITE classrooms to provide proper cooling, lighting, and soundproofing.

The estimated facilities and equipment costs to add another site to the UWIDITE network would be about $37,000, excluding shipping and renovation costs, and excluding costs for a minicomputer. If we assume that life expectancies and replacement costs for the UWIDITE hardware are similar to those estimated by the AMC for Indonesia, we project the total annual facilities, equipment, and materials costs for the UWIDITE network to be approximately $60,000, of which $35,000 should be budgeted for facilities and audio equipment, $14,000 for the graphics equipment, and the remaining $11,000 for course materials and supplies. We should note that the costs for course materials and, to some extent, additional microphones and facilities renovations would increase as the number of

Exhibit 3-27

Estimated UWIDITE Equipment and Facilities Requirements for System Start-up
(Nonrecurring Costs)

| | Project Administration (Main RSP Office at Mona) | Teleconference Preparation | Teleconference Delivery (per site) | Unit |
|---|---|---|---|---|
| A. Facilities | | | | |
| 1. Office Space | 800 | | 400 | Square Feet |
| 2. Classroom Space | 600 | | 600 | Square Feet |
| 3. Renovations (Cooling, Lighting Soundproofing) | 19,000 | | 4,000 | U.S. Dollars |
| B. Equipment | (spares) | | | |
| 1. Audio | 3,100 | | 2,700 | U.S. Dollars |
| 2. Graphics | 4,000 | | 10,028 | " |
| 3. Slow-scan | 6,623 | | 13,900 | " |
| 4. Network | 2,070 | | 5,768 | " |
| 5. Support* | 6,400 | 3,400 | 9,000 | " |
| 6. Office | 5,100 | | 500 | " |
| 7. Classroom | | | 1,000 | " |
| C. Supplies | | | | |
| 1. Audio | 2,900 | | | U.S. Dollars |
| 2. Graphics | 3,000 | | | " |
| 3. Slow-scan | 2,000 | | | " |
| 4. Network | | | | " |
| 5. Support | 1,300 | 1,300 | 500 | " |
| 5. Office | 1,500 | 2,500 | | " |
| 6. Course Materials | | | 3 | U.S. Dollars Per Student Per Course |

* Includes $6,000 per site for a minicomputer.

## Exhibit 3-28

**Estimated UWIDITE Equipment and Facilities Requirements for System Operations***
(Recurring Costs Per Semester)

| | Project Administration (Main RSP office at Mona) | Teleconference Preparation | Teleconference Delivery (per site) | Unit |
|---|---|---|---|---|
| A. Facilities | | | | |
| 1. Upkeep | 950 | | 200 | U.S. Dollars Per Semester |
| B. Equipment | (Spares) | | | |
| 1. Audio | 155 | | 135 | " |
| 2. Graphics | 400 | | 1,003 | " |
| 3. Slow-scan | 662 | | 1,390 | " |
| 4. Network | 104 | | 288 | " |
| 5. Support | 320 | 170 | 450 | " |
| 6. Office | 250 | | 25 | " |
| 7. Classroom | | | 50 | " |
| C. Supplies | | | | |
| 1. Audio | 483 | | | " |
| 2. Graphics | 500 | | | " |
| 3. Slow-scan | 333 | | | " |
| 4. Network | | | | " |
| 5. Support | 217 | 217 | 83 | " |
| 6. Office | 250 | 420 | | " |
| 7. Course Materials | | | 3 | U.S. Dollars Per Student Course |

* Assumes 10 year replacement costs for facilities and audio equipment, 5 year replacement costs for graphics and slow-scan equipment, and 3 year replacement costs for supplies.



