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Abstract

To devise an efficient instructional television system, the planner must first identify and assess objectives for target audiences; allow for construction of a flexible, expansible system; plan for exchangeable instructional tapes; observe instructional procedures for large class, small group, and remote location operations; consider types of library tape storage; plan to integrate the proposed system with research interests; allow for present and long-range curricular and service functions of the system; and evaluate whether a television system is needed to satisfy the identified instructional objectives. Next, the planner must choose between a centralized-studio, decentralized-mobile, or combination philosophy of operation through analyzing cost effectiveness and ability to meet functional requirements, and determine the size and number of systems (each of which consists of program origination, distribution, and reception components) needed. Once these decisions have been made, the television studio can be planned and equipped with the system (large, medium or small) which is best suited to the proposed instructional objectives, operational philosophy, and budget. Finally, the system should be staffed with an administrator, a coordinator of objectives and system capabilities, a non-technical operator, and a technician. (SP)

Guidelines for the Integration of Instructional Television in Speech and Hearing Facilities

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Although instructional television has been put to many uses in schools and colleges, it has not always been as successful as educators would like to believe. Surprisingly, large sums of money have been spent for instructional television systems that have fallen into disuse. It seems particularly important in this day to examine the reasons these failures have occurred and to establish models that will guide the design of efficient instructional television systems.

The television planner, whether a consultant, administrator, or member of a staff and faculty team, is responsible for four major tasks. He must (a) define the scope of the television system, (b) obtain construction or remodeling specifications for a television studio, (c) equip the television system with its component parts, and (d) select competent personnel to operate the system. Yet, before each of these can be treated, the planner must be assured of the systems success. He can begin by examining the professional functions of the facility and the objectives of its personnel.

Audiences. Perhaps the largest number of poorly planned Tv systems have resulted from a failure to identify the intended audiences. The fact that some planners speak in terms of the audience rather than the plural, audiences, is good evidence that a lesson can be learned. Few television systems are used by homogeneous groups directed by a single objective. It is the responsibility of the planner to understand and to assess objectives as well as to place priorities on those that wil

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direct the design and operation of the television system. It is important to match the objectives of those who plan the system with those who use the system. Administration, faculty, staff, and students should be encouraged to contribute objectives detailing the manner in which the system can assist or expand on-going professional functions. Objectives can be obtained from institution and department administrators, teaching, research, and service staff, as well as graduate and undergraduate students.

Flexibility. Closely related to the analysis of target audiences is the flexibility of the system to serve these audiences. Far too often expanding enrollments, increased faculty, media oriented administrators, and the pressure of growing service commitments have taxed an inflexible system to its limits, whereupon it has been disgarded as obsolete. It is unfortunate that the lack of flexibility has brought the demise of so many small systems as well as a few large ones. Remember, for instance, the Midwest Program for Airborne Television Instruction. Multiple channel programing and modular expansion techniques offer solutions to planning a system with flexibility regardless of its size. New systems are planned in a modular or stage approach which allows for expansion no matter how inexpensive the initial installation may be. Ultimate objectives must be noted at the outset when initial planning and purchases are discussed and before bids, schematics, and blueprints have been approved.

Exchange. Let it be placed in the forefront now so it will not be forgotten later: instructional videotapes are the most valuable asset of any television system. However, these productions may have limited use, perhaps even to the extent of a single playing if the need for exchange is not recognized early. Exchange can apply to the transmission of your productions by mail or courier to other departments within the institution, institutions tangent to the base institution, or to other organizations and agencies across the country that may benefit from your work. If sufficient planning supports an active facility, there is little reason not to expect that at least some videotape productions will be desired by related concerns which would be willing to

exchange their tapes for yours or even rent your tapes. This topic is so important that the major portion of television equipment that is purchased is dependent upon your intentions for the exchange of instructional programs.

Observation. The observation of large-class instructional procedures, small group or single patient therapy, and remote location instruction are three objectives with which to plan the instructional television system. What will be observed must be considered as well as who will be observing. Sterectypes of the ways in which television systems are used often limit our perception of what the system can actually do. Large-class instructional procedures may include the observation of teaching assistants, a guest lecturer, or a student teacher. Small group or single patient therapy, perhaps the most popular objective, is not the only one that will efficiently employ the system. Remote location instruction by student therapists or practice teachers while fulfilling their assignments in classrooms and hospitals away from the base institution can be a special use of a properly planned system. In addition large scale magnification of the physiological components of therapy, displaying muscle and mouth movements, may direct the planning and operation of a system which will either incorporate these objectives at the outset or allow their incorporation in a modular fashion at a later time.

Library Storage. Like the exchange of videotape productions, library storage is a difficult objective to consider at the outset of planning. Library storage not only involves a decision as to how many tapes will be stored but also what size units of information need to be stored. This second question is of primary concern in the planning stage. If small units of information--a single therapy session, a psychological test, an articulation test--are to be catologued and stored, the system must be capable of accurately selecting these segments from larger programs while simultaneously rerecording them on the designated library tape. Library storage decisions will also effect the space allocated for the system. Due to the size of each tape reel and

important requirements for the positioning and temperature of tapes during storage, facilities must be planned to meet storage demands.

Research. Teachers and therapists have just begun to integrate the television medium with research interests. One-way observation techniques, immediate playback to patients, and feedback to students and therapists offer special research opportunities. Using the system to meet the research interests of staff and faculty is not an elaborate task if carefully laid plans assure that the installation is compatible with these interests.

Present and Ultimate Uses. It is important to distinguish between the present and ultimate uses of the television system. If the system could be installed immediately, what would be its use? If it couldn't be installed for two years, what changes within the institution and discipline might make new and larger demands of the system? The answers to these questions will determine the building blocks of the television system. The expense and physical allocation of the system require that uses be anticipated long in advance of actual operation. Trends in the numbers of students and faculty, research interests, and service functions must be determined for the period in which the present equipment is intended to operate without major additions or revision. Initial planning must encompass the ultimate uses in order for the system to accommodate later additions.

