Content

Design, Development, and Deployment

for the

Navy Integrated Learning Environment

Version 1.4

05 October, 2004

How to use this Document

The document serves as the first step in understanding the Navy Guide to Content Design, Development and Deployment. The initial rules and guidelines listed in this document are a starting point in the process of developing the Navy Content Object Model (NCOM). The document will be used to develop Navy Integrated Learning Environment (ILE) content that adheres to both the Navy ILE vision and mission and Navy-SCORM.

The Navy Guide to Content Design, Development and Deployment is organized into 6 areas of interest. The following will provide the name and a summary of each area of interest.

- **Part One: Overview -** Briefly describes the vision, mission, and goals of the NAVY ILE and the role that Navy-SCORM has within the Navy ILE. This document focuses on the application of Navy-SCORM for design, development, and deployment for the current and legacy ILE systems Describes the concepts of interoperability, Reuse, Repurpose, and Reference (R3), and discusses the relationship between NCOM and the Advanced Distributed Learning (ADL) Shareable Content Object Reference Model (SCORM).

- **Part Two: Content Design –** Describes the process of organizing content, selecting instructional and assessment strategies, and determining a delivery platform. Instructional Designers (IDs) are referred to the SCORM, SCORM CAM, and SCORM Sequencing and Navigation documents for important information on designing for the Navy. The instructional strategy and design process is summarized, including aspects of learner assessment and feedback. The components and subcomponents of learning content are delineated and successful design principles are recommended.

- **Part Three: Content Development -** This section explains techniques to ensure that the design of any content is adhered to in the development process. The unique characteristics of Content Sequencing in SCORM are described. The concept of metadata is introduced and explained in some detail, along with a discussion of its importance to learning content.

- **Part Four: Content Deployment -** This section briefly covers the testing of content in the LMS through the Content Compatibility Center and the ADL Test Suite. Good testing practices are mentioned as well as the list of deliverables to accompany each unit of content submitted to the Navy. Emphasis is placed on the Content Submission Form and the protocol for completing it accurately.

- **Part Five: References -** The reference list is provided to document resources used to compile information in this document. These references provide useful information for additional reading on a variety of related topics.

- **Part Six:** The appendices provide a glossary, additional detailed information and a variety of examples for use and reference.

¶ NOTE ¶

This document is an example of Reuse, Repurpose, and Reference (R3) in that it has repurposed Shareable Content Object Reference Model (SCORM 2004) sequencing content from the Learning Systems Architecture Lab at Carnegie Mellon University. Their work, except where otherwise noted, is licensed under the Creative Commons Attribution-NonCommercial-ShareAlike License.

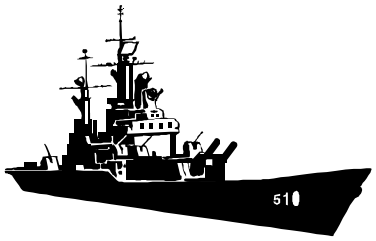
To view a copy of this license, visit http://creativecommons.org/licenses/by-nc-sa/1.0 or send a letter to Creative Commons, 559 Nathan Abbott Way, Stanford, California 94305, USA.

Attribution Noncommercial Share Alike

Table of Contents

TABLE OF FIGURES

TABLE OF TABLES



PART ONE - OVERVIEW

The following sections briefly describe the vision, mission, and goals of the NAVY Integrated Learning Environment (ILE) and the role that the Navy Content Object Model (NCOM) has within the Navy ILE. Additionally, the concepts of interoperability, reuse, repurpose, and reference (R3) are introduced. Finally, the relationship between Navy-SCORM and the Advance Distributed Learning (ADL) Shareable Content Object Reference Model (SCORM 2004) is discussed.

1.0 INTRODUCTION

1.1. Purpose Statement

The document serves as the first step in understanding Navy-SCORM for the development of Navy Integrated Learning Environment (ILE) content. The initial rules and guidelines listed in this document represent a starting point in the process of the Navy-SCORM development. The document will be used to develop Navy ILE content that adheres to both the Navy ILE vision and mission and Navy-SCORM.

1.2. Task Force EXCEL (TFE)

Task Force Excellence through Commitment to Education and Learning (EXCEL) (TFE) is creating major cultural changes by focusing Navy learning on fleet mission requirements through the use of human performance measures—providing Sailors with the "tools and opportunities" to grow and develop, both professionally and personally, while improving mission accomplishment.

The Four Quadrant Human Performance System Model (HPSM) is the underlying human performance process by which TFE and partners are redefining Navy policies, structures, and mechanisms. For more information on HPSM, go to http://www.excel.navy.mil/human.htm.

The 5 Vector Model (5VM) defines the parameters around which a Sailor's personal and professional development is designed. Eventually, the 5VM will change the promotion and detailing process. For more information on the 5VM, go to http://www.npdc.navy.mil/. The 5 Vectors are:

- Professional Development
- Personal Development
- Leadership
- Certifications & Qualifications
- Performance

1.3. SeaWarrior

Sea Power 21 is the strategic vision for how the Navy will organize, integrate and transform to deal with the dynamic threats we face in today's global environment. It reflects fundamental changes in the technology and tactics used to strike our enemies, in how we defend the fleet and the nation through control of the seas, and in the approach to how we deploy resources to support both our offensive and defensive capabilities. Sea Power 21 consists of three key components:

- Sea Strike – Projecting Precise and Persistent Offensive Power
- Sea Shield – Extending Global Defensive Assurance
- Sea Basing – Enhancing Joint Operational Independence

Sea Strike, Sea Shield, and Sea Basing will be enabled by ForceNet, an overarching effort to integrate warriors, sensors, networks, command and control, platforms, and weapons into an integrated and networked combat force from the seabed to space. ForceNet will be the Navy's plan to make network-centric warfare an operational reality. Essentially, it entails using information technology (particularly networked sensors and command and control systems) to improve real-time situational awareness, and enable warriors at all levels of the chain of command to make more informed decisions and therefore improve combat operations and increase force survivability.

Underlying Sea Power 21 is a Global Concept of Operations which governs how we will manage and deploy unprecedented combat power and war fighting capabilities. It determines the size and composition of the Fleet, based on the war fighting strategy. This Global Concept of Operations is supported by a triad of organizational processes:

- Sea Warrior – Putting the right Sailor with the right skills in the right job at the right time
- Sea Trial – Enabling innovation through rapid concept and technology development
- Sea Enterprise – Streamlining operations and retiring obsolete systems/platforms to free up resources for investment in the new infrastructure needed to transform the Navy

This triad comprises a blueprint for a dramatic and fundamental transformation of how the Navy performs some of its most basic mission-essential functions. Sea Warrior encompasses the full human resources lifecycle – from recruiting, to training and education, to staffing and career management, to how we leverage the investment made in a Sailor after they retire. Taken together, Sea Trial and Sea Enterprise address the full lifecycle of technology resources – from requirements gathering, to innovation and research & analysis, to prototype development, to acquisition, to how and when to sunset obsolete or redundant systems and platforms.

According to Admirals Harms, Hoewing, and Totushek:

This is the goal of Sea Warrior: to integrate the Navy's manpower, personnel, and training organizations—active and reserve—into a single, efficient, information-rich human resource management system. Its focus is on growing individuals from the moment they walk into a recruiting office through their assignments as Master Chiefs or Flag Officers, using a career continuum of training and education that gives them the tools they need to operate in an increasingly demanding and dynamic environment. Through Sea Warrior, we will identify Sailors' precise capabilities and match them to well-articulated job requirements that far exceed the simplistic criteria used today. In addition, we will implement different types of incentives and flexible rotation dates and move the Navy toward a job-based compensation system.
- U.S. Naval Institute Proceedings from June 2003

This solution provides the Sailor with access to a career-long training and education continuum and allows learners instant access to the tools to perform their jobs successfully.

1.3.1. SkillObjects™

In 2002, the Chief of Naval Operations (CNO) funded the Navy's Workforce (INWF) project, an aggressive effort to develop a data rich, occupational analysis that would update the Navy Occupational Standards. The initial requirement was to capture and characterize the occupational work (jobs) for Navy enlisted personnel and develop a new occupational classification system. The SkillsNET Corporation process, suite of technology, and information rich data model was selected by Navy Leadership to underpin the occupational analysis effort. SkillsNET's data model, the trade marked SkillObject™, brings a fidelity and structure to an otherwise incomplete and unstructured human resource data modeling.

The Navy has proven the utility of the SkillsNET approach and data model with its integrated data clusters of knowledge, skills, abilities, tasks and tools (KSATT) components of the SkillObject™. SkillObjects are used to develop a set of normative data ready for multiple uses in all types of other applications and other processes. The SkillsNET organizational structure of occupational data affords Naval Leadership a strategic view of work and adds a new dimension of currency to work descriptors. Refer to Appendix J for SkillsNET Taxonomies; Knowledge, Resources, and Skills and Abilities.

Subsequent CNO funding supported the effort to classify SkillObjects into skill standards that are used for numerous Navy functions, including manpower, recruiting, distribution, and training. More recently, CNO initiated the Sea Warrior Project that builds from the work-based standards to capture and provide Sailors with an environment whereby they can make decisions about career choices, follow-on duty assignments, and training.

1.3.1.1. Level I – Occupational Job Task Analysis

The Level I process generates two kinds of SkillObjects which relate to work being accomplished. These are Occupational and Organizational SkillObjects. Occupational SkillObjects are defined as work accomplished that is primary to a Navy occupation. The training for this work is usually accomplished through formal training as in schools or center classes.

Organizational SkillObjects are defined as work accomplished through "other duties as assigned" or collateral duties, work that is not considered official Navy occupation, these include watches.

1.3.1.2. Level II – Training and Requirements Analysis

The Level II process is a method which gathers information for training and the Integrated Learning Environment. The content data elements offer more granular/discrete descriptors of work requirements and performance statements. Level II data elements are anchored by subtasks, steps, specialty skills, special abilities, specific tools, specific knowledge, specific resources and performance standards.

1.4. Integrated Learning Environment

In December of 2002, NETC established the Integrated Learning Environment (ILE) as a mechanism for transforming legacy systems and business processes into a "system of systems" that would enable the changes needed to accomplish RiT (Revolution in Training) goals and provide the functions required to realize Sea Warrior. The stated ILE vision is, "Improve and support job performance and mission readiness by providing high quality learning and performance support available anytime and anywhere. Provide an environment to analyze, define, develop, document, and implement human performance and learning alternatives, acquire products, and provide life cycle support per the vision, goals, and objectives of the "Revolution in Training."

There is a range of key functional participants that will be operating in the Navy's Integrated Learning Environment:

- Navy "Users" – people and organizations responsible for providing learning (e.g., educators, trainers, managers, personnelists, and operators) and receiving learning to improve readiness and performance;
- Acquisition Interests – those responsible for learning acquisition considerations, including government and private-sector interests having both managerial and technical responsibilities; and
- Content and Tool Providers – government and private-sector interests responsible for designing and developing learning content and tools (e.g., SCORM-conformant content, Learning Management Systems, Learning Content Management Systems, information technology architectures, etc.).

The Integrated Learning Environment, therefore, must have well-defined interfaces that allow people to interact, organizationally and technically, within the Navy, as well as with other audiences in the Department of Defense, Federal government, and the private sector. This will be especially important as technology-enabled, sharable, reusable content and tools become more ubiquitous, and as technology-enabled interactions between the learning, personnel, and operational communities become more commonplace.