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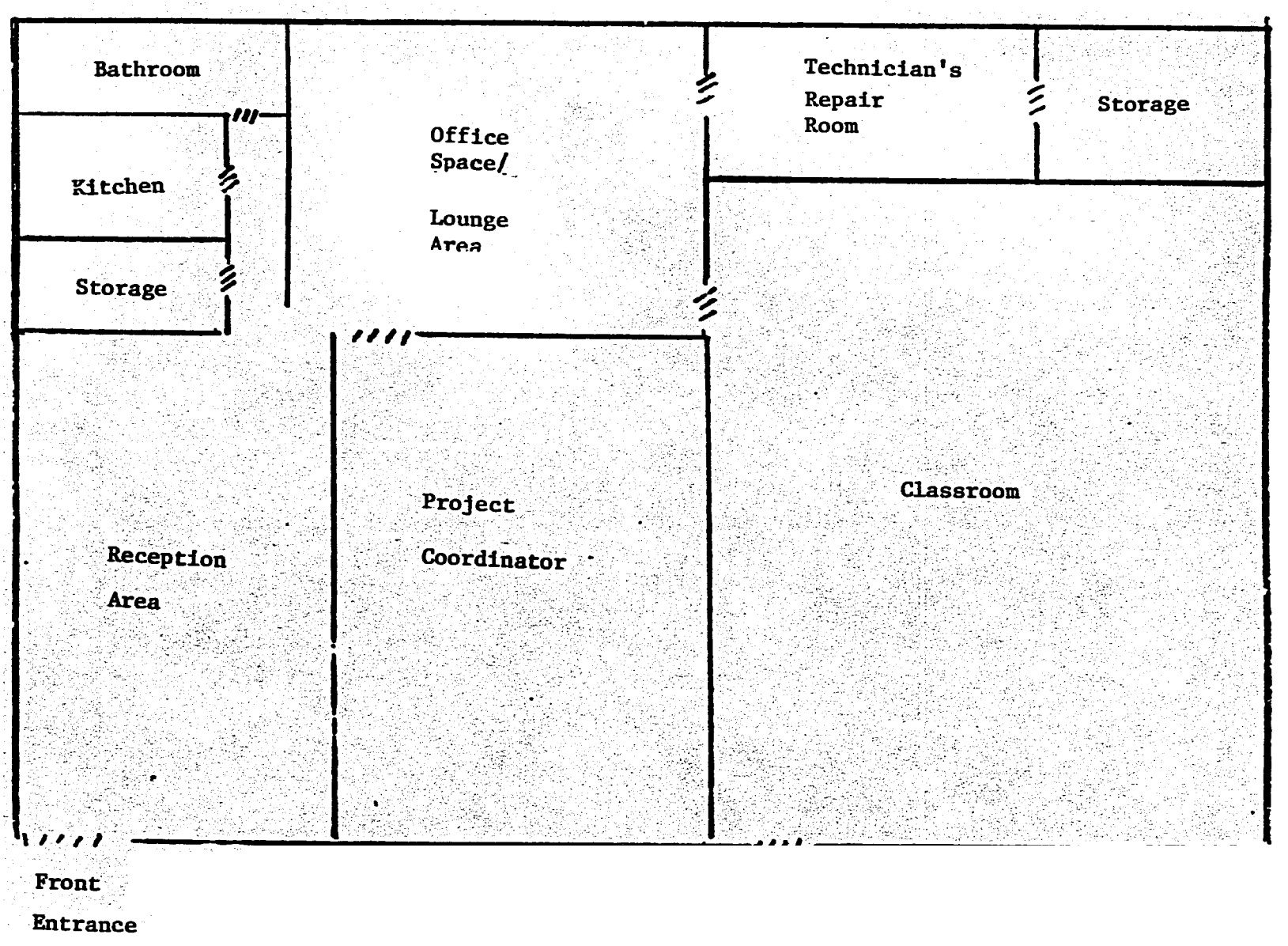
Exhibit 3-29

Mona Facility



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students per site per course increases. We have assumed an average class size of 16 students per site in the above estimate of annual UWIDITE equipment and facilities requirements.

### 3.6.3 Support

Estimates of UWIDITE support requirements during system start-up and normal system operations for a single semester were obtained from project records, interviews with project staff, and on-site observations. These estimates, shown in Exhibit 3-30 for system start-up and Exhibit 3-31 for system operation, show particularly heavy use of transportation and communication services during system start-up. As in the corresponding exhibits for the Indonesian demonstration, those items listed under "Teleconference Preparation" represent support requirements per course, and those items listed under "Teleconference Delivery" represent support requirement per site. Travel and communication between Jamaica and Washington, D.C. for management training during system start-up are included under the heading "Project Administration."

In general, the UWIDITE network now requires a modest amount of travel and delivery costs for project administration, course delivery, and system maintenance. The most important entry in the exhibit as far as system affordability is concerned is the cost to lease the satellite channel, which has increased from $106,000 per year to about $130,000 per year with the addition of Antiqua. Compared with the $320,000 annual leased cost for the two channels of the Indonesian network, the cost of the one-channel UWIDITE leased circuit is almost 60 percent lower (although on a per channel basis it is only a little lower, and on a per site per channel basis, it is somewhat higher). Unlike SISDIKSAT, the cost for the UWIDITE leased circuit is based upon the mileage covered in the UWIDITE network, not the number of sites. On a per site basis, the costs for the leased circuit is still more affordable in the West Indies -- $12,000 per site per semester for UWIDITE compared to $15,000 per site per semester for SISDIKSAT. With an average class size of 16 students in the West Indies versus 40 students in Indonesia, however, the leased line costs for UWIDITE equate to $750 per student -- twice the $375 cost per student for the SISDIKSAT leased lines. Once

