



DEFENSE CENTERS OF EXCELLENCE
For Psychological Health & Traumatic Brain Injury

Defense Centers of Excellence (DCoE) Training & Education Directorate

Best Practices for eLearning

11 Feb 2011

2345 Crystal Drive ★ Crystal Park 4, Suite 120 ★ Arlington, Virginia 22202 ★ 877-291-3263

1335 East West Highway ★ 9th Floor, Suite 640 ★ Silver Spring, Maryland 20910 ★ 301-295-3257

WWW.DCOEHEALTHMIL ★ Outreach Center: 866-966-1020

Table of Contents

Introduction	3
What is eLearning?	3
Producing eLearning: Roles and Responsibilities	4
Advantages and Challenges of eLearning.....	5
Seven Best Practices for Developing eLearning Courses	6
eLearning Tools and Technologies	9
Summary.....	11

Introduction

The Training & Education (T&E) Directorate's mission is to assess training and educational needs across the Services in order to identify and promote effective instructional material for stakeholders resulting in improved knowledge and practice of Psychological Health (PH) and Traumatic Brain Injury (TBI) care. This document provides course sponsors with an overview of eLearning, including its advantages and disadvantages, best practices for developing content and technology selection criteria. Course sponsors are those who initiate, procure, manage or make decisions about the development and/or delivery of training or education courses, events or programs.

eLearning is becoming an increasingly attractive mechanism by which to deliver training and education, and the T&E Directorate can empower course sponsors by:

- Providing information on how training and education can be developed and delivered effectively using certain eLearning technologies
- Supporting the conversion of traditional classroom-based learning programs to eLearning formats
- By advising what technologies are best suited to a particular audience size, level of learning, required features and interactivity

What is eLearning?

Quite simply, eLearning is *learning* mediated by technology. Historically, eLearning was divided into distance-learning, using information technology to deliver instruction to learners at remote locations from a central site, and computer-assisted instruction, using computers to aid in the delivery of stand-alone multimedia packages.

Many adult learning best practices from the classroom also apply in the electronic, or "e" world. In both settings instructors must match learning objectives to the appropriate learning and evaluation approach. Similarly, adult learning requires that learners:

- Relate new ideas and concepts to previous knowledge and experience
- Integrate their knowledge with related conceptual systems
- Look for patterns and underlying principles
- Evaluate new ideas and relate them to conclusions
- Reflect on their understanding and learning processes

These strategies do not change when transitioning from classroom-based learning to eLearning. Perhaps the biggest difference between designing training modules for a traditional classroom and for e-enabled environments relates to appreciating the capabilities and limitations of the teaching toolkit. This has expanded beyond the books, handouts, flipcharts and chalkboards of yesteryear to computers, virtual classrooms, simulators and other technologies designed to facilitate communication between people and minimize the need to be in the same place at the same time. Furthermore, eLearning enables non-traditional learning methods suited to visual learners and explorers. For instance, simulations and other experiential methods may be more accessible via eLearning than via traditional, classroom-based learning. eLearning technologies allow instructors to manipulate two previous constraints, time and place. Time and place are the primary factors that differentiate eLearning from more traditional, classroom-based models, as well as the unique interaction between the learner and the learning technology.

Producing eLearning: Roles and Responsibilities

To understand roles and responsibilities for producing eLearning, storyboards are important. Storyboards are a mock-up version of the final content, as it will appear in the course. Storyboards include attached design and production notes to help development technologists build the course materials to design specifications. Formats and requirements vary across technologies. For a live virtual classroom event, an appropriate storyboard may be the slide deck instructors use along with any planned interactions with their audience. For a self-study, however, storyboards tend to be significantly more detailed. As a general rule, the more complex a course is, the more details required in the storyboards in order to accurately convey your intent to the course developers.