Curricular needs during the first five year period of television operation should determine the basic design of the system. In order to assess these needs curriculum areas must be distinguished and growth and expansion analyzed. Curricular and/or service subdivisions must be outlined and their individual growth rates calculated. Determine the present and what will be the future status of the instructional programs. What classes are likely to be added with what corresponding number of students? List the kinds of courses now taught and visualize the additions that future budget allocations might allow. Ask yourself what potential uses these classes can make of the

television system. Service functions must receive similar attention. What demands will audiology, aphasia, and articulation place upon the television system in the years following initial installation? What uses will be made of the television system for remote recordings in classrooms and hospitals distant from the base institution? These questions require thought and planning far in advance of the time that they are usually thought relevant.

Immediacy and Distribution. A final evaluation must assess the need to record and distribute the professional functions for which the system is designed. If uses do not utilize television's potential for preserving events or for transmitting information to larger numbers than can view the original event, then other means for fulfilling these objectives will be more economical and equally effective. Television systems are far too costly for them to do what other procedures can do as well or better. The unique potential of television to preserve the extraordinary and to transmit it at the convenience of large numbers are the special uses for which no other medium but television can be put. The immediacy of the medium can provide records of patients and therapists which examplify theoretical issues, display diagnostic tests, and hold for permanent use guest lectures and staffing sessions. These productions can be distributed as part of classroom instruction and in-service workshops and can be sent to other institutions and agencies for consultation and viewing.

Planning the system, then, must begin with thorough answers to seven important questions:

1. What diversified groups within the institution will use television and what are their specific objectives?
2. To what extent will there be a need to expand the system in two to five years due to increased enrollments, larger service commitments, and new programs?
3. What groups or agencies outside the institution will want to see your television productions and do these agencies have television programs you

will want to use?

4. To what professional functions (e. g., guest lectures, workshops, instruction, therapy) will television contribute?

5. What number and types of recordings will you want to save from year to year as permanent library collections?

6. What interest is there among staff and faculty to use the television medium as a tool for research?

7. Do your objectives require the preservation of professional events or their distribution to large and diversified groups?

I. Defining the System

Centralized vs. Decentralized. In the early planning stages a choice is usually made between two philosophies of operation. One is the centralized concept which dictates that equipment be installed and operated from a central studio, while the other is the decentralized concept which disperses less complex equipment in several locations. In addition systems can be designed to provide both centralized and decentralized service but cost is an important factor and one concept may be adequate for some objectives. Let's consider each of the alternatives: the centralized system, the decentralized system, and the system that can accomplish the objectives of both.

The centralized plan entails the added planning and expense of either remodeling or constructing a room suitable for a television studio. The recording and viewing functions can be combined by providing a studio large enough to allow operation and storage of equipment and the viewing of productions by the largest audience that will use the system. A classroom may be adequate for some objectives while only an auitorium may satisfy others. The centralized system is most often a single function system, allowing either viewing or recording but not both simultaneously. If diverse groups will have access to the system, each with divergent interests and objectives,

scheduling arrangements will limit use of the system. On the other hand, the centralization of funds and equipment can permit special studio installations which will enhance the quality of the video recordings. This equipment can be built-in for convenience of operation.

The decentralized system is primarily a mobile system. It can be shuttled to various locations as it is needed. Due to the mobility of the equipment, it is by necessity smaller, generally less complex, and less expensive than the centralized equipment. The savings from the decentralized system may be used to purchase a second mobile system so that diverse groups can record or play back simultaneously in different locations. An auditorium or classroom usually provides the large-group viewing area. The mobile systems are constantly on the move from therapy suites to classrooms without prior scheduling or preliminary arrangements. Lighting and sound control are generally not important concerns of the user, and so the quality of the production, although adequate, may lack the technical perfection of the studio-based system. In addition personnel experienced with the system must be available to transport the system from location to location and to make technical connections before each recording or viewing session.

There is a third more complex and expensive system which combines portions of both the centralized and decentralized systems. There are two general versions of this combination system. The first is a simple repetition of both the centralized and decentralized system, providing a planned studio area with fixed equipment plus one or more smaller mobile units which can be stored in the studio and used throughout the facility. Optimal sound and lighting conditions in the studio allow the more professional production, while the smaller units can be transferred between therapy suites and classrooms.

The second combination system is generally more expensive than the first but replaces the disadvantages of both systems with technically perfect, highly mobile,

and easy to operate equipment which accepts modular expansion. The system can begin small and be expanded to and beyond the capabilities of the initial centralized and decentralized systems. Usually the long term goals of this system support the construction of a television studio with mobile equipment. The additional cost rests with a cable system for distributing the programs to classrooms and therapy suites which may be potential sources or reception centers for television content. Productions are recorded and played back from the television studio where information can be sent to any desired location. Productions may originate from different locations in the facility while being recorded in the television studio. The combination system with distribution capability provides the most economical means of expanding a small television system to meet increasing demands.

Studio-based and Mobile Schemes. A selection must be made from among the centralized, decentralized, and combination systems. Table 1 indicates the professional functions to which these systems can contribute.

