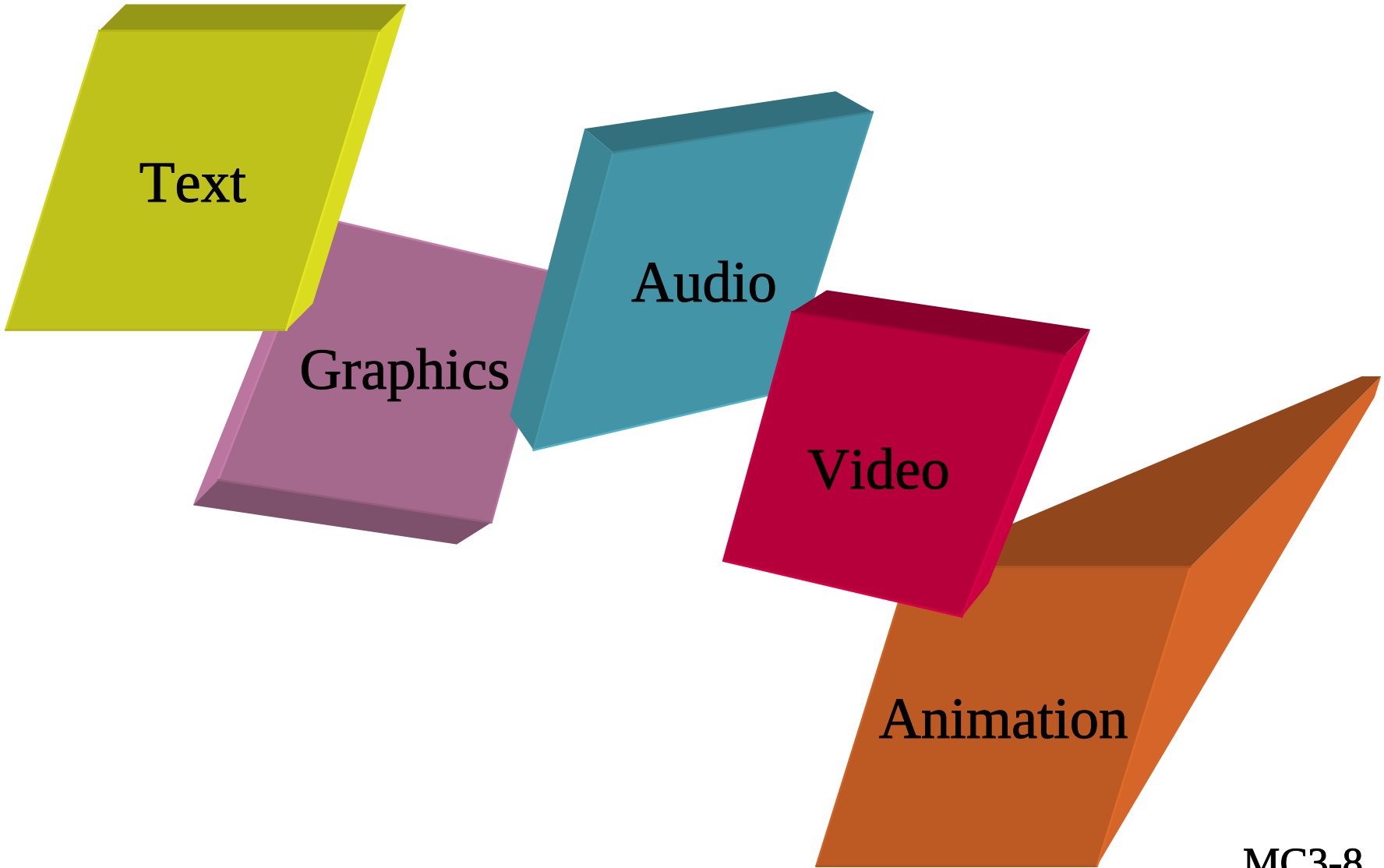
Technology: Media Categories



Audio

As we noted in Module One, *audio* refers to sound elements in a program. These elements can include recorded narration, music, and sound effects (e.g., a bird singing or telephone dial tone). Audio can assist students' learning, as well as add realism, excitement, and motivation to the program.

There are many ways that your students can add audio components to their projects. They can record the audio with a microphone (digital audio); control a CD with audio; use synthesized speech; create music with a MIDI input device; or use clip audio (i.e., elements that are available for free or for sale).

Digital Audio

Audio can be recorded with a computer and stored in a digital format on a computer disk or CD-ROM. The audio files can be accessed and played by a computer program. A major advantage of this technology is that teachers and students can record their own voices or sounds and store them on a computer disk.

Bringing sound into the digital domain of computer bits and bytes requires a sampling process. At small but discrete time intervals, the computer takes a "snapshot" of the level of the sound. This process is called *sampling*, and the number of samples taken each second is referred to as the *sampling rate*. The more the samples, the better the sound quality. For example, audio sampled 44,000 times per second (44 kilohertz or kHz) will provide better quality than audio sampled 22,000 times per second (22 kHz).

