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ABSTRACT

The uses, pitfalls, and mechanics of videotaping for educational research are summarized. The first section discusses methodological aspects of videotaping, suggesting the capabilities of the technique and specific uses for videotaping in research studies. Disadvantages are also detailed, and a simple framing technique is described which can insure that the research task is amenable to videotaping. Under procedural aspects of videotaping, the discussion covers equipment considerations, including selection, tape format, and maintenance. The physical setup for videotaping is then explained, with emphasis on camera placement, procedures, materials, and audio recording, including types of microphones and subject placement. Specific video recording methods are presented and include suggestions for focus, lighting, and camera placement. Tape and equipment storage guidelines are also suggested. Six references and a glossary of technical terms are provided. An appendix summarizes and lists the specific, sequential steps in videorecording, from preparation through production and equipment storage. (LMM)

Program Report 83-1

VIDEOTAPING IN CLASSROOMS: A GUIDE FOR RESEARCHERS

by

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and

Mary Brady

A Report from the Program on
Student Diversity and Classroom Processes:
Interaction and Organization

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Wisconsin Center for Education Research

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- diversity as a basic fact of human nature, through studies of learning and development
- diversity as a central challenge for educational techniques, through studies of classroom processes
- diversity as a key issue in relations between individuals and institutions, through studies of school processes
- diversity as a fundamental question in American social thought, through studies of social policy related to education

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Researchers in a variety of disciplines in the social sciences use videotaping for data collection. Videotaped records of classroom activities address a major problem in educational field research: the increasing abstraction of the original data from raw materials to coded form to summarized findings, making alternative interpretations impossible. This report provides a summary of the uses, pitfalls, and mechanics of videotaping for educational research, including a glossary of technical terms and appendix.

Methodological Aspects of Videotaping

Videotaping can provide contextual, spatial, and temporal information of vital interest. In some studies, visual information that accompanies verbal production is necessary for interpretation. Such body language as gaze direction, touching, and head orientation often denote an intended listener in the absence of any verbal signaling. Additionally, videotapes allow identification of speakers that would, in certain situations, be difficult or impossible with the sole use of audiotaping. Videotape recordings preserve the "natural coloring" of an event in ways that prose, anecdotes, and audiotapes cannot. While the variables of human behavior under study in any single data pass may be quantified into computer-readable input, it is refreshing and thought-provoking for researchers to return to the whole picture. Two general principles guide the approach taken here: the importance of the inveatigator knowing the goals of research in advance of video recording, and the importance of doing a "dry-run" before the actual data collection commences.

Videotaping allows an observer to replay an observation, to manipulate time and space, to make minute examination of events, and to examine actions and behavior by several people after the fact. Taping allows scrutiny of these events in a different setting. While live observations focus on only one aspect of an occurrence of human behavior, videotaped observations can be used to examine a number of these aspects simultaneously. Categorizing and coding data can be

done much more reliably, and researchers can share actual data samples as well as conclusions. Videotaping can capture occurrences that would either have been vastly altered by the presence of a human observer or, had one been present, the observer would have been physically unable to hear, see, and record all that went on simultaneously.

The primary disadvantage in using videotape is the subjects' heightened awareness of being observed. Some researchers have alleviated this problem by placing equipment behind a curtain, one-way mirror, or other facade (e.g. Cherry & Lewis, 1976). Videotaping may be difficult in the home or in school settings. The design of the research, the subjects' ages and attitudes, and the videotaper's technique are factors that mitigate against videotaping. For example, videotaping cannot capture every syllable uttered by a 6-year-old racing around the playground. Other technologies, such as a wireless microphone might be used, but the more esoteric the application, the less likely that the correct hardware will be available. It is important to choose a method of data collection that is compatible with data requirements.

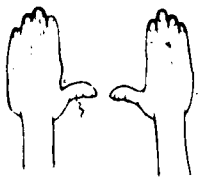

Figure 1. Framing

It is essential to be certain your task is amenable to videotaping. One way to determine whether this is the case is to view your subjects with the frame formed by your thumbs and forefingers (see Figure 1), since this is approximately what will be seen through the camera lens.