Insert Table 1 about here

Functions and the emphasis placed upon them differ from one facility to another. Specific planners need to select from or add to Table 1 those functions which can benefit from the television medium. Although many facilities may engage in all functio few actually have a need for television to contribute equally to all functions. These are the priorities which must be determined on the basis of present need and potential use. If the priority functions of the facility fall entirely within "centralized" or "decentralized," the appropriate system will adequately perform the selected functions and no further expense need be encountered. If, however, a consideration

of these functions five years hence would reveal priority changes crossing into the domain of a second system, then, a third, combination studio and mobile system, must be planned even though current demands may not fully utilize the initial potential of the system. Note that in Table 1 several functions can be served equally as well from either a centralized-studio or decentralized-mobile system. A combination system would privide the flexibility for these functions to be performed by either system. Imagine for the moment that five years have elapsed, taking into account the growth rate of your present facility. Compare your system needs function by function with Table 1 to select a studio, mobile, or combination system.

Subsystems. When the system has been described in terms of a centralized-studio, decentralized-mobile, or combination system, we can move to the second but equally important concern of determining the size of the system. Television systems are described in detail by identifying their subsystems or component parts. Systems comprise (a) program origination, (b) distribution, and (c) reception components. Each system consists of a source of program content (the television recorder or camera), a reception device (the television monitor), and a means of sending the program from recorder to receiver. The program is distributed either through conduit installed within the walls of the facility or through flexible cable accompanying each system. The number of systems is not dependent upon whether the master scheme is studio-based, mobile, or a combination of both. Elaborate multi-system mobile schemes may for some needs provide more efficient service than a combination studio and mobile system.

Determining the Number of Systems. The need for a multi-system approach can be determined by the degree to which a particular facility performs the television related functions listed in Table 2. Table 2 lists these functions in terms of the number of systems which are needed for varying degrees to which the functions are performed.

Insert Table 2 about here

These estimates are based upon operating facilities of different sizes which use the television medium as called for in the routine of therapy, teaching, research, and in-service training. Television does not accompany these functions consistently. It is important to note that Table 2 does not concern the degree to which television is used but rather the degree to which the functions occur. Table 2 becomes a good estimate of the number of systems because television usage is a reliable correlate of the number of times professional functions are performed. It is difficult to determine the number of times television will be used before the installation is operative, but planners can estimate the degree to which the various functions are performed on the basis of weekly and monthly schedules. Growth rate must concern us here also. Five year estimates can assure that the system will be compatible with later demands.

Traditionally, the number offunctions and the degree to which they are carried out increases proportionately with the number of faculty and staff. As functions of the facility increase, greater demands are placed upon the system to be at different places for different purposes. Excessive movement of the equipment to and from locations does not encourage its most efficient use and will ultimately disappoint one user in favor of another. Usually scheduling and priorities result, creating delays in gaining access to the system. Thus, the medium looses one of its most important characteristics--that of immediacy.

In light of these disadvantages it is far simpler to encourage a multi-system approach when five year growth estimates warrant it. When estimates place one near the high end of the system estimates in Table 2, it is only good sense to choose the next highest. The number of systems can be expanded beyond three; however, this is

so easily done that it is best to wait until the need actually arises. This is an important feature of modular expansion. After initial systems are planned and operative it is a simple matter to add systems.

Summary. Distinctions can now be made between the centralized (studio-based), decentralized (mobile), and combination systems. These can be arranged several ways to serve a wide range of professional objectives.

A single video recorder can be deployed (a) in a studio, (b) as a mobile unit, or (c) be used interchangeably between both schemes. If a single video source is used interchangeably, a studio is built and equipped with recording and reception equipment that can be easily transported to remote locations. Two videorecorders can be deployed in either a studio and mobile combination or as two mobile units. If professional objectives demand greater flexibility and the number of users is high, a second mobile unit may be more desireable than a studio unit. Thirdly, three video recorders can be deployed in a studio system with two supporting mobile units or as three mobile units. Usually the factors which encourage a three unit approach also dictate the need for a studio. This becomes increasingly important for the larger installation in order to provide adequate storage and maintenance areas. These plans can be summarized in the following manner:

I. Small systems: one video recorder
   - A. Studio system, or
   - B. Studio system adaptable to mobile operation, or
   - C. Mobile system without studio

II. Medium systems: two video recorders
   - D. Studio system with separate mobile system, or
   - E. Two mobile systems

III. Large systems: three video recorders

F. Studio system with two separate mobile systems, or

G. Three mobile systems

II. Planning and Constructing the Television Studio

The purpose of the television studio is to provide optimal lighting and to control sound. Productions in a studio achieve a higher level of technical quality than do the typical mobile productions. In addition the studio provides a safe storage space for the television equipment, a control room for supervision and direction of productions, and a distribution center for sending or receiving a signal from any location in the facility.

Size. The overall studio dimensions should be approximately 20 x 30 feet if an existing classroom or auditorium can be used for a large-group viewing area. Figure 1 indicates that one end of the studio should be divided by a partition, creating a 6 x 12 foot section for the control room and a 6 x 5 foot room for storage.

Insert Figure 1 about here

The front of the control room faces the remaining portion of the studio and is constructed of glass from three to seven feet above the floor. Although portions of the floor may be carpeted, the area directly in front of the control room must be tile in order to allow camera movement.

Sound Control. Unwanted sounds may be isolated by having the contractor make the walls of conrete block in the manner depicted in Figure 2. If an existing room will be remodeled for the studio, walls can be inexpensively covered with rock wool

and muslin and then covered with perforated transite accostical tile from three feet high to the ceiling. This procedure is schematically shown in Figure 3. These techniques should quiet the studio to approximately the 25 decibal level.

Insert Figure 2 and Figure 3 about here

Air-conditioning. The studio ideally should be cooled by a central air-conditioning system which is neither directly above or below the studio so that fan and motor noises do not filter into the room. If a window is present the noise level of the room will rise, but an alternative is to use the window location for an individual room air-conditioner which has a minimum 20,000 BTU capacity. Unless the room is properly air-conditioned, the television equipment will not operate satisfactorily. Temperature in the studio should not exceed 72 degrees.

