

Navy Information / Application Product Suite (NIAPS)

Interface Design Document for Application e-Learning Training Modules Version 1.0

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1. INTRODUCTION

1.1 Purpose

The NAVSEA Navy Information Application Product Suite (NIAPS) and Distance Support Program requires all e-learning developers to make sure that the application training interfaces of the e-learning modules that they deliver to the program conform to a common interface design specification.

This Interface Design Document (IDD) is intended to serve as a guide for developing the interface 'look and feel' for application training e-learning modules for NIAPS applications. This guide should be used by all persons applying to join the NIAPS program if a requirement exists to provide e-learning training modules.

All application-specific e-learning modules that are delivered to NAVSEA will conform to this design specification. By looking and behaving in the same manner, these e-learning modules will further enhance the user's learning experience.



2. GENERAL GUIDANCE FOR DEVELOPING E-LEARNING MODULES FOR NIAPS TRAINING

2.1 Overview

*Learn one,
know all.*

This Interface Design Document (IDD) is intended to promote consistency and usability across e-learning modules for NIAPS applications. The intent of the IDD is to overcome the inevitable conflicts that arise when users have to employ different human-computer interfaces (HCIs) to learn the different applications. Furthermore, different user interfaces slow down learning, because users are required to learn a new training interface associated with the e-learning modules for each application within NIAPS. The IDD embodies the "learn one, know all" design paradigm. Developers should follow these guidelines when creating CD-based and ILE-compliant e-learning courseware for NIAPS.

The contents of this document should be treated as general guidance by e-learning module developers. It covers the development of web-based training components, in general, and application-specific training components, in particular. It also presents guidelines relative to delivery environments, screen real estate management, strategies for presenting large amounts of information, and strategies for making training intuitive.

The recommended design paradigm requires separating style from content. Consequently, developers should implement e-learning modules such that the code associated with style is separate from the training content.

2.2 Web-based Training Components

ISTI's design paradigm for web-based training of NIAPS applications includes both structural as well as conceptual components. *Structural components* include code for desktop or laptop 'skins', as well as text-only delivery. The development of *conceptual components* follows ISTI's design guidelines based on the Science of Learning. These guidelines pertain to considerations such as presentation of content, navigation structure and behavior, display of graphics and photographs, presentation of audio clips and video clips, semantic cues (e.g., colors, icons and symbols, fonts), levels and types of interactivity, test components (scoring, feedback and remediation), incorporation of chat and forums, and types of feedback.

While there are several methods of delivery that are potentially viable for NIAPS e-learning modules (CD-based, text-only, and ILE-compliant), this document is written assuming the content will be delivered on a CD. However, where other forms of delivery would require a different approach or technique, those guidelines are presented in the appropriate subsections.

The e-learning code created by developers should be written to accommodate all methods of delivery to include CD-based, text-only, and ILE-compliant modules. All modules should be



developed in Html 4.0 or Xhtml 1.0. By using a Cascading Style Sheet (CSS), the developer would be able to supply an ILE version, a standalone CD version (browser-based), and a text-only version for handheld devices and/or for the visually impaired.

2.3 Level of Interactivity

The Department of Defense Handbook: Development of Interactive Multimedia Instruction (IMI) MIL-HDBK-29612-3 (<http://www.au.af.mil/au/awc/awcgate/dod/hbk3.pdf>) provides a single comprehensive resource of definitions, abbreviations, and acronyms related to military training and interactive courseware, including Levels of Interactivity (see Appendix A) This IDD primarily contains guidelines for developers that are creating Level II (or lower) e-learning modules. It also anticipates that some developers may need/want to implement selected Level III features to enhance the learning experience and, therefore, contains the guidelines appropriate for some of those features as well. For example, it includes guidelines for drag and drop capabilities of text or graphics. This is considered to be “manipulation of graphic objects to test the assessment of the information presented,” as discussed in the Level III: Complex Interaction section of Appendix A.

2.4 Specific Issues in Application Training

2.4.1 Screen Real-estate

A key challenge in the design of application training systems is the limited “screen real-estate” that is available for incorporating training-related features. In some cases, a screen shot of the software application can be expected to fill the entire screen, leaving no room for the application training interface. This challenge cannot be overcome by shrinking the screen shots and associated graphics because such measures can render them illegible. To effectively overcome the limited screen size problem, the following remedies are suggested:

- allow the training interface to be minimized;
- whenever possible, reduce the software application window to a size smaller than 800 x 600 pixels, before taking screenshots; or
- for large screenshots, create a multimedia presentation capable of zooming in to the specific area (of the screen) that is being discussed.

These three strategies should be employed by developers to overcome/circumvent the limited screen real estate in designing application training interfaces.

2.4.2 Explaining Menu Options

A common deficiency in software training systems is the failure to provide visual assistance to users searching for a specific menu option. To avoid this problem, references to Menu Options or Buttons should be linked to the appropriate screenshot or partial screenshot, with the menu item highlighted.



2.4.3 *Limitations of Help Button*

Application training modules should **not** contain a Help button.

