

RTNDF's Teacher-to-Teacher Guide

Starting Out - Equipment

Even seasoned pros often find the topic of technology intimidating: sorting through the range of systems and products available, finding the right mix of equipment for your particular program, handling the myriad options of upgrades, and matching your programs' needs with the available funding can stymie even the most experienced teacher. To a novice, however, this task can be overwhelming.

We asked broadcast teachers **Phil Harris, Janet Kirby** and **Rob Munzing** to help us out by putting on paper put some thoughts on buying technology. **Phil** graciously combined their respective insights and recommendations into what follows.

Purchasing Equipment

By Phil Harris, with Janet Kirby and Rob Munzing

A school system should make every effort to make modern technology available to its students; unfortunately, however, the terms "modern technology" and "school budget" are rarely found in the same sentence.

However, the experiences of Janet, Rob and I demonstrate that the task can be accomplished. **Janet** notes, for example, that story-telling skills and many production skills can be taught with a bare minimum of equipment and that, with the technology currently available at the

handheld unit, the mic, transmitter, battery, and antenna are all part of the microphone. When small, unobtrusive clip-on mics are desirable, a two-piece wireless unit is the best choice. In this case, a thin wire connects the mic to a separate transmitting unit that can be clipped to user's belt. In both cases, the receiver is located near the camera and connects to the mic input on the camera.

Studio Gear for Television Production:

- 1-2 cameras
- 2 friction tripods
- Studio monitor
- 4 small monitors (1 for each camera, 1 preview monitor, 1 program monitor) for control room
- 2 lapel mics (or one per anchor)
- Audio/video switcher
- 3-5 lighting instruments and stands or means to attach them near the ceiling

Luxury item: Headsets for camera operators and director. Your local electronics store should offer low-cost wireless headset walkie-talkies that will be clear in the short distance between your control room and your studio space.

Switchers and Special Effects Generators (SEG's): A switcher is a device that allows cutting from one video source to another. Some switchers allow for dissolves and

consumer level, it is possible to offer students new digital technology without a huge investment.

Another issue that often stumps new teachers is their unfamiliarity with broadcast technology and equipment. But *don't think you have to know everything about video equipment before you can start!* After all, you don't know everything about human physiology, but you know how to find a doctor.

Find a Vendor

My first suggestion is to find a reliable vendor to guide you through the process. This is probably the most important decision you'll make in starting your program. If you have limited knowledge of the technology (and nearly all of us fall into this category), search for a vendor who can offer you the services of a systems engineer to configure the entire system. Piecemeal purchasing from multiple vendors might save money initially, but won't be a true savings if your gear is not compatible. Remember: you'll be stuck with any mistakes you make for the next several years.

Rob suggests including your district's technology director in this process. If the technology director is not well-versed in video gear, you might want to contact someone on the engineering staff of your local television station or television production house for technical advice.

Try to find an equipment vendor who is also a systems designer or engineer. A designer/engineer will not just sell you *equipment*--he or she will help you develop a *system*. (There are teachers who have bought

fades as well. An SEG does everything a switcher does, along with a wide variety of special effects. Obviously, an SEG will be more expensive than a simple switcher. One consideration should be the number of inputs the switcher will accept; the smallest number probably is six but in planning for the future, you might consider something with no less than 10 inputs. Discuss this with your systems designer.

Some units will provide audio mixing and switching as well as video switching.

Switchers and SEG's can be purchased as stand-alone pieces or as a parts of software/hardware installed in a computer. Ask your systems designer which models would be best for your needs. Bear in mind, however, that if you are trying to engage as many students as possible at the same time, items designed to be combined and installed on a single computer will occupy only one student at a time.

Post-production Nonlinear Editing (NLE) for Television Production:

You must have a way to input your raw video footage into the NLE editor and output your editing footage to your distribution device. Typically, you'll need recording/playback deck(s) for this purpose in order to avoid using the cameras as source. Of course, if you are using a camera with an onboard hard drive you'll be able to connect the camera's hard drive directly to the NLE editor and transfer the file with a simple click-and-drag operation that takes mere seconds. It is highly recommended that any deck you purchase have firewire inputs and outputs.

a large amount of equipment only to learn, to their horror, that the pieces will not communicate with each other.) The systems designer/engineer can also guide you in purchasing the equipment that is most appropriate to your needs.

