REUSING SHARABLE CONTENT OBJECTS: LESSONS LEARNED FROM NIGHT VISION TRAINING

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ABSTRACT

A key Advanced Distributed Learning (ADL) operational capability stated in the Sharable Content Object Reference Model (SCORM) is to construct and reuse self-contained and reusable instruction, or shareable content objects (SCOs) suitable for student learning needs. In a recent review of lessons learned from the ADL Prototype Program, Stout, Slosser, and Hays (2001) cited this as a high priority issue. Night vision training is an application area in which the ability to develop and reuse instructional content and media for different night vision devices across diverse user groups results in significant economies of effort. This training area serves as an effective test bed for evaluating strategies and techniques for developing and defining SCOs that can be effectively reused. Since all service components and many government agencies use similar night vision devices, and most service branches have continuous operations (24/7) requirements, SCOs developed for one organization or user group are usually relevant for other branches and services for innumerable mission essential tasks. In other words, SCO applicability is nearly universal, but there are caveats. In this paper, we review our experience developing a series of computer- and web-based night vision training products and provide examples of successes and challenges in developing and reusing SCOs. Key lessons learned include: (1) a SCO is a dynamic construct; (2) a SCO product must be both content- and user-centered; (3) a SCO must include learning objectives, main and embedded topics identified, operational definitions, a glossary, and an abbreviation/acronym list; (4) an organized library of text and multimedia is essential; (5) an "all-knowing champion" to orchestrate the finding, assembling, and reworking of SCOs to meet new user's needs and organizational requirements is essential; and (6) ADL developers must budget sufficient time and resources to tailor appropriate SCOs for users other than the original target audience. We discuss the implications of our work for the ADL initiative.

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INTRODUCTION

Background

A key operational capability in Advanced Distributed Learning (ADL), as stated in the Sharable Content Object Reference Model (SCORM), is to construct self-contained and reusable instruction, or shareable content objects (SCOs), suitable for student learning needs (Joint ADL Co-Lab, 2002). This capability sets ADL apart from traditional CBT and WBT delivery concepts. This implies the capability of readily developing reusable blocks of instruction, and shifting the blocks of instructional text and multi-media content between various training products with little or no alteration.

This capability has numerous prerequisites. It requires that course developers and training personnel be able to (1) identify required knowledge and skills, (2) identify and locate appropriate training content, and (3) obtain and assemble SCOs from instructional resources to meet training requirements. These resources may be distributed across different physical locations and available at different times. In addition, the student(s) and the instructor/facilitator(s) may be in different locations (Ruffner, Woodward, and Fulbrook, 2001; Weisenford, Jesukiewicz, and Brown, 2000).

ADL Prototype Program Review

The development and reuse of SCOs is a high priority issue for the ADL Initiative. In a recent review of preliminary results from the ADL Prototype Program, Stout, Slosser, and Hays (2001) cited lessons learned about the creation and use of SCOs. First, they noted that feedback from the Prototype Program participants indicated there was a lack of guidance regarding what constitutes a SCO as a chunk of reusable content. The authors concluded that best practices are needed to establish an optimal tradeoff between cost and the increased granularity of content; that is, the size and composition of the SCO. Second, Stout et al. noted that creating a SCO is not a trivial exercise and that SCO developers needed sound guidance on techniques for SCO creation if the process will produce reusable content. Specifically, a SCO must be a stand-alone chunk of content and cannot rely on other SCOs to be understood. The authors recommended that a separate category within SCORM be developed for such content as glossaries, help files, etc that could then be metatagged, and that developers consider making a glossary a Sharable Resource.

Purpose and Scope

The purpose of the present paper is to expand on the work we previously accomplished on applying ADL technologies to night vision training and to extend the findings reported in Ruffner, et al. (2001). In the previous paper, we discussed converting multimedia training material into ADL-compliant computer- and web-based training products. In this paper, we focus on the development and reuse of SCOs. This paper does not deal with software compatibility issues involved in the SCORM conformance testing procedure. In other words, this paper is about the nature of SCO content, not about the coded labels that define a SCO in a software program.