In most e-learning applications, it is necessary to include a Help button which explains how to use the e-learning application itself. However, in an *application training* e-learning module which is concerned with *explaining another application*, the use of a Help button can be expected to create confusion with the user wondering: *What will happen when he clicks that Help button? Is this Help button part of the application he is learning about or is it a Help button that is part of the e-learning system?*

Rather than go down this confusing path, we must recognize that any training system which is explaining another application cannot itself have a Help button. To avoid the need to provide a Help button, e-learning developers should strive to create an intuitive and user-friendly e-learning application.

What this means is that the standardized user interface (UI) for application training must be kept as simple and intuitive as possible. The help available in application training should be limited to Chat, Forums, Feedback and other Contact Information.

3. NIAPS 1.0 E-LEARNING MODULE DESIGN GUIDE

3.1 Desktop/Laptop Skins

This section presents guidelines for the appearance and required behavior of the 'skin'. The skin refers to the color scheme of the background and the borders of the entire screen. It is highly desirable to provide several skins, thereby allowing the user to customize the screen for use in different lighting conditions or to satisfy their own preferences. Shown here (Figure 1), and throughout this document, is a white skin – primarily white background with dark text on most areas and windows.

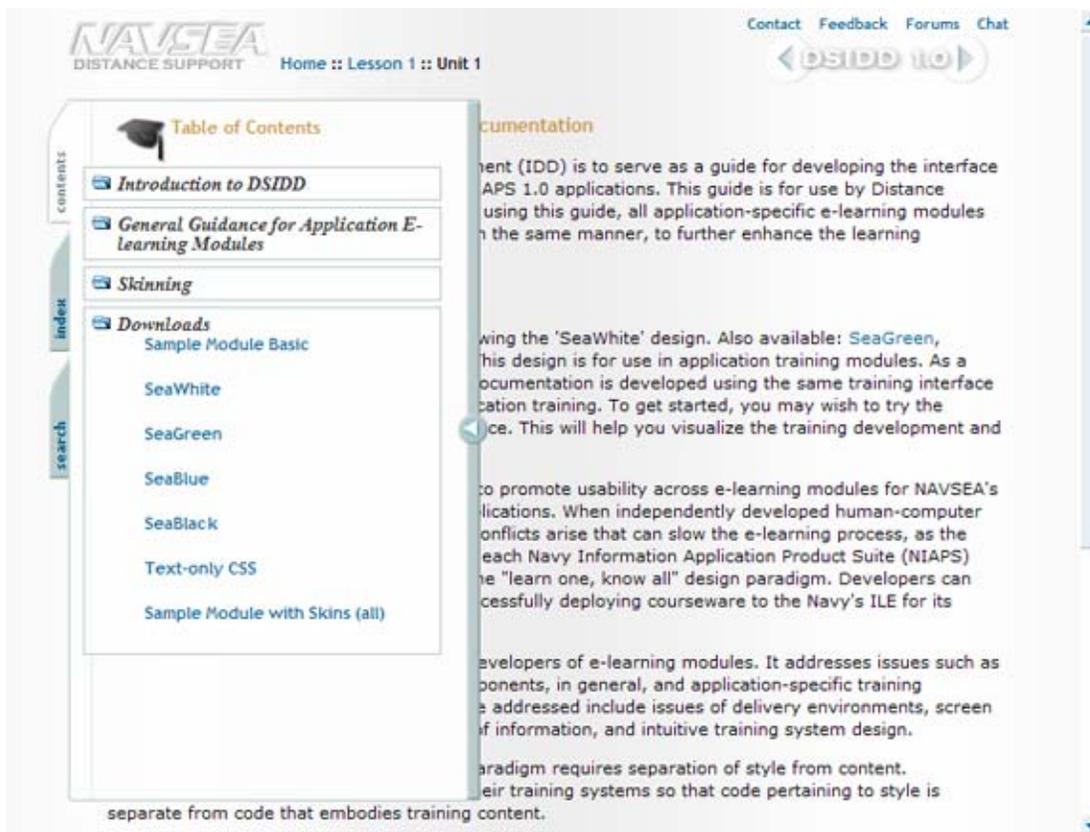


Figure 1. Sample Page of Courseware with a White 'Skin'



Figures 2 and 3 show examples other skins (i.e., color schemes) that could be provided by developers. Users should be able to select these color schemes by name (e.g., Sea White, Sea Blue, Sea Green) from a menu.



Figure 2. Sample Page of Courseware with a Blue 'Skin'