Procedural Aspects of Videotaping

Equipment Considerations

Having decided that the unique quality of videotaped data is necessary for a particular research objective, the investigator contemplating such a project must address several issues regarding equipment and materials. Describing the features of the data to be collected is the first step: quantity, unit type. Once these requirements have been delineated, the project budget (or the investigator's expectations) should be adjusted accordingly. It may be preferable to rent equipment and hire temporary personnel if data collection periods are short. Rental of equipment is costly, however,

and problems encountered with breakdowns, availability, shoddy maintenance, and lack of back-up equipment may indicate purchase rather than rental.

If the investigator decides to purchase equipment, the second step is selecting the appropriate hardware, which is largely a matter of anticipating future needs. (See Bensigner, 1978, for a guide for purchasing equipment.) The current boom in the home video market has produced an astounding array of consumer products for video production as well as for viewing. Winslow (1978) predicted that the prices for video equipment will hold and probably decrease, since they are consumer products. This has been the case with video products in the last several years. The features available now--slow motion, remote control, longer recording time, two audio tracks--far surpass those available in the same price range a few years ago. The quality and ease of operation of these new video products have also improved substantially (Notes 1, 2, and 3).

The prospective owner of equipment should consider both tape format and equipment maintenance. If the tapes, once recorded, will never leave the lab, then format choice may be less important. However, if the tapes will be distributed outside the project, interchangeability with others' equipment is a must. Helical-scan videotapes may be Beta format (I or II), VHS (video home system), 3/4" cassette, or 1/2" open-reel EIAJ format. Each of these formats requires a different machine for use. There are no great differences in cost or quality, though length of recording time per cassette or reel varies from 20, 30, or 60-minutes (3/4" format) to 6 hours or more (Beta II). The VHS format seems to be most widely distributed, although Beta sales may very well approach or surpass VHS in the coming years (Nulty, 1979). Two other format differences that may be of interest to some researchers are: (a) editing capability--there is no way to make clean edits on 1/2" open-reel tape, but all other formats may be electronically edited; and (b) ease of loading--cassettes are easier to handle in the field and do not require rewinding before unloading as reels do. Videotapes can be dubbed up to any other format or film (with some loss of visual quality) for showing at conferences, in classes, and so on.

The second, and perhaps more important, factor in equipment choice is maintenance. In addition to repairs for breakdowns, periodic maintenance is a must for efficient performance. Although video recorders have solid state circuitry, motors, belts, and video heads do wear out and require replacement. Almost all equipment comes with a 90-day service and 1-year parts replacement warranty; however, if the vendor is not a factory authorized dealer, it may be necessary to ship the equipment across the country for servicing. For this reason, most universities and schools employ engineers to maintain

electronic equipment. Many dealers will also provide service and loaner equipment while yours is in the shop.

The Physical Setup

Camera Placement. The television picture is two dimensional but has the advantage of capturing motion and zooming from distant to close-up shots, allowing one to focus on aspects of the shot that may be of interest at any given moment. The television frame allows the observer to look at a scene or person from only one angle at a time. For example, suppose the focus of study is two people interacting face-to-face. Their expressions are of primary importance. Figure 2 illustrates the choices available in camera placement. First of all, either one or two cameras can be used. Using two cameras (as illustrated in 1 and 2) yields full-face shots. However, it is extremely difficult and expensive to synchronize the two tapes. This approach requires an additional camera and recorder. In camera placement 3, profiles, subjects' head turning and/or change of posture result in loss of information. When using only one camera, the best choice for camera placement is illustrated by number 4, which is positioning of the subjects to one another at 90°, as, for example, at the corner of a table. This provides 3/4 profiles and more visual information.

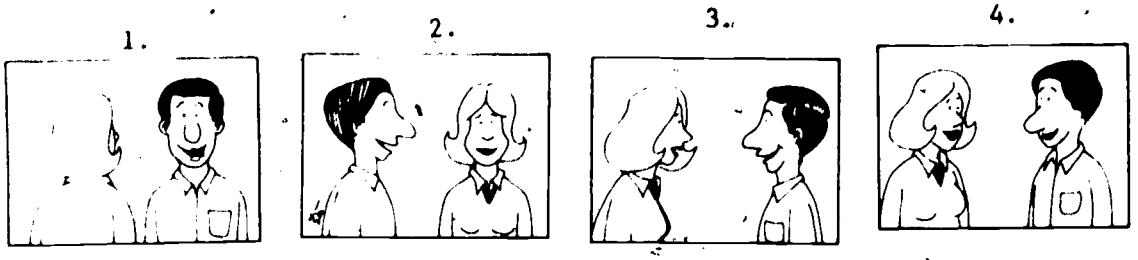

Figure 2. Visual results of different camera placements.