Organization of This Paper

This paper is organized into six sections. Following the introductory section, we provide a brief overview of night vision training. In the third section, we lay a foundation for the later discussion of issues involved in developing and reusing SCOs by providing a summary of our experience developing a series of computer- and web-based night vision training products for the US Army and US Air Force. In the fourth and fifth sections, we provide examples of preliminary SCOs we developed and some of the challenges and successes we encountered. We then cite lessons learned that can be applied to other training domains. In the final section, we discuss the implications of our findings for future ADL research and development initiatives and activities.

NIGHT VISION TRAINING OVERVIEW

The capability to operate and fight at night using such devices as night vision goggles (NVGs) is critical to US military success, and requires frequent and effective training. Night vision training is a critical training area affecting all the military services. In our previous work (e.g., Ruffner, Antonio, Joralmon, and Martin, 2001; Ruffner, et al., 2001; Ruffner and Fulbrook, 2002; Ruffner and Woodward, 2001), we discussed NVG

performance deficiencies and requirements for night vision training, and provided discussions of contemporary and emerging technologies for providing safe and effective training. These technologies include instructor-lead training, hands-on training, simulation, aircraft/vehicle training, and the ADL technologies of computer based training (CBT) and web-based training (WBT).

We also identified ten lessons learned about training NVG knowledge and skills in a CBT and WBT environment that are relevant to the application of ADL technologies to other training domains. The lessons learned are summarized in Table 1. A detailed discussion of each of the lessons learned is provided in the Ruffner et al. (2001) I/ITSEC Conference paper. These lessons learned served as a starting point for the current effort.

Table 1. ADL Lessons Learned

1	Early and continued customer and end-user involvement is critical for buy-in and support.
2	Rapid prototyping is an invaluable development tool for obtaining user input.
3	The ability to shift blocks of information between training products is critical.
4	Recognize the capabilities and limitations of the instructional and delivery technology.
5	Transferring training material usually requires careful review and extensive revision.
6	It is essential to use vocabulary level and terminology appropriate for the end users.
7	Multimedia capabilities must support the instructional objectives, and not vice versa.
8	Selection of multimedia to meet training objectives requires careful planning.
9	The required mix of instructional, software, and media specialists can increase costs.
10	Consider end-user experience, capabilities, and confidence in using the technology.

Night vision training is an application area in which acquiring and maintaining the ability to develop and reuse instructional content and media for different night vision devices across diverse user groups (e.g., dismounted warfighters, drivers, aviators) results in significant economies of effort. Due to this, the area of night vision training serves as an effective test bed for evaluating strategies and techniques for developing and defining SCOs that can be effectively and efficiently reused across DoD.

DEVELOPMENT OF NVG TRAINING PRODUCTS

Over the past five years, we developed four CBTs and two training videotapes to meet specific US Army and US Air Force night vision training needs. The purpose of the training products was to improve the safety and effectiveness of night operations for drivers and dismounted warfighters. The six training products, listed in Table 2, were developed as part of a Small Business Innovation Research (SBIR) program as a collaborative effort with the Army Simulation, Training, and Instrumentation Command (STRICOM), the Army Infantry School Dismounted BattleSpace Battle Lab (DBBL), the Army Program Manager, Night Vision / Reconnaissance, Surveillance, and Target Acquisition (PM NV/RSTA), and the Air Force Research Laboratory Warfighter Training Division. The training products are described briefly in the following paragraphs with the intention of providing the reader with the necessary familiarization and background for the discussion of lessons learned about developing and reusing specific SCOs.

Table 2. NVG Training Products

Training Product	Category
Night Driving Training Aid	CBT/WBT
MNVD Training Aid	CBT/WBT
Security Forces Training Aid	CBT/WBT
TLOS Interactive Training Aid	CBT/WBT
MNVD O&M Video Trainer	Videotape
AN/PVS-7B/D O&M Video Trainer	Videotape

Note: CBT = Computer-Based Trainer; WBT = Web-Based Trainer; MNVD = Monocular Night Vision Device; TLOS = Target Location and Observation System; O&M = Operation and Maintenance.

For purposes of this discussion, each lesson is a SCO that includes objectives, text of one or more topics, multimedia, a glossary, links, and quiz questions. The list of CBT/WBT trainers is also chronological. In each

trainer, we were able to reuse SCOs/lessons from previous trainers, but the reuse was never complete as the lessons learned will point out.