A reliable vendor should be up-to-date with the latest equipment and trends, but should also know your situation and be willing to work with you within your budget. Describe your class and its purpose clearly and completely. Be honest with the vendor regarding your knowledge of television production equipment. If you are new to this field, you don't want to end up with equipment that is so far above your head you may not be able to operate it. If you already have a setup, have the vendor visit your school, where he or she will conduct a site analysis with you.

After collecting several site analyses, consult with your technology director and/or advisor and decide which system recommendations interest you. Next, formalize these recommendations and put your project out for bid with several vendors.

I strongly recommend that your initial purchase be made entirely from a *single vendor*. Bid the proposal as a complete "system" – do not accept separate bids on separate parts of the system.

It is extremely important that you build "installation and training" into the bid proposal. Make sure that the vendor you select also provides service and repair and determine that the procedures and cost for repairs are acceptable to you.

Rob also warns you to be careful

A small editing program such as the freeware that usually comes with new computers works just fine and is a way many teachers start out. It does not typically offer extensive editing options but will do simple editing adequately. After all, you wouldn't want to start out with a program so complex you're not ready to use it. Both PC and Mac computers are shipped with this software.

Whether you purchase a Mac or PC platform is often a decision made for you by the technology department of your school system. Many school systems have policies of purchasing only one platform for the entire system.

While PC and Mac users often defend their respective platforms as the "best" with near-religious zeal, the fact is that both platforms provide entirely acceptable results and both platforms are found in the television industry. Moreover, as you move up to more complex editing software, the majority of the most popular editing programs are available in both the PC and Mac versions. If you are in a situation where you are offered the choice of either platform, make your decision based on the platform with which you are more comfortable *and* the platform with which you have the largest group of people who can help you if you run into difficulty.

Note: It is critical that you involve your systems designer in any decision related to editing equipment. This is true whether you are just starting out with freeware or you're about to upgrade to a multi-station \$300,000.00 system. Rare is the teacher who knows all of the requirements and factors necessary for the effective purchase of a

when price shopping, noting that sometimes a package with the lowest price may be just “smoke and mirrors,” containing hidden charges or omitting needed accessories. Paying a little more for reliable service may well be worth it in the long run.

If all goes well, your systems designer/engineer/vendor will become a colleague for the length of your career.

[Note: People often post highly technical questions on the RTNDF listserv. While queries to the listserv can often yield useful information, questions specific to your system should be addressed to your vendor. He or she understands the way your entire system is configured and is far more likely to provide you with information applicable to your needs than someone who is not familiar with your system design.

We do suggest using the listserv as a source of recommendations for local vendors.]

Here are some other things to keep in mind:

- You'll probably never get as much equipment as you need. Technology is just too expensive.
- You'll need to work with your systems designer to develop an *equipment replacement cycle and budget*. This equipment will not last forever, so plan for its demise and/or obsolescence. As a rule, the lower-end gear is less expensive and less well made (although the best you can do on a small budget), so plan to replace the lower-end gear more often. Some of the

nonlinear editing system.

Rob came up with this list of tips for buying your NLE:

- Involve your tech support from the start. That way, they can better troubleshoot when problems arise.
2. Max out your RAM. Not including enough RAM is the biggest mistake people make in system configuration.
 3. Get as large a hard drive as you can afford: digital video is a huge drain on hard drive space.
 4. Get a fast processor. Dual processors are now available for even faster editing.
 5. Limit your machines exclusively to doing digital editing
 6. Decide on a single editing program. You don't want to waste time teaching different editors.
 7. Consider “turnkey solutions.” A turnkey system is one where the computer, monitor, keyboard and all software are distributed, serviced and maintained by a single manufacturer. These setups are very practical for school situations and offer a one-time setup that is consistent from machine to machine. Buy everything from your usual vendor and make sure the vendor gets the entire NLE from one manufacturer.

Note: I particularly endorse Rob's suggestion to limit your NLE's to digital editing. *In particular, do not put these computers on the Internet.* I have yet to find a teacher fast enough to keep crafty students from downloading material from the Internet. NLE editors are very sensitive. After installing them, obtain a program from your technology department that will “lock” all the primary editing program data, thus preventing computer-savvy students

better-made gear will last beyond its normal life span and will need to be replaced by more current, state-of-the-art equipment.

What Kind of Equipment Do You Need?

