TWELVE TIPS

# Twelve tips for developing educational multimedia in a community-based teaching hospital

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SUMMARY *The Office of Educational Technology at Lehigh Valley hospital was formed in 1997 with one of its goals being to develop educational multimedia programs for medical education. The first project chosen was a hypertension/hyperlipidimia tutorial for third year medical students. Proper planning and project management techniques, including suggestions for project team participants, tips on selecting a first project, an instructional design based on constructivism, introducing computer-based training into the curriculum, and what tools to use are discussed. Also addressed are ways to overcome unforeseen challenges, such as scheduling time with an extremely busy subject matter expert, unavailability of project team members due to other commitments, and finding inexpensive graphic resources for the program.*

Attending lectures is an integral part of a third year medical student's rotation in a teaching hospital. While lectures are a time-honored method of disseminating information, they take the students away from the clinical setting where learning also occurs. Also, lectures occur on a set date and time; if the student misses a lecture (perhaps she is attending to a patient), she has to wait for the lecture to be repeated. The faculty member must also take time out of his schedule to give the lecture, which takes him away from patient care and teaching students in a clinical environment. In addition, giving the same lecture over and over is tedious for the lecturer, which is not conducive to a rich learning experience.

Converting the lecture to computer-based training (CBT) relieves the faculty member of the tedium of delivering the lecture as well as offering a convenient and interesting method of learning for the student. The Office of Educational Technology, a unit within the Center for Educational Development and Support at Lehigh Valley Hospital, was formed with one of its objectives being to create and develop innovative instruction through the appropriate integration of technology into the curricula of graduate and undergraduate medical education programs. Creating multimedia CBT to replace lectures falls under this mandate.

## Where to start?

While some members of our newly formed department had experience with multimedia programs and their related software, the multimedia development team concept was new to our environment. We had little idea how to organize or how to manage multiple projects, nor were we sure of the correct hardware and software available to us.

Instead of building the department infrastructure in a vacuum, we looked to other models to emulate. We looked for a community-based teaching hospital that was producing educational multimedia programs. Our search was not successful, so we broadened our search to include any healthcare multimedia development groups on which to model our team and found the Faculty and Instructional Development Group at Virginia Commonwealth University/Medical College of Virginia (VCU/MCV).

Our group made a site visit to VCU/MCV to observe their organization and meet with their members. As a result, we incorporated many of their practices in our departmental procedures. We could not, however, mimic their entire organization since our environments are so different. Being a medical school, the staff members of VCU/MCV don't have the same responsibilities that we have. Their charter is to work with the faculty to educate students on medical topics via computer technology. At LVH, educating medical students is only part of our job. We also provide computer education (office automation, operating system, hospital information system) to the entire hospital staff and physician office staffs.

> **Tip 1**
> When searching for a model for the development team, it's rare to find an exact match for your organization. Adapt and modify what you find to best fit your needs.

## Introducing CBT

Medical education at Lehigh Valley Hospital is traditionally delivered through lectures, grand rounds, assigned readings and clinical experience. CBT is a new paradigm, and thus suspect as to its validity. Many faculty members and students are wary of using CBT because of the lack of instructor/student feedback. Faculty members are especially reluctant as their medical training did not include computers, nor did they grow up with computers like the large majority of medical students and residents did.

As we began working on our first CBT project, we also introduced other CBT programs to the staff and students.

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We gave demonstrations of commercially produced CBT products, and encouraged faculty to include them in their lectures and reading lists. Links connecting to medical sites on the Internet were made widely available, and web-searching classes were offered. These efforts helped to reduce the anxiety level regarding CBT use, and also promoted use of technology to deliver medical education as well as self-study via CBT.

> **Tip 2**
> Educate colleagues on CBT theory and uses. Emphasize its advantages and how it can positively affect their lives.

### Members of the project team

The chief of ambulatory medicine, a long-time champion of computer-based education, joined the project team as the subject matter expert (SME). The other members of the project team included an instructional designer, academic programmer, and educational technology analyst.

While a four-member team might seem a bit large, it was necessary to make sure we had all the skills needed to create an effective program. For instance, although the SME is a proponent of CBT, he is not a programmer. The programmer doesn't know educational theory nor does he have a medical background. The instructional designer and educational technology analyst brought educational theory and experience to the group. We needed the expertise of these four people to properly create the CBT program.

> **Tip 3**
> Include members on the project team who are experts in the subject matter and educational theory as well as the technical aspects of creating multimedia programs. It is very helpful if the SME is a proponent of educational multimedia.