The selection of a sampling rate is based primarily on two factors: the quality of sound needed and the disk storage space available. The two factors are interrelated: the higher the quality, the more disk space required, and vice versa. For most educational applications, a sampling rate of 11 kHz is sufficient. If storage space is at a premium, even a 5 to 8 kHz rate will provide intelligible narration. For music programs, higher quality, and therefore higher sampling rates, are recommended.

Compact Disc-Audio

Compact disc-audio (CD-Audio or CD-A) is a popular consumer format that can store up to 74 minutes of high-quality music on a compact disc. The standard sampling rate for CD-Audio is 44.1 kHz, which provides very high quality sound.

In most cases, students will not have the equipment necessary to record a CD-A; however, they can use commercial CDs to enhance their multimedia projects. Commercial CD-Audio discs can be controlled through software programs by specifying the timecode in a hypermedia or authoring program. For example, if students want to create a multimedia program that plays a particular section of Beethoven's Fifth Symphony, HyperStudio will allow students to set the start and end times (in minutes, seconds, and frames). A control panel is used to select the track (song), time, and other

parameters for a CD-Audio clip. It is important to note that the audio is not recorded; HyperStudio merely controls the CD-Audio disc.

Synthesized Speech

Synthesized speech uses a computer program to translate text into spoken output without any recording process. It simply applies its phonetic rules to pronounce all of the words. The disadvantage of the text-to-speech synthesis method is the unnatural and mechanical sound that results. For instance, problems arise with words (such as *live*) that do not follow consistent rules of pronunciation. Most computer synthesizers cannot accurately differentiate between the use of *live* in these two sentences: "I live in Florida" and "We are using live bait."

Another problem with synthesized speech is that synthesizers do not have the natural inflections of a human voice; they do not "drop off" to indicate the end of a sentence as we do in natural speech. The robotic sounds can be a problem in educational settings, where realistic speech is important for teaching pronunciation and language.

An example of synthesized speech is the Blabber Mouth II feature of HyperStudio. With this feature, students can type in text and select one of many "voices"; the computer then does its best to read the text. Because the only component that the computer has to store is the text, the file size is very small for this type of audio.

Musical Instrument Digital Interface (MIDI)

A *synthesizer* is a musical instrument or device that generates sound electronically. Synthesizers have existed in various forms for many years, but many of them were incompatible with each other. In the early 1980s, several manufacturers agreed on a hardware standard for the instruments and the Musical Instrument Digital Interface (MIDI) specification was developed.

It is important to note that MIDI music is *not* sampled and digitized like digital audio files. Instead, MIDI contains information *about* the sound (such as the note value, the duration, and the pitch), not the sounds themselves. MIDI files provide the instructions on how to reproduce the music. The computer then interprets the MIDI instructions and produces the music using the sounds that are embedded in the sound card, MIDI instrument, or sound module. An advantage of MIDI technology is that it can produce very complex music with very small files. It can play the sounds for stringed instruments, woodwinds, brass, and percussion simultaneously. To produce a MIDI composition, one uses a MIDI input device (e.g., a keyboard) and software that captures everything as it is played. After the musical information is loaded into the computer, it can be edited or revised in relation to its rhythm, meter, tone, and many other parameters. With MIDI sequencing software, you can experiment with harmonies, record different parts, and play them back as a complete arrangement. MIDI files are often used in multimedia projects because the file sizes are very small. For example, a file that is less than 10K may play a

song that is 2 to 3 minutes long. If your school does not have the equipment to record MIDI files, you may be able to locate copyright-free files on the Internet by typing "copyright-free MIDI files" into your search engine. (Note: Sites come and go, so if we were to give specific Web addresses, they might be gone by the time you read this. Conducting your own search will probably be more fruitful.)

Digital Audio File Formats

Many different audio file formats are used for digital audio. Some of the formats work only on Macintosh computers; others work only on Windows computers. Some file formats may be recognized by one program and not another. For example, .SND and .AIFF formats are common on Macintosh computers, whereas .WAV is the most common format for Windows computers. A common format on the Web is .AU, which works on both Macintosh and Windows computers. If you have an audio file that is not in the correct format, there are programs that will convert files from one format to another. For example, SoundApp (type SoundApp into your search engine to fine where to download this program) will convert an .AIFF file to an .AU file and GoldWave (type GoldWave into your search engine to find where to download this program) will convert from .WAV to .AU.

Obtaining the Rights to Audio Files

The fair-use portion of copyright law is generally interpreted as allowing students to use copyrighted music in a classroom situation to fulfill an instructional objective (such as an assignment to create a multimedia project). If students want to use music on their Web site, however, they must be very careful that they have the rights to record and/or play the music files. Recording a song from the radio and adding a link to it from a Web site would definitely violate copyright laws.

To be on the safe side, it is best to purchase the rights to any song your students want to use. There are several options for obtaining musical rights, including locating shareware sound files on the Web or on a CD-ROM.