The roles and responsibilities of training team members follow:

- **Course sponsors** initiate course development based on current needs. Course sponsors secure financing for course development as well as edit and approve storyboards. Often, Course Sponsors bring together a training team comprised of subject matter specialists, course designers, technologists and development technologists. Course sponsors provide recommendations to the course owners from initial development through deployment. Often course sponsors will provide information for course owners to make decisions on course deployment, content refresh and eventual retirement. Course sponsors may also be course owners.
- **Course owners** may not have visibility into the needs of the organization as the course sponsors do, but are ultimately responsible for ensuring staff is properly trained. Course owners typically provide funding for course development and oversee the process. Course owners have the final approval for the course or product and as such, should be consulted in advance of key decision-points. Once a course is developed, the course owner has ultimate control and authority over how it is used.
- **Subject matter specialists (SMSs) or subject matter experts (SMEs)** identify course content and consult with course designers on storyboards.
- **Course designers** design content and questions that are relevant, focused, and leveled according to the course's learning objectives. Course designers work with SMSs or SMEs to design the learning and develop the content, including scenario-based exercises. Course designers also design quality assessment questions and direct course sponsors to where training is available. Finally, course designers originate visual ideas, provide graphic suggestions, and include interactions suitable to content.
- **Technologists** are experts on the technologies available, their ideal uses and limitations, benefits and drawbacks, costs, time, and resources necessary to develop courses. Technologists should understand the development process for each tool, but do not need to know the technical aspects of building them.
- **Development technologists** handle the technical aspects of development and deployment. Because of this, they need to have a deeper understanding of these technologies and they are the ones who actually create the suite of development tools. Development technologists build out the course using the completed, approved storyboards. The development technologist can help to determine if a course should be custom developed or can be created using standard off-the-shelf technology.
- **Graphic artists** assemble the images, typography and motion graphics for the eLearning tools. They are also responsible for illustrations, user interfaces, and web design. A primary responsibility of the graphic artist is to present information in visually appealing, accessible and memorable manner. This is an important role in the development of eLearning.

Training teams maximize value brought to the audience via learning technologies when they:

- Have a robust toolkit that can address learners' needs efficiently and effectively
- Pick the right tool for the job, based on a strong understanding of learners' needs

- Have experienced designers who understand how to facilitate learning in technology-enhanced environments

Advantages and Challenges of eLearning

When developing any training program, three interrelated and constraining factors must be considered at each stage of the process: cost, scope and time. Typically, an organization selects the two most critical to the program, realizing that the third may be impacted. For example, while using new course development software increases cost (related to software purchasing and staff software utilization training costs), overall, the course quality may be significantly improved. Throughout the development process, these three factors may need rebalancing as they are highly interdependent. For example, changes in the scope of training impacts the cost and time to develop the training.

Factor	Advantage	Challenge
Cost (resources)	<ul style="list-style-type: none"> ▪ eLearning delivery methods typically cost less than traditional, classroom-based models and minimize associated costs of travel. Though initial production costs can be high, subsequent playback/access costs are typically significantly lower ▪ Sessions can often be recorded and accessed later, at little or no cost, depending on the technology 	<ul style="list-style-type: none"> ▪ Up-front costs to purchase the course development and/or delivery technology and associated time and cost to train staff ▪ Requirement to have computer/internet access that also meet minimum system functionality (confirming compliance with this requirement may take time/cost) ▪ Learners with minimal computer skills may require training on the technology ▪ Instructor may not always be available on demand
Scope (depth, breadth and quality)	<ul style="list-style-type: none"> ▪ May decrease social isolation when interactive tools, i.e., blogs, discussion boards, etc. can provide a more accessible learning venue, particularly for geographically dispersed learners ▪ Confidential learning environment reduces stigma of seeking information on PH and TBI issues ▪ eLearning enables standardization of content and delivery ▪ Class work can be scheduled around personal and professional work ▪ Assessments may be conducted to determine the appropriate level and style of instruction for a particular set of learners. The results may be used as input in creating learning paths to offer learners the option to select courses that meet their level of knowledge and interest 	<ul style="list-style-type: none"> ▪ Unmotivated learners or those with poor study habits may fall behind ▪ Some courses, such as traditional hands-on or lab courses, are difficult to translate to this environment ▪ For learners who prefer classroom and face-to-face interaction, the relatively solitary environment may actually increase learners' sense of social isolation ▪ Slow internet connections or technical difficulties may cause learner/instructor dissatisfaction ▪ Inconsistent or minimal technological support may be available for remote learners ▪ Learning activities require complete attention; learners may multi-task and lose focus on course content
Time (schedule)	<ul style="list-style-type: none"> ▪ Participants are trained quickly, flexibly and across geographic borders ▪ Flexible scheduling supports a wider variety of participant learning options ▪ Asynchronous; allows learning at own pace and at any location ▪ Often delivers the same information in less time than a traditional classroom-based setting 	<ul style="list-style-type: none"> ▪ Slow internet connections or older computers may decrease delivery time ▪ Training converted from classroom to eLearning requires significant conversion time (and labor cost) ▪ Managing learning development and delivery technologies can involve a learning curve (and associated cost)