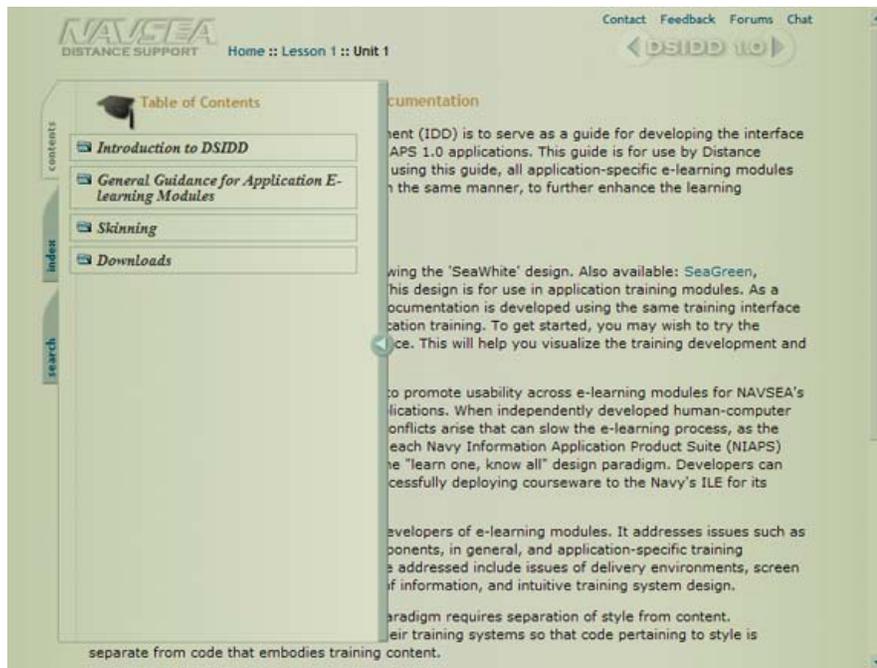


Figure 3. Sample Page of Courseware with a Green 'Skin'



Technical: All design should be done with CSS, keeping style entirely separate from content. Where available, the user's choice should be stored in a cookie, which loads the appropriate CSS and graphic files. A CSS should also be included for text-only display, to accommodate handheld units and/or devices for the visually impaired.

3.2 Windows

The application training modules should not open new windows. A common difficulty for inexperienced computer users is being able to understand the behavior of new windows. Often they will open a new window, then click elsewhere, and subsequently lose the “child” window with no knowledge of how to retrieve it. Additionally, opening new browser windows may cause difficulties in SCORM-compliant and 508-compliant systems.

However, it is sometimes difficult to present all of the training content on one screen. In light of these layout constraints, some content can be minimized, or displayed initially as thumbnails. To view this information, the user will click on the icon or thumbnail representing the content. When maximizing this content, the content should be displayed inside the originating window. For example, clicking on a thumbnail image should open the full-size image directly after its containing paragraph. Subsequent text would then resume just below the full-size image.

The application training content should always be contained within a single window, with the following exception: Training systems which are launched in a SCORM-compliant ILE will be constrained by the rules of the hosting ILE. In some cases, the Table of Contents will need to reside in a separate window. In this case, each shareable content object (SCO) should still display all its content within the SCO window.

Technical: This should be implemented as a JavaScript function, which toggles the display. By scrolling, all page content should be visible to the user within the originating page.

3.3 Navigation

This section contains the guidelines for the appearance and required behavior of the navigation function.

3.3.1 Tab Navigation

Shown on the left is a tab panel containing:

- *The Table of Contents*, which should show all available content in the course.
- *The Index*, which should show all glossary terms and acronyms.
- *A Search function*, which should list internal and/or external search results, as available. External search results are only available with an active internet connection.

It should be possible for the Tab panel to be minimized by the user, to increase the viewing area. Clicking on a button (shown in Figure 4 as an arrow in the center of the panel) should open/close

the panel. The Tab panel resides at a level above the content (i.e. content should be hidden by this panel when it is maximized).

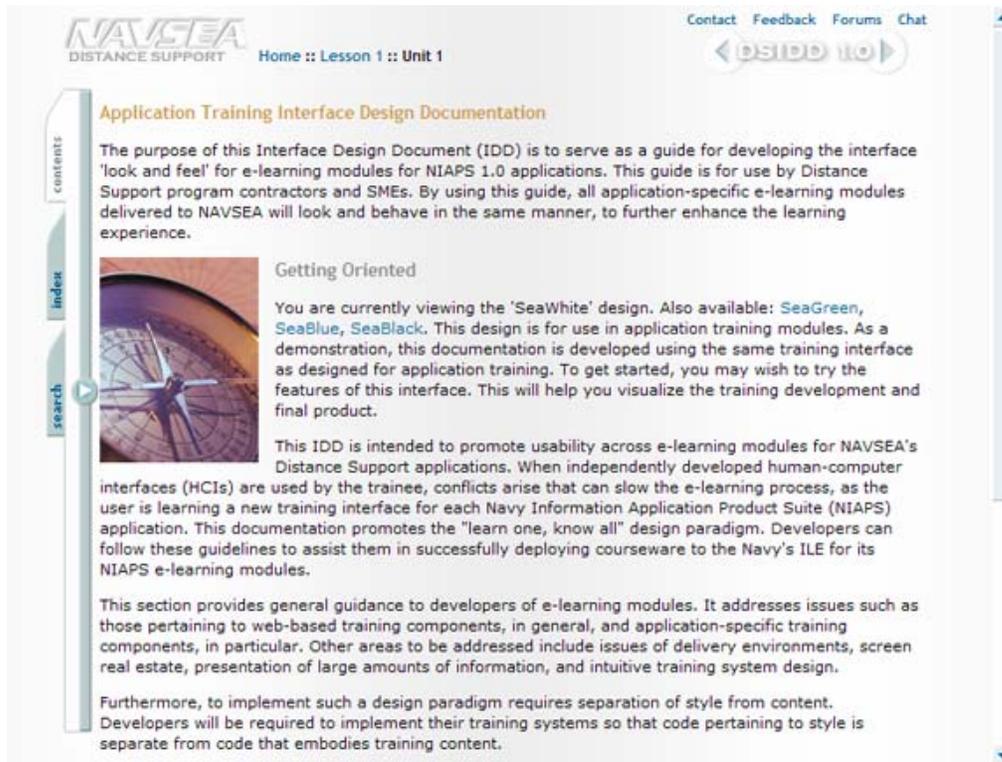


Figure 4: Tab Panel is Minimized

Note: The tab panels are further discussed in section 3.12 of this IDD.