## Exhibit 3-30

**Estimated UWIDITE Services Requirements for System Start-up**
(Nonrecurring Costs Per Semester)

| | Project Administration | Teleconference Preparation (per course) | Teleconference Delivery (per site) | Units |
|---|---|---|---|---|
| **A. Transportation** | | | | |
| 1. Air Travel | 3 | 1 | 4 | Round trips |
| 2. Per Diem | 9 | 3 | 12 | Person Days |
| 3. Ground Transport | 9 | 3 | 12 | Person Days |
| 4. Shipping/Delivery | 1 | | | Percent of Equipment costs |
| **B. Communication** | | | | |
| 1. Telephone | 60 | | 10 | Long Distance Calls |
| 2. Telex/Cable | 8 | 2 | 3 | Transmissions |
| 3. Satellite Access* | | | 10,000 | U.S. Dollars |
| **C. Other** | | | | |
| 1. Computer | | 50 | | U.S. Dollars |
| 2. Maintenance | 20 | | 10 | Person Days |
| 3. Publications/Graphics | | 100 | | U.S. Dollars |
| 4. Customs Clearance | | | 1 | Percent of Equipment Costs |

* Included under both start-up and operational costs.

Exhibit 3-31

**Estimated UWIDITE Services Requirements for System Operations**
(Recurring Costs Per Semester)

| | Project Administration | Teleconference Preparation (per course) | Teleconference Delivery (per site) | Units |
|---|---|---|---|---|
| **A. Transportation** | | | | |
| 1. Air Travel | 5 | 1 | 1 | Round trips |
| 2. Per Diem | 10 | 2 | 3 | Person Days |
| 3. Ground Transport | 10 | 2 | 3 | Person Days |
| 4. Shipping/Delivery | | | | Percent of Equipment |
| **B. Communication** | | | | |
| 1. Telephone | 50 | | 5 | Long Distance Calls |
| 2. Telex/Cable | 4 | 1 | 3 | Transmissions |
| 3. Satellite Access* | | | 11,000 | U.S. Dollars |
| **C. Other** | | | | |
| 1. Computer | | 150 | | U.S. Dollars |
| 2. Maintenance | 20 | | 10 | Person Days |
| 3. Publications/Graphics | | 100 | | U.S. Dollars |

* Increase in leased line costs from system start-up reflects the recent inclusion of Antiqua.

again, it becomes apparent that conclusions regarding system affordability must take into account the educational context within which each system operates. To the extent that more students can be served by the system, and to the extent that system costs represent a small part of the universities' annual operating budgets, the satellite network becomes more affordable.

Further conclusions regarding the affordability of UWIDITE to the University of the West Indies, and comparisons with the Indonesian demonstration, are offered in Chapter 4.

## 4.0 CONCLUSIONS

As we look across the findings from both the Indonesia and Caribbean Rural Satellite Projects -- at once both alike and dissimilar in their missions and structures -- we can draw conclusions about how the projects functioned, where they had problems, why, and how. This chapter discusses the conclusions in terms, again, of the six evaluation questions which have been the common thread of our evaluation efforts. Our aim in this (and the following) chapter is to provide guideposts for agencies and organizations which might be considering implementing similar telecommunications projects in the future, as well as for governments and ministries which might be planning to sponsor such projects.

### 4.1 System Use Patterns

Once system start-up was achieved, both projects relatively quickly began to use their systems to their full schedule capacity, implying that the Rural Satellite Program addressed a real demand in these developing countries. The two demonstrations studied here suggest that that demand exists in the educational sector and can be met by this technology, but it is also reasonable to assume that this is true in other sectors, as well. India's experiments with satellite telecommunications for rural areas, and the Peru project discussed above in this report, both seem to have demonstrated an ability to meet demands in the agriculture and commercial sectors as well, and other projects have suggested an ability to address needs in primary health, basic education, and so on.

System uses in the two demonstrations evaluated can be divided into a number of categories: undergraduate teaching, graduate teaching, university administration, system planning and scheduling, and system maintenance. Teaching was the major use in both demonstrations. There was a different mix, however, between the two demonstrations in terms of the type of teaching done: Indonesia focused on undergraduate teaching, while the University of the West Indies did more graduate level and in-service teaching on its system. Indonesia's emphasis on undergraduate teaching on the system reflects the enormous demand for higher education

in Indonesia compared with its ability to meet this demand. As a nation, Indonesia graduates many times more high school students that its university system can accommodate, and there is a greatly felt need there to try to do more to accommodate them. The Open University, which in its first semester was slated to register close to 60,000 students, is another manifestation of Indonesia's attempt to meet the demand for undergraduate education. The SISDIKSAT system's potential for expanding higher education opportunities in Indonesia -- in conjunction with the Eastern Islands institutions or with the Open Univeristy -- is great. The University of the West Indies, being an older, more established university system, apparently felt that it could make better use of the system by using it more for graduate and inservice teaching. To be sure, it also used it, and used it increasingly over time, for undergraduate Challenge teaching, and Challenge teaching remained an important part of UWIDITE -- that should not be overlooked. But at the undergraduate level, distance teaching in the University of the West Indies was viewed not as a replacement for face-to-face teaching, but as an enhancement of it on the main campuses and as a better way to reach students at the extension centers. At the graduate and inservice training levels, for the courses taught over the system, it was quite possibly the sole source of the teaching for those courses, rather than supplementing face-to-face teaching.