Fiscal responsibility and the desire to minimize inconvenience and non- value-added costs associated with training, require course sponsors to consider the advantages and disadvantages of eLearning. Course sponsors should prioritize face-to-face learning in situations where being together in the same place at the same time adds value, and recognize that not all learning is suitable for technology-enabled delivery.

Best Practices for Developing eLearning Courses

Course sponsors must be able to identify the characteristics of successful eLearning modules and courses. Ideally, technology-enabled learning should be:

- **Flexible**, allowing trainees to learn where and when they need to
- **Engaging**, meaning relevant, interesting and applicable
- **Just-in-time**, close to the time of need and linked directly to work
- **Just-enough**, focused, minimizing the need to sort through irrelevant or extraneous information
- **Just-for-me**, individualized and able to bridge the gap between what I know right now and what I need to know going forward

Additionally, course sponsors should be familiar with best practices for developing content or adapting classroom-based content for eLearning modules.

Develop meaningful learning objectives. As with traditional classroom-based training, eLearning course objectives are developed so that participants clearly understand the learning they are required to demonstrate at the end of the training. Quality eLearning limits instruction material to essential information defined through clear, meaningful, performance-based objectives that are achievable in the allotted time.

Courses can address different levels of knowledge, defined as follows:

- **Basic:** Assumes no prior knowledge of course content
- **Intermediate:** Assumes basic knowledge and should introduce and develop topics that exceed basic knowledge
- **Advanced:** Assumes mastery of the subject and should focus on in-depth knowledge or a broader range of applications
- **Overview:** Provides a general review of a subject area from a broad perspective.
- **Update:** Provides a general review of new developments and assumes prior knowledge on the subject

Learning objectives must include outcomes that are confirmed in the development of the course. These objectives should be appropriate to the level of knowledge addressed by the course. Learning objectives should not express higher knowledge levels than confirmed by the program and should not appear to be statements of course content (not articulated outcomes to be achieved).

Choose the appropriate technology. Learning objectives, the characteristics of the target audience (e.g., level of education, technological savvy, etc.), the target KSAs (knowledge, skills, abilities), and the teaching organization's technology logistics resources heavily drive the eLearning course design and technology selection. Technology and its features can be engaging to some learners but frustrating to others, so selecting technology that is suitable for the intended audience is critical. Given the broad range of available features and costs of eLearning technologies, program managers who may not have eLearning technology expertise should strongly consider consulting with an instructional design specialist before making their decision. Selection of the appropriate technology supports the learner's ability to demonstrate repeated successful integration of the training information into their knowledge base, improvement in their relevant skills, and/ or positive change in their attitudes. Furthermore, this new set of KSAs persists long after learners leave the training.