1. Over-the-shoulder - camera A } 2 cameras
2. Over-the-shoulder - camera B }
3. Profiles - 1 camera } 1 camera
4. 90° angle placement - 1 camera }

No one method is "better" than another. It depends on the important aspects of the interaction and the number of video setups used. A pilot study, or a trial taping, is most helpful in determining whether critical features will be captured. If it is necessary to count eye blinks in slow motion, profile shots will not be very helpful. If placing subjects at a table will restrict their natural behavior because they happen to be 2-year-olds, it may be necessary to sacrifice full visual information for their comfort and cooperation. However, if the design calls for counting the eye blinks of a pair of

2-year-olds engaged in interaction, it may be that there's something wrong with the design. Pulling the trigger and anticipating that the results will turn out the way you want them to results in disappointment. Unlike real-time observations, video observations can be replayed, criticized, and analyzed repeatedly. There is no escaping the presence, or absence, of those critical features on the tape.

Procedures and materials. In deciding on the physical setup for recording, it is best to plan the recording setup with a figure or sketch made in a preliminary visit to the research site, so that information about lighting, ambient noise, furniture, and extraneous people is known. An example of these schematics, or maps, is given in Figure 3 (Wilkinson, Clevenger, & Dollaghan, 1981).

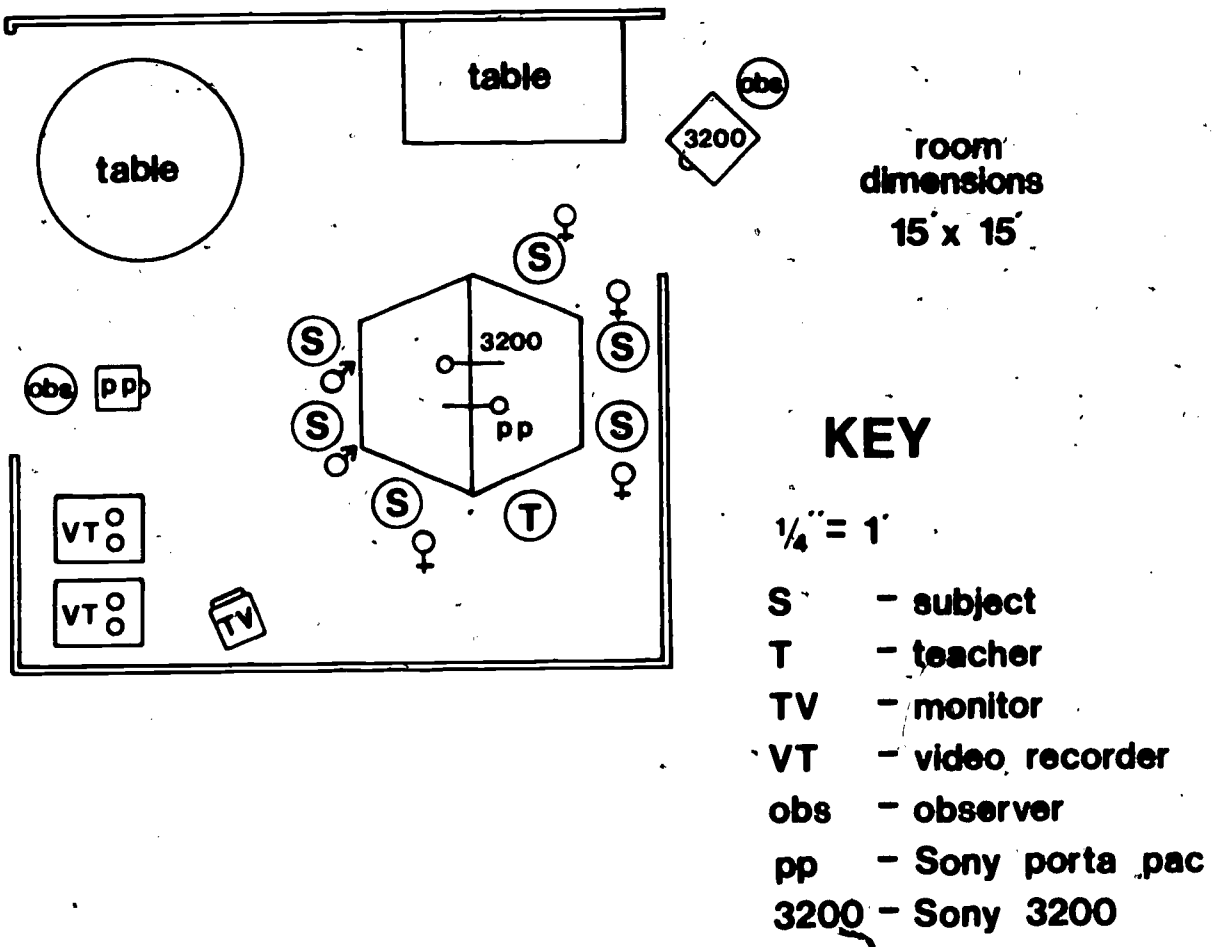

Figure 3. Map of a classroom.

The components that are required for videorecording include the following: videotape recorder (VTR/VT), camera w/zoom lens (CAM), power adaptor, microphone, microphone cable, earphone, 15-foot camera extension cable, three-prong to two-prong electrical adaptor, videotape, 15-foot power extension cord, tripod.