3.3.2 *Breadcrumb Navigation*

The intent of breadcrumb navigation is to show, at a glance, the path down through the hierarchy to the current location. In the figure below, 'Home' and 'Lesson 1' are links to travel back up the hierarchy. Although these links may not always be used, they can help orient users relative to their current locations.



Figure 5: Breadcrumb Navigation

Breadcrumbs are generally located at the top of the page or the top of the content panel. In this design, they are at the top of the page near the logo.

3.3.3 Sequential Navigation

Sequential navigation should be provided to allow the user to navigate sequentially through the units. This navigation should follow the Linear Sequencing model, as defined by ADL (Figure 6).

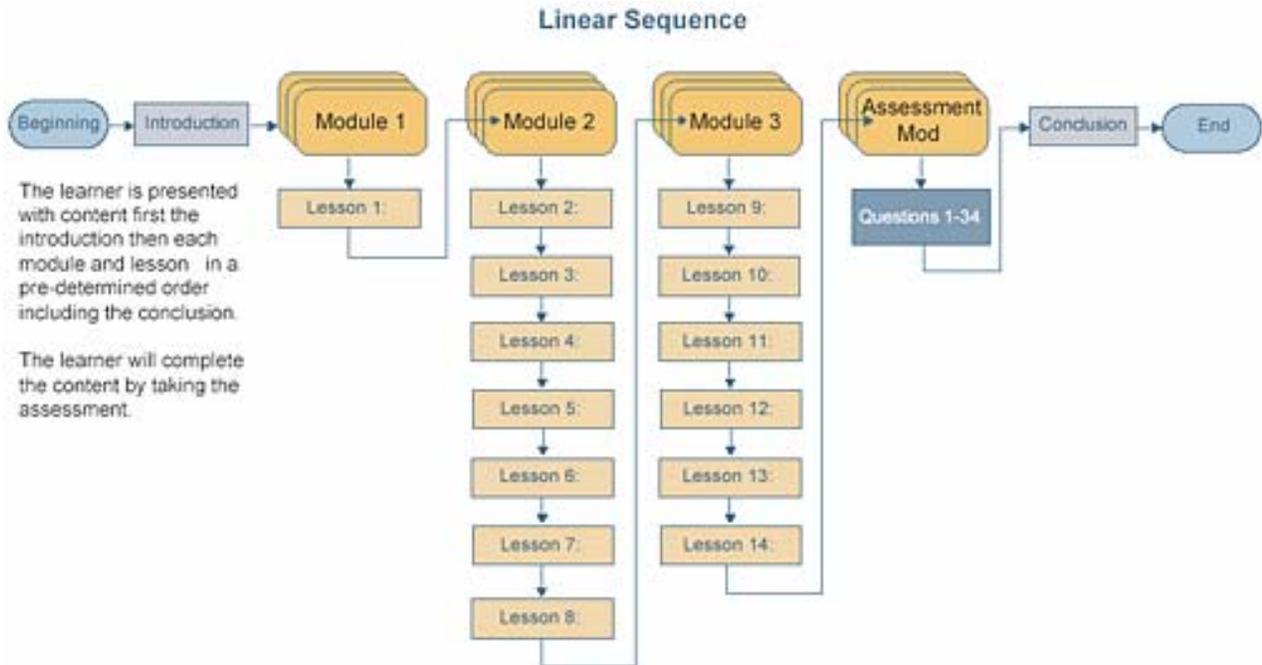


Figure 6: Linear Sequencing as Defined by ADL

In this sequencing model, the Back and Next button are *always available*.

Technical: For more sequencing information, see <http://www.adlnet.gov/downloads/296.cfm>.

In this user interface, the Back and Next buttons should always be positioned at the top right. This decision follows the design principle that essential navigation should always be available without having to scroll down a page to locate the navigation controls.



Figure 7: Back and Next Buttons

The Back and Next functions should also be accessed by using the left and right arrow keys on the keyboard.

3.3.4 Chat, Forums, Feedback, and Contact Information

As noted earlier, training for applications should not include a Help button. The supplementary help functions should be located at top right (where a Help button would have been, had one been called for).

The supplementary help functions include: Chat, Forums, Feedback, and Contact Information. These links are optional. The module developer should work with the sponsor/customer to decide which supplementary help functions can be reasonably provided. Since these functions typically require an internet connection, special consideration must be given to those situations when some users can be expected to be connected to the internet, while others are not. In this case, the user who opens a chat window or forums, without an internet connection, should receive an alert indicating the problem. If these functions are provided, the windows should be designed using the same styles as the areas where content is presented.