Organize course content logically. Well-designed courses include a timed agenda, learning objectives, instructional content, exhibits and examples. Thoughtfully chosen graphics and animation convey learning points, further detail content and help enhance recall. Limit the use of branched interactions and extensive hyperlinks that send learners to outside websites, content areas or on a path that travels far from the original topic. This is especially important for navigating through simple or obvious information so that distraction and wandering is minimized and tempo, organization and focus are maximized. Providing glossary definitions and content for further study, such as downloadable/printable documents or Web links in a reference section rather than as part of the core course content improves the organization and flow of the training.

Update course content regularly. Courses should be reviewed at least annually to ensure that the most current information is presented. Subject matter experts can review learning objectives and course content for technical accuracy and relevance.

Interactivity is essential for learner success. Effective “interactive” learning uses various methods to engage the learner with the content and decreases passive receiving of information from an instructor or content on a screen. Additionally, the careful design of content layout, overviews, summaries and information sequence can improve learner engagement.

Interactivity is enhanced by	Interactivity is NOT enhanced by
Embedding varied learning activities	Surfing the internet to locate and read reference material
Embedding quality interim review questions	Clicking on the "next" button
Providing unique interim feedback to the learner	Misusing animated graphics or images for distraction or entertainment

Use interim review questions. Often required at timed intervals for continuing education credit, the use of well-designed and timed interim review questions can also capture the learner's progress and provide real-time feedback during course delivery. Objective questions (i.e., those with one correct answer that minimizes use of forced choice, e.g., true/false) are most effective. Varying the types of questions also enhances interactivity, such as the use of interactive puzzles or drag/drops that require more learner attention and critical thinking than standard multiple choice questions.

Reinforcement feedback

This feedback entails specific responses to correct answers to questions in self-study programs. Such feedback logically explains why the answer selected was correct. Simply restating the correct answer choice affirmatively does not explain why the answer was correct. Another way to reinforce correct answers is to introduce alternative forms of explanation, such as scenario-based or situational formats. This simulates a real-life experience with the question at hand, which is ideal for both visual and interactive learners.

Evaluative feedback

This feedback includes specific feedback given in response to incorrect answers to questions in self-study programs. Unique feedback must be provided for *each* incorrect response, as each one is likely to be wrong for different reasons. Feedback must logically explain why the selected answer is incorrect. Simply changing one or two words does not make the feedback unique. Furthermore, the learner should only receive feedback for the choice selected. This encourages the learner to review the pertinent material before proceeding to the next question or course topic. For example, if a learner selects choice B, only the feedback for choice B should appear. The feedback can reference where the correct answer can be found, but should not provide the correct answer within the feedback. It should be noted that in many internal checks on learning, there are multiple tries permitted before more robust explanations are offered. For instance, on the first try, the feedback may simply encourage the learner to "try again." Successive failed attempts will then prompt more detailed feedback.

Below is an example of a well-written question with the appropriate evaluative feedback.

Question: What is the most accurate diagnostic study for the presence of acute pancreatitis?

- A. Serum lipase.

Feedback: Correct Answer. Although lipase can be produced by other organs in the body, it is predominantly produced in the pancreas. An increase in lipase level is the best indicator of injury to the pancreas, and the most common injury to the pancreas is pancreatitis.

B. Serum amylase.

Feedback: Incorrect. Amylase is primarily produced in salivary glands and the pancreas. An increased amylase level can result from a salivary gland tumor or inflammation of the parotid gland instead of injury to the pancreas.

C. Creatinine clearance.

Feedback: Incorrect. Creatinine clearance is not affected by pancreatitis. However, decreased creatinine clearance can falsely elevate the amylase and lipase concentrations in the blood.

D. Complete blood count.

Feedback: Incorrect. Although pancreatitis can cause an elevated white count, there are many disease processes that can cause an elevated white count.

Multiple choice questions should include at least four answer choices. In some cases, the use of three choices will be acceptable but should be an exception. The answer choices should also be listed in a logical or chronological order. Answer choices such as "all of the above" or "none of the above" may also be used.