In addition, extra microphones, microphone cord, extensions, microphone (table or floor) stands, and a battery may be needed. Use the battery only if it is necessary to be away from an outlet; batteries can be unreliable. Any of these components can break down during recording, so include back-up equipment. Every piece of equipment should be tested before departure to the research site. Microphone cables and jacks often suffer shorts in the course of normal use. Long cords and cables will allow routing and securing of the wires away from danger.

It is necessary to become familiar with the equipment and to simulate the observational setup (see Appendix for step-by-step instructions). Zooming, panning, tilting, and focusing are techniques that should be mastered. Experimentation with angles, distances, and contrast levels created by different types of lighting is a part of this process. The limits and flexibility of the tripod and cables are also important. The observer who is comfortable with the mechanics can more easily concentrate on the salient features of what is captured on tape. A good technique is to: (a) set-up the actual room plan, (b) tape it with assistants playing the role of subjects, and (c) rewind the tape, play it back, and critique the product. The value of the practice session is in "trouble-shooting" the design. Realistic assessment at this stage will prevent the production of useless data.

Audio Recording

Videotaping allows the researcher to frame visual reality and move with a slightly greater degree of freedom when aided by a zoom lens. The audio component of video tape recording is a separate, yet related issue. Recorded audio moves the researcher into a slightly more restricted perceptual realm than that of the live observer. While binaural perception allows one to select and tune in one voice out of the classroom "hubbub," the microphone treats all sounds as if they come from one source. Thus, upon playback, the listener cannot use directional cues to locate or tune in any one voice. A certain degree of discrimination is lost, which may or may not be important in the particular situation (see Figure 4).