The ILE is people, processes, and technologies. While the most obvious attributes are technologies, the ILE is conceived as a means to enable individual excellence through highly personalized interfaces to essential decision support and learning activities with supporting business rules. The ILE combines support tools for developing and distributing electronic course materials, and managing student and curriculum records, with standards for classifying content, formatting files, and interoperability among other systems. It provides five primary services to its users:

- Design, develop, and display of individual learning plans derived from Sea Warrior validated organizational requirements
- Learning and performance support content design, development, display, and event data capture
- Learning consumption, ashore and afloat
- Performance assessments
- Business analytics for managing investments

The ILE will support a range of pedagogical and andragogical learning approaches to meet the diverse requirements of the Navy's workforce. Learning and performance support materials will be provided in the most cost-effective manner to include a larger body of foundational simple serial learning media to a growing body of highly adaptive learner-sensitive content. The ILE will avoid lowest common denominator solution paths including geographically constrained, instructor-centric training as these will by definition address a limited subset of the required population. The Navy's primary investment will be learner-centric, highly deployable content.

1.4.1. ILE Architecture

Multiple legacy systems will be used in the initial days of ILE implementation. While these support legacy training methods, the transition to full functionality will avoid constraints imposed by these tools and associated business rules. Therefore, the Navy intends to build ILE using an Information Services Architecture (ISA) to allow maximum data interplay across systems. The Integrated Learning Environment – Information Services Architecture (ILE-ISA) is the technological and procedural foundation of the RiT, which enables the CNO's vision to become reality. ILE-ISA is a full Enterprise Architecture conforming to DoD guidance and industry best practices that addresses technology, business processes, and organizational roles and responsibilities as one unified comprehensive architecture. As an Enterprise Architecture, it encompasses the full set of integrated functions and specifications from networks, computing hardware, software applications, database design, standards-based interoperability methods and protocols, user-based use cases, and advanced information specifications. ILE-ISA provides the primary operational capabilities required for the RiT that can be enabled or supported by technology.

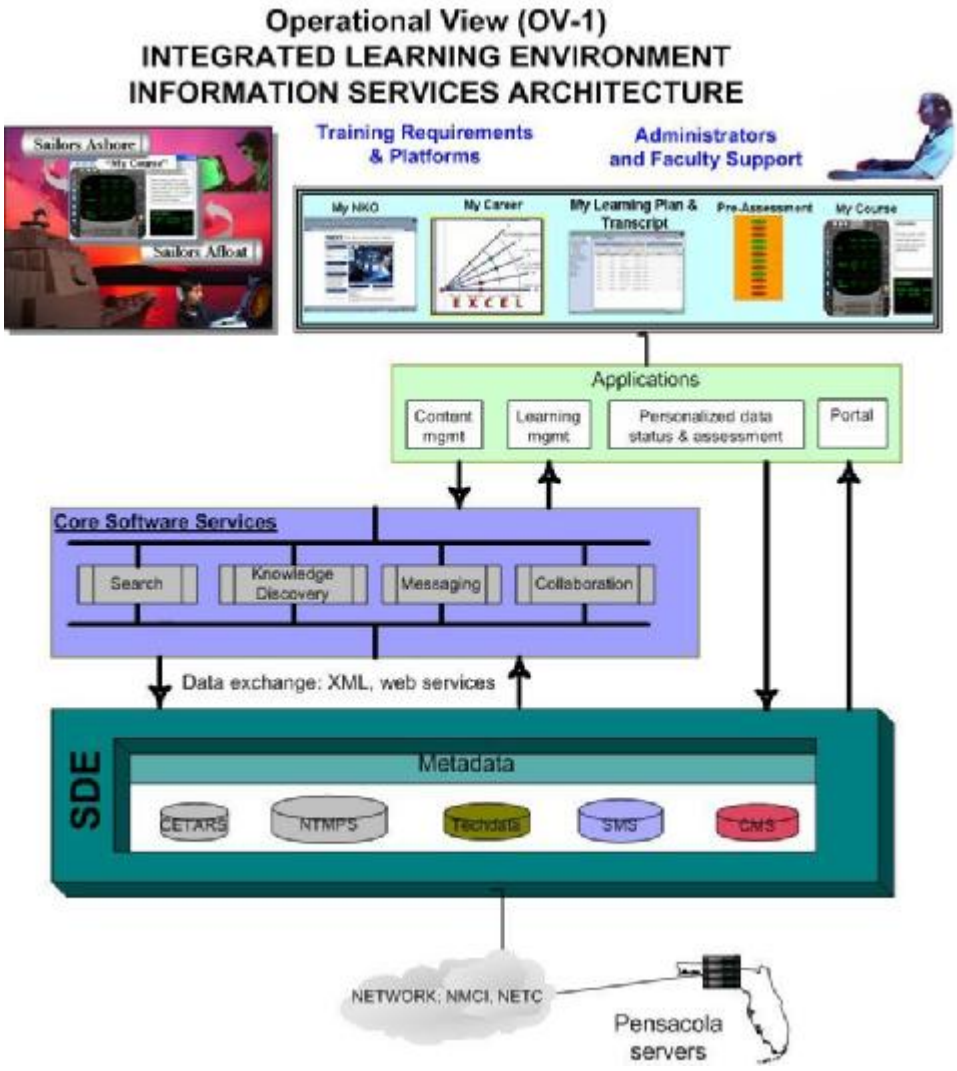


Figure 1.1: ILE-ISA layered architecture of the Navy training and education planned information infrastructure.

1.4.2. My Course

My course is defined as a set of ELO's for a sailor based on personal training needs. IA Set of ELO's for a Sailor based on all of personal training needs. Training Needs are based on the 5VM (5 Vector Model) system runs a gap analysis via an algorithm. The gap analysis ID's all of the SkillObjects are needed to satisfy a training requirement.

SkillObject data is linked to an ELO(s). A set of ELO's makes up "My Course"

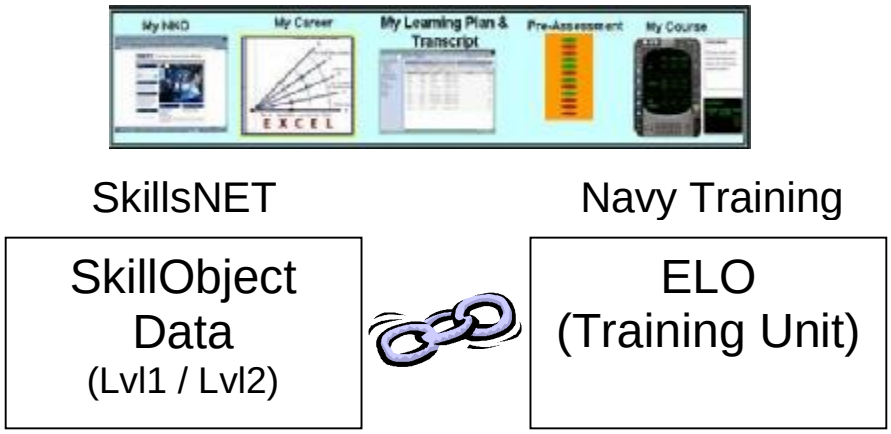


Figure 1.2 – The key to "My Course" is the linkage of a SkillObject to an ELO(s)

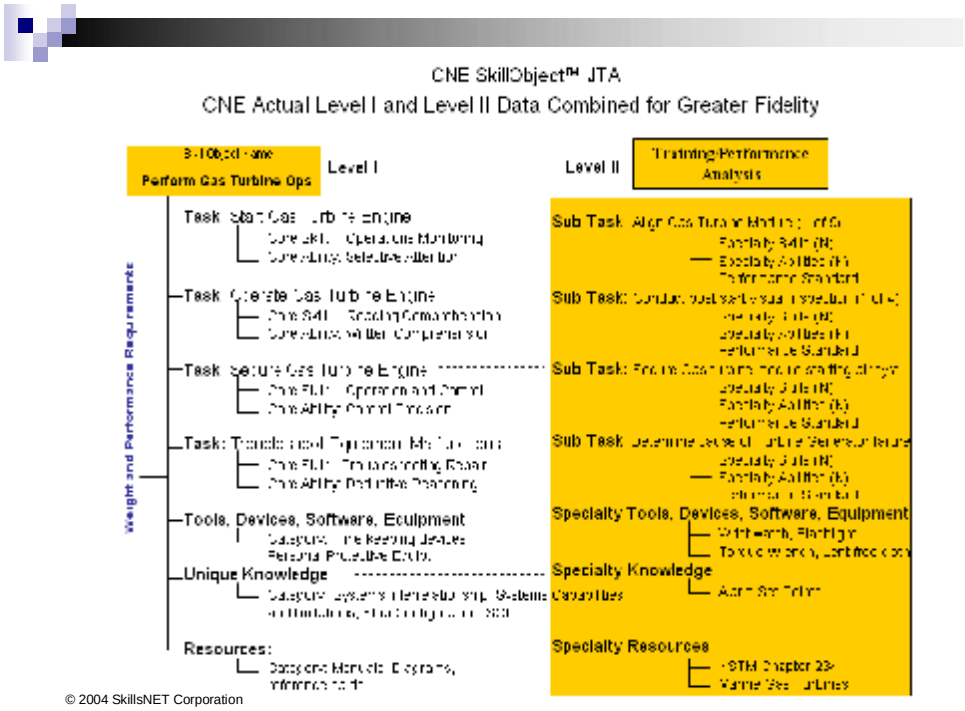


Figure 1.3 – Example of SkillObject Name and Training Performance Analysis

1.4.3. ILE Process

This document outlines the guidelines for content designers and developers.
The ILE Process Flow for content design and development can be seen in the Navy ILE Acquisition, Content Design, Development, and Deployment Overview Process Flow.