The questions throughout eLearning modules are intended to ensure learners can apply the important points of the content to real-life situations. Interim review questions guide the learner through the learning process by eliciting responses that test the learner's understanding of the material, and interim review questions offer evaluative feedback to incorrect responses and provide reinforcement feedback to correct responses. Ideally, interim review questions outline key learning points and serve as a preview for the final test, which will provide an opportunity to apply learning in novel ways or to new situations or scenarios. Strong designs highlight difficult concepts and provide immediate opportunities to assess and deepen comprehension.

Questions should require learners to work out problems and select the correct answer from those provided. Multiple choice questions can test deeper learning. In addition to the correct answer, choices should include appropriate "distracters" (wrong answers) for learners who take a predictable, but still incorrect, wrong turn.

Questions in the interim reviews should primarily be some form of multiple choice (with one correct answer), with no more than approximately twenty percent of the total questions being forced choice, (e.g., yes/no or true/false questions). Using different types of questions enhances learner interest and interactivity. Varying the question style in other ways, such as the use of interactive puzzles, drag/drops and matches are also effective since they may require more interaction than standard multiple choice questions. While there are no "wrong" types of interim/test questions to ask learners, variety is important and certain question types have less utility than others, and therefore should be used sparingly.

Types of Questions to Avoid or Use Sparingly	
Type of Question	Explanation / Rationale
Multiple choice with multiple answers	Questions that provide unique feedback are difficult to construct and not give away the correct answer. However, when written within the context of a situation or scenario, multiple choice questions require more complex thinking

Types of Questions to Avoid or Use Sparingly	
Type of Question	Explanation / Rationale
	from the learner, which makes the questions more valuable.
True/False and Yes/No	The learner has a 50% chance to select the correct answer.
Negative questions such as "Not" or "All except"	These questions are confusing for the learner.
Questions with response options: "All of the above" or "None of the above"	These responses allow the learner to recognize only one/two correct options to choose the correct answer.
Questions with incomplete stems	The use of direct questions makes it easier to express ideas. The incomplete stem forces the distracters to come at the end of the statement, where they may not fit as well.
Questions that test comprehension of easy-to-understand concepts or trivial details	Questions should address key points, appropriate to the level of knowledge of learners.
Questions with polar opposite response options	The learner has a 50% chance to select the correct answer.
Questions with lengthy response options	Lengthy responses draw attention to that answer choice, and the learner is more likely to select it as the correct answer because it contains details and precise information.
Questions with implausible response options	Obviously incorrect answer choices and/or obviously correct answer choices do not test the learner's knowledge of the content.
Questions that include phrases lifted directly from the course material	This becomes a simple recall activity for learners and does not confirm knowledge or understanding of the information.
Drag and Drop	It is difficult to provide unique feedback for this type of question.

Soliciting Feedback. Timely and accurate learner feedback is an essential component of health care education. For maximum accuracy, feedback should be obtained as soon as each course session is complete. Immediate learner feedback improves the overall course because instructors can integrate quality suggestions into future editions of the training.

eLearning Tools and Technologies

There are many forms of learning technologies. Courses can be improved using “widgets” (graphics, audio, video, animations typically inserted into other courses), video conference systems, virtual classroom events, self-studies, other market-leading technologies and tools vetted and screened by global practitioners.

The evolution and maturation of eLearning tools has made it easier to build richer performance and improvement solutions, many with minimal or no expertise in computer programming. Course sponsors must determine the availability of development technologists when selecting eLearning technologies.

Perhaps the two most critical factors that will help determine which of these technologies is most appropriate for your program are:

- 1) The size, nature, and location of the audience
- 2) The type and complexity of the learning to be achieved

The matrix below offers a comparison of common eLearning technologies, including important features and applications.

