by Richard Rose, Ph. D.

Personnel Training

Does your staff need some refresher courses? Individualized onsite training often proves more useful than certificate-based training.

There are 12 eager students currently enrolled in my basic networking course. Nine of them are life-long telephone management employees well into their fifties. They are being retrained because their company is "getting into networks," and because they are DOS illiterate. The course and its companion lab book require that I discuss the subtleties of complex architectural elements of the NOS, which I did. During this discussion, the eyeballs of these nine students turned to glass. Because they have no idea what a path is, much less a UNC, they fell apart in the first lab and have been limping along ever since. Without the successful completion of the first lab, the subsequent labs cannot possibly work. These students don't know when they will actually work with this technology, but they are certain that it will not be for at least three months. The chance that they will retain anything useful from the class after that amount of time approaches zero.

The three other students are experienced networking professionals who are attending to brush up for the certification test. They find my continual explanations of terms like *IRQ*, *cluster*, and *track* excruciatingly elementary. Their frustration with the course's pace leaves me feeling that a better way must be available. There is a better way: tailored, onsite training.

CHOOSING A TRAINER

Deciding the best method for training network staff is really a no-brainer. If certification matters to the organization, official curriculum classes that prepare for certification tests are the best choice for staff training. These classes can supplement an organization's in-house training, which is more finely tuned to the specific network and staff needs. If certification is not an issue, the choice is simple. You can keep the training effort entirely in-house—provided you have on-staff trainers who have the required technical and presentation skills, as well as time available in their busy schedules.

It's important to keep in mind that making a staff member responsible for training can lead to a variety of problems. First, not everyone has the skills to be a teacher. In addition to a thorough knowledge of the subject matter, a teacher must have excellent presentation skills. Second, it's better to have a neutral source provide the material—office politics can sometimes taint an otherwise good learning experience. However, most often, the time factor weighs heavily in the decision. Who on your staff has the extra time to plan and prepare course work?

If your organization doesn't have the resources to use on-staff trainers, you will want to bring a training company to your site to do the job. (Table 1 on page 68 provides a list of major training organizations.) And there are some good reasons for choosing a training organization that will come to your site rather than sending your workers to an offsite training facility.

- Onsite training is more likely to target the specific needs of your company than open registration courses would.
- The instructors have the flexibility to tune the direction and pace of the training to the needs of your network management staff.
- With onsite training, those who most need the training can attend, yet they are still available at the workplace to deal with any legitimate crisis.
- Your staff is trained on the actual hardware and software that your company uses.

