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ABSTRACT

The requirements for various types of communication systems for the Fort Lincoln First Facility are presented in this section. No attempt is made to specify hardware or to select hardware suppliers, but instead a description is provided that can be used to obtain designs and quotations from such suppliers. A "communication system" is defined as those technological means by which teachers, aides, students, and administrators can carry on instruction, monitoring, observation, and professional development, but does not include such items as books, overhead projectors, etc. Educational system requirements and communication subsystems are discussed. (For related documents see ED 047 171 through ED 047 188.) (Author/LS)

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**GENERAL LEARNING CORPORATION
EDUCATIONAL SERVICES DIVISION**

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COMMUNICATION SYSTEM
FOR FORT LINCOLN FIRST FACILITY
Addendum to Midterm Report

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COMMUNICATION SYSTEM
FOR FORT LINCOLN FIRST FACILITY

1. INTRODUCTION

The requirements for various types of communication systems are presented in this section. The nature of the Fort Lincoln First Facility education program is first considered, and the communication requirements are derived from the characteristics of the program. No attempt is made to specify hardware or to select hardware suppliers, but instead a description is provided that can be used to obtain designs and quotations from such suppliers.

A "communication system" is defined in this section as those technological means by which teachers, aides, students, and administrators can carry on instruction, monitoring, observation, and professional development, but does not include such items as books, overhead projectors, etc.

It is assumed that:

- There will be no other Fort Lincoln School requiring interconnection (via closed-circuit TV, audio, phone, etc.), with the First Facility for a period of at least two years.
- The Fort Lincoln First Facility will serve to train not only the initial complement of personnel for the First Facility but also provide professional, in-service training for personnel that will staff other Fort Lincoln elementary schools.
- There will be a central production facility for the preparation of instructional materials for the entire Fort Lincoln School System.

Only commercially available materials will be used initially in that First Facility (at least until the central facility is established and support personnel are available to assist and train First Facility faculty).

- The First Facility, because of its unique education program, will draw many outside visitors, and special provision should be made for handling these visitors. Furthermore, it is assumed that even after other Fort Lincoln Schools are built, the First Facility will continue to be the school where visitors from other districts and states will be sent to view the Fort Lincoln program in action.

2. EDUCATIONAL SYSTEM REQUIREMENTS

In previous sections and reports we have described the individualized instruction procedures that will constitute a large proportion of instruction. These procedures call for:

- Instructional materials by students
- Prescription by teachers of activities and curriculum materials based on their diagnoses of individual student needs
- Planning of instruction and definition of goals for each student with the participation of both the student and his parents
- An intensive effort to bring the specialized skills of individual teachers to bear on the learning needs of individual students (even though the student may not be studying directly under that particular teacher)
- A systematic effort to help school personnel develop and perfect professional skills.

All of these emphases carry important implications for the design of a communication system for the Fort Lincoln First Facility. In the following paragraphs, an attempt will be made to capture these implications. To do this, a summary is presented of the procedures which will be used extensively in all stages of the school. A short description is given for each procedure, and those aspects that directly affect the design of the communication system are emphasized. Table 1 lists the procedures and relates them to communication system components. Prototypical procedures in both the instructional and administrative areas are shown. While the procedures are by no means exhaustive, it is believed that they are sufficient to establish the design of the required communication system.

TABLE 1

EDUCATIONAL PROCEDURES RELATED TO COMMUNICATION SUBSYSTEMS

Educational Procedures	COMMUNICATION SUBSYSTEMS				
	A. Video	B. Audio	C. Film/Slide Proj.	D. PA/Intercom	E. Micro
INSTRUCTIONAL					
1. Individual Study & Research	✓	✓	✓		
2. Indiv. Tutoring & Diagnosis	✓				✓
3. Small Group Tutoring & Discussion	✓	✓	✓		
4. Counselor/Aide Obsvn. of Student, Teacher or Class	✓	✓			
ADMINISTRATIVE					
1. Protective Surveillance	✓				
2. Announcements & Paging				✓	
3. Visitor Procedures	✓	✓	✓	✓	

2.1 Instructional Procedures

2.1.1 Individual Study and Research

The first procedure to be discussed is the most important and frequent one: individual study and research by a student under the guidance of a teacher, following an individual plan developed by the student, his parents, and his counselor. Under this procedure, the student will most often be studying in an assigned area but not at any one fixed location or desk. Instead, he may move at his own discretion from location to location within the area. As his studies require him to make use of resources located either within or outside the area, the student will move to those locations. At any time that he has questions, he can ask for assistance from other students, an aide, or a teacher.