Night Driving Training Aid

The Night Driving Training Aid (NDTA), is a multimedia, interactive CBT/WBT developed for Army vehicle operations with NVGs. It provides instruction on the various factors that affect driving with the AN/PVS-7B/D NVGs (See Figure 1). The major SCO topics in the NDTA include NVG Concepts, Hardware and Adjustments, NVG Working Conditions, Preparing for NVG Driving, Conducting NVG Driving, and Driving Hazards.

Some lessons in NDTA were adapted from an instructor's guide on NVG operations provided by the Air Force Research Lab. The instructional content included text, imagery, and a few short video segments. The majority of the trainer was written as original text and multimedia.

Figure 1. Night Driving Training Aid CBT/WBT.

Monocular Night Vision Device Training Aid

The Monocular Night Vision Device (MNVD) Training Aid is a CBT/WBT developed for the Army PM NV/RSTA. It provides instruction on the basic operation and maintenance (O&M) of the AN/PVS-14 MNVD (see Figure 2). The MNVD O&M Training Aid major SCO topics include Operating Instructions, Operator Maintenance, Unit Maintenance, and Direct Support (DS) Maintenance. The MNVD has many similar characteristics as other NVGs, but there are many specific differences as well. In this trainer, the basic concepts of NVG operations were reusable, but most SCOs had to be written as original text. The majority of imagery also had to be produced for this trainer, as most imagery of other NVG systems (e.g., AN/PVS-7) could not be reused.

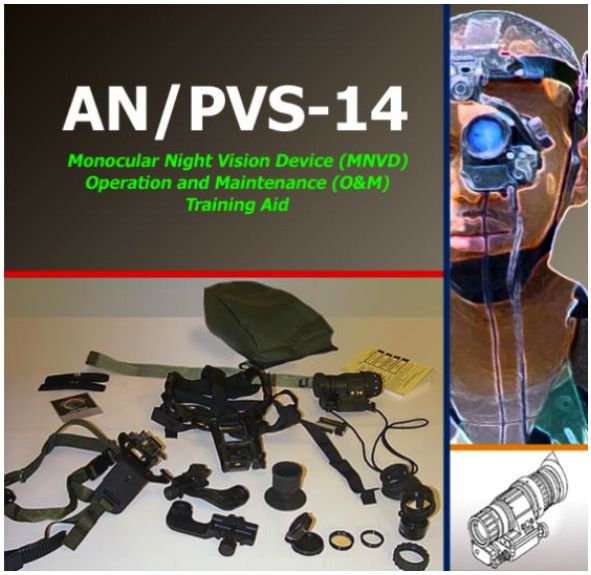

Figure 2. MNVD CBT/WBT.

Air Force Security Forces NVG Training Aid

The Air Force Security Forces NVG Training Aid is a CBT/WBT developed for the Air Force Research Laboratory Warfighter Training Division and the Security Forces Command. It provides instruction on using AN/PVS-7B/D NVGs and a handheld thermal viewer in conducting the Security Forces air base defense mission (see Figure 3). The major SCO topics of this training aid are NVG/FLIR Concepts, Conditions Affecting NVGs, NVG Equipment Basics, Pre-Mission Checks, NVG Driving Operations, and NVG Dismounted Operations. In this trainer, there was a significant amount of reusable text, but most operational imagery that involved personnel was of Army soldiers. Hence, a major effort to collect Air Force and Security Force imagery had to be accomplished.

Target Location and Observation System Interactive Training Aid

The Target Location and Observation System (TLOS) Interactive Training Aid (ITA) is a CBT/WBT developed for the Army PM NV/RSTA. It provides instruction on using the TLOS for active and passive location and observation of threat electro-optical systems and tactical targets The major topic areas of the TLOS Training Aid

Figure 3. Security Forces CBT/WBT.

are Components Controls and Indicators, Operation and Laser Safety (see Figure 4).

The TLOS is a unique electro-optic system that has both an image intensification system like an NVG, but also a laser that can be used to illuminate an area. The near-IR laser light is invisible to unaided vision, but can be seen through the image intensifier. A unique interaction between the NVG component and laser allows a user to view flashes of laser light appearing as "augmented optical returns" to the NVG part of the TLOS.

Figure 4. TLOS CBT/WBT.

Since this system has so many unique features, only the most basic information about NVGs (image intensification) and lasers could be reused from other sources. Hence, the great majority of text and imagery had to be originally produced for this trainer, despite the fact that we had a huge imagery and text library of generic SCOs that we could and would have used, if possible.