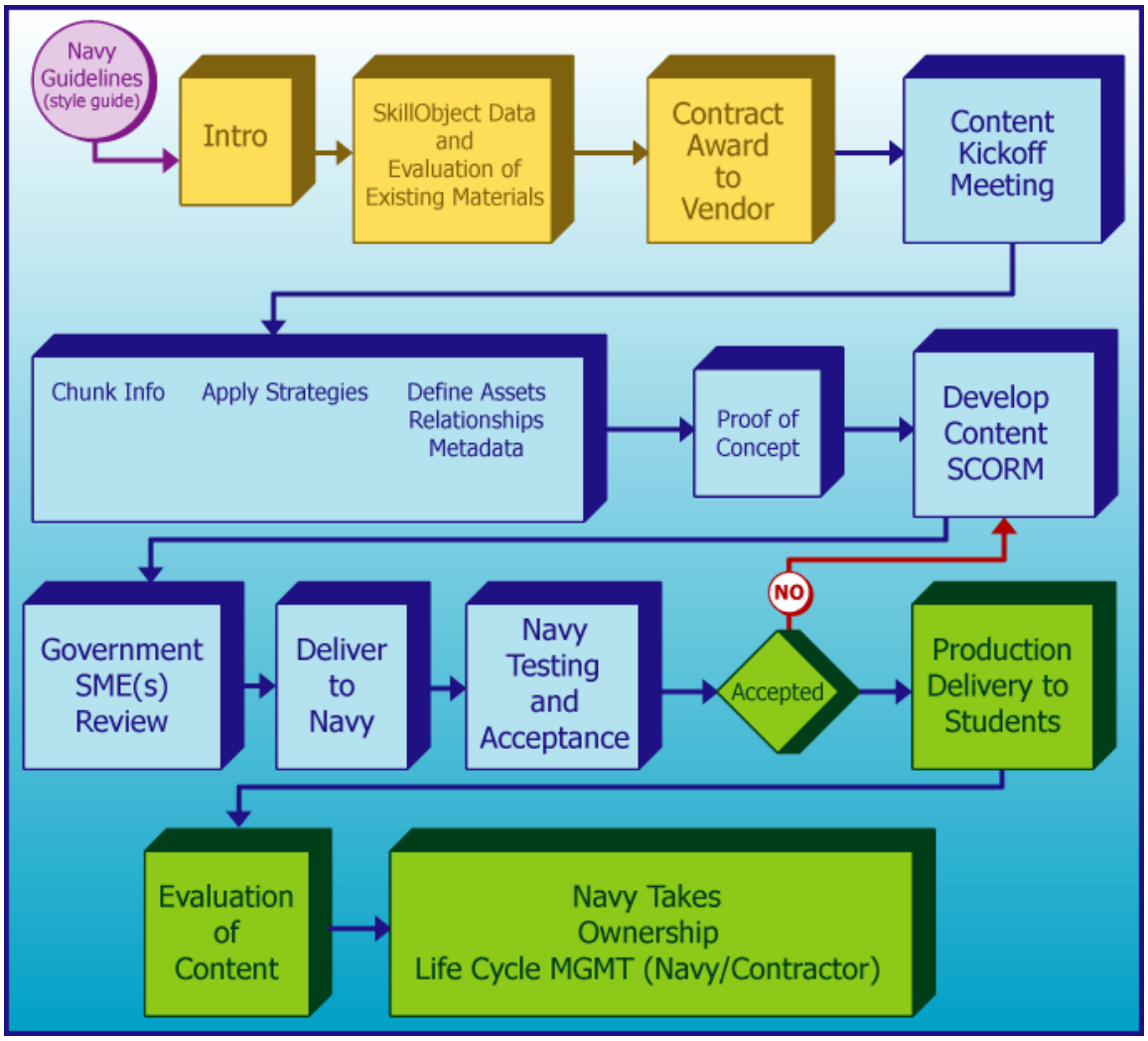


Figure 1.4: Navy ILE Acquisition, Content Design, Development, and Deployment Overview Process Flow

1.5. Navy-SCORM

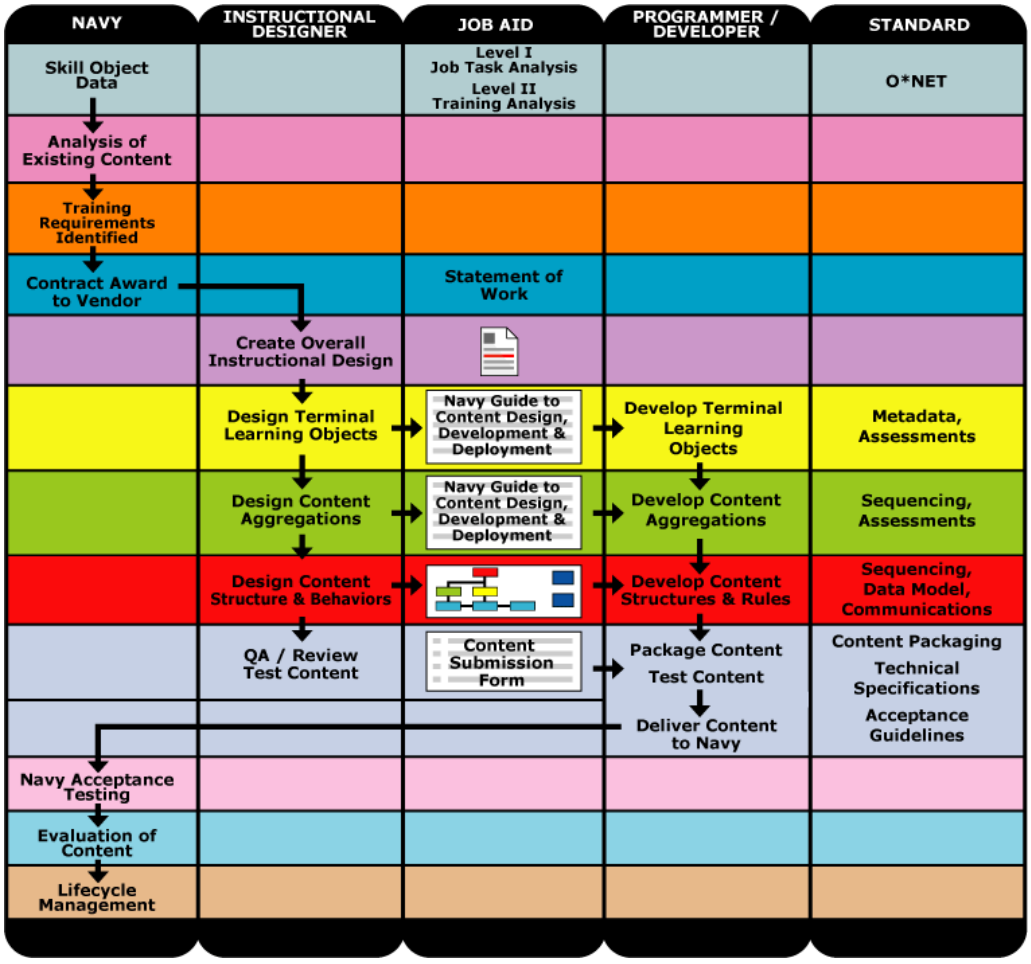


Figure 1.5: Navy-SCORM Content Design and Development Process Flow

1.5.1. The SCORM and Navy-SCORM Relationship

In order for the NCOM to accommodate sound ISD, learning theories, and R3, it must abide by specific Extensible Markup Language (XML) and data design rules. Technically, it is a data drill down that gives meaning to the Assets, Enabling Learning Object (ELOs), Terminal Learning Objects (TLOs) within the NCOM hierarchy. The data drill down hierarchy of the NCOM dictates that a:

- Learning Object Aggregation is the top-level grouping of related content containing TLOs and ELOs
- TLO is an aggregation of one or more ELOs
- ELO is an aggregation of one or more Assets
- Asset is a single media element or a single text element

The NCOM organizational structure is devised according to the requirements of XML and data systems logic. This logic is captured in the NCOM XML model and allows for the storage and retrieval of content data by Content Management Systems (CMS) and Learning Management Systems (LMS). The integrity of the NCOM content XML structures must be strictly maintained in order for the ILE to function.

The TLO is coded as an XML “container” element, as is an ELO. Container elements are formal, hierarchical designations devised for the sake of sound XML data design. The TLO and ELO elements hold no raw data. Only the Asset element holds raw data. Just as relational databases must follow strict rules of data design, so must the NCOM.

A SCO is a launchable object that includes the Computer Managed Instruction (CMI) tracking for launch and completion. An ELO shall be represented by a SCO.

A Sharable Content Object (SCO) is the basic building block for SCORM conformant courseware. A SCO is a collection of assets developed to provide the instructional requirements of a Learning Objective (TLOs and ELOs). The Navy has mapped a SCO to the Enabling Learning Objective, and in its absence, the Terminal Learning Objective.

Navy-SCORM builds on established SCORM principles and facilitates the implementation of SCORM 2004. Navy-SCORM is a SCORM -based standard that facilitates content organization and SCORM 2004 supported behaviors through advanced aggregations of content; these aggregations enhance R3 capabilities by defining required and recommended meta-data data values and strategies as supported by the SCORM 2004 CAM. By default, learning content delivered according to the SOCRM-Navy standard will be SCORM -compliant.

Content that has earned designation as "SCORM-compliant" has been designed, developed, and validated according to the rules and regulations specific to ADL SCORM. Therefore, it is incumbent upon content developers who intend to design and deliver content according to SCORM and the emerging Navy-SCORM specifications to gain a firm grasp of the fundamental principles and requirements set forth for SCORM compliant content within the ADL SCORM 2004 guidelines documentation.

While it is beyond the scope of this document to provide SCORM documentation for those who may not have such an understanding, these materials are available on the ADL SCORM Website, www.adlnet.org, and may be freely downloaded for review.
For developers unfamiliar with SCORM content design, the study of SCORM documentation is strongly recommended in order to gain a working knowledge of the concepts and requirements of the NCOM model. We feel it is unlikely that an understanding of the NCOM model can be achieved without first acquiring at least a nodding familiarity with the SCORM design and development guidelines serving as Navy-SCORM foundation.

1.5.2. Reuse, Repurpose, and Reference (R3)

The development of the NCOM was fueled by the need to efficiently and effectively R3 objects in order to create content for the Navy ILE. The following defines reuse, repurpose, and reference:

- Reuse—the use of an existing object in a new learning event without any modification to its instructional treatment, context, or content
- Repurpose—the use of an existing object in a new learning event with little to no modification to its instructional treatment, context, or content
- Reference—the use of an existing object(s) as an information source or resource for generating ideas for new learning events

Specifically, Navy-SCORM was devised to provide a data structure that would fulfill the following requirements:

- Interoperability to facilitate the R3 of content items across multiple communities
- Using and applying creative, sound, and effective Instructional Systems Design (ISD)
- The application of various learning theories to facilitate performance-based learning and measurable outcomes

Navy-SCORM fulfills these requirements by accommodating sound instructional designs and abiding by specific Extensible Markup Language (XML) and data design rules.

1.5.2.1. DoD and the Advanced Distributed Learning (ADL) SCORM

The Sharable Content Object Reference Model (SCORM) is part of a strategy called the Advanced Distributed Learning (ADL) initiative. The primary sponsors of the ADL initiative are the United States Department of Labor, Department of Defense (DoD), and the National Guard Bureau. The White House Office of Science and Technology Policy established the ADL initiative in 1997 to standardize and modernize the way in which training and education are delivered. The ADL initiative and SCORM seek to maximize technology-based learning to generate substantial costs savings. Government, academia, and private industry from around the world support ADL and SCORM initiatives. SCORM promotes efforts in four areas: reusability, durability, accessibility, and interoperability (see Table 1.1: SCORM Concepts and Definitions).

Table 1.1: SCORM Concepts and Definitions

SCORM Concept	Definition	Example
Reusable	Content is reused in a new context without any modification to its instructional treatment, context, or content, and is able to "stand-alone." It can be used across communities for many different learners.	Content about the hydraulic mechanisms of a turbine engine can be used across communities of practice within the Navy as well as other DoD entities.
Interoperable	Content will function in multiple applications, environments, and hardware and software configurations regardless of the tools used to create it and the platform on which it is delivered.	Content developed in a development software tool for delivery in a LMS will operate in any other SCORM - conformant LMS equally well.
Durable	Content does not require modification to operate as software systems and platforms are changed or upgraded.	Purchasing a new revision of a development software tool or upgrading the existing development tools will have no impact on the delivery of content to the learner.
Accessible	Content can be identified and located when it is needed and as it is needed to meet training and education requirements.	An Instructional Designer for contractor A can search a repository for content on turbine engines and identify the existing content available for her course, based on descriptive information about the content supplied by the original developer or content owner.

1.5.3. Navy-SCORM and its Application to Learning Events

The ILE NCOM acknowledges the SCORM concepts and definitions in Table 1.1: SCORM Concepts and Definitions and achieves R3 within and across various communities of practice for the development of enabling objectives with the use of Enabling Learning Objects (ELOs) and Assets— which will be discussed in Section 2.0: The Navy Content Object Model Defined. This document specifically applies the NCOM to the training community for the design and development of ILE content.