Lighting. If an existing room will be remodeled for the television studio, windows must be permanently covered and existing lights removed if they hang from the ceiling. A minimum of 150 foot candles of light is necessary for adequate black and white television operation. This can be achieved with 150 watt swivel spot lamps spaced every 36 inches in linear fashion across the ceiling. Each lamp must be covered with a removeable diffusing lense to avoid harsh shadows or to create high key lighting. Professional lighting instruments can also be used and are particularly recommended for color recording. These are the incandescent and quartz iodide lamps available for two types of fixtures: the scoop which provides general illumination and the spot which provides specific illumination. Three scoops and two spots are sufficient for most television productions. The cost of these fixtures is considerably more than the 150 watt spots.

Distribution. A 20 x 30 television studio necessitates the availability of a classroom or auditorium for large-group viewing purposes. To utilize the flexible characteristics of a studio, a distribution system must carry the signal from the studio to the large-group viewing room, classrooms, and therapy suites. This same system can receive signals from these rooms and carry them to the television studio for recording. One cable may connect all the potential sources for reception. If a new facility is being built, electrical contractors can install conduit on or in the walls to each location. If an older facility with drop ceilings is to be used, ceiling tiles can be removed and the cable placed above them. If neither of these possibilities exist, new conduit will have to be run outside existing walls to each of the reception rooms. The cost of distributing the signal is dependent upon the number of rooms for which reception is needed and the distance of these rooms from the television studio. The number of rooms connected to the system can be expanded gradually in an older facility to keep cost of the distribution system minimal at the outset. The first distribution to be made is that between the television studio and the large-group viewing room. A second cable is run along side the video cable to provide each room with television sound. A disadvantage of distributing the signal through a single cable is that only one program at a time can be sent or received. For a small system with one programing source this is not a disadvantage. For larger systems with multiple programing sources several systems may be operating simultaneously. However, whenever mobile systems are available, the equipment can be easily moved to the classroom or therapy suite, bypassing the need to use the distribution system in the event it is already in use. This disadvantage may also be avoided by providing several cables each linking distinct portions of the facility. One cable may connect classrooms, another therapy suites, a third the large-group viewing room. Thus, each function is served with a separate cable enabling the distribution system to send and receive programs simultaneously. Lastly, a method of radio frequency distribution

is available which can send up to twelve programs on the same cable simultaneously. Objectives, however, can often be adequately served with the less expensive cable method.

III. Equipping the System

A television installation should be planned with the small, medium, or large system best suited to serve the professional objectives of the facility. Seven model systems are decribed below with their specific components and approximate costs. Equipme summaries following each model will help place the component parts in perspective.

Small Systems

A. Single recorder, studio-based system. The studio-based single system requires the construction or remodeling of a room capable of providing the light, sound, and cooling characteristics described above. Program content is originated with a single videotape recorder. The system recorder should provide an optional color mode for when additions can expand the system to full color operation ($4,500). The video recorder operates in conjunction with an audio/video console which allows fading and switching between cameras and microphones. The console provides monitoring service for each video channel in addition to a line monitor which displays the final recorded picture ($4,000). The origination equipment is complemented with two vidicon cameras, one heavy-duty and pedastal mounted, the other lightweight and tripod mounted. The pedastal mounted camera provides flexible movement for on-the-air positioning of the camera. The camera should have a large screen viewfinder, easy access controls, and capability for external sycronization to allow distortion-free switching from one camera to another ($2000). The pan-tilt assembly and mobile pedastal should be heavy-duty with cradle head operation and crank-up and lock pedastal ($700). The second camera is used for viewing at close range a patient's writing and pointing responses during therapy and testing ($1,200). The camera must have a 2:1 sync option if the audio/video console is purchased without a sync generator. This option reduces picture

distortion when switching between cameras. The tripod should be lightweight with a friction pan-tilt head and preferably come with a dolly ($100). If distortion-free switching between cameras is desired a syncronous generator must be added to the audio/video console ($1,000). The sync generator will provide professional broadcast quality "takes" from one camera to another whereas a 2:1 sync option provides a second of distortion between camera switches on the final recording. A lense complement must be purchased for the tripod mounted camera consisting of a 12.5 (wide angle), 25, 50, and 75 millimeter lenses ($275). For the pedastal mounted camera a 4:1 (25 to 100mm) zoom lense with manual or electronic _ control is necessary (manual, $600, electronic, $900). An electronic pan-tilt unit may be needed for the tripod mounted camera in order to provide remote control camera movements from the audio/video console ($475). The pan-tilt unit can be moved with the patient's writing across the table or as pointing responses vary from one stimulus display to another.

The program content is distributed from the cameras or video recorder to the audio/video console with coaxial cable ($10/25ft). From the console monitors the audio and video signal must be distributed to classrooms and therapy suites designated for television reception. Coaxial cable again carries the video but now must be accompanied by a pair of wires for the audio. The length of the video cable can exceed 500 feet without amplification which is sufficient for most complex routing schemes. The audio signal must be connected to a distribution amplifier at the audio/video console ($250) before being routed to the reception rooms along side the video cable. Signals can be received on conventional television receivers ($150); however, higher quality pictures with finer resolution will be achieved if television monitors are purchased ($450). Speakers and enclosures must accompany each television monitor ($50) but are unnecessary if television receivers are used. Dolly and pedastal mounts for television monitors are optional ($60) but provide mobility for each monitor, allowing positioning from front to back of the reception room or from room to room.

Two microphones will be needed, one a standard floor model with optional table stand ($75) and another for around the neck use ($50).