As the student completes assigned learning tasks, the teacher will ask him to take special tests that measure his comprehension and mastery of the assigned unit. The teacher will want to record the student's progress by periodically videotaping some of these test performances, either as he works alone, with the help of an aide, or directly with the teacher. These recordings will be kept on an individual "progress tape" for that student so that his parents, other teachers, and the student himself can detect and assess progress over time.

Other self-instructional activities will call for the student to listen to a lesson from an audio tape. These lessons will be stored on standard tape cassettes (e. g., in the IPI curricula). Written or printed materials designed for use in these lessons may also be required. In lessons in the language arts area, the student may be requested to record his response on the same tape cassette, either to be reviewed later by a teacher or to compare his own performance with that of the taped speaker.

Other instructional activities may call for the student to study special materials on film strips or film cartridges. While some of this equipment can be used in special carrels located in each stage, the education program will be enhanced if the equipment, film, tapes, lesson materials, etc. are freely available throughout the area. Students will use the equipment with a minimum of direction from aides or teachers. It should be emphasized that the informality and self-directed character of the education program must not be compromised by an "egg-crate" learning environment.

2.1.2 Individual Tutoring and Diagnosis

Another important procedure is individual tutoring and/or diagnosis by a teacher. This will occur most often when the student is beginning a new and difficult task, when he has an unexplained difficulty and requests help, or when he manifests the need for intensive work in a particular subject area. This procedure will probably take place in an unoccupied corner of an instructional area, within sight of other students, but will engage the student and the teacher exclusively. To perform the tutoring or the diagnostic function, the teacher will need to have ready access to extensive portions of the learning materials' inventory. She will proceed to review the work that the student has done most recently and begin to administer items from tests covering units that are prerequisites to the work with which the student is having difficulty. The communication system must make it easy to store and quickly retrieve any item, page, task, direction sheet, etc. from the set of available materials. A microform storage and retrieval system will perform this function. While the student and teacher are working together, there will be no need for a printout of any of the material reviewed, since the teacher will be present and eliciting verbal comments only. Upon completion of the exercise, the teacher

may prescribe a given assignment for the student, and materials for this can be retrieved from the usual materials storage area. When working with the student, the teacher may videotape portions of the exercise. This tape will often, but not always, be partially copied onto the student's "progress tape" so that parents, counselor, and the student himself can assess progress.

2.1.3 Small Group Tutoring or Discussion

Small group tutoring is a procedure that will take place whenever a group of students can be found who are at the same place in the curriculum in any subject. By a "small" group is meant a group of three to ten children accompanied by an adult. The adult may present a lecture, a single concept film, or a videotaped lesson. This may then be followed by a group discussion. Note that this procedure may also be used in those learning activities that call for role playing in groups, discussions of previously covered materials, contests or games in any subject, etc. The purpose of viewing or listening to the initial lecture, film, or tape may be to establish a common context for a role playing exercise, or to present instruction or information, or to establish an affective set, etc. The group's activities can be moved to a fixed location in the area if special equipment is required. The group's exercise may extend from 15 minutes to approximately two hours, and, depending on the exercise called for, the group may require the use of audio and video record and playback equipment. For example, if the lesson deals with social interaction (e.g., parliamentary procedure in social sciences, projective testing in the affective domain, etc.), it may require that each section of the lesson be taped and then played back for group discussion. Other lessons may call for the group to review a slide lecture or a movie. In any case, the group must be able to control the presentation by stopping and starting, rewinding, changing volume, light, etc.

2.1.4 Counselor/Aide Observation

Counselors and aides will often need to observe a class, a teacher, or an individual student. For example, to maintain close contact with the progress of one of her students, a counselor may want to observe his behavior with his peers, in class, while reciting, while studying, etc. In most instances the teacher will simply walk to the area where the student is working and observe as necessary. In some cases, however, she may want to observe without disturbing the instructional environment. For this purpose, she will need to be able to observe the environment through a video monitor in a central monitoring facility focusing on a single student, following his movements and behavior, and listening as he interacts with his teachers, peers, aides, etc. The function of controlling the equipment, (e.g., focusing, zooming, camera switching, etc.) may be performed by a technician or by the teacher herself. The movement of the camera should not be apparent to those being observed, although a clear signal should be present to indicate that the area is being monitored. In addition, she may want to record his behavior on videotape while she is observing. This monitoring activity may extend from five to 30 minutes.

An aide may also need to monitor a class, teacher, or student. Instead of observing for the purpose of counselling, however, the aide will be using a prescribed procedure to observe and record data requested by a teacher. The data requested may consist of information required to develop a sociogram, behavioral management data, etc. In any case, the aide will need to observe the entire class on some occasions and only individual members of the class at other times. Again, she must be able to follow any individual student as he moves about the area. She may also want to record some or all of the observed behavior.