Monocular Night Vision Device (MNVD) Operations and Maintenance Videotape

The Monocular Night Vision Device (MNVD) Videotape, developed for the Army PM NV/RSTA, provides familiarization with the basic operation and maintenance (O&M) of the AN/PVS-14 MNVD (see Figure 5). It includes instruction on basic operator tasks, operator maintenance, unit maintenance, and DS maintenance for the AN/PVS-14 MNVD.

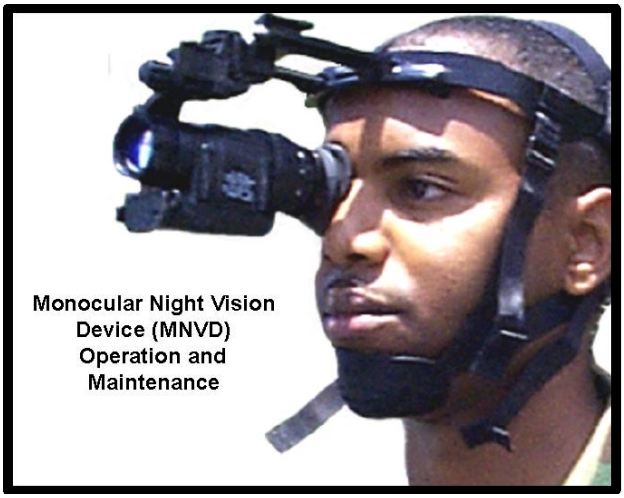

Figure 5. MNVD O&M Training Videotape.

The use of digitized video provides an excellent source of reusable material. Even non-digital sources can still provide "screen captures" to some degree, and short snippets of video can be used in CBT/WBT trainers as well. The issue is always a trade-off between video length and the amount of memory used, as the total memory in any trainer has far-reaching potential consequences for users based on bandwidth and system limitations. So, video segments must be used carefully to illustrate critical concepts where motion matters.

AN/PVS-7B/D O&M Videotape

The AN/PVS-7B/D O&M Videotape was developed for the Army PM NV/RSTA. It provides familiarization training with the basic operation and maintenance of the AN/PVS-7B/D (see Figure 6). It includes instruction on

basic operator tasks, operator maintenance, unit maintenance, and DS maintenance for the AN/PVS-7B/D NVG.

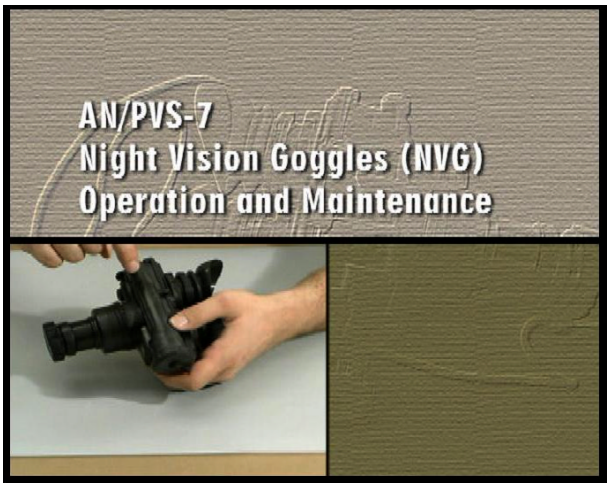

Figure 6. AN/PVS-7 O&M Training Videotape.

Video segments and digital image grabs were taken from this trainer and used in other CBT/WBT trainers very effectively. The videotape is composed of a continuous presentation of material covering numerous topics. Most topics can be easily separated into SCO segments. We cataloged each video to identify topic segments for later use. This will also help when we execute a plan to convert our videotapes into DVD trainers, where specific topics can be immediately accessed similar to a CD ROM.

EXAMPLES OF SHARABLE CONTENT OBJECTS

As discussed previously, a SCO is a self-contained and reusable piece of instruction suitable for student learning needs. SCOs also have assets (e.g., text and image files) that have meta data tags (e.g., Type of NVG) useful for locating a SCO appropriate for a particular learning application. In order to set the stage for our discussion of lessons learned, we provide examples of learning content (lessons) from the training products we are using as SCOs. These were chosen for presentation here because they are applicable to a variety of night vision devices, applications, and users.