A. Equipment Summary for the Single Recorder Studio-based System

Equipment		Approximate Cost
(1)	Color and black/white recorder	$4,500
(2)	Lightweight vidicon viewfinder camera with 2:1 sync	1,200
(3)	Tripod with friction head and dolly (for above camera)	100
(4)	12.5, 25, 50, 75 mm lense complement	275
(5)	Pedastal viewfinder camera with sync option	2,000
(6)	Mobile pedastal withcradle head	700
(7)	4:1 (25 to 100mm) manual zoom lense (with electronic control, $900)	600
(8)	Audio/video console without sync generator (for switching and fading)	4,000
(9)	Three television monitors @ $450 (television receivers @ $150)	1,350
(10)	Pedastal mounts and dollys for monitors @ $60 (optional)	
(11)	Three speakers and enclosures for monitors @ $50	150
(12)	Remote control pan-tilt, $475 (optional)	
(13)	Sync generator for audio/video console, $1,000 (optional)	
(14)	Floor microphone with table stand	75
(15)	"Lavalier" microphone	50
(16)	Audio distribution amplifier	250
(17)	Six 25ft lengths RG59 coaxial cable @ $10	60

(18)	Distribution system: 350ft RG11 cable and conduit, installed for eight adjacent rooms	1,200
	TOTAL without options	$16,510

B. Single recorder studio-based system adaptable to mobile operation. The primary difference between system A and system B is that the convenience and ease of operating the studio console is replaced with a system capable of being deployed in or out of the studio. Technical advantages offered by the audio/video console are not available with the mobile version single system. Specifically, pictures cannot be faded in and out and distortion-free switching with a sync generator is no longer an option. Monitors for each camera and one for the final recorded picture, previously mounted on the console, are reduced to one monitor mounted on a dolly or table top in the studio. Pictures from each camera cannot be viewed simultaneously from one location. Each camera channel is monitored from the viewfinders on the cameras. The essential change from system A to system B is within the origination components. Distribution cables running throughout the building can be optional. The convenience and technical "extras" provided by the console are replaced by a videotape recorder with a portable switching unit ($25). The recorder can be the same as that described with system A, as most recorders can be mounted either in a console or on a mobile cart. What is lost between system A and system B is the simultaneous monitoring service of each camera and the availability of professional techniques for switching and fading between cameras. If the sync generator was considered for system A, then, this too must be considered lost. The advantage of system B is clearly economy and flexibility to move the television recorder out of the studio and into a classroom or therapy suite without concern for the availability of a distribution line leading back to the studio. If the number of remote locations is large, requiring an extensive distribution system, system B can record and play back by moving

the recorder to the desired location. System A can do everything planned for system B by positioning a tripod mounted camera in a remote location and sending the signal through the distribution line to the recorder in the studio. If most productions are to take place in the classrooms and therapy suites and only occasionally in the studio, then system B may be more economical. If the facility is a large complex but does not wish to incur the cost of an extensive distribution system, system B is a good initial system which can be expanded by adding the console in the studio when objectives demand professionally staged and lighted productions. If the facility consists of several floors without excess to an elevator, then, of course, the flexibility of system B is lost and system A or system B with a distribution line is necessary.

B. Equipment Summary for the Single Recorder Studio-based System Adaptable to Mobile Operation

Equipment		Approximate Cost
(1)	Color and black/white recorder	$4,500
(2)	Table/cart for video recorder	40
(3)	Lightweight vidicon viewfinder camera with 2:1 sync	1,200
(4)	Tripod with friction head and dolly (for above camera)	100
(5)	12.5, 25, 50, 75mm lense complement	275
(6)	Pedastal viewfinder camera with sync option	2,000
(7)	Mobile pedastal mount with cradle pan-tilt head (for above camera)	700
(8)	4:1 (25 to 100mm) manual zoom lense (with electronic control, $900)	600
(9)	Four television monitors @ $450 (television receivers @ $150)	1,800

(10)	Pedastal mounts and dollys for monitors @ $60 (optional)	
(11)	Four speakers and enclosures for monitors @ $50	200
(12)	Remote control pan-tilt, $475 (optional)	
(13)	Floor microphone with table stand	75
(14)	"Lavalier" microphone	50
(15)	Portable switcher	25
(16)	Distribution system: 350ft RG11 cable and conduit, installed for eight adjacent rooms, $1,200 (optional)	
(17)	Five 25ft lengths RG59 coa ial cable @ $10	50
	TOTAL without options	$11,610

C. Single recorder completely mobile system. If professional lighting and sound will not be ultimate objectives, a single mobile system can provide economical and adequate recordings. The television studio is not necessary for system C but preferably a storage room can be made available for the recorder and cameras. System C differs from systems A and B in that no distribution system is available nor are professionally "finished" productions possible. A single mobile system can be moved from classroom to therapy suite with little preparation. When the professional functions to which television contributes are limited to one or two, system C is sure of not being overtaxed. System C is most appropriate when limited use will be made of the medium and there is no reason to expect expansion of the television system.

Program content can be originated with a black and white recorder ($1,100) and either one or two mobile tripod mounted cameras. If one camera will be used and expansion unlikely, the camera may be an economical industrial random interlace type ($150). Random interlace provides no option for switching between cameras without

severe distortion during the switching process. If two cameras are desired they must both have 2:1 sync options (@ $1,200). Tripods for either type camera can be economical quick set types with pan and tilt friction heads (@ $65). The recorder is connected to the monitor with coaxial cable ($10/25ft). Reception equipment consists of television receivers ($150) or monitors ($450) for higher resolution pictures. Lense complements for each camera must consist of the 12.5, 25, 50, and 75mm lenses ($275). A zoom lense and remotely controlled pan-tilt motor are optional.

System C is not intended for expansion but to provide mobile and flexible use for a limited number of professional functions. Its simplicity makes its expansion to system B costly and inefficient. Should system C be the result of economy rather than limited use, a larger but still mobile recorder should be chosen in place of the initial recommendation, preferably with a color mode ($4,500), and the optional 2:1 sync camera ($1,200) should be a requirement.