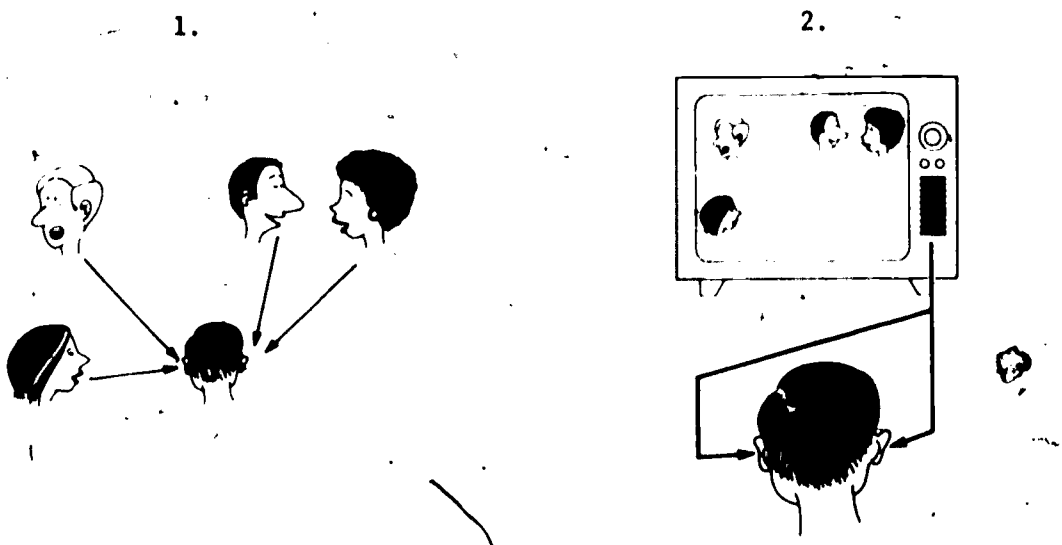

Figure 4. The comparison of real sound and recorded sound.

1. Live sound reaches observer's ears from four directions.
2. Taped sound reaches observer's ears from direction of one speaker.

Consider a situation of taping a group of children in order to be able to count words-per-minute from one child. It is often very difficult to be able to distinguish the child's voice from those of his or her peers. One could probably guess by the combination of mouth opening and talking, but unless the child has a unique voice, it's not possible to separate it from the others. Children's voices are all fairly high pitched, with much less variation than adults'.

It is possible to approximate the type of audiotaping to be obtained by placing an observer in the position that the microphone will occupy in the set. Discriminating between voices in the live situation will be more accurate than that recorded on tape. On the other hand, the microphone can be placed where the live observer cannot be placed. The biggest problem in obtaining successful audio-recording is unrealistic expectations.

One decision involves omni- vs. unidirectional microphones. Use unidirectional mics if you are concentrating on only one speaker per microphone. Lavalier mics are unidirectional, that is, they pick up sound only from one direction, or in a roughly cardioid (heart-shaped) pattern, with the speaker facing the mic at the vortex. Most portable video and tape recorders have inputs for only one audio source at a time; without a mixer, only one microphone per recorder can be used. A mixer allows use of several mics per recorder, but will necessitate

constant audio monitoring. Each mic input has a different volume level, and one subject's heavy breathing may obliterate another's speech unless someone is standing at the controls.

Lavalier microphones can be worn about the neck on a string or pinned to the lapel. They are not designed to be placed on a stand or held in the hand. Omnidirectional microphones are designed for use on a stand, either table or on the floor. They will pick up sound in a half-spherical coverage area as shown in Figure 5.

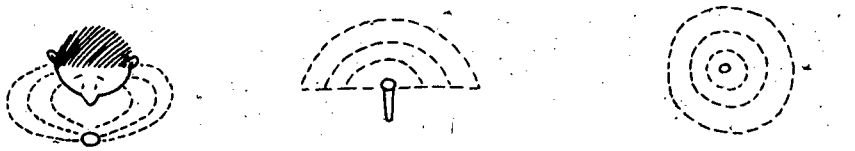

Figure 5. Microphone pick-up patterns.

While all microphones are somewhat directional in that they will pick up sound better when the source is in front of rather than behind the mic, shotgun mics are most directional. They require an operator and have a very narrow pickup pattern, concentrating on whatever source the mic is directed toward. They are useful when the target speaker changes frequently, as in a large group discussion. There is also an omnidirectional microphone in the camera itself (internal mic), which may be used as a last resort. This microphone will pick up a lot of extraneous noise including such things as rings clinking against the tripod and unwanted voices. However, such extraneous noise may be what you want on tape if you're interested in, for example, students' abilities to study in a specific environment, such as the cafeteria.

Another consideration when choosing a microphone is the degree to which the equipment will be obtrusive. A subject wearing a lavalier mic cannot be totally mobile. A mic on the table cannot be used to capture the subject's speech when he or she leaves the table to go to the blackboard. The subject might be intimidated by having a shotgun mic pointed directly at his or her face.

An auxilliary recording device, such as a tape recorder, may be helpful, but will not synchronize precisely with the videotape. Such auxilliary devices may be used infrequently to provide additional types of information.