1.5.4. Navy-SCORM Metadata

The purpose of meta-data is to provide a common nomenclature enabling learning resources to be described in a common way. Meta-data can be collected in catalogs, as well as directly packaged with the learning resource it describes. Learning resources that are described with meta-data can be systematically searched for and retrieved for use and reuse. (ADL, 2004, p. CAM-4-4)

In order to catalogue and search for objects (i.e., Assets, ELOs, and TLOs) within the repository SCORM LOM XML metadata must be applied to these objects. XML Metadata can be defined as:

- Descriptive information about an object for "purposes of description, administration, legal requirements, technical functionality, use and usage, and preservation" (Getty). Metadata is designed to help locate, organize, access, and use objects effectively
- Navy-SCORM uses the SCORM/IMS Packaging and its LOM specification as its content and configuration model. Figure 1.6: SCORM and NCOM Hierarchies depicts this relationship

SCORM		NCOM
- Root Aggregation	→	- Learning Object Aggregation
▪ Aggregation	→	▪ Terminal Learning Object (TLO)
▪ Sharable Content Object (SCO)	→	▪ Enabling Learning Object (ELO)
▪ Asset (with metadata)	→	▪ Asset

Figure 1.6: SCORM and NCOM Hierarchies

SCORM/IMS Packaging and its LOM are a specific form of metadata. Within the SCORM/IMS Packaging model there are essentially two types of metadata documents:

1. Manifest document—The manifest document supplies the content references and organization of an amalgamation of content objects
2. Learning Object Metadata (LOM)—Supplies descriptive information concerning the nature of specific learning objects

The SCORM notion of a learning object embraces individual media files as well as amalgamations of content into hierarchical structures. For more information, reference the SCORM/IMS Packaging specification.

Within the NCOM, metadata tags are required at the Asset, ELO, and TLO levels. Appendix C provides Navy-SCORM metadata requirements that are specific to the Navy. All content that is created for the Navy ILE must be compliant with Navy-SCORM metadata requirements. Note: to achieve the goals of the ILE, the developer must work closely with the Instructional Designer (ID) to properly and consistently identify/label the tags, particularly those within the educational category.

1.5.5. Repository

A content repository is a data storage facility for content and content metadata. The Navy's ILE NCOM is designed to harness the repository and R3 concepts and allows for the following:

- Reuse of objects contained within the repository
- Repurpose of objects contained within the repository (this can also include the use of raw data)
- Development of new objects created from raw data
- Reliable presentational rendering of content by a compliant LMS or LCMS according to the intentions of content designers and developers.

1.6. The Navy Content Object Model Defined (NCOM)

Technically, the NCOM is a data drill down that gives meaning to the Learning Object Aggregation (LOA), Terminal Learning Object (TLO), Enabling Learning Object (ELO), and the Asset that make up the NCOM hierarchy (see Figure 1.6). The NCOM seamlessly correlates to the SCORM. The NCOM's hierarchical objects are defined as:

- Learning Object Aggregation - top level grouping of related content; the TLO is also called the organization that contains TLOs and ELOs
  - Terminal Learning Object (TLO)—an aggregation of 1 or more or ELOs, it satisfies one terminal objective and correlates to a SCORM aggregation
    - Enabling Learning Object (ELO)—an aggregation of 1 or more Assets, it satisfies one enabling objective and correlates to SCORM SCO
      - Asset—the base building block of TLOs, it is either a representation of text or a media element (e.g., web file, assessment object, video, and other data elements)

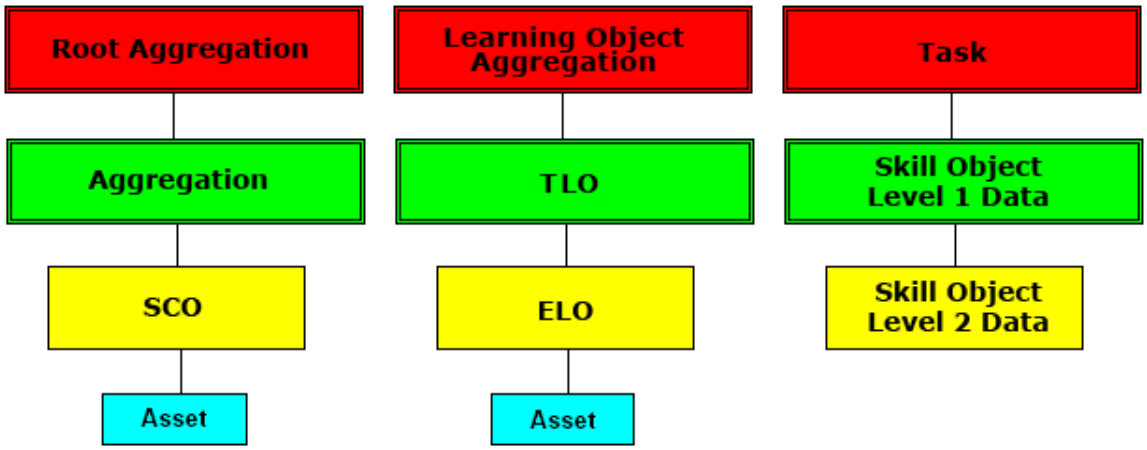


Figure 1.7: SCORM Hierarchy compared to the NCOM Hierarchy and SkillsNET SkillObjects

It is important to understand the one to one relationship between SCORM and NCOM. A SCO (ELO), an aggregation (TLO), or a Learning Object Aggregation could represent any number of "traditional" instructional design components such as lessons, modules, units, segments, or courses (Carnegie Mellon University, 2003). In Figure 1.7 the red boxes represent the Learning Object Aggregation which correlates to SCORM root aggregations—these are the highest levels of groupings. The green boxes represent TLOs, which correlate to SCORM aggregations—these are the lower level groupings. The yellow boxes represent an ELO, which correlate to a SCO within SCORM. The

turquoise boxes represent the combination of one or more Assets contained within an ELO (SCO).

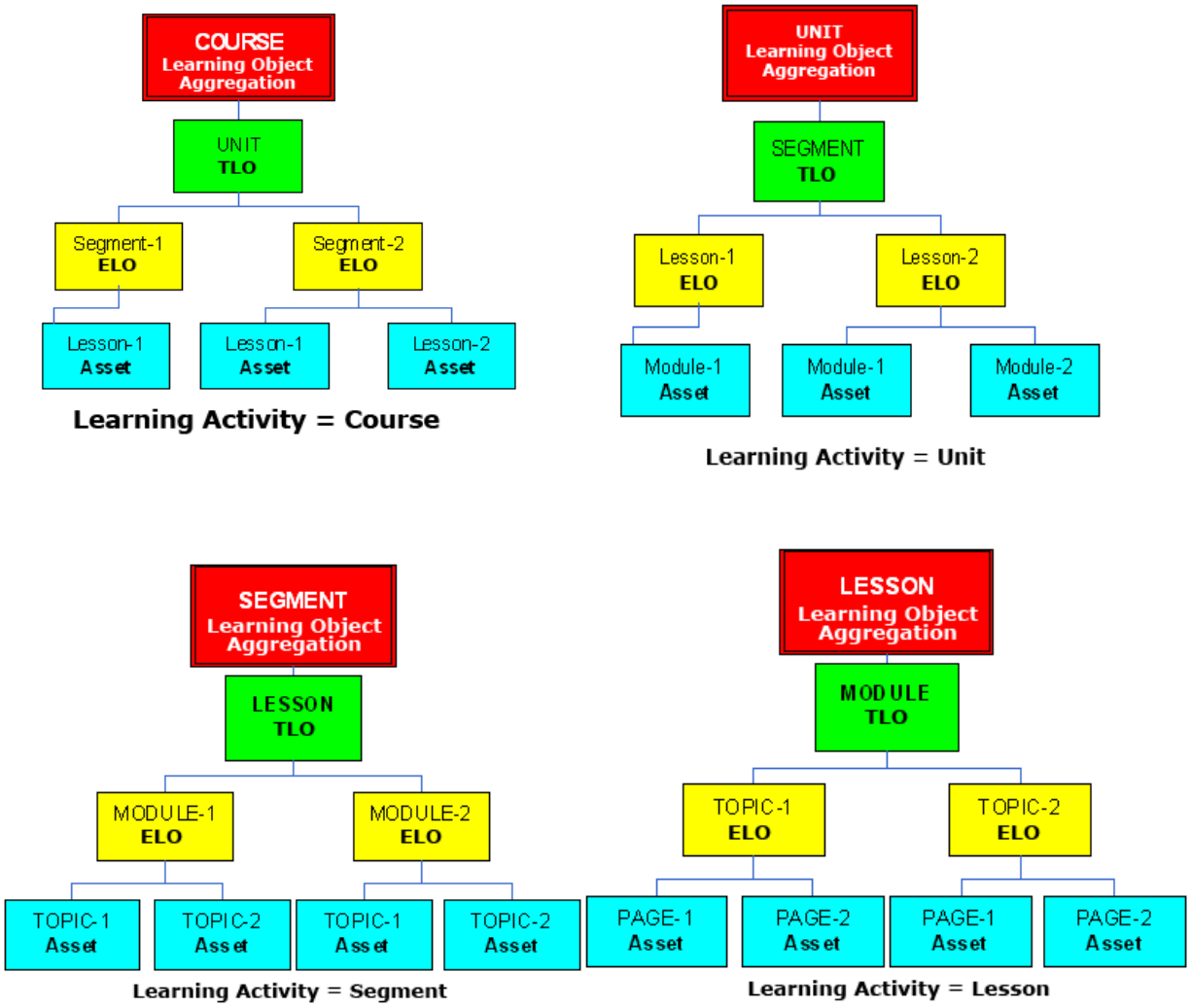


Figure 1.8: NCOM TLOs

The following sections will discuss the NCOM, beginning with the smallest unit, the Asset, to the largest unit, the TLO.

1.7. Asset

Within and across communities of practice, the Asset is defined as any digital resource that can be repetitively used across different environments, for different purposes, having different end users (McGee 2003; Wiley, 2002). In general, the Asset enables reuse of data within and across communities of practice.

Within the NCOM, the Asset (see Fig. 1.9 Asset) is the object that has reuse potential across applications and across communities of practice. These applications can be for instructional purposes (i.e., as presented in the NCOM) or for technical publication, simulation, electronic support systems, or other information dissemination purposes.

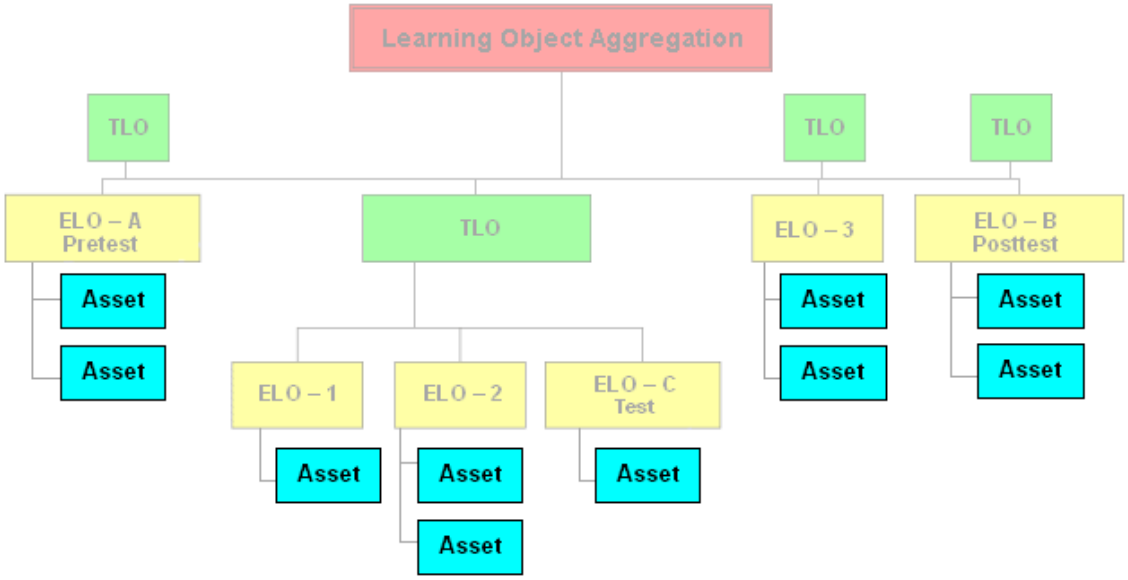


Figure 1.9: Assets

An Asset (see Figure 1.9: Assets) is the smallest unit within the NCOM. An Asset:

- Is any media type—text, graphic, sound, animation, video, web page, assessment object, or other data piece that can be delivered to a web client
- Is the base building block of TLOs (e.g., content, technical publications, instructor/student guides, etc.)
- Has reuse potential in many applications across various communities of practice
- Requires metadata
- Appears within an ELO

In order for a single Asset to be reused, repurposed, or referenced (R3), it must have metadata so that it can be searched and found. Assets assigned with metadata descriptions have greater R3 potential as they may be returned as distinct, individual items by a specific search. Within the NCOM, all Assets that are non-gratuitous media type files—text, graphics, images, sounds, animation, video, etc. require metadata.