C. Equipment Summary for the Single Recorder Completely Mobile System

Equipment	Approximate Cost
(1) Black and white portable recorder	$1,100
(2) Table/cart for video recorder	40
(3) Two lightweight vidicon viewfinder cameras with 2:1 sync @ $1,200 (optional)	
(4) Tripods, friction heads, and dollys for viewfinder cameras @ $100 (optional)	
(5) Industrial random interlace camera	150
(6) Tripod for industrial camera	45
(7) 12.5, 25, 50, 75mm lense complement	275
(8) 4:1 (25 to 100mm) zoom lense, $600, manual (optional without viewfinder cameras)	

(9)	Three television receivers @ $150	450
(10)	Floor microphone with table stand	75
(11)	"Lavalier" microphone	50
(12)	Remote control pan-tilt, $475 (optional)	
(13)	Four 25ft lengths RG59 coaxial cable @ $10	40
(14)	Portable switcher, $25 (with viewfinder cameras only)	
	TOTAL without options	$2,225

Medium Systems

Medium systems differ from small systems in that two complements of origination equipment are available. There are two general types: the studio system with separate mobile origination which is an expansion of a single recorder studio-based system (A) and two mobile systems which is an expansion of a single recorder system adaptable to mobile operation (B).

D. Studio system with separate mobile origination. This system provides professional television service to those facilities which divide their use of the medium between studio and remote location productions. All equipment described under system A is needed for this system with the addition of a second videotape recorder and a third vidicon camera. The recorder can be either of two types. If remote recordings and playbacks will not be done outside the building, a relatively mobile recorder should be purchased as was described for system A ($4,500). If remote locations include hospitals and classrooms away from the base facility, a compact and lightweight recorder is needed of the type described with system C ($1,100). This recorder should weigh about 60 pounds in order to be carried to and from vehicles which transport the system. The advantage of this medium-sized system is that it can allow separate function

to be recorded simultaneously by different parties. Both recordings can take place in the television studio if separate distribution lines have been installed to several parts of the building. Or if one production needs the better lighting and sound characteristics of the television studio, the second, mobile recorder, and a third camera can be moved to other locations in the building. In addition all medium and large systems provide the capability of editing videotapes for special viewing or library storage. One recorder is used to play back, while the second recorder is rerecording specific segments in a preselected order.

The lightweight recorder with tripod mounted cameras provides a flexible remote system. If playbacks are desired at remote locations, a small portable monitor ($125) may be purchased; however, some viewfinder cameras can be used as monitors. As the number of reception rooms are increased additional receivers ($150) or monitors ($450) can be purchased.

E. Two mobile systems. This system is an expansion of system A and designed for facilities that do not intend to construct a television studio. The studio, audio/video console, and sync generator options are replaced with a flexible and economical system that can undergo consistent use. Recorders and receivers are moved wherever they are needed rather than sending their signals through a distribution system to the television studio. If remote location production will occur outside of the building, this system can be assembled by adding a lightweight, compact recorder to system B ($1,100). If recording will be limited to the building, a larger but still mobile recorder should be selected ($4,500). A third vidicon camera with viewfinder and 2:1 sync completes the medium-sized mobile system. In other aspects system B and system E are identical. The primary advantage of system E is economy. It permits a larger number of functions to be served by television than the small systems, but does not offer the ease of operation and technical perfection that the television studio and complementing equipment provide.

Large Systems

A third category consists of two types of large systems: the studio system with two separate mobile recorders (F) and three mobile systems (G). Large systems can be either initial installations or expansions of the small and medium-sized systems.

F. Studio system with two separate mobile systems. Portions of this system have already been selected for the small studio-based system. This system is designed to serve a large and diversified number of professional objectives. While the studio and mobile recorder are part of the medium system, the addition of a third recorder will complement the earlier system stages and expand service capacity still further. The recorder may be either lightweight for remote location recording out of the building or heavier in design to provide color operation and heavy-duty use. This system is adaptable to expansion by adding any complement of recorders and cameras. Along with the third recorder, two additional vidicon cameras need to be purchased with tripod supports. Recording systems can be stored in separate locations: one system is always available in the television studio, while the other can be designated for specific functions, e. g. therapy and instruction, and stored in their respective locations. This system is designed to make no compromise between technical perfection, ease of operation, and flexibility.

G. Three mobile systems. This system is identical in service capacity to system F with the exception of providing professionally staged and lighted productions in the television studio. It differs from its medium-sized counterpart (E) by the addition of a third videotape recorder and two vidicon cameras and tripod supports. As in the fixed system this addition can be either lightweight or heavier duty and color, depending upon the need to have a highly mobile recorder capable of being transported from location to location by a single staff member. Additional monitors or receivers may be purchased to accommodate simultaneous and multi-room viewing as well as to avoid their movement from room to room. If studio productions are

unwarranted, a completely mobile system is most economical. However, some space must be allocated for the safe storage of television recorders and cameras. The planning of this system requires close attention to the expanding needs of the facility, for generally when professional objectives require three or more recorders, a television studio becomes necessary. Although economy may be a major justification, the central studio makes scheduling of productions and storage of equipment an important advantage. It is important to emphasize that the television studio can provide a recording location irrespective of other functions occurring throughout the building. If there is any doubt as to the need of a studio, it is better to return to the medium-sized studio system, postponing the addition of a third recorder and additional cameras until a later time.

IV. Personnel

Effective use of the instructional television system depends to a great extent upon the skills and ingenuity of those who operate the system. Television systems are properly utilized and maintained when operating personnel are considered in the final cost estimates. The number and professional qualifications of personnel will differ with the size of the system, but the following list should be considered minimal for one which undergoes consistent use.