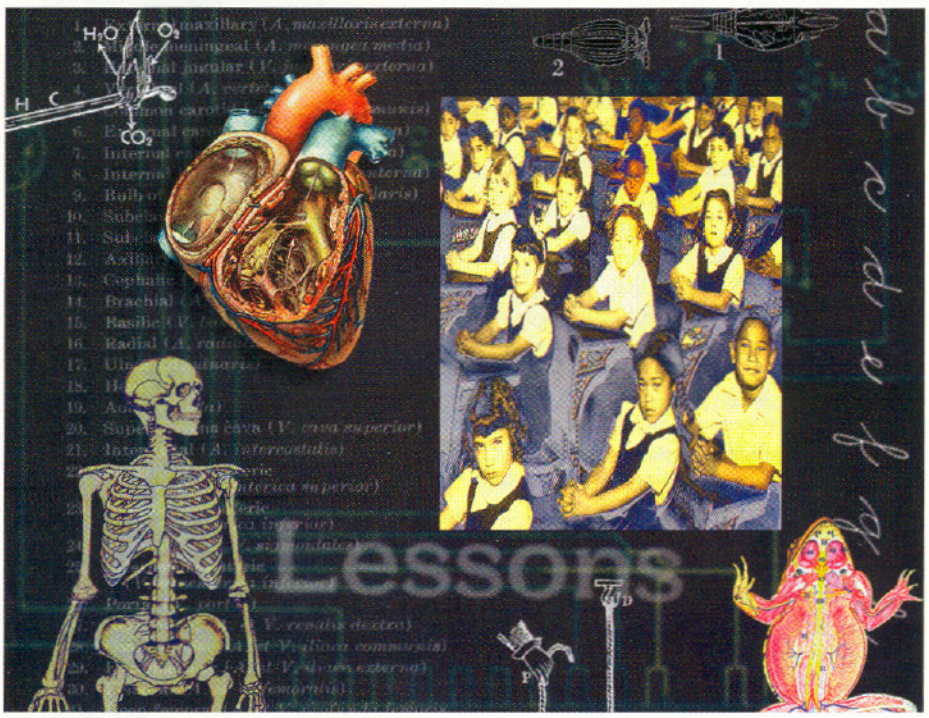


Illustration by Sarah Pyle

Once you've established that onsite classes are the best choice, the critical question is, how do you get high-quality training that will bring the results you pay for? The process is the same as the one you face when contracting for any other deliverable. You need to write specifications for potential vendors to respond to, evaluate their recommendations, draft a final agreement, facilitate the delivery of the product, and evaluate the results. This endeavor takes some time, but is well worth the energy you spend. If you were buying a cluster of routers, you would certainly want to know something about routers and routing theory before you started the procurement process. If you want a successful training program, you need to know something about instructional design, adult learning, and training delivery options. The balance of this article is a crash course in just that.

INSTRUCTIONAL DESIGN

From the moment you decide to move forward with a training program, reality factors work continuously to create distance between your intentions for the program and the results you will finally achieve. Instructional design is the process by which you and your training provider fight back to get your training effort headed in a consistent direction and keep it there, in spite of all the distractions. "Instruction Guidelines," on page 70, outlines many of the points you should address with your training vendor.

The heart of any successful instructional design process is accountability: Trainers fulfill the responsibility of teaching the staff how to run and maintain an efficient network. Network management training cannot afford to be mostly about itself, the way many people's college experience is mostly about going to college. In ancient China, medicine was geared toward the prevention of illness, and the doctor was fired if the patient got sick. That's how you should think about network management training: The network staff is the constant and the training strategy is the variable. If the training does not go a long way toward assisting the people in keeping the network healthy, it is time to rethink the way the training is conceived, structured, and delivered.

MASTERY LEARNING

Network management training must be different from other forms of formal education. It should not be about beginning to contemplate, understand, be exposed to, or see the beauty in computer networks. It must be about mastery—the ability to do something in a consistently excellent way. Considering how critical the performance of network management personnel is to the success of the organizations they serve, it is clear that nothing short of mastery will do. Fortunately, 40 years of solid research on how to teach people to master job skills is available. The most accepted learning strategy to grow out of all that analysis is Mastery Learning, which is most closely associated with Benjamin Bloom and two critical documents, "Taxonomy of Affective Learning" and "Taxonomy of Cognitive Learning," written in the 1950s. Three core ideas are at the heart of Mastery Learning: the 80/80 Rule, ability grouping, and the tutorial mode. Any network manager contracting for onsite training services would do well to insist

that each concept be incorporated into vendors' training proposals.

The first concept, the 80/80 Rule, is that the trainer moves forward only if 80 percent of the audience is comfortable with 80 percent of the skills they have been taught so far. The best way to make the case for the 80/80 Rule is to describe what happens when it is not honored. Imagine you have a five-day training class for 20 network management staff members. You have structured the course so that each day's work builds on the material you presented the day before. Let's assume that after the first day, only 70 percent of those attending are really on top of the content. That means on Tuesday morning, 14 of the students are up-to-date and can profit fully from the new material that builds on what was taught Monday; six cannot. Let's further assume that of the 14 who have a fighting chance, 70 percent stayed in the game on Tuesday, and the rest got confused. You now have 10 students who are in a position to keep up on Wednesday. Half the class is gone. On Thursday morning, seven are left standing. On Friday, five are still treading water. By the time the class ends on Friday afternoon, virtually the entire class has lost the thread.

This theoretical doomsday scenario may overstate the case a little. Monday's survivors are now a somewhat more select group who should have a somewhat better than 70 percent chance of making it through Tuesday. Also, some of what is taught on Tuesday may not depend entirely on Monday's work, so even the 30 percent who fogged up on Monday might gain something out of the second day of instruction. Still, it's clear that many students will be in trouble by Friday.

Ending the class with only a few happy campers would be bad enough, but the results are potentially worse because trouble also brews at the top end of the learning spectrum. In every class, a small percentage of very capable students becomes bored and alienated by what they see as the instruction's slow pace. Each day they move further ahead until they, too, find the training of little interest.