1.8. Enabling Learning Object (ELO)

An ELO is the smallest piece of instruction delivered and tracked by an LMS—it is inherently instructional (see Figure 1.10: Enabling Learning Objects (ELOs)). An ELO is a collection of Assets that include instructional treatment and are designed to present learning activities.

An ELO:

- Ø Is a collection of one or more Assets
- Ø Represents an independent piece of instruction
- Ø Satisfies a single enabling objective
- Ø Cannot directly access another ELO—cannot contain links to another ELO
- Ø Has reuse potential across applications within the training community

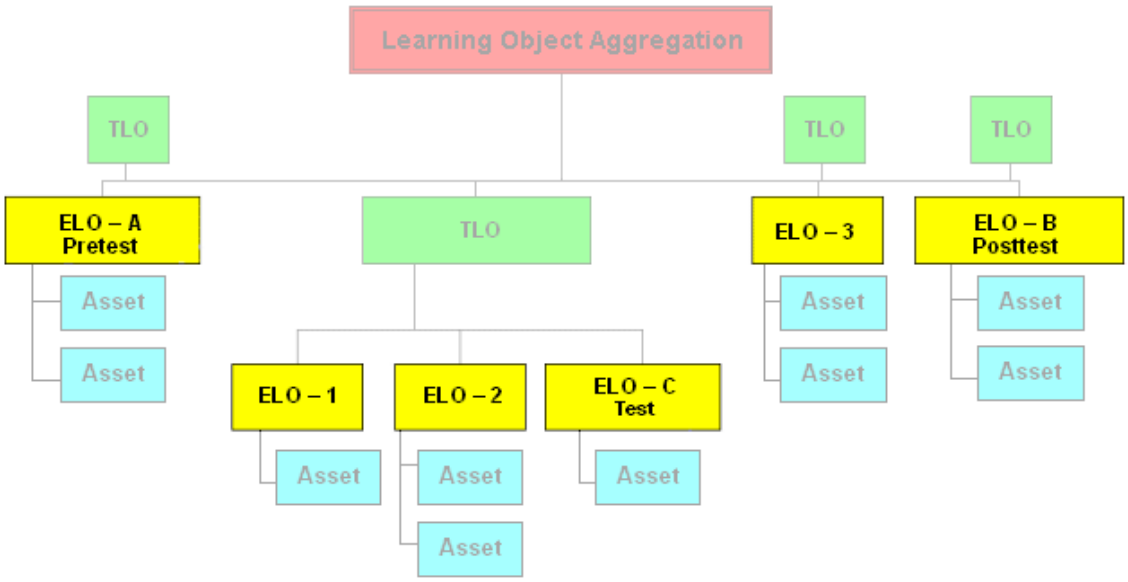


Figure 1.10: Enabling Learning Objects (ELOs)

Figure 1.10 Enabling Learning Object (ELO) depicts ELOs as lessons. However, ELOs can be used to depict various instructional components. The ways that ELOs are used will depend upon the way the instruction and learner navigation is designed and structured as well as how the learner is tracked.

Within the NCOM, an ELO is an independent stand-alone unit of instruction that satisfies one enabling objective. Since the NCOM facilitates R3 and adheres to the SCORM standard, an ELO must be small enough to accommodate R3, address a single enabling objective, and contain all of the related materials to support its enabling objective.

1.9. Terminal Learning Object (TLO)

A TLO is based on the research about Learning Objects. Within the instructional design community at large, a Learning Object is defined as:

> Any digital resource that can be reused to support learning. The term "learning objects" generally applies to educational materials designed and created in small chunks for the purpose of maximizing the number of learning situations in which the resource can be utilized. (Wiley, 2002, p.1)

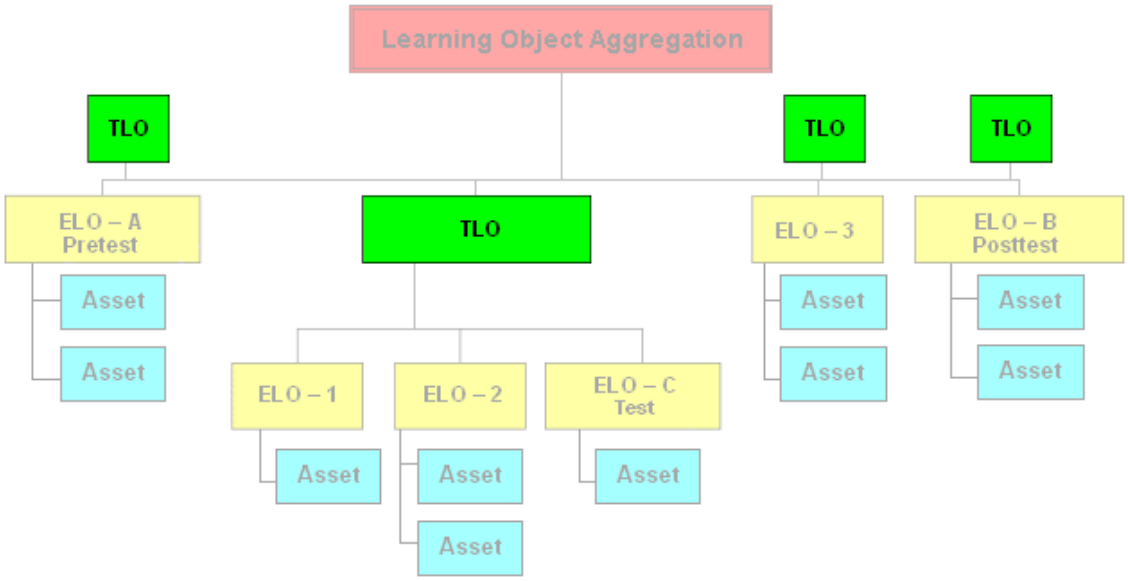


Figure 1.11: Terminal Learning Object (TLO)

A TLO:

- Ø Is used to aggregate ELOs—this is simply a TLO
- Ø Satisfies a single terminal objective
- Ø Has reuse potential across applications within the training community

1.10. Learning Object Aggregation

Within the NCOM a Learning Object Aggregation allows for the aggregation of ELOs and TLOs to build a specific learning event (see Figure 1.12 Learning Object Aggregation). Navy-SCORM adapts the Carnegie Mellon (2003) definition of an aggregation to describe aggregations within the NCOM.

An aggregation is a parent and its children in a tree structure. Aggregations are used to group related content (i.e., Assets, ELOs, and TLOs) so that it can be delivered to the learner in the manner prescribed by the instructional design. SCORM sequencing rules

allow you to prescribe the behaviors and functionality of the content (ELO) within the aggregation (TLO) as well as how the aggregation (TLO) relates to other aggregations (TLOs) within the same root aggregation (Learning Object Aggregation).
A Learning Object Aggregation is the top-level grouping of related content; the Learning Object Aggregation is also called the organization. It is used as the highest level of aggregation – this is the Learning Object Aggregation

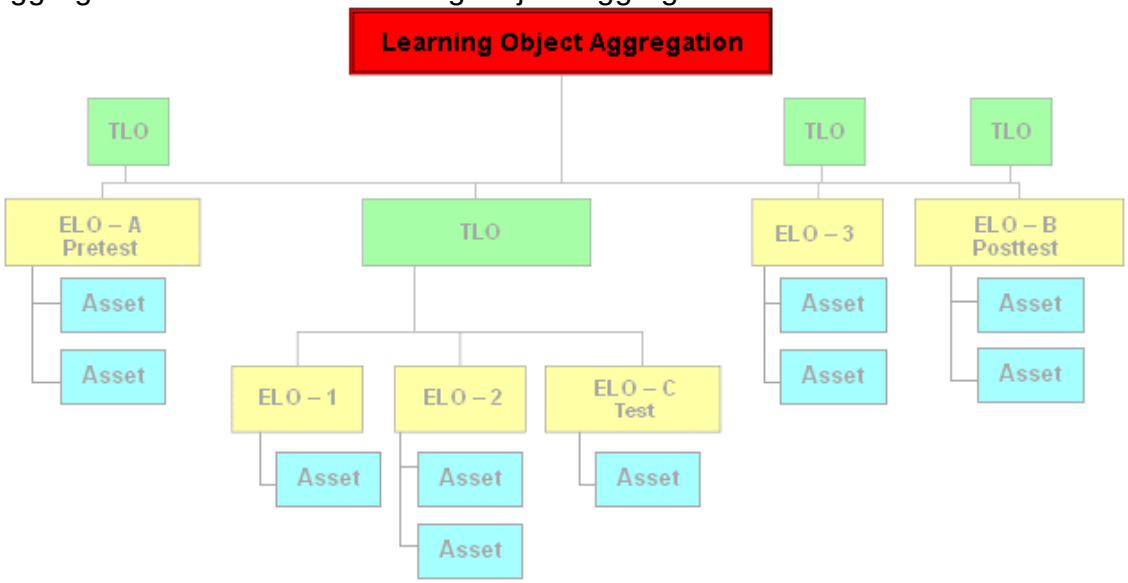


Figure 1.12: Learning Object Aggregation

Within the ILE, a Learning Object Aggregation is any learning opportunity—formal or informal—that has a specific intended learning outcome. It is translated in the NCOM as an aggregated unit of instruction that fulfills either an enabling or a terminal objective. In Figure 1.12 Learning Object Aggregation, the red box depicts the Learning Object Aggregation (root aggregation) that fulfills a terminal objective of the entire learning event. The green box depicts a TLO (aggregation) that fulfills a terminal objective for the lower level learning event. Each yellow box is an ELO that fulfills a single enabling objective or serves as an assessment.

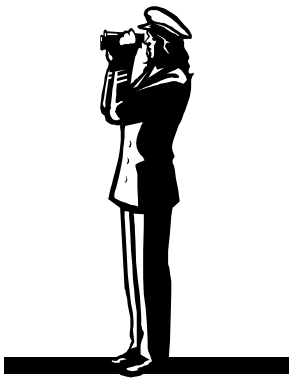
1.11. Summary

- The Integrated Learning Environment (ILE) was established by NETC to support the changes needed to accomplish the Revolution in Training goals and provide the necessary functions to accomplish SeaWarrior
- NCOM provides guidance on how to effectively reuse, repurpose, or reference (R3) content
- The NCOM hierarchy consists of Learning Activities, which contain Terminal Learning Objects (TLOs), which contain Enabling Learning Objects (ELOs), which contain assets
- An ELO equates to a Shareable Content Object (SCO) as defined in SCORM. A SCO is a launchable object and must include computer managed instruction (CMI) tracking for launch and completion
- A TLO satisfies a single terminal objective
- An ELO satisfies a single enabling objective

The Navy Integrated Learning Environment is a groundbreaking initiative that promises to revolutionize how the Navy provides education, training and performance support. It is the flagship of the learning technology fleet.