Audio-only distance teaching may be better suited to graduate and inservice teaching than to undergraduate teaching. In both demonstrations, the face-to-face element that was missing appeared to be more of a problem for undergraduate students and their teachers than it was for those in the higher level courses. Our findings suggest that distance taught courses require a certain amount of organization, readiness, and preparedness that undergraduate students may be less inclined than graduate or professional students to manifest. As if to affirm that, in UWIDITE undergraduate courses, for example, just the presence of a tutor in the distance taught classroom had a noticeably positive impact; tutor presence seemed to make the undergraduate students more focused and prepared, and they indicated that they learned more. Indonesia's highly satisfactory experience in using their system to instruct Open University tutors contrasts with its experience in undergraduate instruction.

All this is not to say that the greater organization and preparedness required of undergraduate students in audio-only distance taught courses cannot ultimately be developed in these students; rather, it means that more attention needs to be paid to this set of factors in undertaking this type of teaching to undergraduates.

The UWIDITE system used a larger proportion of time for system planning and scheduling, and a smaller proportion for system maintenance than did the SISDIKSAT system, suggesting that with more planning and scheduling, the need for system maintenance is lower. Alternatively, and perhaps more accurately, the fact that the UWIDITE system was not as complex technically as the SISDIKSAT system may be the reason less system maintenance was required.

Moderate use of both systems was made for purposes of university administration and coordination. It is perhaps somewhat surprising that more use was not made of the systems for this purpose, given that the campuses involved are on different islands and are separated by large geographical distances. In Indonesia, at least part of the lower than expected use for this purpose derived from the fact that the university Rektors did not seem to feel comfortable holding their periodic meetings over the system. The nature of these meetings, being somewhat "political" in nature, may account for the reluctance of these university administrators to hold them in any way other than face-to-face. A similar desire for face-to-face contact was also expressed by UWI administrators.

Early in the planning of the Rural Satellite Project, hope was expressed that the projects might also facilitate the exchange of research information among researchers on separate campuses. We found few such uses of the system. Our data do not allow us to explain why; perhaps with more familiarity and institutionalization of the systems on these campuses, such uses eventually will occur more frequently.

With regard to system components, the audio component was by far the most heavily used, as was planned. The facsimile equipment was used in a minor way.

## 4.2 Acceptance of the Technology

At both demonstrations, expectations were initially positive about the projects. They were looked upon as having the potential to expose undergraduate students to teachers to which they would not normally be exposed, facilitate course and curriculum planning and implementation by faculty, and ease communication among university administrators. There was a good climate of receptivity: we found little technology-shyness, and while there were some concerns among faculty and administrators as to how well the system would work, guarded optimism prevailed prior to start-up.

When the applications planning, management, and support were adequate, continued and increasing acceptance of the technology occurred, as, for example, among the Vice-Rektors and the Open University officials in Indonesia, or among the JHPIEGO conferees in the Caribbean. When such factors were not adequate -- as when course handouts were not distributed on time to the receiving distance teaching locations, the starting times of sessions were delayed, sessions were postponed, or teachers were not trained in proper distance teaching techniques -- users (and, quite likely, potential users) became disenchanted. It stands to reason that a technology which itself is more complex than the instructional or communications technology it enhances or supplants requires more careful planning and logistical support if it is to function satisfactorily and to be accepted by its users and beneficiaries.

Administrators generally accepted the technology and used it appropriately. Interestingly, though, many administrators felt that a telecommunciation system did not diminish their need, or provide a substitute, for face-to-face meetings. Faculty were particularly pleased by the capability provided them by the teaching system to reach students they would not have been able normally to reach. This seemed to provide them satisfaction in terms of both being heard by a wider audience and opening up new learning opportunities for students. Teaching faculty also uniformly expressed the opinion that distance teaching required more preparation than traditional teaching and that less was covered than traditional teaching, per unit of class time, due to the necessity

to speak slowly and deal with the system's technical requirements. It would appear to be necessary in the future to schedule longer class times for distance taught courses than for traditional courses.

While they did not necessarily express great enthusiasm for distance teaching as compared with traditional teaching, students were accepting of it and the technology which made it possible. They were particularly pleased by the capability the system gave them to hear viewpoints of students on campuses other than their own.

Although the demonstrations were conceived of originally as being primarily audio in nature, some supporting graphics equipment was provided as well. There was a consistently expressed sense of positive expectation toward the graphics component of the satellite systems which, when it worked well, seemed to enhance appreciation of the system. The transmission of patient diagnostic information among medical personnel in the Caribbean provides a particularly successful example of such a use. When the graphics component was available but did not work, as occurred in Indonesia, users expressed great disappointment. This suggests that in order not to arouse expectations in a primarily audio system, graphics monitors should not even be present unless and until the audiographics systems are fully functional.