2.2 Administrative Procedures

Among the administrative procedures that will require communication services are those for "protective surveillance," for making announcements and paging, and for accommodating visitors. These procedures are common to many schools, and the equipment to provide the required services has long been available to educators. This section, therefore, will only describe the functional requirements for the proposed equipment and those unique characteristics of the Fort Lincoln First Facility that might affect the design.

2.2.1 Protective Surveillance

The Fort Lincoln First Facility will be open all year round for instructional purpose from 7 a. m. to 7 p. m. , Mondays through Saturdays . Community groups, parents, and students who wish, may make use of the equipment and the facility. As a result, the number of students, faculty, administrators, parents, community visitors etc. in the facility at any one time will vary drastically during the day and from day to day. This will require a flexible facility in which some sections can be "closed off" while other sections remain open.

Since the facility will have sophisticated equipment and materials and since these will be, for the most part, spread throughout the facility, it is important that there be a monitoring system. Equipment must be safeguarded from theft, tampering, or sheer curiosity. Thus a "surveillance" system must provide not only the "burglar alarm" and "fire alarm" function which many schools have traditionally required only at night, but must permit monitoring of closed off portions of the building during the day. (Also see Midterm Report, Administrative Procedures, page 3-32.)

2.2.2 Announcements and Paging

The procedure for making announcements and paging is also somewhat different than that followed in most schools. It is expected that each day will begin with some announcements of interest to all members of the school community. These can be performed by using an intercom. A system for paging individuals must take into account the fact that the education program encourages students and faculty to move freely through the facility. Furthermore, it should be remembered that individualized instruction does not require the degree of silence usually found in the traditional classroom. As a result, when a loudspeaker is used to page a student or faculty member, students will not be interrupted, provided that the system is designed properly.

2.2.3 Visitor Procedures

It is expected that the Fort Lincoln First Facility will be a nationally known school and that visitors will want to come and observe the operation of the system, discuss its innovations with staff, and carry documentation on the system away with them for possible use in their own communities. In addition to these visitors, there will be visitors from the community interested in the operation of the school and its programs. This interest may emanate from a concern for a student or students or it may arise from a personal interest in participating in the education program, either as a resource person or as a student in some evening program. As a result of these concerns, provisions must be made for handling large numbers of visitors with widely varying backgrounds and interests. The communication system must permit the following functions to be performed for groups of varying sizes:

- Supply information -- background information on the education program, its structure, theory, operation, results.
- Permit observation -- practices followed by the school, procedures that may be going on at various times, etc.
- Discussion. — group discussion of the philosophy of the Fort Lincoln Schools, training in various techniques or subjects, etc.
- Documentation — storage of various kinds of documents, tapes, film strips, movies, etc. dealing with various aspects of the Fort Lincoln School program.

The communication system must allow visitors to be paged throughout the facility. In addition, all visitors, staff, and students should be able to take telephone calls in a variety of locations that offer privacy and isolation from noise.

3. COMMUNICATION SUBSYSTEMS

The program described above, which makes a heavy demand for communications facilities, will be seriously affected if they are not available. This section will attempt to translate the requirements imposed by the education program into general communication subsystem specifications. As indicated earlier, the intent is not to design the communication subsystems and their interrelationships, but rather to provide a description that can be used to obtain recommended designs from suppliers.

3.1 Video

The video facilities will probably be the most demanding and expensive subsystem in the Fort Lincoln First Facility. As the descriptions of the procedures make clear, many instructional procedures will make use of video techniques. It is necessary, therefore, to obtain equipment that is adequate for the task it is to perform, flexible in its operation, and compatible with expected future improvements in the technology.

A central, video monitor, record, transfer, storage, and viewing area should be provided in the First Facility. This area should be tied to remote cameras and monitors by means of an extensive and flexible switching device so that the procedures described above can be carried out with a minimum of interruption of instructional activities. Since many of the operations will be controlled by a specially trained person, working under the direction of a teacher who may be in a remote location, it will be necessary to connect the central area to the building-wide intercom system. The video system should be able to accommodate a maximum of three taping operations at one time. A separate monitoring area for use by staff should allow for

the simultaneous monitoring of a maximum of eight cameras in the central area. Controls for the remote cameras (zoom, focus, audio, volume, etc.) should also be located here. In order to meet the needs of individual teachers wishing to observe their students, monitors and controls should be placed so that two teachers will be able to observe at one time without interfering with one another.

A separate section in the central area should be provided for visitors to observe instructional activities. This viewing area should accommodate up to 20 persons at one time. The system should permit use of both speakers and earphones to monitor audio signals from any camera location. In this way, it should be possible to have one group observe a class or individual while, at the same time, another group of visitors monitors other instructional activities.

The location of cameras in the facility should make it possible to observe any major area, and microphones for monitoring audio signals should be located near the camera.