Delivery Method	Features	Applications
Teleconference – Telephone only and best suited for meetings rather than training	<ul style="list-style-type: none"> ▪ Audio communication between groups ▪ Combine with distributed slides or handouts 	<ul style="list-style-type: none"> ▪ Basic level learning ▪ Mobile and dispersed learners ▪ Audience Size: <200; Global accessibility
Virtual classroom – Best suited for live virtual training where tracking attendance and participation compliance is required	<ul style="list-style-type: none"> ▪ Audio via computer (no dial-in required) ▪ Website tours and public/private text chat ▪ White board, polling, slides and Website tours ▪ Multimedia/ Flash applications integration ▪ Sessions can be recorded for later playback 	<ul style="list-style-type: none"> ▪ High level learning for smaller groups ▪ Collaborative/ practice-oriented learning, scenarios and application training or demonstrations ▪ Tracks interaction level for compliance requirements ▪ Audience Size: <500; Global accessibility
Recorded virtual classroom – Best suited for review or for long application demonstrations	<ul style="list-style-type: none"> ▪ Deliver with the real-time webcast but record for future playback. Recorded presentations cannot track participant interaction for compliance ▪ Recorded white boarding, slides and website tours 	<ul style="list-style-type: none"> ▪ Basic-mid level learning ▪ Application demonstrations and follow-up refreshers ▪ Audience Size: No limit; Global accessibility
Self-study courses – Best suited for self paced, text-driven work and non-linear, decision-tree type self-studies	<ul style="list-style-type: none"> ▪ Simple text, graphics and quizzes ▪ Multimedia/Flash can be integrated ▪ Can be downloaded for offline viewing ▪ Usually lower cost and easy access 	<ul style="list-style-type: none"> ▪ Basic-mid level learning ▪ Fact-heavy, detail-oriented material ▪ Scenarios and case studies ▪ Audience Size: No limit; Global accessibility
Web-based live conferencing – Also referred to as "webinars", these are best suited for real-time virtual meetings	<ul style="list-style-type: none"> ▪ Presenters/learners hear via audio-conferencing ▪ White boarding, polling, slides and website tours ▪ Polling and quizzing results ▪ Sessions can be recorded for later playback 	<ul style="list-style-type: none"> ▪ Basic-mid level learning ▪ Practice-oriented learning, mentoring, application training or demonstrations ▪ Audience Size: <1200; Not globally accessible
Audio/video webcast – Best suited for one-way presentations with video	<ul style="list-style-type: none"> ▪ Streamed video and/or audio from presenters ▪ Interactive polling, quizzing, chat and slides ▪ Measurement and performance tools 	<ul style="list-style-type: none"> ▪ Basic-mid level learning ▪ Panel sessions and videos ▪ Audience Size: Webcast limit of 1,000 learners for video events and 2,000 for audio-only events; May not be globally

Delivery Method	Features	Applications
		accessible
Video-conferencing – Requires training room with portable unit, Videoconference room or Tele-suite	<ul style="list-style-type: none"> ▪ Full screen, two-way or multi-way video with audio ▪ Computer screen sharing ▪ Live video of participants, provided each site has appropriate technology 	<ul style="list-style-type: none"> ▪ Mid-high level learning ▪ Small sessions with audio-visual contact, multipoint trainings followed by group discussions and role playing ▪ Audience Size: <150; Global accessibility

Summary

When compared with traditional classroom-based learning, eLearning offers many advantages particularly beneficial to warriors, veterans and their families, including the opportunity to learn about PH and TBI conditions and symptoms from remote locations, without fear of stigma. However, eLearning challenges, including the limits of face-to-face networking time and learner proclivity to multitask, warrant consideration. Overall, program managers must consider many variables inherent to developing learning objectives and when determining whether and when to use eLearning.

Selecting the eLearning technology that most appropriately suits the content and learner needs will improve the overall learning experience. Programs can use the information in this document to strengthen their learning program development capabilities and directly affect end users of this document--the personnel who design, develop and deliver training and education programs across the services.