It is also an integrating mechanism that will make it possible to move tailored learning across the personnel and learning domains – anytime and anywhere -- in order to improve individual and mission readiness and performance. In that regard, it is a critical enabler for several of the Navy's priority transformation initiatives, like Sea Warrior and Sea Power 21.

Many of the pieces – technologies, organizational structures, and operating procedures – have been developed, and some have been put into operation. A few must still be developed. Putting the remaining pieces in place will allow the Navy to test and assess the capabilities and effectiveness of its Integrated Learning Environment.



PART TWO - CONTENT DESIGN

The following section: Content Design focuses on the application of NCOM for designing learning activities. Optimizing the benefits of Navy-SCORM to design effective instructional materials requires that designers and developers work closely together throughout the process. Such collaborative efforts can ensure that the development of ILE content adheres to Navy-SCORM guidelines and will function within the Navy ILE.

2.0 DESIGNING CONTENT FOR THE ILE

Understanding Navy-SCORM is only the first step in designing content acceptable for meeting the Navy ILE's vision, mission, and goals. Understanding the science of learning sufficiently to design effective learner-centric instruction is also required. Most important is acknowledging that Instructional Designers (IDs) must depart from old models that focused almost exclusively on information display, chunking, and sequencing. It is imperative that IDs employ models that use a combination of learning principles having the intent to very specifically lead the learner to the desired operational environment performance. The following sections present designer qualifications, various principles that IDs will consider in their design, and the major steps in preparation for development of ILE materials.

2.1. Designer / Developer Qualifications to Develop ILE NCOM Content

Note that the human performance parameters and goals mentioned as central to the Navy's Revolution in Training are equally applicable to those developing learning. The majority of the labor categories required for development of learning activities are not essentially changed from those required in previous content development efforts except for the application of the following additional requirements:

- SCORM 2004
- Americans with Disabilities Act, Section 508
- Navy-SCORM

2.2. SCORM 2004 Reference Documents:

The following is a list of SCORM 2004 reference documents with a brief description of their contents:

Sharable Content Object Reference Model (SCORM) 2004 2nd Edition Addendum
The SCORM 2004 2nd Edition Addendum documents all of the ADL Community reported issues with the SCORM 2004 2nd Edition. The document also captures the corrections needed to address these reported issues. Corrections, changes and clarifications found in this document should immediately be reviewed and implemented by the ADL Community. The information in this addendum supersedes referenced information in the SCORM 2004 2nd Edition document suite.

Sharable Content Object Reference Model (SCORM) 2004 2nd Edition Overview
The SCORM 2004 Overview book covers the history and objectives of the ADL Initiative and SCORM, including the specifications and standards from which SCORM borrows. It also describes how the various SCORM books are related to one another.

Sharable Content Object Reference Model (SCORM) Content Aggregation Model (CAM) Version1.3.1
The SCORM Content Aggregation Model (CAM) book describes components used in a learning experience, how to package those components for exchange from system to system, how to describe those components to enable search and discovery, and how to define the sequencing rules for the components.

Sharable Content Object Reference Model (SCORM) Run-Time Environment (RTE) Version 1.3.1
The SCORM RTE book describes the Learning Management System (LMS) requirements for managing the run-time environment (i.e., content launch process, communication between content and LMSs and standardized data model elements used for passing information about the learner). The RTE covers the requirements of SCOs and their use of the API and the SCORM Run-Time Environment Data Model.

Sharable Content Object Reference Model (SCORM) Sequencing and Navigation (SN) Version 1.3.1
The SCORM SN book describes how SCORM conformant content may be sequenced through a set of learner-initiated or system-initiated navigation events. The branching and flow of that content may be described by a predefined set of activities, typically defined at design time. The SCORM SN book also describes how a SCORM conformant LMS interprets the sequencing rules expressed by a content developer along with the set of learner-initiated or system-initiated navigation events and their effects on the run-time environment.

Sharable Content Object Reference Model (SCORM) 2004 2nd Edition Document Suite
The SCORM 2004 Document Suite is a ZIP file that contains all SCORM components: the SCORM Overview, SCORM Content Aggregation Model (CAM) book, SCORM Run-Time Environment (RTE) book and the SCORM Sequencing and Navigation (SN) book.

Shareable Conference Object Reference Model 2004 Conformance Requirements (CV) v1.1
SCORM 2004 contains a great deal of technical information for a variety of audiences, but product vendors need to know which specific information is critical to making their learning products SCORM 2004 conformant. The ADL Technical Team has collected and structured that information in a concise format that product vendors can reference in the creation of their products. This document provides a detailed listing of the SCORM conformance requirements as defined in the Sharable Content Object Reference Model (SCORM®). Learning Management Systems (LMSs), Sharable Content Objects (SCOs), Meta-data and/or Content Packages must adhere to these requirements to be recognized as SCORM 2004 conformant. To achieve a conformance label all conformance requirements for the associated product must be met. This document is technical by nature and is meant for LMS Vendors, Content Providers, Meta-data Creators and Content Package Creators.

SCORM Version 1.2 To SCORM 2004 Changes Document
This document provides a high-level summary of the key differences between SCORM Version 1.2 and SCORM 2004. This document is not an exhaustive listing of all SCORM Version 1.2 to SCORM 2004 changes, but rather a guide to be used with the SCORM 2004 documentation suite to allow SCORM implementers to understand the changes from SCORM Version 1.2 to SCORM 2004 more easily and to determine what changes are needed to SCORM Version 1.2 products to migrate them from SCORM Version 1.2 to SCORM 2004 conformance. Note: This document does not address changes between the SCORM 2004 and the SCORM 2004 2nd Edition. For detailed treatment of these changes, refer to the Revision History appendix in each book of the SCORM 2004 2nd Edition.

2.3. What Designers Should Know About the SCORM RTE

The programmatic nuts-and-bolts of the SCORM RTE may be of little use or interest to most IDs. However, knowledge of the prescribed methods for the aggregation and configuration of content as SCOs (i.e., ELOs within the Navy model) to satisfy the technical requirements of the SCORM RTE is critical to achieving both SCORM compliance and effective instruction within SCORM boundaries.

2.4. What Designers Should Know About the SCORM CAM

The SCORM CAM is the heart and soul of all SCORM issues. It defines the how-to and why of SCO organizations (i.e., ELO organizations in the Navy model). Without this knowledge, it is virtually impossible to manage content design in accordance with SCORM requirements. IDs do not need to know the extensive catalog of possible XML attributes within the LOM specification, there are, however, certain required metadata elements and data values that must be applied as prescribed in order to achieve compliance within the SCORM and the Navy specifications.

2.5. What Designers Should Know About SCORM Sequencing and Navigation

The SCORM Sequencing and Navigation (SN) book (ADL, 2004) describes how SCORM -conformant content may be sequenced to the learner through a set of learner or system-initiated navigation events. The branching and flow of that content may be

described by a predefined set of activities. The SCORM SN book describes how sequencing information can be applied to define various sequencing strategies; how sequencing information is interpreted at run-time to make sequencing evaluations; and how navigation requests, triggered through a learner's interactions with content objects, are processed to identify the next content object for delivery (launch).

It is not necessary for IDs to know how sequencing information is interpreted at run-time to make sequencing evaluations, but it is necessary for IDs to understand the rules regarding SCORM sequencing and navigation so that their instructional organization, structure, and navigation is SCORM compliant and will work in a SCORM environment.

2.6. Analysis

All good designs begin with a quality analysis. Contracted IDs and developers of ILE content will be supplied this information by the government in the form of GFI/M (government furnished information/material).

The Navy will conduct analyses, which involve occupational and human performance analyses to identify the tasks, knowledge, skills, abilities, tools, subtasks, conditions, equipment, performance standards, and instructional learning objectives related to a specific job. In addition, the analysis data will include other essential information for the ID to fully understand the performance requirements of the learner.

Level I Data Available:

- SkillObject
- Tasks
- Unique Knowledge
- Abilities
- Tools
- Skills
- Resources

Level II Data Available:

- All data in Level I
- Terminal Learning Objectives
- Enabling Objectives
- Learning Object Aggregation
- Performance Standards

With this information in hand, the design phase can begin.

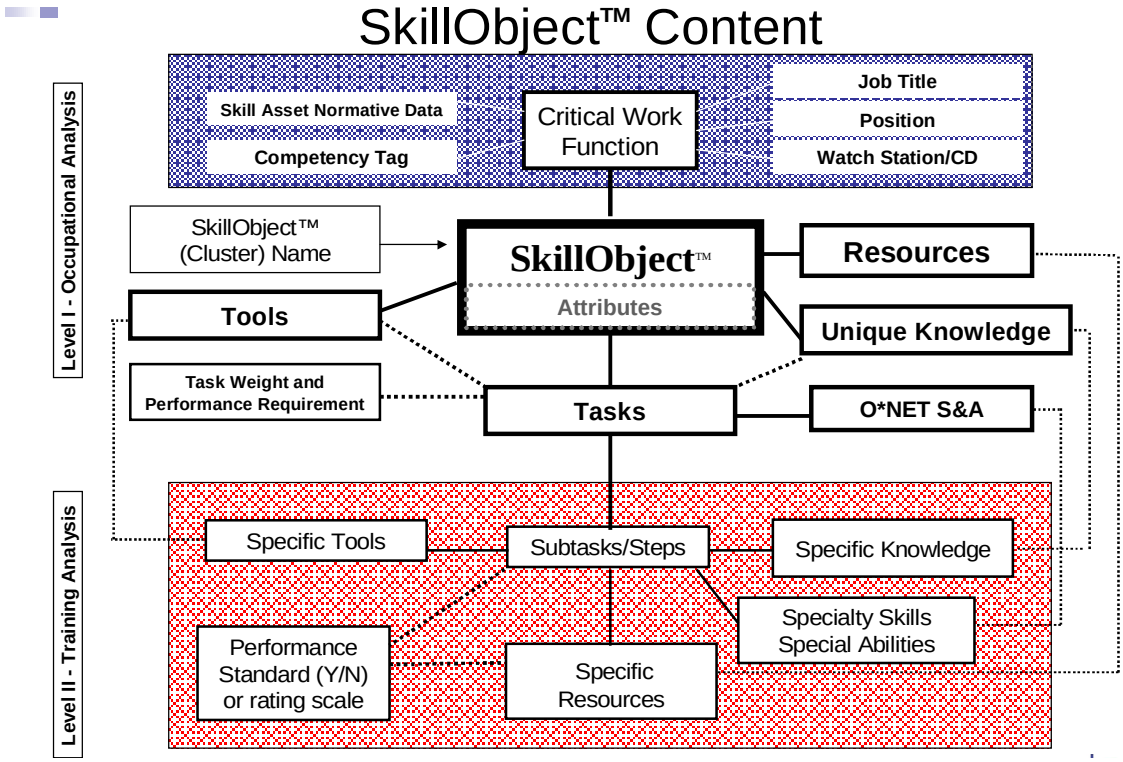


Figure 2.1 SkillObject Content - Level I and II Data

2.7. Instructional Design

Before the first Asset is developed, ELOs identified, and TLOs aggregated the instructional strategy(s) must be identified and the instructional design must be completed. The inputs from the analysis are considered in conjunction with instructional design theories to formulate the most effective and efficient instructional strategy and design.