Obtaining Sound Files From the Internet

Numerous shareware sound files are available on the Internet, including archives of Macintosh audio files (.AJFF or .SND format), audio files for Windows computers (.WAV format), and files designed to play on both Macintosh and Windows (.AU and .M1D format). Prior to incorporating these files into a Web page or an application that will be distributed beyond the classroom, you should carefully read the permission statements. If there is no permission statement associated with the file or Web site, send an e-mail message to the site administrator to request permission.

Obtaining Sound Files from CD-ROMs

If you are seeking music or sound effects for a multimedia project, you can locate

"clipmusic" discs. Clipmusic discs were designed to distribute musical files that can be legally copied and used by the person who purchased the disc. Some of these clipmusic discs contain sounds (such as trains, planes, cars, etc.); others have short music files that are in the public domain (generally those that are more than 75 years old). Public domain music can be used freely in any environment.

In most cases, when you buy clipmusic discs, you also purchase the rights to duplicate and use the files. However, always read the fine print (or place a call) to make sure you can use the files on a Web site or in a multimedia project that will be distributed beyond the classroom.

Audio Guidelines

There are many situations when audio is appropriate in a multimedia program. For example, if the program was designed for nonreaders, or if it contains music, then audio is definitely required. In addition, audio is a great way to teach someone a different language or to include sound effects (such as heartbeats). However, audio files can be quite large, and students should be cautioned to use them only when necessary. The following guidelines should be considered for audio.

- Use audio only when it is appropriate to the content of the program.
- Record audio at the lowest acceptable sampling rate, to save file space.
- Use synthesized speech for programs that require a lot of spoken words.
- If possible, use MIDI for music—the files are much smaller than digital audio.
- Do not add audio that will distract from the screen display.
- Check copyright restrictions if the audio will be played outside the classroom environment.
- If the audio file format is not recognized by your software program, locate an audio converter program to change the file format.

(Adapted from *Multimedia Projects in Education,* Ivers & Barron, 1998, pages 79-82. See page iv of that text for permission to reproduce up to 15 pages.)

Advice on Basic Audio

Because video is such a visual medium, the audio is often neglected in beginning video production. Audio can be just as important as the picture -- we want to be able to hear what we see! What follows are some suggestions and considerations for capturing good sound. Add in any tips of your own.

Always, always, always:

- Test your equipment before you leave the classroom or plan to use it. It's better to find out a microphone isn't working in class than when you're out in the field trying to gather video.
- When you're using the camera, check your sound before you start. Do a brief test, then play it back and listen to it on your earphones.
- Take a pair of earphones with you so you can listen to the sounds you are gathering.

Getting good sound in interviews:

- Ideally, a microphone is held or placed 4 to 6 inches away from a person's mouth in order to capture clear audio. If you use the on-camera microphone, the ideal distance is about 3 feet -- just far enough away to focus on a good head-and-shoulders shot (but be careful about any noise you make -- because you're closer to the on-camera microphone than they are, you will be louder).
- If one is available, use a clip-on lavalier mike or a handheld microphone for interviews. The closer the microphone is to the source of sound, the better.
- If you use a lavalier mike, be aware of things around the mike that may rub against it and interfere with the audio you are trying to record. For example, long hair and necklaces can rub against the microphone, causing noise.
- When recording interviews, you will often have two or three people with important roles. One person will run the camera, one person will ask the questions (and take notes if necessary), and one person will hold the microphone. Usually the person asking the questions can also hold the microphone (or can use a lavaliere mike). There is also the "one-man band." This is one person who does it all -- shoots the video (either on a tripod or on his or her shoulder), holds the microphone or uses a lavaliere mic (if she or he holds the microphone, a tripod is usually used so the interviewer can stand closer to the interviewee), *and* asks the questions! Bear in mind that the more people closely involved in getting the interview, the more intimidated the person being interviewed may feel.

Adding music to your video:

- If you plan to use music, be aware of the impact of music and sound effects on your piece. Choose them carefully to reflect the feeling and pace of your shot.
- One way to try experimenting with adding music and sound effects after your shoot is to use the "audio dub" feature on your camera (if it has one). This feature allows you to record audio (music, voice, or other sounds) over the video you've captured just by

pressing down the button while you play the video in the camera. Bear in mind that if you use this feature, you will erase all other audio on that part of the tape.
- Pay special attention to the distance from the source audio to your mike and the background noise. These will be the most important variables in getting good audio.

Natural Sound:

- Any sounds that occur naturally are called "natural sound" (e.g., the roar of a crowd of protestors, the sounds of birds in a forest, the general noise in a room). This is in contrast to something like an interview, which wouldn't happen unless you asked a person questions. If you want natural sound, decide if you want to hear specific voices or just general room noise. The on-camera microphone will pick up a lot of general room noise.

<http://pblmm.k12.ca.us/TechHelp/VideoHelp/bProduction/Audio_Advice.html> Adapted with permission from San Mateo County Office of Education.