In general, compared with other means of communication -- such as telephone, mail, or travel -- the satellite communication systems, even though they were primarily audio, were accepted and embraced by the users in these demonstrations. For some, face-to-face communication remained the preferred method of communication, but when this was inconvenient or impossible, the satellite communication system filled a definite niche.

### 4.3 Student Learning

To the best of our ability to tell, student learning was not enhanced through distance teaching by satellite communications. At the same time, it did not appear to be diminished. While learning qua learning may not have been enhanced overall, the satellite communication experience was a broadening one in itself. Students reacted positively to the experience of hearing the viewpoints of students on campuses

other than their own. When the campuses were spread out across different nations, as in the case of the Caribbean, the experience was even more salient. For example, while in one sense it "wasted" class time to have to discuss the different perpectives on family law or accounting across the Caribbean nations in those respective courses, in another sense it had to serve to broaden students' perspectives on those subjects.

Clearly, students cannot learn if classes are cancelled, as occurred often in Indonesia. In the first full semester of operation of SISDIKSAT, at least half the classes were cancelled in almost half the courses. This points to the great importance that management and logistical support plays in the operation of a distance teaching system. Similarly, if students cannot hear the other sites well (as was often reported for UWIDITE), the ability to learn is diminished. Even if the problems are not caused by the system equipment, but rather by the lines connecting the sites, as seemed to be the case, this still holds. Also important in supporting the learning process is timely distribution of printed material that supports the lectures. Finally, since distance taught courses by their nature (having more sites and students as well as an additional technology with which to deal) cover less material in the same amount of class time than do traditionally-taught courses, provision should be made for increasing class time in distance taught courses (at least initially until all involved become acclimated to the system).

A satellite communication system is only as strong as its weakest link. As important as it is to pay attention to the technical functioning of the system's components, equal attention must be paid to management of the system (scheduling, coordination, information-giving) and to logistical support of the distance teaching.

Presence of tutors in distance taught classrooms appears to go a long way toward supporting the system and, in turn, improving the conditions for learning. When tutors were present, at least in undergraduate classes, printed material to support the lecurers was more often distributed on time, equipment presented less of a problem, attendance and student attentiveness were both reported as being higher, and ques-

tion and answer and review periods were more fruitful. Students at UWI reported that they learned more with tutors present. Perhaps these positive effects come from the "face-to-face" element that both students and faculty report as being important, perhaps from the presence of an "authority" figure who can better deal with both instructional and equipment snags. Whatever the reason, the presence of tutors in undergraduate distance taught classes appears to have many positive effects.

### 4.4 Appropriateness of Teaching Techniques

Quite clearly, there are adaptations that need to be made in distance teaching (in Section 2.4, we discuss them). Training on these techniques is necessary; otherwise, teaching faculty are unlikely to think of all of them and will change their normal teaching style in the appropriate direction only slowly. Even though teaching faculty have experience in teaching their subject matter, they must be introduced properly to both the system and the appropriate techniques for distance teaching.

Teaching faculty in the UWI system exhibited more of the appropriate teaching behaviors than did those in Indonesia. We suspect that this is due to the fact that more of faculty that taught on the system at the former demonstration received training in this regard than did those at the latter demonstration. Evidence exists in Indonesia strongly indicating that when distance-teaching faculty do use teaching techniques appropriate to the medium, students feel that their learning is facilitated and enhanced.

Opinion as to what were the most appropriate and effective techniques to use in order to take full advantage of the technology was reasonably consistent. Faculty should lecture no more than 15 minutes without stopping for questions and answers; student discussion should be encouraged; faculty should receive training on the proper use of audio-visual and graphics equipment; students and faculty need to be taught proper microphone usage; lectures must be presented more slowly, deliberately, and precisely and should include more examples and repetition; classes should be longer in order to accommodate for the slower pace

required in distance teaching; and, if regional or cross-national accents are a factor, that must be recognized (by surfacing it as an issue and reminding both students and faculty to speak clearly and distinctly). To this we would add, from our observations, two other items of which distance teaching faculty should be aware. The first is that faculty who are distance teaching also should be aware of the geographical location of their students and to accommodate to it. For example, in Indonesia, courses in Forestry, Fishing Gear, Soil Science, and so on will have to deal with different fishing practices, forest ecology, and soils on different islands just as, in the Caribbean, lectures in Family Law and Accounting would have to deal with different laws and accounting practices in the various island nations. The second is that teaching faculty should make backup provisions in case, as happens, the printed material fails to arrive at the receiving sites or on-site tutors do not show up.

Again, as discussed above, proper support for the courses in terms of insuring timely delivery of printed supplementary material and having a tutor present both to keep students alert and deal with local issues and questions should be considered as part of the appropriate techniques repertoire for distance teaching. The positive association of these two elements with student satisfaction, attendance, and perceived learning was quite noticeable.