### The first project

The SME reviewed his lectures and recommended converting the hypertension/hyperlipidemia (HT/HL) lecture to a computer-based format. The project team collected the lecture materials, including outside readings and sample case studies. As we reviewed the HT/HL materials, we saw many opportunities to include education on skills and medical aspects that weren't included in the non-computer-based HT/HL education. For instance, in the HT/HL lecture, patient data was given to the students as if the patient interview had already taken place. In the HT/HL CBT, we decided to include a patient interview to provide the patient data as well as allow the student to view a patient interview to reinforce the importance of interviewing skills. Other features we added include the ability to order multiple lab tests (versus being given the pertinent lab information) to properly diagnose the patient, a patient bill that keeps a running tally of all services provided (to teach managed care principles), pertinent heart sounds, fundoscopic exam results, a pop-up glossary (hypertext), and a 'library' which included articles and other HT/HL reference materials. We also included a testing area to quiz the learner on HT/HL information and treatment. The test includes feedback for all answers and allows the student to review material in which she is deficient.

The above features make for a very sophisticated CBT, especially for a first time project. Since we insisted on adding so many advanced features, the development time greatly expanded. In addition, we also had to learn on the fly how to use more sophisticated programming tools and methods, which caused some headaches and delays.

> **Tip 4**
> Choose a simple first project. While you might be tempted to add features that make the CBT more interactive and exciting to use, it's less frustrating and faster to create a simpler CBT the first time. To protect your sanity, save the flashy stuff for future productions when you have more experience with CBT programming.

### Instructional design

The term 'educational multimedia' might conjure thoughts of technology-based learning systems containing sound, animation, and video. Unfortunately, many educational multimedia products rely heavily on technological wizardry to impress learners while ignoring sound instructional design, which forms the structure where learning takes place. Instructional design techniques ensure that projects include a needs assessment, a goal and scope, an audience analysis, learning objectives, appropriate instructional strategies, an assessment plan, and formative and summative evaluations.

In the process of learning and teaching, subject content is often approached in a mindless manner. Learners and teachers are often trapped by old categories of information, automated behaviors that may cause us to miss new signals, and the inability to think from more than a single perspective (Langer, 1997). Our team wanted to avoid the 'mindless' approach to our project as well as create a product that was challenging and motivating. Consistent with flow theory (Csikszentmihalyi, 1990), we attempted to create an activity that was gratifying and that learners would enjoy doing with no conscious thought to reward or gain, even if the activity was difficult. These concepts were foundational to the project, but needed to fit neatly within the instructional design model we selected. Our instructional designer chose a combination of instructional design methods, using the Instructional Systems Design (ISD) model (Dick & Carey, 1990) framed by a constructivist learning environment (CLE). The ISD model was modified by process rather than structure and included Gagne's nine significant events of learning (Gagne, 1985) which guided development of the instructional plan.

For the constructive process to occur, the learning environment should be representative of the real world and contain adequate resources to enable problem solving. In other words, students become active participants and interact with the learning environment. Using the ISD model and CLE, our team was confident that we had achieved an excellent synergy between our foundational concepts, instructional design model, and learning environment. Since learners become active participants in a CLE, they will be motivated, even gratified, and less susceptible to mindless learning behaviors.

> **Tip 5**
> Use sound instructional design techniques to guide the project.

### The prototype

With the instructional design of our CBT program in place, our first task was to build a prototype of the HT/HL CBT. Building a prototype is necessary to gain a clear picture of the CBT program's design and how effective its navigation method will be.

We decided to do a rapid prototype, which consisted of our navigational screens along with one case study and its supporting reference material. From this rudimentary program, we hoped to determine whether or not the CBT program was navigated easily and intuitively. Had we created a more traditional (working) prototype, it would have included all our cases and much more reference material (i.e. an alpha version of the final product).

We decided to do a rapid prototype because it takes less time to review and test the program as it is being built than it is to build then go back and make major revisions.

> **Tip 6**
> Develop a rapid prototype early in the production stages to demonstrate the CBT to the target audience to get their buy-in.

### The target audience

The target audience should consist of a sampling of the people for whom the CBT is being created. It is tempting to include a large number in the target audience; avoid this temptation. Many people in a target audience will elicit many differing opinions—the 'too many cooks spoil the broth' syndrome. Also, with a large group, it is hard to get everyone involved in a timely manner. For time and clarity, keep the target audience to a manageable size.

Use target audience participation for selling your CBT program by including potential proponents of CBT technology as well as people who might be resistant to CBT. Including these people will excite the proponents and educate the resistors.

Once the target audience has been identified, create an agenda for the testing of the prototype. Ask for feedback from specific questions about the CBT—the navigation, look and feel, etc. Avoid open-ended questions like, 'What do you think?' since these questions rarely elicit helpful (if any) criticism.