The type of impedance the recorder accepts, and what type of connector it receives the signal from is important to note. More types of connectors are available than necessary, they are all

mutually incompatible, and the terms used to describe each are non-standard. For audio recording every "male" plug must be matched by a compatible "female" jack. Inputs on your recorder are female jacks. Outputs on the end of your mic cables are male plugs. Between these two components adaptors can transfer the signal. Extension cords and mic cables can be wired differently, which also affects audio recording. In general, the fewer adaptors used the better; although they do not actually add noise to the signal, they provide one more point along the cord where solder can inopportunely let loose, or wires can break. Some videotape recorders have high impedance mic inputs, and most studio microphones output a low impedance signal. This inconsistency may be a problem which can cause a "buzz" or "hum" signal. For best results, the low impedance mic should be matched to the high impedance input of the video recorder using an impedance matching transformer at the tape deck input. This has the advantage of making the signal louder and clearer. It is an infrequently used component that may be very necessary, depending on the criteria of research.

Testing audio equipment is essential. It is most important to listen to the signal while taping via headphones or earphone. After recording the data it is also necessary to check the audio recording. The audio signal is susceptible to equipment damage and environmental interference. It is typically less obvious when malfunctioning than a video problem.

Video Recording

Focus. Practicing how to focus on buildings and trees is a good technique, but focusing on a human face is more difficult. Always focus on the eyes, not the hand or shirt. If the eyes cannot be the object of focus then focus on the part of the body closest to them, such as the hair or nose. The technique for setting focus is as follows:

1. Zoom in as close as possible to the subject's face.
2. Focus (adjust focus ring on lens).
3. Zoom out to frame the subject as desired.

It is not necessary to refocus unless the camera is moved, the subject moves forward or back, or the focus changes to another individual. In other words, "zooming in" and "out" is possible without refocusing. It is best to check the focus if it looks a little fuzzy.

Lighting. Subjects placed in front of a brightly lit window result in silhouettes. If they already are in such a spot, the camera must be moved so the window is behind it. Ordinary fluorescent lighting in most institutions is fine for videotaping. Incandescent lighting is not quite as even as fluorescent for videotaping, but in

high enough wattage it will usually suffice. In homes, it is advisable to bring an auxilliary light source, an extension cord, a tripod, and tape to situate it, since home environments are unpredictably lit.

Camera placement. The aspects of camera placement most often ignored are camera height and distance from the subject(s). If it is not possible to see over someone's head or another obstruction with your lens, the camera must be raised, as in Figure 6.

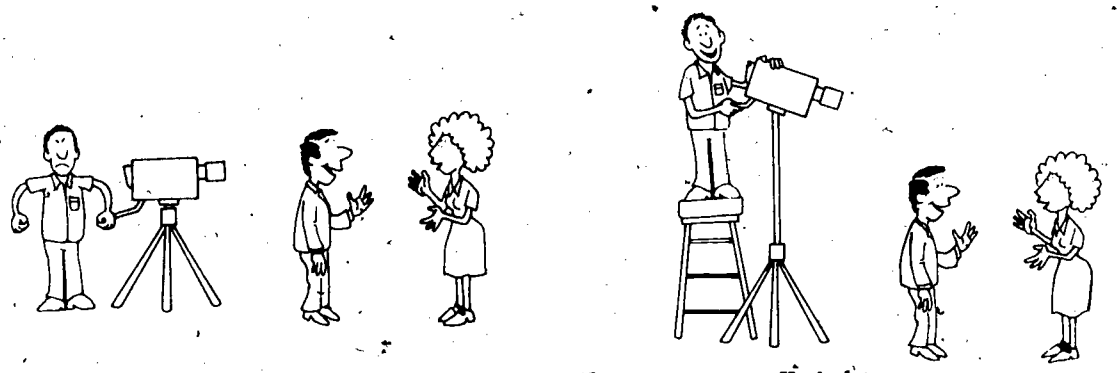

Figure 6. Camera Placements: Height

The technique of zooming in allows the camera operator to be quite far away (e.g. 20 feet) from the subjects and achieve close-up shots.