Administrator. For most systems the administrative function can be filled by expanding the responsibilities of an existing position. The director or chairman of the facility often assumes this responsibility. The administrator plans the yearly budget and sets policies as to the system's use. He is responsible for the allocation of system time among faculty and staff and integrates the system into the university or inter-agency television network for the purpose of exchanging videotape productions. He directs public relations efforts, while his clerical staff is made available for the preparation of correspondence and the recording of yearly production schedules,

maintenance costs, and technical specifications. The administrator selects the following personnel.

Coordinator. A system coordinator can be obtained by arranging released time for a faculty or staff member who has an interest in or experience with the television medium. The coordinator is responsible for working with faculty and staff who will use the system and for assessing their objectives in relation to the capabilities of the system. The coordinator suggests ways in which faculty and staff can utilize the television medium to advance their teaching, therapy, and research. The coordinator keeps a daily schedule of personnel using the system and the objectives of their productions. Productions are scheduled with the coordinator after an initial discussion of how the system may best be employed to achieve specified goals. The coordinator sees that the system is properly maintained and operated by qualified personnel.

Operators. Operators are trained to utilize all performance capabilities of the system and to perform non-technical maintenance tasks. Most facilities maintain a policy that discourages faculty and staff from operating the system. Technical adjustments and procedures for assembling equipment at remote locations usually prevent optimal productions when faculty and staff alone operate the system. Some faculty over time may become qualified to operate the system. These members may begin to assume some of the responsibility for operating the system in cooperation with an experienced operator or when the system has been prepared for use by an operator. Videotape recorders and vidicon cameras are easily damaged from misuse. Students hired on a part-time basis or a full time staff member must be available to see that optimum technical conditions preserve the life of the equipment and to assure the best possible production.

Technician. The most valuable staff member over time will emerge to be the technician. If one is to be hired, he should have passed the Federal Communication Commission examination for the First Class Radiotelephone license and preferably have

had experience with repairing and maintaining videotape recorders and cameras. All equipment must undergo periodic technical adjustment and will be in need of repair more than expected. This individual can either be hired on a "standby" basis while holding a position within the institution or may be procurred through the manufacturer on a service contract basis. If a qualified technician is available, he will prove more economical than a service contract with the manufacturer.

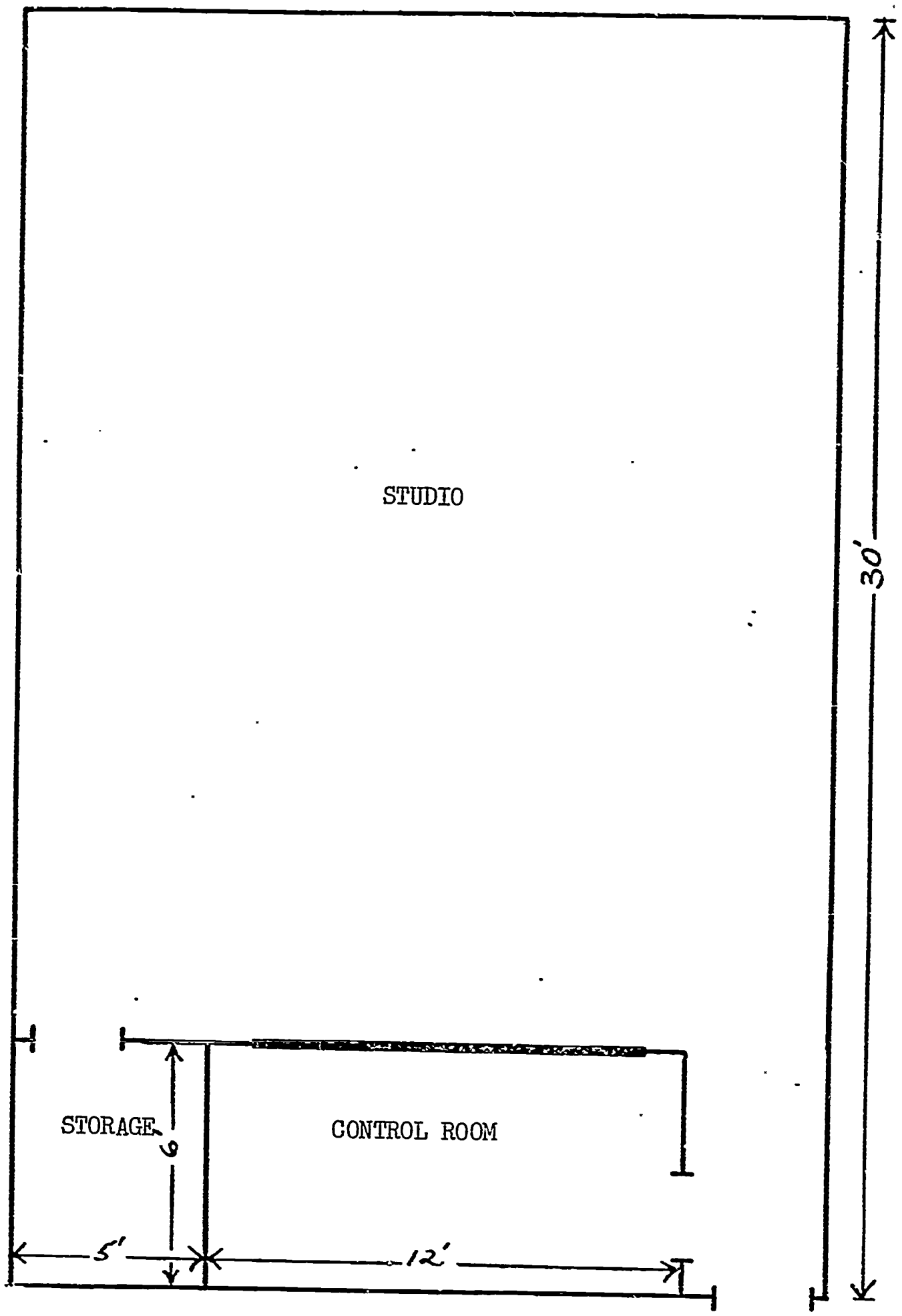
An important objective of this paper has been to engender a feeling for the difficult and painstaking process of planning a successful television system. If one is left with a respect for those who operate a successful system, a good portion of this objective has been satisfied. If the reader has gained interests and insights into how television can add to the prefessional objectives of the specialist, then the full objective has been achieved. Any television system can significantly improve our work in a number of ways, but it is the carefully planned system that succeeds in a hundred ways.