This scenario is clearly unacceptable, but what is the alternative? Mastery Learning's answer to the problem is ability grouping. After the first day, or even earlier, the instructor should start working with that lower 30 percent and the top 10 percent as separate units. Because it usually does no good to just repeat instruction, the teacher must find alternative ways of presenting the material to the less prepared group the second time around. Enrichment activities that go beyond the required skills to address higher levels of job performance must also be available to push and challenge the top students.

Fortunately, an onsite instructor who is operating outside the world of open registration, certification-based courses can center the presentation around the students in the class and the skills they need, rather than around the requirements of a battery of certification tests. It's important that the instructor recognize the various levels of student ability as early as possible, and that the instructor track the students for instruction before the problems occur.

The third element of Mastery Learning is a strong emphasis on tutorial mode. One-on-one tutoring has been continually demonstrated as the most effective teaching technique. With tutorial help, the most mod-

TABLE 1—TRAINING CENTERS

If you are considering hiring a trainer to come to your site, it may be easier to contact larger training organizations or call the vendors directly. Here is a list of contact information for national training companies.

3Com
Santa Clara, CA
(800) 847-6972
http://www.3com.com

Artisoft
Tucson, AZ
(800) 233-5564
http://www.artisoft.com
dlaux@artisoft.com

Astron
Orem, UT
(800) 263-1995
http://www.astonet.com

Banyan
Westboro, MA
(800) 832-4595
http://www.banyan.com

Bay Networks
Santa Clara, CA
(800) 252-6926
http://www.baynetworks.com

Cisco Systems
San Jose, CA
(800) 553-6387
http://www.cisco.com/warp/public/10/index.shtml

Digital Equipment
Maynard, MA
(800) 332-5656
http://www.digital.com\info\learning\dls.html

ExecuTrain
Alpharetta, GA
(404) 667-7700
http://www.executrain.com

HTR
Rockville, MD
(800) 882-6420
http://www.htr.com
info@htr.com

IBM Professional Certification
Austin, TX
(800) 426-8322
http://www.training.ibm.com\usedu

Info Image, Workgroup University
Phoenix, AZ
(800) 489-9511
workgroup_university@infoing.com

Ingram Micro
Santa Ana, CA
(800) 234-9220
http://www.ingram.com\newtech\dismain.html

Knowledge Alliance (formerly Random Access/Training Access)
Aurora, CO
(303) 338-7130
http://www.knoall.com

Lotus Development
Cambridge, MA
(800) 346-6409
www.lotus.com
CompuServe: GO LOTUS

Microsoft
Redmond, WA
(800) 688-0496
http://ftp.microsoft.com/services/msedcert/e&cmap.zip
CompuServe: GO MECFORUM
The Windows 95 Microsoft Network also offers the Microsoft On-Line Institute: moliquest@msn.com

Microware
Education Centers
Fremont, CA
(800) 444-7300
http://itbridge.com

New Horizons Computer Learning Centers
Santa Ana, CA
(800) 633-7763
http://www.newhorizons.com

Novell
Provo, UT
(800) 233-6232
http://corp.novell.com\educat

Productivity Point
Hinsdale, IL
(800) 848-0980
http://www.propoint.com

PTS Learning Systems
King of Prussia, PA
(800) 229-3210
http://www.ptsls.com

Santa Cruz Operations
Santa Cruz, CA
(800) 726-8649
http://www.sco.com

Sun Microsystems
Mountain View, CA
(800) 422-8020
http://www.sun.com/sunservice/suned

Syntrex
Valley Forge, PA
(610) 650-3100

Teknowlogy Education Centers
Dallas, TX
(214) 373-9998
http://www.teknowlogy.com

Trellis Network Services
Boston, MA
(508) 485-7200
http://www.trellisnet.com
trellis@trellisnet.com

USConnect
Stamford, CT
(203) 977-1175
http://www.usconnect.com

Valinor
Manchester, NH
(800) 370-8258
http://www.valinor.com

Wave Technologies
St. Louis, MO
(800) 828-2050
http://www.wavetech.com or
info@wavetech.com

Westcon Services
Eastchester, NY
(800) 526-8322
jjohnson@westserv.com

In addition, the Communications Corp. of America maintains a general home page of authorized Lotus, Microsoft, and Novell education centers.
Nashville, TN
(800) 472-8361
http://www. edunet.comcorp.com

estly gifted trainees become more than adequate performers of a task, and the average student becomes an exceptional performer. Mastery Learning moves naturally in the direction of tutorial attention because even ability grouping does not always target student learning as precisely as the instructor would like. While it is impossible to give tutorial attention to every trainee consistently, you should ask your training provider to make some provision for working with your people as individuals at least some percentage of the time. It's difficult to predict the correct percentage for tutorial time; however, more is always better.