Tape and Equipment Storage

Tape(s) should be clearly labeled on reel or cassette, and boxed in an upright position for storage. Storing them on their sides for long periods can cause an accumulation of magnetic particles that may degrade the tape. Cables and cords should be gently coiled, never knotted or wound tightly about the forearm.

Reference Notes

1. Performance data and specifications, Model NV 8200 and NV 8170. Panasonic Company, One Panasonic Way, Secaucus, NJ 07094 (201) 348-7000.

2. Performance data and specifications, Model NV 8400. (ibid.)

3. Specifications: Hitachi Camera GP-5. Hitachi Denshi America, Ltd., 58-25 Brooklyn-Queens Expressway, Woodside, NY 11317 (212) 898-1261.

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Glossary

Beta: refers to a particular tape format. Original Beta (1 hour), Beta II (3 hours), and Beta III (5 hours) may or may not be compatible. You can play back a 1-hour Beta tape on some Beta II decks, but not all. Be aware of this and check compatibility beforehand.

cable: attached to video camera and/or video recorder and/or TV set. Carries audio and video signals. NOTE: Full of fine wires--handle with care.

cord: long cord attached to microphones and electrical equipment (see cable note).

dolly: physically move the camera away from (dolly back) or towards (dolly in) the subject.

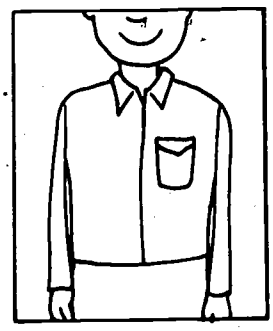
film: (verb, noun)--not synonymous with "tape" or "videotape."

gaffer's tape: useful for taping down cords to prevent stumbling, also known as duct tape.

head room (noun): the frame of picture

Too much head room

Just enough head room



Too little head room

Usage: "Give him a little more head room."

impedance: a measure of the opposition to the flow of current in an alternating current circuit.

jacks: the concave end of a cord connector or adaptor. Also referred to as "females."

mixer: an electronic device that enables combining 2 or more sources of audio input.

pan (verb): to move left or right horizontally. Usage: pan left, pan right.

plugs: the pointed end of a cord connector or adaptor. Also referred to as "males."

set (noun): the scene of the taping. May be naturalistic (a school, a playground) or artificial (a lab, a specially designed room).

tilt (verb): move up or down vertically, sometimes done automatically by camera if left unattended without tilt knobs tightened.

zoom (verb, adjective): motion of going from a close-up shot to a far-away shot (zoom out) or vice-versa (zoom in).

Appendix: Videorecording

You will need five pieces of equipment:

1. The video taperecorder (with tapes)
2. The power supply unit
3. The video camera
4. The tripod
5. External mic and connecting cords

Unpack everything and mount the camera on the tripod.

Plug in the power supply unit to an electrical outlet near your taping position. (Make sure the power switch is Off.)

Connect the recorder to the power supply.

If you are using an external mic, plug it into the camera (back) and put it in position near the subjects.

Connect the camera to the recorder (camera input terminal).

Place videotape in recorder and thread it.

Switch on power supply and video recorder.

Check that red (power) lamp on camera is on.

Aim at subject and focus. Check that iris indicator is at center.

Adjust zoom manually.

Check iris close/auto/open. Leave it in center position unless:

a) background is very bright and subject is dark, in which case set iris switch to open.

b) background is very dark and subject is much brighter, in which case set iris switch to close.

You are now ready to run a test recording.

When you are ready to record, press Record and Play switches on recorder.

Press switch on pistol grip of camera. Red recording light should now go on in the viewfinder, and recorder will start.

Press Stop-button to stop recording.

When pausing for more than a minute or two, set switch on camera to Standby, to preserve battery and tube.

You can review your recording by rewinding tape and monitoring it through the viewfinder (no sound); you can review the audio recording through the earphone (you need to plug it into recorder).

When recording is complete, pack the equipment (reverse order of above) carefully.

DO NOT:

- Point camera at bright lights.
- Leave lens cap off when not filming.
- Store in hot/damp places.
- Coil cords tightly.
- Leave too little time to prepare yourself for taping. If you have to rush, you will probably do it wrong and damage the equipment.