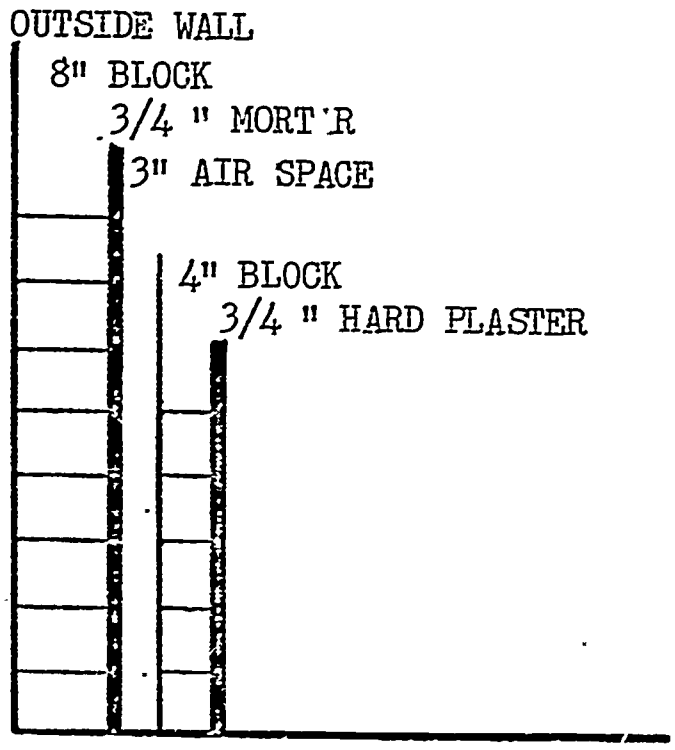
Figure Captions

Fig. 1. Studio with Storage and Control Room

Fig. 2. Cross-sectional View of Isolation Sound Control for Studio Walls

Fig. 3. Cross-sectional View of Absorption Sound Control for Studio Walls


STUDIO
30'
STORAGE
9
CONTROL ROOM
5'
12'


OUTSIDE WALL
8" BLOCK
3/4 " MORT R
3" AIR SPACE
4" BLOCK
3/4 " HARD PLASTER

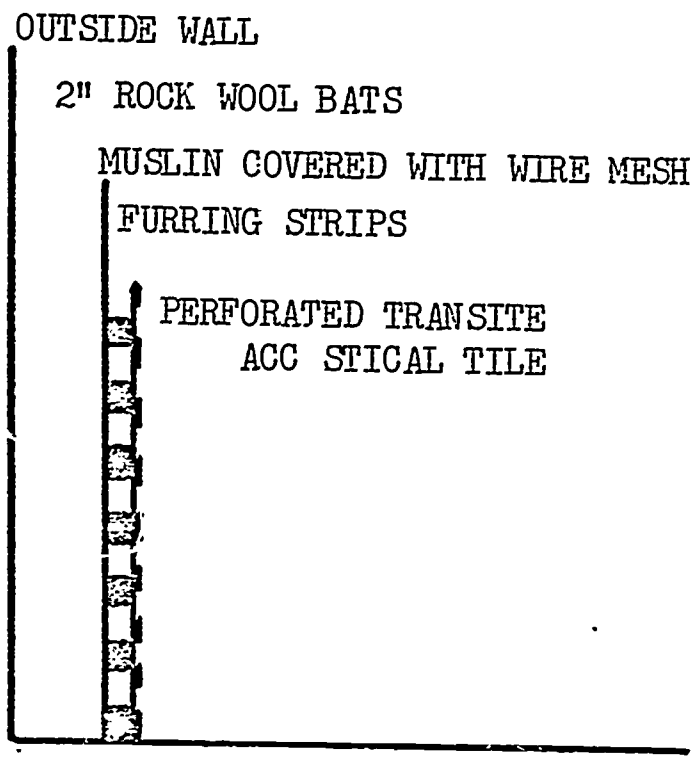

OUTSIDE WALL
2" ROCK WOOL BATS
MUSLIN COVERED WITH WIRE MESH
FURRING STRIPS
PERFORATED TRANSITE
ACC STICAL TILE

Table 1

Professional Functions Most Efficiently Served by Centralized and Decentralized Systems

Functions	Centralized	Decentralized
Instruction	x	
Small-group therapy	x	x
Individual therapy	x	x
Psychological testing	x	x
Workshops/in-service training	x	
Research		x
Staffing	x	
Remote location: screening, therapy, patient observation		x
Clinical interviews		x

Table 2

Number of Systems Needed for Varying Degrees to Which Professional Functions Are Performed

Professional Functions	1 system	2 systems	3 systems
	below	between	above
Number of classes taught	2	2-4	4
Small-group therapy sessions/ week	3	3-6	6
Individual therapy sessions/week	10	10-20	20
Psychological tests/week	2	2-5	5
Workshops		2 systems	
Staff and faculty engaged in research to which television can contribute	2	2-3	3
Patients staffed/month	5	5-10	10
Number of days/year staff and faculty are at remote locations where television can be used	2	2-5	5
Clinical interviews/ month	2	2-5	5