Our data -- at least from UWIDITE, where there was a longer period of experience with the system -- suggest that appropriate teaching behaviors increase over time. Whether this reflects greater opportunity for trial-and-error on the teachers' part or the cumulative effects of training, we do not know. But it is reasonable to assume that this process can be speeded up by putting effort early into training of system users on the proper techniques of teaching over the system, not just in a one-time orientation seminar, but with periodic refresher sessions. Care should be taken not to provide this training too early, either. In Indonesia, training of dosen was provided long before the system became fully operational, priming these important deliverers of system service. As system start-up was delayed more and more, fewer of these faculty members actually taught over the system in its first two semesters of



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operation. The difficulty of bringing complex technical systems into operation in a sometimes difficult environment should be considered in planning training of its users.

### 4.5 Institutional Development

When appropriately supported, a satellite communication system can help to build institutions, forge linkages, and provide an additional means of outreach. Obversely, when not appropriately supported, a satellite network is not going to promote institution building significantly. We have seen how the Open University of Indonesia has actively and productively pursued using the system to help build that fledgling institution. More interinstitutional outreach and linkages could be possible in Indonesia, once the system becomes more stabilized. Demand from other Indonesian organizations to use SISDIKSAT for their administrative and outreach activities has been manifested, but SISDIKSAT officials are awaiting system stabilization before they will address those concerns. We have also seen how UWI has used UWIDITE to reach out to Challenge students and make them feel more a part of the university, and we have seen how UWI administrators have used the system for university administration/coordination purposes.

One area in which satellite communications can be particularly helpful is in standardization across campuses: of institutional materials, examinations, and grading procedures. We have seen some of this in both demonstrations but believe that there is room for much more.

The University of the West Indies has been particularly active in developing and promoting a variety of programs which reach across the region -- the Certificates in Education Program and the JHPIEGO Reproductive Health Courses come to mind. By seeing and promoting UWIDITE as a regional resource, the UWIDITE administrators have helped not only to build institutions and institutional linkages, but also to strengthen the UWIDITE system itself.

At this point in the life of each of the two projects, the question remains open as to where, institutionally, each of the projects best fits. For SISDIKSAT, does it make sense for it to be run by and for BKS, or would it better serve as an important resource vehicle for the

Open University? For UWIDITE, some faculty raised the question of how independent UWIDITE should be from UWI. Although these are important questions, it is not up to the program evaluator to provide answers: the answers must come as part of the policy and decision making process within and between the government ministries involved and the agencies which will provide the future funding for these programs. What is clear is that the satellite communications projects can contribute in an important way to institutional development.

## 4.6 System Affordability

We presented a profile of the start-up and operational resources required to implement and manage each of the two projects to assist the Government of Indonesia, the University of the West Indies, and other interested parties in their decisionmaking regarding the future of their respective systems. Our resource analysis of the two distance teaching demonstrations reached no firm conclusion as to the affordability of each satellite system to its member institutions. Although we stopped short of any definitive answer to the question of system affordability, several important findings emerged from our analysis.

Overall, the UWIDITE network appears to be more affordable than the SISDIKSAT network principally because of the lower cost for the leased telecommunications circuit. Annual costs are $130,000 in the Carribbean for a single channel versus $320,000 in Indonesia for a two-channel system. These costs equate to $12,000 per site per semester in the Caribbean versus $15,000 per site per semester in Indonesia. Given UWI's success in negotiating a 20 percent discount from Cable and Wireless for the leased circuit, the opportunity for further reductions in SISDIKSAT operating costs through similar negotiations with PERUMTEL should be pursued. On a per-student basis, however, the leased costs for UWIDITE are twice those for SISDIKSAT ($750 per student in the West Indies vs. $375 per student in Indonesia).

Both systems have total manpower requirements averaging 3 to 4 full-time equivalents per remote site and 9 to 10 full-time equivalents for project headquarters. The UWIDITE project, however, shows a more favorable mix of staff, as it is currently managed entirely by local staff

with many of the administrative duties performed by mid-level clerical staff. On the other hand, SISDIKSAT is currently managed with heavy expatriate consultant involvement, and with many of the administrative and clerical duties performed by senior level technical staff.[1] And since the UWIDITE instructors are trained in the use of the classroom equipment, less continuous presence of system operators and technicians is required in the UWIDITE classrooms than in Indonesia, where instructors are not encouraged to handle the equipment.