COOPERATIVE LEARNING

While Mastery Learning provides the ideal structure for training network management personnel, cooperative learning provides the ideal style. The thought behind cooperative learning is that if everyone collectively is responsible for the success or failure of the unit's mission, which in this case is keeping the network humming, everyone should also be collectively responsible for learning how to do that job. While Mastery Learning stresses the importance of creating groups, cooperative learning is about what happens inside them. Following are practical examples of cooperative learning.

The instructor sets the tone to help everyone throughout the class. In some of the networking classes I have taught, I have wondered whether some of the trainees suspected that I was filing secret reports with their employers on how they were doing. Such students never ask a question or request help. If they cannot do an exercise in the lab book, they patiently sit until time runs out, with the hope that they won't be noticed and that they will have better luck with the next task. Needless to say, they don't learn much.

Trainers should create an atmosphere that is conducive to risk and the learning that comes with it by encouraging students to ask questions and by clearly establishing that mistakes are expected. Trainers should also encourage productive tangents and reassure students that while the training is being evaluated, the trainees are not. Good learning opportunities are never grim and solitary—students should expect to leave the training with new skills and a strengthened spirit of cooperation within the workgroup.

The initial direction of the training is negotiated through group process. The training should begin with a discussion of how the technology being studied is going to impact the job responsibilities of various members of the class. The group can then create real workplace scenarios that become the focus of the class's work. For example, imagine that the

POINTS TO CONSIDER WHEN DESIGNING THE TRAINING STRATEGY

Instruction Guidelines

When your training provider submits a proposal, insist that it include a detailed plan for each area described below (see figure). You need to block out some time to work with your training provider to discuss these points.

Assess your needs:
- State the mission of the organization.
- Define how the network supports that mission.
- Explain why your staff needs training.
- Describe your expectations of the training.
- Describe pitfalls the training will help you avoid.

Assess your learners:
- Who will receive the training?
- Could the group scheduled for training succeed in gaining the desired level of job competence in a reasonable period of time without training?
- Would providing those staff members with the materials and the time to study them achieve the same result?
- What skills do the students have, and how will the training build on them?
- What training have they already received?
- Do they have the time to be trained?
- How will their usual work load be attended to while they are in training?

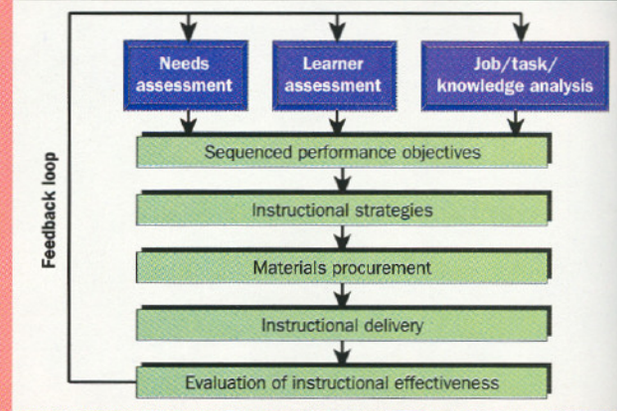
Analyze students' jobs, tasks, and knowledge:
- Decide which employees within the group will be trained to perform which aspects of network management and support.
- Detail the overall job description of each staff member to be trained.
- Describe the discrete job tasks that staff members must perform to excel in their roles as outlined in the job descriptions.
- State the knowledge necessary to achieve those tasks.

Create performance objectives and measurements:
- Generate performance objectives for each person in the following form: By the end of the proposed training, manager X will be able to consistently succeed at task Y.
- Propose tests to determine whether the training has met performance objectives. This could include a skills test using paper and pencil or hands-on testing where the students have to perform skills independently or under close supervision.