3.4 Toolbars

Only two types of toolbars are used in this design specification: the video controller and the multimedia controller.



Figure 8: Sample Video Controller

Technical: The design for the video and multimedia controllers will be subject to review pursuant to the development of the first e-learning module. The recommended implementation, at this point, is a semi-opaque Shockwave file, which allows one controller file to be used in all skins. Loading the videos as thumbnails first will allow the user to read other content while the file downloads.



3.5 Keyboard Shortcuts

Keyboard shortcuts should be provided to assist handicapped users, as well as to facilitate navigation for experienced users.

The left and right arrow keys should be used to navigate through the lessons sequentially, as specified in section 3.3.3, Sequential Navigation.

Since an ILE could launch the module in a browser window which has no toolbars, keyboard shortcuts should be used to increase or decrease the font size (see also section 3.7.2.) A keyboard shortcut should also be provided to receive the text-only version of the module.

3.6 Scrollbars

There are two types of scrollbars: vertical and horizontal. *Vertical scrollbars* should be located both inside the Tab Panel and along the outside of the instructional content page.

The vertical scrollbar inside the Tab Panel should only be active (visible) when the number of items in the list shown is too long to be viewed on one screen.

The same is true for the vertical scrollbar associated with the instructional content area – it should only be active when necessary. Although it is desirable to avoid having to scroll down to see all of the lesson content in a window, it is not always possible. The content of some instructional units requires more real estate on the screen (especially when viewed on laptop monitors). Therefore, it is recommended that the instructional content be developed so as to “minimize” the use of vertical scrollbars.

Horizontal scrollbars should be disallowed. This is especially true for application training, because it is in application training that:

- developers would be most inclined to use such scrolling to traverse the entire application screen; and
- users are most likely to lose context and misunderstand.

To avoid major communication problems between users and developers, horizontal scrollbars should be avoided at all costs. If screenshots are too large to display in the page, the developer should opt for using a multimedia presentation, which zooms into the area of the screen being discussed.

3.7 Content Presentation

Content for both the ILE and CD versions should be optimized for display in 17" desktop and laptop screens. Margins should allow content to properly display at resolutions which are no more than 750 pixels wide.



3.7.1 Colors/Fonts/Text Display

With the exception of bold text, text styles should be limited to those which are contained in the CSS. Styles should never be manually placed into the HTML or XHTML, since these will display incorrectly in other skins or text-only versions.

The use of ALL CAPS, blinking text, and long paragraphs of centered text should be avoided.

Preferred fonts for paragraph content should be the sans-serif fonts: Tahoma, Verdana, or Arial. The preferred fonts for headers should be Times, Trebuchet, Tahoma, Verdana or Arial.

3.7.2 Acronyms

Although not a strict requirement, acronyms within the content should be properly tagged to display full text on mouseover.

Technical: The following html code may be used inside any paragraph to display acronyms on mouseover:

```
<acronym title="Subject Matter Expert">SME</acronym>
```

(Replace "Subject Matter Expert" with the appropriate title, and SME with the appropriate acronym.)

3.7.3 Display of Graphics and Photographs

Graphics and photographs should be displayed either in full size, or as thumbnails, or as links in text. Thumbnails and links should open the full-size image inside the same html page (pushing any subsequent content further down the page).

Drawings and charts should, whenever possible, be created and displayed in vector format. A vector drawing, (e.g., a drawing in Shockwave format) uses less bandwidth, is more maintainable, has clearer text, and can be magnified.

Alternative text should be provided for all foreground images.

3.7.3.1 Captions

Captions for thumbnails should be aligned next to the image. These captions should be styled using the caption-link style from the CSS.



Figure 9: Examples of Thumbnail Images with Captions

Captions for full-size images should be aligned to the top-left or top-center of the image. These captions should be styled using the caption-text style from the CSS.

3.7.3.2 Zoom In/Out Capability

Shockwave files contain a zoom capability. While additional zoom functions may be provided at the discretion of the developer, standard icons should be used.

3.8 Availability and Control of Audio Clips

Audio clips should play in a master controller. The volume setting for this controller should remain consistent throughout all pages.

3.9 Semantic Cues and Icons

“Semantic Cues” [Madni, 2002] may be used in accordance with the Iconography Documentation (to be developed). Semantic Cues are icons, strategically placed throughout the learning content, that indicate to the user the type of material being presented (e.g., concept, procedure, hint/tip, etc.). These may include standardized icons, colors, fonts, and symbols.

3.10 Exercises

Exercises, in the form of multiple choice questions or “drag-and-drop” graphics, should be included in the Table of Contents. They can be related to one or more units, or an entire lesson, and should be structured to allow the user to utilize the information learned in the preceding material. An exercise should open in a unique panel, with its own Continue button. A progress bar should be provided inside this exercise panel, to show the number of questions completed and remaining. If the progress bar is included, then it needs to be included in all exercises within the e-learning module.