There should be one fixed location in each stage that can be used to hold and record small group interactions. This fixed location should contain camera, camera controls, monitor, audio controls, plug-in facility for lapel microphones, and lighting controls.

Plug-in outlets for portable video monitors should exist at several locations in each stage.

3.2 Audio

Equipment to provide audio record, playback, transfer, duplication, erase, and storage will play a substantial part in the instructional activities of the First Facility.

Central audio facilities should be combined with those for video to provide equipment for erasing and duplicating tape cassette programs as well as storage space for back-up equipment and cassettes. In addition, tape recorders (reel to reel) should be stored here.

Audio programmed material (i. e. instructional materials on tape cassettes) should be available throughout the facility along with small playback units so that students may listen to assigned lessons. Approximately 3 percent of the student body in each stage will make use of tape cassettes on any given day. Each lesson will average between 15 and 30 minutes in length. Lesson materials can be grouped by subject area for storage in each stage. Where economics dictate arranging equipment components together in fixed locations, each stage should have a separate grouping. These, in turn, should also be separate from the fixed groupings of video equipment mentioned in the preceding section.

3.3 Film/Slide Projection

Only limited use of film/slide projection equipment is expected during the initial phases of the First Facility operation. This is due to the fact that individualized instructional materials are not currently available for use on this equipment. Therefore, it will be used primarily for showing films and slides to groups of students, parents, visitors, or staff. As these materials become more widely available on Super 8 cartridges, single concept films, etc., the appropriate equipment will be acquired. Film sizes, lenses, and general features of the equipment will reflect the requirements of the materials as they become available.

Film and slide projectors must be available in the central observation area for use in the information program for visiting groups. As indicated above, the maximum group size should be limited to 20 persons.

As with tape cassette players for audio materials, single concept film projectors, film strip viewers, etc., should be available for use throughout the facility. Although centralized for storage and control purposes, they should be available with a minimum of red tape. Any item of equipment borrowed by a student should be his responsibility while it is in his possession.

3.4 Public Address/Intercom System

The requirements for public address (PA) systems as they are used traditionally, such as in an auditorium, a gymnasium, etc., are not presented in this section. Instead, only those requirements that are imposed or made possible by the unique features of the Fort Lincoln education program will be discussed.

Because of the individualized nature of the program, it will be possible to make public address announcements for small groups and even individuals without disturbing the education program. For example, it will be possible to call Stage II girls to a special meeting or film, to remind the teachers in Stage III of the teachers' meeting scheduled at 3 p. m., etc. Therefore, the PA/intercom system can be used for a great deal of the day-to-day communication between the "front office" and teachers, students, and aides in the instructional areas, provided only that the intercom system is sufficiently flexible.

The intercom system should be designed to permit various speakers located throughout the facility to be addressed individually and in combination (e.g. the math and language arts areas but not the social science area). Speakers should

be located in the various areas in such a way as to achieve total coverage; however, designers should be sensitive to the location of fixed facilities where recording may be taking place. Individuals being called should be able to reply without handling buttons or controls. The height of speaker locations should reflect the age levels in the various stages. If the intercom function is integrated with the audio monitor and record function, attention should be given to separating the paging and visitor control operations, (which will be handled from the administrative offices), from the monitor and record operations which will be handled from the central observation area.

3.5 Microform

Initially, microforms will not be used in the instructional program to any great extent because appropriate materials are not yet widely available in this medium. However, it is expected that as they are developed for individualized instruction by commercial publishers (as well as by developers, teachers, students, etc. in the Fort Lincoln Schools), there will be more demand for microfiche or microfilm in cartridge form. Only one viewing device, located in Stage III, will be required initially (for teacher planning and diagnosis). It will permit use of a standard cartridge or fiche format and the reproduction of any page on a microform medium. It will not be necessary to have equipment to photograph materials since they will be obtained commercially or produced by a service bureau. The viewing device should permit rotation of the image and allow easy selection of the page to be viewed (either by manually selecting a fiche or moving the film past the viewer to a selected page). Lenses, magnification, light, etc. can be specified at the time of purchase to reflect the requirements of the materials available at that time.

3.6 Installation and Service

Because of the extensive and sophisticated nature of the communications subsystems required by the Fort Lincoln First Facility, it is recommended that a single "turn-key" contract be let for the installation and maintenance of the equipment. This arrangement should provide technically competent and prompt service, both at the time of installation and afterwards. Since the various devices will probably be manufactured by different companies, it is important that a single agency take the responsibility for being the system contractor. The agency would make certain that the various equipments are compatible and that the various manufacturers maintain their equipment at peak operating efficiency, perform preventive maintenance with a minimum of interruption to school schedules, maintain back-up equipment nearby for use by the school in the event of "downtime," and see that adequate parts and labor supplies are readily available.