Sequence performance objectives:
- Put the performance objectives in a certain sequence and understand the dependencies between them. Trainers must be conscious of the logical sequence of job skills. For example, prerequisites cannot be explained if the objective is to teach level-3 skills.
- The training must be taught in a logical sequence. Basic learning must precede higher learning.

Specify instructional strategies:
- Decide how the training material will be delivered to meet the objectives.
- Propose alternative delivery systems that meet the needs of the diverse group of trainees.
- Choose a training medium: multimedia, programmed instruction, or computer-based training, for example.
- Find the necessary facilities.

THE INSTRUCTIONAL DESIGN PROCESS



A Winning Proposition. *This flow chart of the instructional design process tracks the areas that should be addressed in a training vendor's proposal. Each of these areas should be included in the training.*

- Decide on the training time period and the schedule. Three or five days of short bursts of training with an opportunity to return to the job and implement the instruction is the best method. Steer away from four-day courses because they destroy the work week.
- Be sure that excessive time does not pass between the time when the training takes place and the time when the trainees have their first opportunity to apply their new learning.
- Plan follow-up activities after the training is completed to facilitate a high level of retention. The half life of new information is incredibly short; it is retained longer when it is put into practice.
- Draw up a handbook of skills for employees who come onboard after the initial training period is over, but who still need the skills that were covered in that training.

Design the instructional materials:
- Choose the materials you want to use. Do they exist at the workplace, such as the Microsoft Tech-Net and the NetWare Support Connection CDs? Can they be readily purchased, such as trade books and vendor documentation? Will they have to be custom-written or adapted for this audience?
- Choose a writer if the documentation is to be custom-written.
- Determine a time frame for the materials' completion and their cost.
- Choose a review board to assess the material and to ensure that it is accurate and up-to-date.
- Make sure the training materials make allowances for differences in job tasks and various backgrounds among trainees.

Deliver and evaluate the instruction:
- Evaluate the instruction to see if it has impacted job performance. If the necessary knowledge hasn't been acquired, implement alternative training methods to repair or replace training.
- Decide how you will follow through if the training has had a positive impact. (Will successful learners move to a next tier? When will training begin on the next product installation or upgrade?) **LAN**

company is installing a new NOS. A few of those attending the class might have primary responsibility for backup and a few others might fill in for them on occasion. This subgroup might wish to discuss what combination of full, incremental, and differential backups they currently use with the existing NOS, what they have learned from current practice, and how they would like to set up the backup procedures on the new system. Their requirements could be the new focus of the lab module on how to configure backups.

The instructor should encourage course changes that emerge from group interaction. In a rigid classroom structure, the instructor covers the book and the students live with it. Some classes are like a bad night at the movies. You paid your seven bucks and cleared the time, so you might as well sit there even if the plot isn't working. Cooperative learning avoids this by requiring trainers to be flexible and prepared. The group can inform the trainer at any time that the pace is too fast or too slow, that the content is not really what they need to do their jobs, or that the presentation style is out of sync with the way they learn best. Trainers must have an up-front commitment to encouraging such suggestions and, where possible, respond to them wholeheartedly. The teaching that results from this willingness to adapt will certainly earn a higher level of buy-in from the students.

Labs are presented as group projects. Standard classroom lab procedure is that each student works independently or with a single partner. In collaborative lab work, the students are divided into teams where each individual is assigned a role: One team member may be responsible for staying on the right step in the lab book, two others work the keyboards at the server and client, and a fourth is in charge of recording the results of the lab exercise. The roles are rotated after each task is completed.

LEARNING IS A PROCESS, NOT AN EVENT

Having stressed the importance of demanding structure, method, and accountability when bringing trainers to your site, you must also realize that none of these elements pays off like a gum ball machine. All the applied learning science in the world will not change the fact that different people learn best in different ways and at different rates. For each individual, the learning curve is more like a staircase, with flat fuzzy times of not-quite-getting-it followed by quick leaps in competence.

Work with established training vendors who are willing to take the time to get to know your people as they struggle through their personal learning processes. Establish long-term relationships with your chosen vendors and show the loyalty that you expect in return when your needs are urgent and their schedules get crowded. Although the availability of a small army of trainers ready to jump off a plane at a moment's notice to deliver training from canned training materials may suggest the opposite, network training will never be a commodity. You get what you pay for and you pay in patience, cooperation, and logistical support, as much as in hard cash. **LAN**

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