Instantaneous feedback should be given during an exercise to emulate a mentor/tutor “looking over the shoulder” of a user. When the user makes an incorrect decision or takes an erroneous action, the e-learning system should immediately make the user aware that the answer was incorrect. Requiring the user to locate the right answer ensures that the user would view the right answer within the appropriate context. More importantly, it stops the user from forming “erroneous cognitive chains” which are difficult to unlearn.

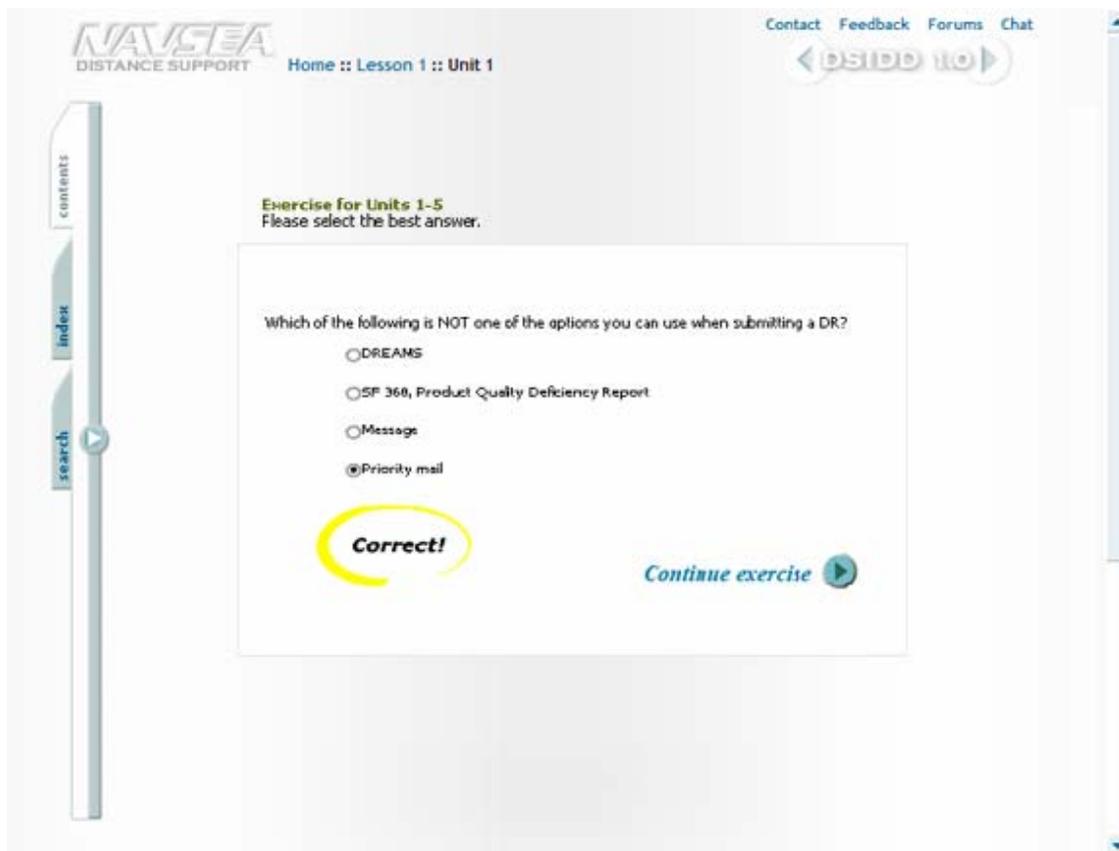


Figure 10: Sample Exercise

Multiple Choice Exercise Questions: When the user gives an incorrect answer, the system should provide immediate feedback to the user that the answer was incorrect. The user should then have the option to choose another answer (without page reload or any other delay). The user may continue to answer and receive feedback until he has provided the correct answer.

Drag-and-Drop Questions: If the user drags his answer “object” to an incorrect location, it should snap back to its original location. The drop targets (i.e., locations where answers can be inserted) should all be easily distinguishable. If the user drops an item close enough to the correct drop target, the item should snap to the correct location.

Fill-in-the-Blank Questions: These types of questions are out of scope of the Level II e-learning modules, and do not have to be included in a Level II system. For example, a user may want to



enter "Quick-Acting Watertight Door," in response to a fill-in-the-blank question. He could type in: QAWT Door, QA Watertight Door, Quick Acting WT Door, or any of a large number of options which would all be correct. Recognizing that these terms all mean the same thing or pertain to the same thing would require a data dictionary.

3.11 Tests

Tests should be designed in the same way as exercises, each in a unique panel with its own Continue button. The Continue button must be disabled until the user has made a choice.

It is important to realize that during the test-taking, correct answers should not be indicated to the user (i.e., immediate feedback should be disabled).

3.11.1 Drag and Drop Test Questions

Drag and drop test questions should snap the user's answer to the closest drop location. The user should be able to change his answer by removing it from one drop location and placing it into another. If two answers are placed on the same location, one must snap back to the original starting location. Only one answer may go to each drop location.