It has taken a long time for our training group to accumulate what has now become a huge digital library of text, lessons, video segments, and still imagery. We have finally reached the stage where we believe we have enough reusable SCOs that a complete trainer on NVGs can be more than 50% assembled from our library. Every new training product, however, will still require new material. Of course, this library of SCOs exists only at our offices, although agencies that purchased the trainers may reuse any material from them to reproduce or develop other training products from our original work.

One major limitation we have observed is that different media developers in our group contributed to the library with their own unique image file identifiers. This makes it very difficult or impossible for someone not familiar with developer code words to browse the large image library for a specific image. This highlights the need for any SCO to include all supporting multimedia so that a larger reference library does not have to be accessed and searched to find and assemble sub-units.

Before we provide examples and anecdotes of specific SCO lessons, we want to point out that the ADL/SCORM initiative has had a major influence on how we develop night operations training products. We are now much more conscious about SCO content, multimedia labels, accessibility within our own library, reusability, and economy of effort when it comes to creating a CBT that is immediately compatible as a WBT product and compliant with current ADL/SCORM standards.

Night Vision Goggle Basics

Both the CBT/WBT trainers and training videotapes have introductory sections that cover basic concepts important for understanding NVG capabilities and limitations. This section is a precursor to basic and advanced topics on operator and maintenance tasks, and operations. Once we developed a video segment for the MNVD O&M trainer, it became a valuable SCO and was easily reusable in the AN-PVS-7B/D O&M videotape. A screen shot from this NVG Basics section is shown in Figure 7. The more generic and basic the skill level of a SCO, the easier it is to reuse.

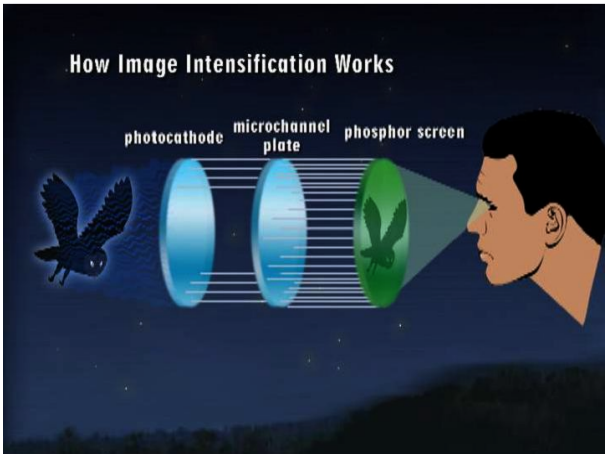

Figure 7. Example of screen shot from the NVG Basics section of the MNVD videotape.

Focusing

This CBT lesson addresses the proper way to focus and adjust an NVG. All NVGs conform to a set of industry standards for adjusting objective and eyepiece lenses to achieve optimum focus. However, the unique lens arrangement in each requires clarification for each NVG system. This is an important topic area because evidence from the field indicates that the inability to properly focus and adjust NVGs is a critical performance deficiency. An example of a screen from the focusing lesson used in the Security Forces NVG Training Aid is shown in Figure 8.

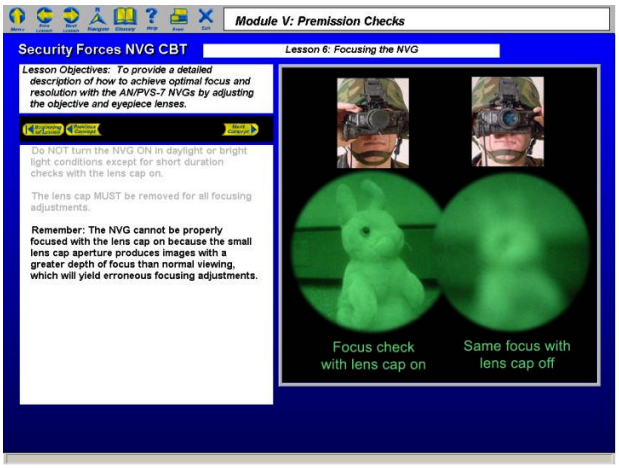

Figure 8. Example of a screen from the Focusing lesson in the Security Forces NVG Training Aid.

To take a generic SCO on focusing and apply it to a specific system, a genuine subject matter expert, familiar with the specific intricacies of the new topic system versus the reused topic system is essential. The fact that some services also use different steps in their procedures for focusing further complicates the ready reuse of a SCO, even for such a narrowly defined topic as this.