The type of technology needed depends on the type of program being produced. For example, if the purpose of the class is to teach students how to operate gear in order to produce video shorts to be viewed in the classroom or placed on tape or DVD to be viewed in their homes, relatively low-end equipment can be purchased to meet this objective. On the other hand, if the purpose of the class is to produce a 60 Minutes-style program to be cablecast or broadcast throughout a viewing area, an entirely different level of equipment will be needed. The equipment will have to be of such quality and strength of signal to successfully survive the transmission process and be viewed favorably by the general viewing audience, which is used to the high-quality images seen on network programming.

Location: the finished program may be produced in a studio or shot entirely on location, or it may include elements produced in both environments. Again, the type of equipment needed will depend on the purpose of the program. As will be seen in our suggested list below, both location- and studio-type gear will be needed.

Suggested Equipment List

With these caveats in mind, **Janet, Rob** and **I** came up with a list of suggested equipment purchases at *three different levels of quality and*

from inadvertently (or even intentionally) corrupting the program. Many editing programs do not come with unlimited re-installs. Further, do not load extraneous programs like word processing programs on these machines. *Keep your NLE's exclusively as editors.*

Tapes: You'll also need a supply of tapes. This is a real and present cost. Mini-DV tapes are expensive and short-lived. Most mini-DV tapes have a 9-pass lifespan. "Pass" is defined as one trip by the video heads either in record or play or scan. Therefore, if you shoot, rewind and view, then rewind and play into an editor, you have already used up 3 of the 9 passes a mini-DV tape is good for. While a tape *can* be used more than 9 times, the likelihood of distortions and artifacts appearing in the video increases dramatically. So be sure to include tapes as a specific line item in your budget.

Janet recommends at least two tapes for each student and a new tape for each program you decide to produce and each event (such as games, programs, graduation, etc.) you plan to tape. Also, encourage students to use a tape until they reach the end of it rather than using the beginning of the tape over and over again and leaving the second half of the tape in pristine condition.

You'll also need a budget for replacing consumable batteries for condenser microphones, remote controls, etc. In addition, the system configuration at each level will require an assortment of *cables and adaptors*. Your systems engineer can give you the specifics of what you need.

Level 2 equipment: A word about

budget; in addition, we selected equipment intended for use in *two environments, studio and remote*.

A couple of points to keep in mind:

- These equipment suggestions are “the basics.” After the essential needs are addressed, various luxury items can be considered, depending on your budget.
- The equipment listed in this discussion is generic. However, we will provide an equipment list with specific brands and model numbers in a later posting.
- As much as possible, the equipment will be presented in the order in which it should be purchased as funds become available.

Level 1

Suggested Product:

At **Janet’s** suggestion, the Level 1 product might include:

- “Morning Announcements” type of program with occasional short packages or VO
- Event videography such as archival recordings of athletic events, programs, graduation, etc.
- Production services (instructional tapes, highlight tapes, etc.) for in-house use only

Location Gear for Television Production:

- 3 camcorders with batteries and cases for location shooting in one of these formats: mini-DV

the equipment mentioned below: some pieces of gear purchased for a basic studio will need to be replaced by higher-end gear when the studio is upgraded because the lower-end equipment may not be compatible with the new higher-end equipment.

When you decide to upgrade to higher-end equipment, try to time the upgrade to coincide with your normal cycle of equipment replacement; this can save you some money. For example, when starting out you might have very small consumer-level camcorders that work adequately with inexpensive tripods. As you move up to better cameras, however, you’ll want to get better tripods that are capable of very fluid movements. If possible, time this upgrade with the replacement of the tripods necessitated by the normal cycle of wear and tear.

Level 2

Suggested Product:

Janet suggests the following activities as typical of Level 2 products:

- 12-15 minute taped newscasts in the style of “nightly news” with readers, VO-SOT’s, packages, sports, etc. These could be broadcast to the student body via closed circuit and/or cable or webcast/Podcast. They could also be live-to-tape (non-stop studio newscast) or all done in post-production (anchors taped separately and edited in)
- Production of DVD’s for customers in student-based enterprise
- Cablecast of the program throughout the community

- or direct-to-DVD or direct-to-onboard hard drive
- Extra camcorder batteries and chargers; try to get at least 2 batteries for each camcorder so one can be on a charger at all times.
- 3 friction tripods
- 3 25-foot extension cords
- 3 handheld mics

Camcorders:

Look for the following *features* in your Level 1 camera:

- Image Stabilization, electronic or optical. This feature helps to diminish the shakiness of the hand-held camera.
- Microphone-in jack, which allows the user to connect an external microphone.
- Headphone jack, used to monitor audio playback
- CCDs (charged coupled devices): a camcorder with three CCDs provides greater image quality.