One of the greatest impacts to your instructional strategy and design will be sequencing, discussed in Appendix F. Once you determine what type of instructional and assessment strategies you will employ in your design, you should consult with a developer/programmer immediately to decide if and how you can implement them using sequencing.

2.7.1. Instructional Design within Navy-SCORM

This document is not designed to teach learning theory or instructional design to the novice. However, we have provided a brief overview and examples of instructional design theories and approaches in Appendix E. This reference is not meant to be a step-by-step guide for designing effective instruction. The examples of instructional theory and approaches provided here is only samples of what can be found in the literature (see Jonassen, 2004 and Reigeluth, 1999). Their inclusion in this document is not meant to imply that instructional designs must be based on one of these theories. It is hoped that this description of sample theories will enable the ID to recognize the importance of basing a design on an instructional design theory or theories, consider the many possibilities at their disposal, recognize that each theory implies certain activities and approaches to instructional design, and that alone, or in combination, these theories can lead to learner-centered designs. The ID must be purposeful in their instructional design and have a theory on which to base decisions makes the design defendable

Navy-SCORM was designed to accommodate any instructional design theory for the construction of terminal learning objects, while also taking into consideration the constraints dictated by the current technical standards. This approach is the key to a reusable terminal learning object strategy that is not only instructionally sound; buy also provides a return on investment that is expected of such a model.

The definition of learning is no longer limited to a change in behavior as was thought for many years. Research in the psychological sciences has given rise to cognitive learning theory. The definition of learning has expanded to include a change in the learners knowledge structures (Woolfolk, 1998). Learning requires the learner to “actively construct new knowledge by integrating data from the environment with existing knowledge in long-term memory. Instructional methods must support this process” (Clark, 2002, pg. 14). We cannot simply present learners with information and expect them to learn. IDs must uphold the core goals central to the ILE and build in instructional strategies that engage learners in processing information to help them transfer it to performance on the job. This is essential to the goals of the Navy’s ILE.

Unlike many learning object construction documents, templates for combining learning objects will not be provided in this document because the instructional design drives the instructional solution and templates can be created by the developer as necessary. However, sound guidelines, best practices, and examples are provided to ensure development consistency and promote reusability of objects.

2.7.2. Learning Objectives

Most instructional design models begin with the development of learning objectives based on a job-task analysis to ensure that the knowledge, skills and abilities being developed are job related. Objectives must be carefully written because all other instructional decisions will hinge on the learning objectives. However, care must be taken not to over rely on objectives. The assumption is that these objectives are concise and on target. Relying on a single portion of the learning objective to create an entire lesson often results in inappropriate instruction. The intent of the objective must be understood, particularly the context in which it is meant.

A Learning Objective is a formal description of what a trainee should be able to do after training is completed. Therefore, a set of well-defined learning objectives serves as a road map for training designers and instructors who have to decide what is to be taught in the training program.

A Learning Objective includes three major characteristics:

- **Desired terminal behavior**. A training objective starts with a verb that indicates the action that a trainee should be able to perform once training is completed. For example, record medical histories of patients
- **Conditions under which the behavior will be performed**. A training objective specifies the tools and equipment used while performing the task, physical and environmental conditions surrounding the task, as well as certain restrictions imposed on the trainee while performing the task. For example, assemble and fasten materials, using hand tools and wood screws, nails, dowel pins, or glue, to make framework or props.
- **Criterion for acceptable performance**. The criterion indicates how well the trainee must be able to perform a particular task. It can include information on time necessary to perform a task, and quantity and/or quality of work produced. For example, take the temperature of five patients to within 0.1 degree of accuracy

Learning objectives are then categorized into five outcome groups, which include: cognitive, motor, verbal, social, and affective/attitudinal.

More information regarding how to develop learning objectives can be found in SkillsNET's manual: Learning Objectives Development: A Self-Paced Training Manual.

2.7.3. Learning Activities

Learning activities are selected based on the learning objectives and their intent based on job performance requirements. Identifying the appropriate learning activities requires many considerations including job information requirements, cognitive skill requirements, performance, and learner characteristics. The final instructional design is likely to be a blending of strategies and methods to accomplish the performance goals. After identifying learning objectives, the instructional designer will identify the four major areas of training development:

- **The extensiveness of training required**: The depth and time spent instructing the trainees on job relevant knowledge, skills, abilities, tasks, and tools. In low extensiveness training, a relatively simple depth of knowledge is needed to do the job. In high extensiveness training, a fairly complex breadth of knowledge is needed to do the job.
- **The nature of training transfer needed**: The need for simple, adaptable acquisition of training. In simple acquisition, the application of what is learned in training on the job is exact or requires little adaptation. In adaptable acquisition, the application of what is trained on the job must be flexible and adaptable to changing environments.
- **The site or location of training**: The location where employee training will occur. Major areas of training sites include on-site and off-site training. On-site is training that is done on the same location as the job. Off-site training is conducted away from the job location.
- **Difficulty to learn the tasks within the training program**: The difficulty to learn the tasks, tools, unique knowledge, and skills of the learning objective. A high difficulty to learn means that the tasks, tools, unique knowledge, and skills are more difficult to learn. A low difficulty to learn means that the tasks, tools, unique knowledge, and skills are fairly easy to learn.

As a result, the four major areas of training development will then determine the appropriate training recommendations. The recommendations will include the following areas:

- **Method:** Specific instructional techniques involved in training employees on job relevant unique knowledge, skills, and tasks. An example might be on-the-job training or classroom instruction
- **Time and structure of practice**: The amount of time needed for training. This includes the amount of hours needed for training as well as whether training should be massed or blocked
- **Meaningfulness**: The degree of purposefulness built into the system for the trainee. This is meant to make sure that the trainee understands why training is important to them. An example includes the need for contextual examples.
- **Hands-On practice**: The amount of hands-on practice that is necessary for training
- **Vicarious learning**: The degree of and type of demonstrations necessary for training. Examples might include live or computer demonstrations

- **Nature of feedback / Trainer to trainee ratio**: The type and degree of feedback that is necessary for the trainer to give the trainee and the number of trainees verses the number of trainers recommended

Utilizing the Learning Activities Matrix (Figure 2.2), developed by SkillsNET, will complete this step.

Hence, for; “with high extensiveness”, “off site”, “difficult to learn”, “with simple transfer”, the recommendations would be the following:

- **Method**: Simulator, simulation, or computer adaptive instruction. Refer to Appendix J for SkillsNET Taxonomies; Knowledge, Resources, and Skills and Abilities.
- **Time and Structure of Practice**: Participants should have distributed, constant, blocked, for weeks to months
- **Hands-on Practice**: High
- **Meaningfulness**: Provide many contextual examples
- **Vicarious Learning**: Provide a combination of video and live demonstrations
- **Nature of Feedback and Trainee to Trainer Ratio**: Some pre-training, no or little post training, immediate feedback from SME, moderate ratio, some singling out
- **Learning Activities**: Lecture, Developmental Organizers, Skill-Practice Exercises, Scenarios, Guided Practice, Game, Demonstration with Return Demonstration, Tests, Reflective Practice, Computer-based Learning, Trial and Error Practice, Video Game Simulations, Action Simulations

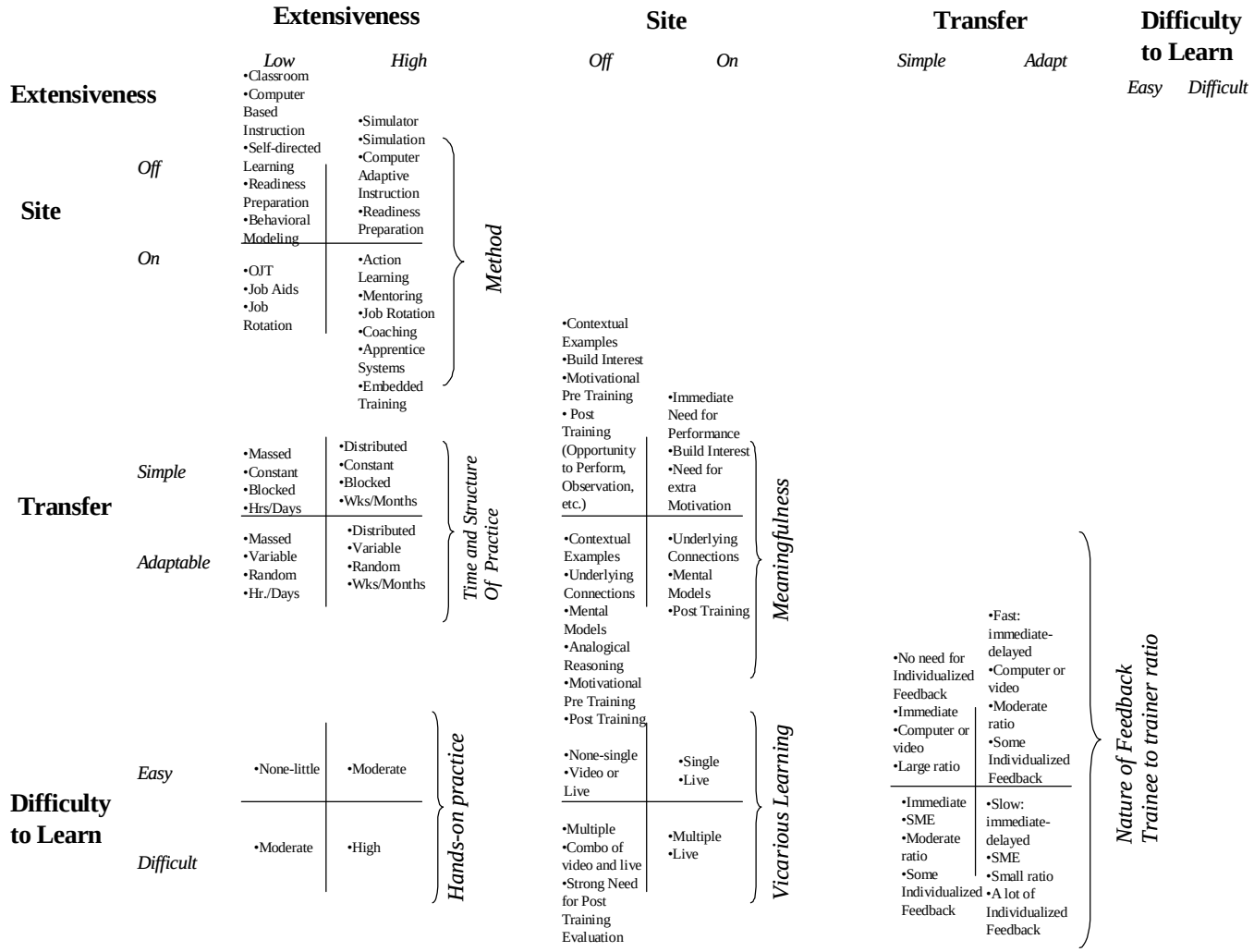


Figure 2.2: Learning Activities Matrix

2.8. Content Organization and ELO Design within Navy-SCORM

The following section will describe what to include for selection of instructional, assessment, and remediation strategies.

2.8.1. Navy-SCORM Content and Instructional Integrity

This section is designed to demonstrate a process for creating ELOs and identifying TLOs. The tips and techniques explained in this section will facilitate your development of what content that is compliant.

To ensure the instructional integrity of Navy-SCORM content make each ELO a stand-alone instructional unit. Navy-SCORM requires that ELOs be developed as topics addressing a single enabling learning objective. As such, ELOs are intended to be inherently small to facilitate reuse by persons other than the original developer. As an enabling objective (EO), the ELO should contain all of the materials and resources required. Structured in this manner, the effective completion of the ELO will impart the knowledge or skill for which it was designed.