3.11.2 Submitting Answers

The developer should provide the user with the opportunity to review his answers before submitting them. If this feature is included in any test within a module, then it should be included in all tests within that module. Once the final submit button is pressed at the end of the test, the test should be scored. For the CD version, the score should be rounded to the nearest tenth (e.g., 84.7%) and displayed to the user. For the ILE version, pursuant to displaying the score to the user, the score should be sent to the ILE to update the user's profile.

Developers should work with the appropriate training organization to determine/specify the criteria for a passing grade. Feedback should be provided to the user on whether or not he passed the test and what his score was. In addition, sponsor/customers can decide whether the developer should provide the ability to print the page showing the test score.

3.11.3 Remediation

After a test is completed, remediation should be provided for all incorrect answers, regardless of whether or not the user scored a passing grade. Each question with an incorrect answer should have at least one reference to the lesson material in the course where this information was presented. The remediation page should present these lesson topics or units to the user and provide individual links to each topic or unit within the course. The user can return to the remediation page after viewing the lesson material again, and then jump to the next remediation

link until all incorrect answers have been covered. There should be no restriction on the number of times a user can revisit the lesson material from the remediation page.

3.12 The Tab Panels

Clicking on each of the Tabs in the Tab Panel should bring the appropriate function to the fore.

3.12.1 Lesson Tree

The lesson tree should use a toggle function to decrease the frequency of scrolling. When a top level Activity or Lesson is open, clicking on a new Lesson should close it. In this way, only one branch is open at any time.

3.12.2 Index

The index should contain a glossary of terms. The text box should allow users to look up terms easily from a long list. Results should be displayed to the right, to allow longer explanations. The Back and Next button may be used with the index panel open. In this case, it should traverse the list of definitions. Clicking on the Contents Tab should return the user to his current lesson unit.

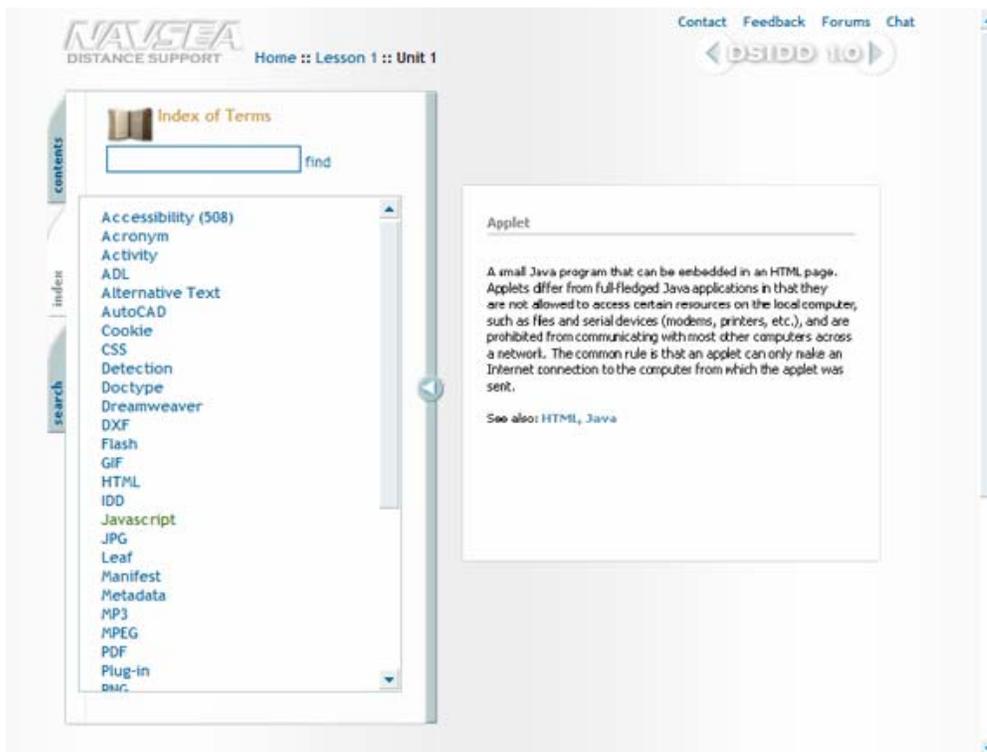


Figure 11: Index Tab

3.12.3 Search Tab

The search tab should include internal and/or pre-determined external search results. These should be separated in the search results display. If external results are included, all URLs should be contained in a text file which can be updated (i.e., Xml, Html or Xhtml). If the course is running in an ILE environment, the display of external search results must be in accordance with the specifications of the hosting ILE environment.