Effects of Artificial Lights

This lesson covers the effects of artificial lights on NVG performance. An important effect is that of blooming, which occurs when a bright light source, such as a vehicle headlight, is in the NVG field of view or is reflected from a surface such as a vehicle windshield. An example of a screen from the NDTA showing the blooming effect is shown in Figure 10.

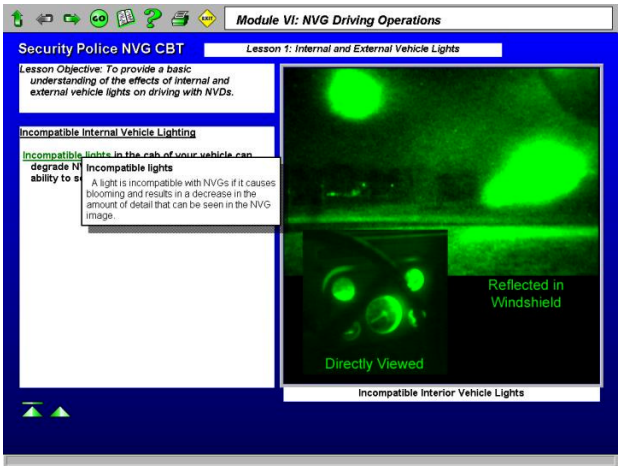

Figure 10. Example screen from the NDTA CBT illustrating the NVG blooming effect.

The interpretation of images through an NVG and specifics about effects is one of the more generic and reusable SCOs in our library. SCOs on atmospheric effects are also readily reusable for all NVG users across DoD, other government agencies, law enforcement, and civil groups.

Hazards to NVG Driving

This lesson addresses the principal hazards to driving with NVGs. The hazards were identified from an analysis of 160 accidents involving Army drivers using NVGs/image intensifiers (see Ruffner, Piccione, and Woodward, 1997). The hazards, listed in descending order of frequency of occurrence in the database, are drop-offs and ditches, collisions with vehicles, collisions with personnel, sudden rises in terrain, slopes, and large objects in the road. An example of a screen showing a drop-off hazard is shown in Figure 11. While hazard and accident statistics apply to more than just Army situations, there are differences in policy and procedures between services for driver and safety observer

requirements. Generally, mission essential tasks, and operational considerations must be tailored to the customer and include imagery of, by, and for the target audience.

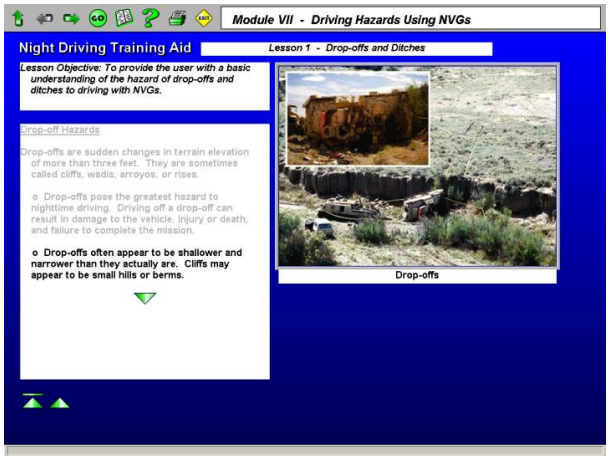

Figure 11. Example of an NDTA screen showing a drop-off hazard.

Laser Safety

This lesson provides a general introduction to the potential hazards associated with lasers and provides information on laser safety practices. This is an example of an instructional unit that was developed specifically for the TLOS training aid, but which has the potential for reuse as a SCO in training aids for devices that incorporate lasers for target identification or range finding. An example of a screen from the Laser Safety lesson is shown in Figure 12. For these SCOs we actually wrote the generic text and imagery first to create a reusable SCO for future trainers. After developing the lesson, we tailored some of the text and imagery specific to the TLOS, but its general applicability is apparent. So, we believe this SCO will be readily reusable in future trainers where a laser is used.