Finally, both systems presently make very little use of their most expensive yet least reliable component -- the graphics equipment. Additionally, the graphicswriter in Indonesia appears to be over-designed for the needs and mechanical skills of the teaching faculty who have participated in the project. Future distance teaching applications could realize considerable savings in start-up costs (an estimated $24,000 per site, excluding the software studio) and operational costs (an estimated $18,000 per site per year, including leased line costs for Channel B) by opting only for audioconferencing applications, over a single channel. Clearly, although it is perceived as a plus to have graphics equipment to support teaching, its low level of use so far has not caused serious problems for most of the satellite courses and conferences in either demonstration. Only the more quantitative teaching applications, such as statistics, economics, and accounting seem to suffer noticeably without graphics. In any case, the high operating cost of the present SISDIKSAT network may require BKS and Indonesian government officials to consider dropping Channel B, sharing system costs with the Open University of Indonesia, or both.

[1] Being less further along in terms of semester of operation than the UWIDITE system, it is conceivable that the SISDIKSAT system, as it progresses, will manifest a lower level of expatriate consultant involvement.

## 5.0 LESSONS LEARNED

The previous chapter reviewed the major findings from both distance teaching demonstrations for the six research questions and drew comparisons and conclusions based on the findings. In this chapter, we discuss lessons learned from the two experiments and suggest strategies for the design and management of future distance education projects in developing countries. Our intention is not to second guess project planners, but rather to offer some guidelines for project implementation, capitalizing upon our unique role as the evaluation contractor for two distance education projects that were, on the whole, similar in design but which, in several respects, yielded divergent results.

### 5.1 Project Design

It is clear that the chances for success of a distance teaching experiment in developing countries are influenced greatly by the decisions made during the planning stages concerning the selection of primary user groups, classroom locations, telecommunications equipment, and local leadership. Our experience suggests that the likelihood of success is increased dramatically by selecting a healthy host institution with adequate resources and in a favorable geopolitical climate, by locating satellite classrooms near other learning centers (such as the university library), by providing user friendly telecommunications equipment with proven reliability, and by seeing that strong local leadership is in place and ready to manage the project.

In the Caribbean, the University of the West Indies -- an institution with fairly solid financial resources, demonstrated institutional stability, and some prior experience with a satellite system -- was designated as the host institution for the Rural Satellite Project. The satellite classrooms were located convenient to the students and faculty, often adjacent to the campus library. Audio-conferencing equipment was supplemented with telewriter and slow-scan video equipment that performed straightforward but effective audiovisual functions. In contrast to these favorable pre-implementation conditions, the Rural Satellite Project in Indonesia became an experiment of the BKS Eastern Islands

University Group, an institutior with scarce resources and an uncertain future. Many of the satellite classrooms were located some distance away from the heart of student activity, and audioconferencing equipment was supplemented with sophisticated graphicswriters and facsimile units that had not been fully tested under tropical conditions. In Indonesia, the project design decisions were made by USAID and the AMC in collaboration with the host country institutions; in the Carribbean, more of the project design decisions were made by administrators of the University of the West Indies.

In addition, with regard to project design and planning, we would echo the sentiment expressed in the Peru evaluation interim report concerning "the need for realistic expectations in project planning."[1] As in the Peru experience, network design, procurement, installation, and testing took much longer than expected, especially in Indonesia. The disparity between actual times and expected times can have negative effects, as was seen in Indonesia, where faculty members were trained in anticipation of full operation of the system, but system start-up did not occur until several months later. In projects like these, there are a large number of actors: AID/Washington, the AID Missions, multiple host country governmental agencies, several interuniversity constituents, an applications contractor, a hardware subcontractor, equipment suppliers, and an evaluation contractor. To obtain a reasonable degree of consensus among these actors about design and operation decisions takes a long time, and to get those decisions implemented adds another increment of time to the process. Granted that the UWIDITE system was less complex, but we would also venture to guess that one reason the UWIDITE operation started up and proceeded to develop faster than the Indonesian project was because UWIDITE's management was more effective at inter-organizational negotiations and moved these along in the inter-

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[1]Mayo, John K., Cruz de Yanes, Martina, Heald, Gary, R. and Klees, Steven J. Peru Rural Communication Services Project: Interim Evaluation Report. Center for International Studies, Florida State University. July 1985, p. iv.

est of getting its project off the ground, even when full consensus was not reached. We realize that in cultures such as Indonesia, where consensus is so important to a decision, the process may be incapable of being pushed along any faster. Planners need to be realistic about factors such as this in developing their schedules for these projects.

Finally, with regard to equipment and planning, a few lessons can be learned from this experience. One is that the graphics component should not be overly complex, as it was in Indonesia in the case of the Aregon graphics equipment. In the Caribbean, where simpler graphicwriters were placed, problems (and disappointments) were not as great. A second lesson is that in future applications of satellite telecommunications in similar contexts, it would be important to make sure that when the audio-supporting graphics component is in place, it is also functioning properly. It seemed as if having the television monitors and graphics equipment present in the classrooms but not functioning engendered greater disappointment than not having them there at all. Third, proper training of users in how to use equipment to best advantage is particularly important. Greater project success and less "expectation-arousing" might occur if the basic (audio) system is introduced first and then, when it is working well, the graphics support equipment is introduced, rather than trying to start up with a variety of complex types of equipment.