Upgrades: As your facility grows, you will want to upgrade your cameras. Of course, upgrades usually go hand-in-hand with higher prices. You are encouraged to discuss “moving on up” carefully with your systems designer.

Upgrade items to consider:

- Direct-to-DVD camcorders
- Direct-to-onboard hard drive camcorders, which allow you to go “tapeless” and to greatly increase the quality of your product. (They also eliminate videotape, a considerable budget item.)
- Better zoom lenses
- Mic inputs that are XLR rather than mini jacks

Location gear:

- Increased number and quality of cameras available
- Wireless mics both handheld and lapel style
- Boundary mics used to mic an entire room or stage
- Fluid tripods, heavier duty than above for all cameras
- Light kits for each camera
- Field monitors for each camera

Tripods: A tripod can make the difference between professional-looking video and video that screams “amateur at work.” Tripods are essential in studio production. They are often mounted on dollies for easier movement throughout the studio. Do not opt for the cheaper, plastic models. They will not hold up and will not give you the fluid pan and tilt that you need.

Although a tripod may be a hassle to carry and set up in the field, the results are well worth the effort. The better tripods come with ball-leveling mechanisms that make level shots in the field a snap.

The smaller a camcorder is, the more likely the student will prefer to hand-hold the camera. Hand-holding a camera should always be the option of last resort.

Light kits: The newer fluorescent light kits available from various manufacturers are much more economical than the older quartz-type light kits. The lamps are far less expensive than quartz lamps and there is no heat issue with the fluorescent kits. Quartz lamps get extremely hot while in use and can seriously burn to skin or ignite flammable items that are too close.

- Larger CCD's.

Camcorders: Rob reported, "One of the most frequent questions I get about camcorders is how many are needed when starting a program. Here's a simple formula: buy one camera for every four students in your class. Nothing will stall a hands-on program like the lack of equipment! Know this as well: your class will quickly become quite popular, so plan accordingly. I started my program in 2000 with eight students. By 2005, more than 275 students out of the school total of 730 had signed up for one of my broadcast/video classes."

Janet echoed a similar sentiment: "A broadcast journalism class is not a spectator sport and students will quickly lose interest if they are not kept busy. Therefore, it is far better to buy more units (cameras, editors, etc.) and put them in the hands of more students at one time than it is to have one very expensive unit that has a long waiting list."

Friction and Fluid Tripod Heads:

The top of a tripod, to which the camera is attached, is called the tripod head. There are two types of tripod heads, friction and fluid. The friction head is very inexpensive and is not considered to be professional quality.

The friction head keeps the camera in place by tightening a screw that presses two plates together. This pressure on the two plates keeps the camera from tilting or panning. Unfortunately, the only way to tilt and pan is to loosen the pressure between the plates. Once the pressure is loosened, the camera is susceptible to every tiny muscle twitch—even the normal breathing –

WARNING: A professional TV fluorescent lighting instrument is not the same as the fluorescent instruments and lamps available at your local hardware store. The lamps available in hardware stores provide a very green or blue tint that will severely inhibit the quality of your TV image. *Use only TV lamps.*

Studio Gear:

- Cameras upgraded as much as possible
- Wireless communication via headsets (actual professional systems, not the inexpensive electronics store systems) between the control room and the camera operators and the floor director
- Character generator for superimposing titles and graphics
- A preview monitor added to monitors above
- Teleprompter
- An audio mixer to replace the A/V mixer used in Level 1
- Video switcher/mixer
- A music library with re-recording rights *or* one that the students have created with

software such as Apple Garage Band

- A lighting grid with studio lights
- A light board
- Dollies for studio tripods

Luxury items:

- Rear controls for studio cameras
- A third camera

Audio Mixers: Audio boards and consoles are designed to:

1. amplify or reduce incoming signals

of the operator.

The fluid head is professional-level gear. The fluid head keeps the camera in place by putting pressure on a very thick layer of grease between the two plates. This pressure can be gradually increased or decreased, making it possible to move the head with only moderate pressure on the pan handle. This makes the camera much more stable.