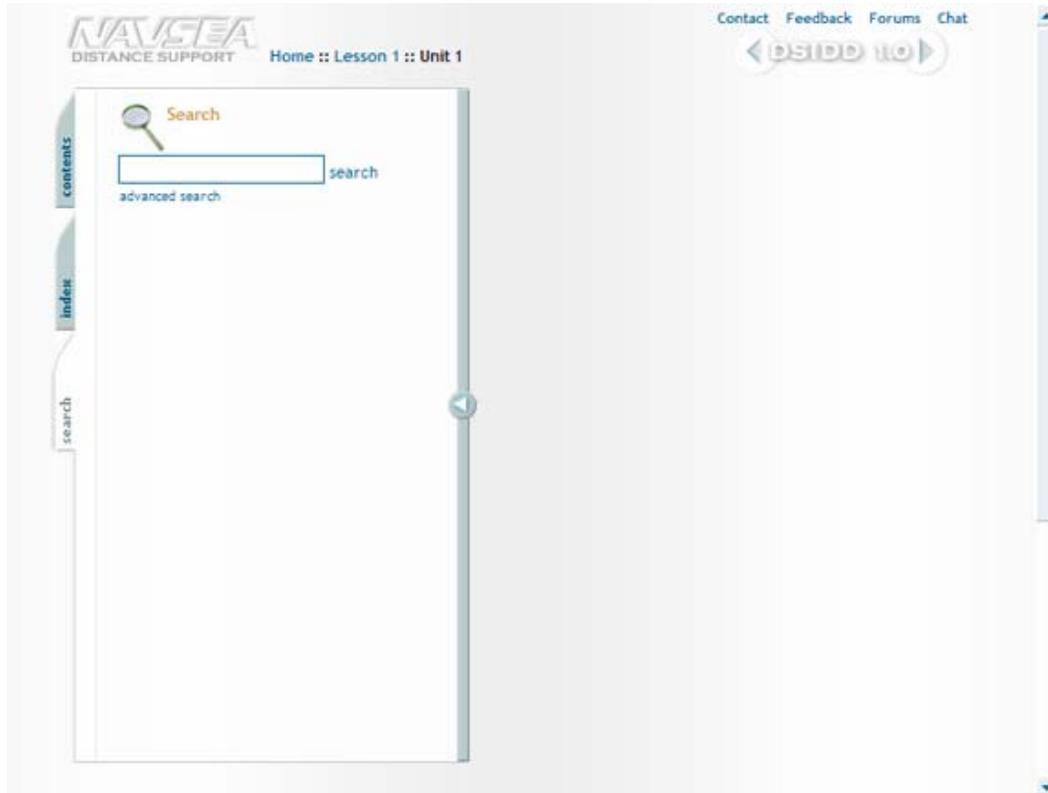


Figure 12: Search Panel



4. COMPLIANCE WITH SECTION 508

In systems that need to be compliant with Section 508, the following guidelines need to be followed:

<http://www.access-board.gov/sec508/guide/1194.22.htm>

All video and audio content should be subtitled. All foreground images should contain alternative text (as opposed to the background images used in the UI). All fonts should be in EM or percent units so the size may be increased or decreased.

A text-only version of all modules should be included by using a "non-styled" CSS. This CSS file should be designed for display in text-only systems.



REFERENCES & ASSISTANCE

Madni, A.M. Semantic Cues to Facilitate Navigation and Accelerate Material Review. ISTI Technical Memorandum, 2002.

Assistance: For assistance in the use of this document you may contact the NAVSEA 03 NIAPS & Distance Support Program Training Lead:

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APPENDIX A: LEVELS OF INTERACTIVITY

The U.S. Department of Defense (DOD) developed definitions for four major levels of eLearning interactivity that can be found in the "Department of Defense Handbook: Development of Interactive Multimedia Instruction (IMI)." The DOD defined these interactivity levels to correspond with various levels of learning (fact, rule, procedure, discrimination, and problem solving), as well as identified the resulting skills expected at the end of the training session. They also use the various levels to assign applicable costs to training initiatives. These *levels of interactivity* provide a basic set of standards to help define the appropriate level for eLearning systems. Each level is indicated by certain core criteria including nature of content, job descriptions, technology infrastructures and even budget constraints.

Level I: Passive

In this level, the learner acts merely as a receiver of information. The learner may read text on the screen as well as view graphics, illustrations and charts. The learner may interact simply by using navigational buttons to move forward or back through the program. Passive eLearning systems represent the majority of online learning being used today. They are still appropriate when the session needs to distribute information quickly. Examples might be new human resource policies and explanations of changes in corporate structure, information that does not directly affect the manner in which the employee must do their job on a day-to-day basis.

Level II: Limited Interaction

In this second level, the learner makes simple responses to instructional cues. As in Level I, there may be multiple choice exercises, pop-ups, rollovers or simple animations. Level II adds a component of scenario-based multiple choice and column matching related to the text and graphic presentation. Certain application simulations may exist that do not require the learner to enter field data, but merely follow a process or procedure. There may also be some interactive animations where the learner has the ability to investigate.

Level III: Complex Interaction

Here, the learner makes multiple, varied responses to cues. In addition to the types of responses in Level II, complex interactions may require text entry boxes and manipulation of graphic objects to test the assessment of the information presented. Techniques for engagement in a complex interaction include complex simulations where the learner must enter actual data into fields and experience consequence for errors and faulty data. In addition, scenario-based branching logic is introduced. When using branching logic, learners experience some kind of jeopardy for incorrect responses, and their progress is determined by their decisions.



Level IV: Real-time Presentation

Real-time presentation creates a training session that involves a life-like set of complex cues and responses in this last level. The learner is engaged in a simulation that exactly mirrors the work situation. Stimuli and response are coordinated to the actual environment. Real-time learning and assessment occurs, and the session is most likely held in a collaborative environment with other learners and a facilitator.