> **Tip 7**
> Identify and organize the target audience for testing the program. Be sure the testing is directed by the production team and not left to the caprices of the target audience.

### Time with the SME

The biggest problem we encountered during production was scheduling time with the SME, who is a practicing physician and a member of the faculty. Because of his responsibilities it was difficult scheduling time to meet with the rest of the production team to review and refine the content of the CBT program. To get his input, we used other methods of communication.

E-mail was an effective tool to get information from the SME; however, the questions posed in e-mail had to be the type that could be answered definitively. E-mail is not a good tool for solving complex problems that require follow up questions and detailed answers. Voice mail has the same advantages and disadvantages of e-mail, except the SME was more likely to check his voice mail on a regular basis than his e-mail.

The most effective method of getting information from the SME was brief meetings, generally prompted by an e-mail or voice mail. The initial contact would tell the SME what we needed and when. After that, we'd schedule a brief (15 min or less) meeting to discuss the topic. Fifteen-minute meetings are easier for the SME to fit into his schedule than hour-long sessions. Sometimes even the 15-min meetings were difficult to schedule. At those times, we took whatever time we could (breakfast, lunch, chance meetings in the hall, etc.).

> **Tip 8**
> To get quality time with the SME, use informal meetings, e-mail, and voice mail. Also, ask for small doses of information rather than inundating him with multiple requests all at once.

### Selecting the development tools

Developing multimedia CBT programs was a new task for our department. Although none of us had any expertise in multimedia programming, we were familiar with the tools used by outside contractors to build multimedia kiosks for Lehigh Valley Hospital. To find the best product suited for our needs, we investigated a variety of programs using sources such as the World Wide Web, industry reviews, and multimedia conferences. We also contacted other organizations doing in-house development for their opinions.

After evaluating the information we gathered, we decided on Macromedia's Authorware for CBT development. Based mostly on personal preference and past experience, we acquired a combination of graphic development applications to include Adobe Photoshop, Macromedia Fireworks, and Fractal Design Painter. We were also able to update our video editing capabilities to include a digital camera for stills and video.

> **Tip 9**
> Get the proper tools for developing the program. There are many sources of information about multimedia development tools. Investigate these sources to find which software and hardware best suits your needs.

### Using the development tools

Once we purchased the development tools, we had to learn how to use them. Like many people in the computer field, we 'played' with the development tools without any formal training, thinking we'd learn their features along the way. After all, that's how we learned most of the software we used in the past. The learning process, however, was slow and painful as we made many mistakes, which threatened to expand our project timeline. Fortunately, we recognized our shortcomings early in the project and enrolled in formal classes on our development tools. The classes taught us more efficient ways to use the features we had learned on our own in addition to teaching us features we didn't know. After attending class, we were able to work faster and more accurately as well as add innovations to our CBT program that we learned in class.

**Tip 10**
Get team members properly trained on development tools. The time and money spent is worth it.

## Outside graphics sources

Although the development tools we purchased are very powerful and have many features, they can't create all the graphics we need (usually because we aren't talented enough). When that happens, we turn to other sources such as the Web, books, journals, etc. Including graphics from outside sources can be a huge time saver since you don't have to re-create something that already exists (and probably looks better than anything you could create). The drawback to using graphics from other sources is copyright issues.

Commercial sources of graphics charge a fee whenever you use one of their images. So not only do you have to pay to put an image in your multimedia program, you'll also have to pay a yearly royalty to continue its use. Some companies sell graphics packages that include thousands of images on a CD-ROM. These packages require a one-time only fee. After payment, the images can be used without limitations or further fees; however, some vendors of these packages require their copyright be attached to their images whenever you use them. The Web is a good source of public domain graphics that can be downloaded free of charge and without any copyright issues.

**Tip 11**
Unless you have an in-house resource for creating computer-based graphic images, use public domain graphics whenever possible to avoid copyright issues.

## Project management

The most important ingredient in multimedia programming is time. It is very important to dedicate a programmer full time on the project. Otherwise, the project could get lost among other responsibilities. To illustrate, the HT/HL CBT program originally had a project timeline of 1 year. With four people on the team, a year should be plenty of time. There were, however, other projects and tasks for which the team members were responsible, and these responsibilities always took precedence over the CBT program. As a result, the completion date for the HT/HL CBT program was moved many times because the project team members spent most of their time on other tasks.

**Tip 12**
Dedicate most or full time to the project. Part time projects drag on and on.

## Notes on contributors

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CHRIS SARLEY is the academic programmer for the project. In addition to his programming skills, Chris also has experience in emergency medicine. Chris has worked for Lehigh Valley Hospital for 11 years.

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