LESSONS LEARNED

The sequential and interdependent nature of our work to develop the series of related training products posed many opportunities and challenges to our team for developing and reusing SCOs. In the above sample training products and the lessons or SCOs developed within them, we provided numerous examples of where the concepts of reuse, tailoring, and sharing were applied with varied success. In this section, we summarize our experiences with a number of lessons learned from our efforts. Many of our observations are consistent with those reported in Stout et al. (2001) and in the general ADL literature. Eight key lessons learned (LL) from our work are discussed in the following paragraphs.

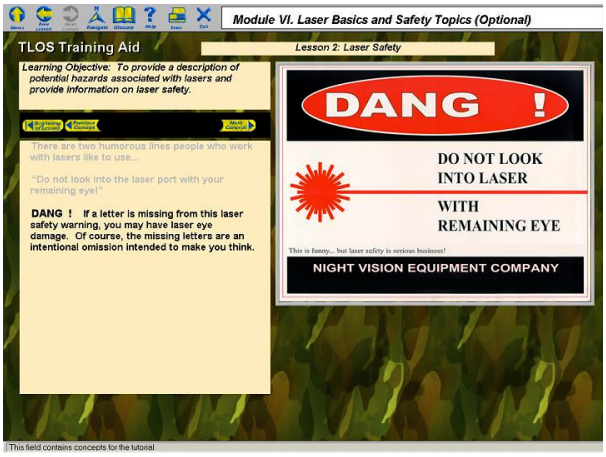

Figure 12. Example of a screen from the Laser Safety lesson in the TLOS Training Aid.

LL1: SCO is a Dynamic Construct

It is highly desirable that a SCO be constructed such that it may be literally lifted, totally unchanged, from one learning context and placed in another entirely different one. In some rare cases, this was achieved; while in others it proved to be quite difficult, if not impossible. By dynamic construct we mean that SCOs need to be flexible — the software codes that define a SCO are standard, but the content within must more tailored than standard. The term granularity has been applied to describe how large or small the chunks (inclusive topics) should be. We speculate that future content standards must recognize that even in a SCO where a single learning objective is stated, there may be multiple topics and varied granularity. These topics may stand alone in some situations, or belong nested among others in a different situation. This is especially true for training that deals with different skill levels in a similar topic. The information at one level must grow in detail and breadth. Hence, the same topic set (lesson or SCO title) at one skill level would have SCO content vastly different than at another skill level.

Clearly, there are situations where the whole is greater than the sum of its parts — where one topic within a SCO is a stand alone or nested SCO in another topic. The notion that SCOs cannot be embedded within SCOs only applies to software restrictions. Topics within a SCO must be able to be defined as SCOs themselves when the situation dictates.

LL2: SCO is a Content- and User-Centered Construct

The focus in SCO development should be centered on the instructional content and the characteristics and needs of the user, rather than on reducing or achieving a content standard or defined level of granularity. It s great when a SCO can be written that is so generic that it can be reused with little alteration, but that will still be the exception rather than the rule, even in SCOs that become incorporated into a comprehensive digital library. The key words that retrieve a group of SCOs should yield different levels of granularity (depth and breadth) just like a key word search in a library would yield multiple texts on the same topic — some done at a simple level, some done at an encyclopedic, biblical reference level. Multiple levels (granularity) of SCOs covering the same topic offer the greatest benefit to instructional developers.

LL3: Required SCO Elements

There are a number of essential content elements that constitute a SCO. A SCO must include learning objectives, main and embedded topics identified, operational definitions, a glossary, and an abbreviation/acronym list as a minimum. This is consistent with the findings of Stout et *al.* (2001). As we pointed out in the examples presented in the previous section, an instructional developer cannot search for all the pieces to a puzzle to assemble it. The pieces must be in place for any given SCO. From there, the elements may be modified, but a complete SCO must be accessed from its source. Libraries do not keep card files on chapters, tables, and figures within texts. Hence, a digital library will likely not provide access to individual images and embedded topics. Each SCO must be composed of all necessary elements and a comprehensive packing list of contents must be included as part of the elements to include imagery (figures), video, tables, and text.

LL4: Requirement for a Text and Multimedia Library

An organized library of text and multimedia is essential for a SCO. The library must be independent of the software used to organize and present the text and multimedia information. This is an extension of the previous lesson learned. A digital library must be organized based on content, not on software design or lines of code. The meta tags that will define SCOs should be intuitive and obvious — just like a key word search. The creator of any SCO should apply a key word set in the same way as they would for any stand-alone composition, no matter the media.