Microphones:

- Dynamic mics are the most rugged professional microphones; they are the hand-held mics typically used by on-camera talent or for on-location interviews. The dynamic mic is a good choice for electronic newsgathering (ENG) work, where difficult conditions are regularly encountered. It also holds up well in school environments.
- Condenser mics are not as rugged as dynamic mics, but they usually provide a better quality sound than dynamic mics do. Problems can result when condenser mics are used in adverse weather conditions, so they are best used in controlled environments such as with anchors or in inside interviews. An example would be the personal mic (lavaliere or lapel mic), usually attached to clothing. These mics require a pre-amp; this means that, unlike the dynamic mics discussed earlier, condenser mics require a source of power, either from an AC (standard Alternating Current electrical power) supply or from batteries.

2. allow for switching and volume-level adjustments for a variety of audio sources
3. allow for creatively mixing and balancing multiple audio signals to achieve an optimum blend of sound
4. route the combined effect to a transmission or recording device.

Sophisticated audio boards or consoles also allow you to manipulate specific characteristics of audio. These include the left-to-right "placement" of stereo sources, altering the frequency characteristics of sounds, and adding reverberation.

Connectors: Audio equipment commonly employs three types of audio connectors for microphones, minis, $\frac{1}{4}$ " phones, and XLR connectors. You are familiar with the mini as the connector on your headphones for your iPod and the $\frac{1}{4}$ " connector as the connector you had for headphones on your stereo system 10 years ago. The $\frac{1}{4}$ " connector looks like a larger version of the mini connector. You already know the greatest disadvantage of both of these connectors – with the slightest tug, the wire disconnects. However, the XLR connector uses a locking mechanism and is impossible to disconnect without depressing the release button. The XLR is the type of connector used in professional video. If at all possible, purchase only equipment with XLR connectors. If that is not an option, then you will need adapters to convert from mini or $\frac{1}{4}$ " to XLR. Once again, consult your vendor for help.

Post Production:

Increase the number of post-production editing stations and perhaps the complexity of the software. One editor for every two or three students in a class is a good

- Shotgun mics are used for on-location production to pick up sounds emanating from a moderate distance from the camera. They are usually used in electronic news gathering situations. These mics have a very narrow pickup pattern and are good for eliminating noise coming from either side of the mic.
- Boundary microphones – also called PZM mics – rely primarily on sounds reflected from a hard surface such as a tabletop or stage floor. (PZM is actually a manufacturer's product name but, as Kleenex is to facial tissue, PZM has become a synonym for the category of boundary microphones.) Boundary mics can be used in multiple, roundtable-type interview situations. Several of these on the front apron of a stage can actually cover the sound of a theatrical performance.
- Wireless microphones can solve many of the audio problems encountered in production. They are especially useful when talent must be free to roam, as when doing an ENG report, for example. Most of the microphones mentioned above are available in a wireless configuration.

Wireless mics are not without problems, however. They must use batteries, and the quality of the signal from a wireless mic is directly related to the strength of the charge of the battery. Less expensive ones also can be susceptible to a variety of interferences ranging from lightning during a storm to walkie-talkies and

goal to work toward. Major software systems like AVID Media Composer and Final Cut Pro are becoming more affordable.

At this point, we still believe that adding more units is better than upgrading to ultra-expensive units. The more hands-on time the students have, the more productive and experienced they become.

An additional item to consider is a system for duplicating the work (event videography) you sell. This might be a small DVD duplication system. There are several on the market. We do not recommend using the DVD burner built into your NLE editor for duplicating videos. *You don't want to wear out that burner.* Talk to your systems designer about his/her recommendations. A small four-at-a-time burner might meet your needs, or you might choose to go with the robotic duplicators that that can do 200 DVD's at a time.

Level 3

Janet suggests that products typical of (appropriate to) Level 3 include the following:

- News magazines, talk shows, extended ENG work on location or electronic field production (EFP) of longer works. This might include video yearbooks and other school-based enterprise that would include event videography for clients.
- Live telecasts.

Studio Gear:

- Increase the quantity and quality of everything above.
- Install the equipment and cabling necessary to send out a feed from control room cable to permit *live* telecast from the

baby monitors. Expensive wireless mics are less likely to be affected.

Wireless mics come in two types: the self-contained (all-in-one) unit and the two-piece type. In the self-contained

studio into the school's closed circuit system in addition to airing taped newscasts.

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