## 5.2 Project Management

One of the largest differences between the two distance teaching experiments continues to be the presence (in the West Indies) and absence (in Indonesia) of strong local leadership for the project. In the West Indies, a senior university administrator with previous telecommunications experience and a high degree of interest in the experiment was chosen as the UWIDITE Project Director. In Indonesia, the designated SISDIKSAT Project Director was a full-time university faculty member with no previous telecommunications experience and a full schedule that interfered with his providing attention to the experiment. It was often difficult to obtain enough of his attention to the project to yield

decisive project leadership. The attitude of project management in the West Indies towards external assistance was in favor of limited technical support and no management support, whereas the attitude of project management in Indonesia was in favor of full technical and management support from the AMC. Consequently, USAID expended far greater manpower resources on the Indonesian demonstration than on the West Indies demonstration. Granted, more students were trained in the Indonesia experiment, making the disparity per student resource cost not as great as it might seem at first blush.

Our observations suggest that many of the operational problems encountered by the SISDIKSAT project in Indonesia may be traced to the less than optimal strong local leadership, leading to the inability of the project, on the whole, to secure local funds for the project, to be actively promoted, to supervise staff on a consistent basis, and to integrate SISDIKSAT courses with standard BKS semester schedules. Other project staff tried to fill this management void by altering their roles, often at the expense of their own duties. By contrast, the Project Director in the West Indies served as a human catalyst for the project -- pooling resources from other sponsors in support of the project, generating frequent publicity for UWIDITE, organizing workshops and planning sessions, and issuing directives to the other project staff.

As an instance of the effective functioning of the Indonesian system when strong local leadership was present, we have the example of the use of SISDIKSAT by the Open University. There, a strong management leader (the Open University director) saw the opportunity for using the system for providing tutor training, and he used it to good effect. Had he been able to obtain more time on the system, we believe that even more positive effects could have accrued to the Open University from use of SISDIKSAT.

Ongoing participation and direction from an experienced local administrative official is needed in future distance education projects in developing countries in order to avoid large amounts of outside management support during not only the start-up phase but also the operational period. Even with such large amounts of donor-contributed manpower, the long-term success of the project cannot be assured if local leadership is not strong and effective.

## 5.3 User Training

Many of the findings described above in this report demonstrate the critical importance of timely user training in distance teaching techniques, course development, teleconference organization, and proper use of the telecommunications equipment. Some orientation should be given not only to instructors but also to all other system users, including government and university officials, tutors, and students. To maximize the effectiveness of the training, the sessions should be conducted just prior to initial system use and should be held face-to-face if possible.

In the West Indies, most of the teaching faculty said that they had received training in UWIDITE course delivery, including proper use of the equipment. Unlike the situation in Indonesia where only system operators and other project staff switched on and adjusted the equipment, the UWIDITE teaching faculty and classroom tutors often operated the audio and video equipment themselves, adjusting the sound levels, positioning the microphones and monitors for optimum reception, etc. As a result, the continuous on-site presence of system operators and technicians was unnecessary in the UWIDITE classrooms. Of course, successful operation of a telecommunication system by its users rather than by system operators and technicians can only be accomplished with coordinated hands-on user training, with reliable telecommunications equipment and transmission lines, and with careful administrative monitoring and management of system use.

Another lesson learned from the demonstrations that relates to user training is the importance of classroom tutors to the overall learning process in distance-taught courses. Both demonstrations revealed dramatic differences between classes with and classes without at least one tutor present in the classroom in such matters as student attendance and attentiveness and the timely availability of class lecture notes or handouts. Many lecturers seemed to underestimate the importance of the tutors and coordinated their activities with them only to a limited extent. In reality, the tutors were often teaching faculty

from the same department at their own campus who reviewed each lecture and organized student questions during local (off-line) breaks. They were individuals who could be called upon to give a guest lecture or back-up lecture in the event of instructor unavailability or technical problems. Many tutors expressed frustration at their limited involvement in and awareness of the overall plan for their distance taught course(s). Greater tutor involvement before and during operation of a distance education network would appear to benefit the program immeasurably, as would training the teaching faculty to accommodate this important element.

## 5.4 Afterword

The demand for higher education in developing countries is there; satellite communications systems can help to meet that demand. Not only can such systems broaden the educational opportunities available to people who are isolated by distance and oceans, but also they can provide a way for them to be exposed to the ideas and thoughts of others far from them. Faculty and administrators, as well, can benefit by greater ease of access to their colleagues. The experience of the Indonesian and Caribbean distance teaching experiments points to the need for careful planning at the outset and continued management attention for such systems to function effectively. The experience of the UWIDITE project at the University of the West Indies, and, in certain respects, the SISDIKSAT project, provides evidence that a well-designed audio-conferencing system, managed well, can be used successfully and affordably for distance education in developing countries.