LL5: The Importance of a SCO Champion

A champion within the development team to orchestrate the finding, assembling, and reworking of SCOs to meet new user s needs and organizational requirements is absolutely essential. This champion must be available throughout the entire instructional development process to ensure SCO survival. This requirement is in addition to the need to have a champion on the user side as well.

The importance of a champion cannot be overemphasized — it is more than a team leader and much more than a one-man show. The complexity of developing CBT and WBT courseware requires a team effort of graphic artists, technical writers (and topic SME), and software experts to develop and create any trainer as a minimum. Any one person who could do all these things could not complete most trainers in a timely manner and the benefits of teamwork to brainstorm and create beyond one vision would be lost. We have only touched the surface on this aspect — an entire paper could be dedicated on the importance of a project champion.

LL6: Budgeting Time and Resources for SCO Revisions

ADL developers must budget sufficient time and resources to tailor appropriate SCOs for users other than the original target audience. We have already experienced the agencies that want and need a training product who assume the trainer will cost next to nothing because we already have all of the lessons ready to go. On the other hand, it is too easy for the course developer to mistakenly assume they can complete a project by reuse alone, and at a cost estimate that falls far short of the actual requirements. Hence, the estimates of manpower that go into any statement of work to produce a training product need to be rethought reflecting the new reality of changes in effort based on reusable SCOs and requirements of ADL SCORM compliance.

LL7: Develop SCOs with Both CBT and WBT in Mind

The notion of reusability is consistent with the notion of avoiding a duplication of effort. Any time a training product is being developed, it is advisable to consider how the SCOs will be used and try to design the presentation to be compatible with all media from the get go. There are numerous differences between a CBT presented on computer- and web-based trainers. This is another topic that can be a paper unto itself. Suffice to say that the advantages and disadvantages between CBT and WBT must be considered — memory, bandwidth,

processor speed, and CD ROM limitations are always at the forefront. However, other considerations include navigation buttons (location and response), development software, interactivity, and image quality. Finally, CBTs are usually platform dependent, meaning a Windows system only runs on a PC. Whereas, a WBT is usually platform independent when delivered. This lesson learned can easily be extended to the emerging concept of mobile learning with wireless delivery to such platforms as handheld PCs and personal digital assistants (PDAs).

LL8: Integrate SCOs with POI

A SCO is only part of a total training support package for most given topics. A Program of Instruction (POI) must identify all the SCOs that comprise the Total Training Package. Some training specialists have suggested that a SCO should never be written within a SCO. However, in any program of instruction it is not practical that an entire POI would be a single SCO, and some topics within a POI require a stand-alone SCO. All SCOs should identify available training support packages so that train the trainer materials can be readily developed.

The point here is that SCOs must have a crawl, walk, run progression like any other set of topics and lessons. For convenience, it is best to think of a SCO as a single lesson topic, even if multiple topics are required within a lesson (more typical than not). For every qualification course, there are required lessons (topics), designated times to complete the lessons, and established standards for each skill level. SCOs must conform to these standards and requirements. In this regard, as legacy course material is converted to ADL/SCORM compliant CBT and WBT products, the entire concept of time to complete some lessons and standards for qualification should be reevaluated.

Some SCOs will require more time, others less, and the level of difficulty may change as some topics can be more easily presented in a CBT/WBT environment than others. This takes time and money most customers will not want to provide. It is up to the developer to convince the customer that users want and need the best training product, not the least, quickest, and cheapest. Such products and attitudes will not advance the ADL CBT/WBT 21st century training initiative. Those developers who are converting uninspired page-turning paper lessons into less inspired page-turning ADL/SCORM compliant WBT lessons should reconsider this policy, we believe.

An important take-away point is this. While we focus on the CBT/WBT ADL world, the real goal is effective, blended training that integrates all training delivery means to yield a better trained user, qualified to a standard in a set of defined mission essential tasks.

CONCLUSIONS

Night vision training is an application area in which the ability to develop and reuse instructional content and media for different night vision devices across diverse user groups results in significant economies of effort. Because of this, the night vision training area is an ideal candidate to serve as an effective test bed for evaluating strategies and techniques for developing and defining reusable SCOs.

In this paper, we provided numerous practical examples of ADL-related issues, focused on SCO content and reusability. We provided eight lessons learned that we hope will help developers better define and develop future CBT and WBT training products.

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