If ELOs are limited to a single, well-written enabling objective, then it is easier to make more of them context-neutral. Where context-specific instruction is required, such as for introductions, conclusions, and transitions, you can create context-specific objectives such as: “Differentiate between your roles and responsibilities as a workplace trainer and as an apprentice trainer in the Instructor Delivery Continuum (IDC).” Although, some of the content will be context-specific to the IDC, most of the content regarding roles and responsibilities of a workplace and apprentice trainer can still remain context-neutral, which will increase its R3 potential.

2.8.1.1. Assets, ELOs, and Reusability

Reusability can and should occur at all levels of NCOM, from Assets to ELOs to TLOs. The amount of reuse potential in each of those items varies. The most reusable components will usually be Assets, because they have the highest level of context independence.

A well-designed ELO should serve numerous audiences in achieving multiple outcomes, across many contexts, making it ideal for courses and uses in addition to the ones for which it was originally designed. They are not only reusable in more contexts than a traditional course, but are also easier to maintain and update, as content requires changes or customization. Since the ELO is stored in an LCMS and delivered via an LMS, it can also be configured in many different ways to meet many different needs.

This ability to reuse ELOs for many different purposes can generate significant time and cost savings and allow the Navy to better respond to its training needs. When you discover an education or training need, you can search the LCMS for existing instructional materials. You can then retrieve content created by different entities and configure or sequence the content to meet your learners’ specific training needs. This

"custom" course can then be delivered by a SCORM-compliant learning management system when it is needed ("just-in-time training") without waiting for weeks or months of development.

As discussed previously, you can reuse any number of NCOM or SCORM components, from Assets to ELOs/SCOs to TLOs/aggregations of content. However, Assets are typically the most context independent items, so they will likely be the most reusable. Learning Activities, courses, and curricula are your most context dependent items, so they may not be reused as often.

The diagram below shows how to structure/organize content in the NCOM. Assets exist as stand-alone items. ELOs contain assets and satisfy a single enabling objective. TLOs are made up of ELOs and satisfy a single terminal objective . Learning Activities are made up of TLOs and ELOs and are groupings designed to accomplish a job performance goal.

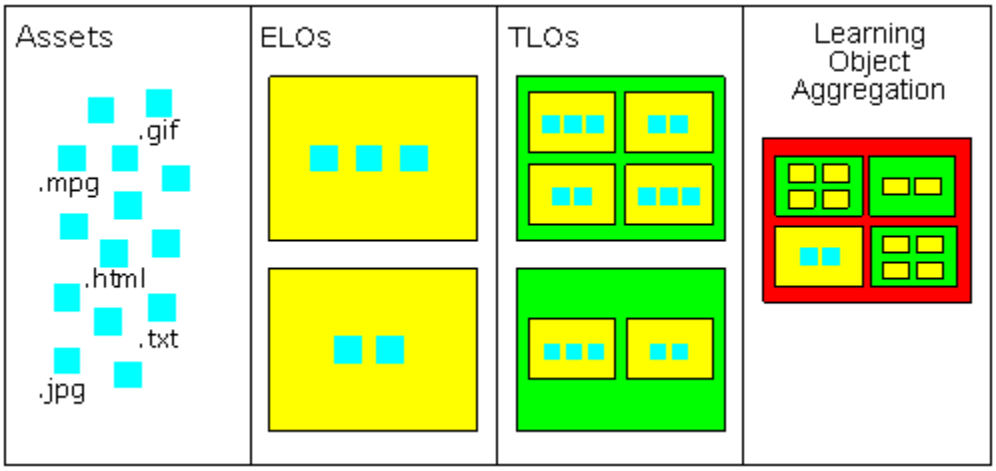
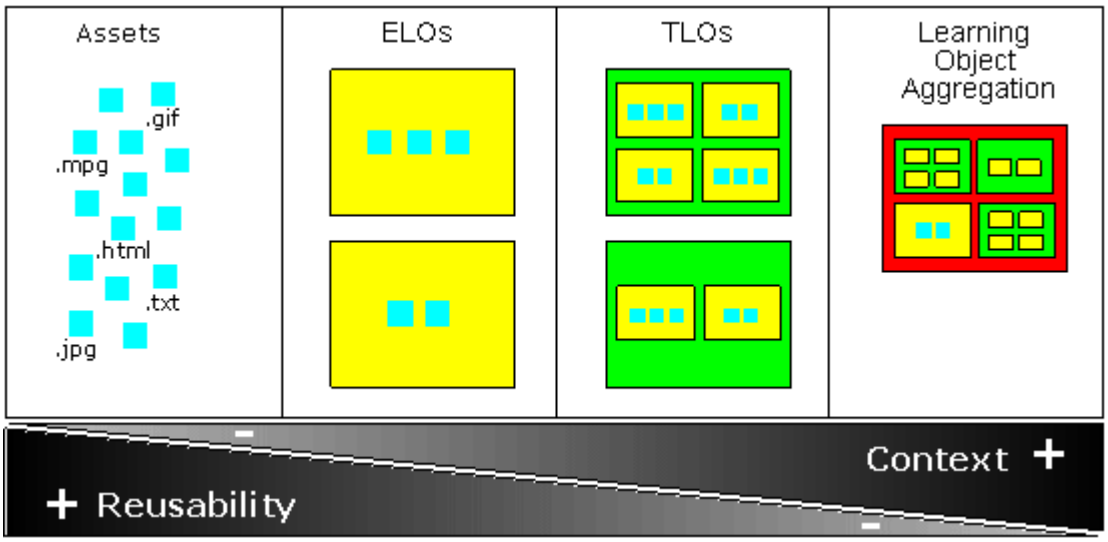


Figure 2.3: NCOM component reuse from Assets to Learning Object Aggregation

Learning activities may be grouped as necessary to accomplish goal.

To understand how much reusability you can expect from each level of your content, as well as how much context each level will have, consider Figure . As you move from left to right (from Assets to Curriculum), the amount of reusability decreases with each level, but as you move from right to left (curriculum to Assets), the amount of context in each level decreases. Your job is to determine the best balance of reusability versus context when you create your ELOs. Remember, the smaller the NCOM component, the more reusable it will be. The larger the component, the more context it will have.



Repurposed with permission © Copyright 2003, Carnegie Melon University (based on work by Wayne Hodgins and Ellen Wagner of Learnativity.org)

Figure 2.4: Determining amount of reusability versus context across NCOM components

For example, it is determined that IDC trainees need training on effective communication as do new Navy recruits. After assessing the performance issues and determining which objectives apply to the audiences identified, you search the repository or your company's database for existing ELOs.

Based on your search results, you decide to use existing ELOs found in the repository and in your company's own database for both the IDC training as well as the new recruit training. Since, the IDC trainees will need more in-depth training you decide to reuse several "effective communication" ELOs that you found. However, the new recruits only need an introductory lesson on effective communication so you will only use a few of the ELOs that you found. Two of the ELOs you found were used in both courses. This example illustrates the importance of reusability for the Navy ILE.

2.8.2. Designer Decisions

As discussed in previous sections of this document, content can be grouped or aggregated in various ways depending on factors to include objectives of the content, characteristics of the intended audience, and the available resources. The ID must establish the organization of the content including:

- How the content will be organized
- Content of the assessments and mapping of items to content
- Process the learner will follow to access assessments, remediation, and content
- What actions will be taken on completion of the assessment

These decisions begin during the instructional design process and continue through the content development process. These decisions impact how ELOS are identified, developed, and aggregated into TLOs.

2.8.3. Identifying and Designing ELOs—Overview

ELOs are the smallest logical unit of instruction delivered and tracked via a learning management system (LMS). One approach to consider for designing ELOs is to write them as a topic that addresses an EO. Enabling objectives will be based on SkillObject data.

Additionally, since NCOM is SCORM-based, just like SCOs cannot directly access other SCOs, ELOs cannot directly access other ELOs. Therefore, ELOs should not be created with any links to content in other ELOs. Put another way, this means a learner cannot access supplemental content from another ELO. It is very important to remember that each ELO should be able to stand-alone. This is significantly different from the way most Computer-Based Training (CBT) lessons and courses function.

An ELO must exist independent of other instruction, so it cannot rely on other ELOs or a particular course structure to give it meaning or place it within a certain context. For IDs, this may pose a concern—how do you ensure the instructional integrity of a ELO if there is no supporting course structure and you don't know the context in which it may be used?

If you use the general guideline of creating your ELOs as individual topics representing an EO and all of the related materials required to support that objective, the effective completion of the ELO will impart the knowledge or skill for which it was designed. As such, an ELO should be instructionally sound.

2.8.4. Moving from a Traditional Course Structure to NCOM

Traditional course structures tend to follow a hierarchical scheme with a course being composed of various lessons and each lesson being composed of topics. Each topic then has one or more objectives.

Table 2.1 lists the enabling objectives (EOs) and the terminal objectives (TO) for one lesson of the Apprentice Trainer Course.

Refer to APPENDIX D for more information on the Instructional Design and Assessment Strategy for the Apprentice Trainer Course

Table 2.1: EOs Identified For One Lesson Of The Apprentice Trainer Course

Lesson Title	Topic Outline	Objective	Objective level
Lesson: Becoming a Qualified Workspace Trainer		After completing this lesson, you will be able to employ strategies for enhancing your personal and professional development as a workspace trainer.	TO
	What is an IDC Apprentice? § Common elements of training programs, including terminology and basic approach at the command, department, and divisional levels. § Instructional Delivery Continuum § Apprentice Level § Practice Items § Activity: Analyze the Command Training Structure	Differentiate between your role and responsibilities as a workplace trainer and as an apprentice in the IDC.	EO
	What is Team Dimensional Training (TDT)? § Definition of TDT § The TDT Cycle § Practice Items	Describe the TDT cycle.	EO
	The Primary Trainer/Apprentice Relationship § Definition and example of a learning coach § Purpose of the apprentice/learning coach relationship § Benefits of the apprentice/learning coach relationship § Practice Items § Activity: Interview your	Describe the primary trainer/apprentice relationship.	EO

Lesson Title	Topic Outline	Objective	Objective level
	primary trainer		
	What is Self-assessment? § Recognizing what you know and don't know § Recognizing when you've done something wrong § Knowing when t ask for help § Practice Items § Activity: Assess your knowledge of IDC topics	Perform a self-assessment.	EO
	What is an Individual Development Plan (IDP)? § Definition of IDP § Purpose of IDP § Use of an IDP to manage professional development, including tracking performance and setting goals § Practice Items § Activity: Develop and review your IDP	Use your IDP to manage your professional development.	EO
	What is Time Management? § Procrastination § Setting priorities § Time management strategies § Benefits of time management § Setting goals § Practice Items	Describe time management	EO
	IDC Trainee Responsibilities § Take initiative for your own learning and ultimate qualification. § Seek out and interact with learning coach and peers § Utilize the tools and resources available § Take advantage of learning opportunities § Take the initiative to become technically proficient.	Describe your responsibilities as an IDC apprentice trainee	EO

Lesson Title	Topic Outline	Objective	Objective level
	§ Practice Items		

Each topic may or may not have a learner assessment. Figure 2.5 hypothetically shows the Apprentice Trainer Course if it was designed as a "traditional" course. Assume this hypothetical "traditional" course was designed for Apprentice Trainees to give them detailed information about all aspects of becoming an Apprentice Trainer.

NOTE: The example below shows only two lessons and three topics for each lesson of the hypothetical "traditional" Apprentice Trainer Course.

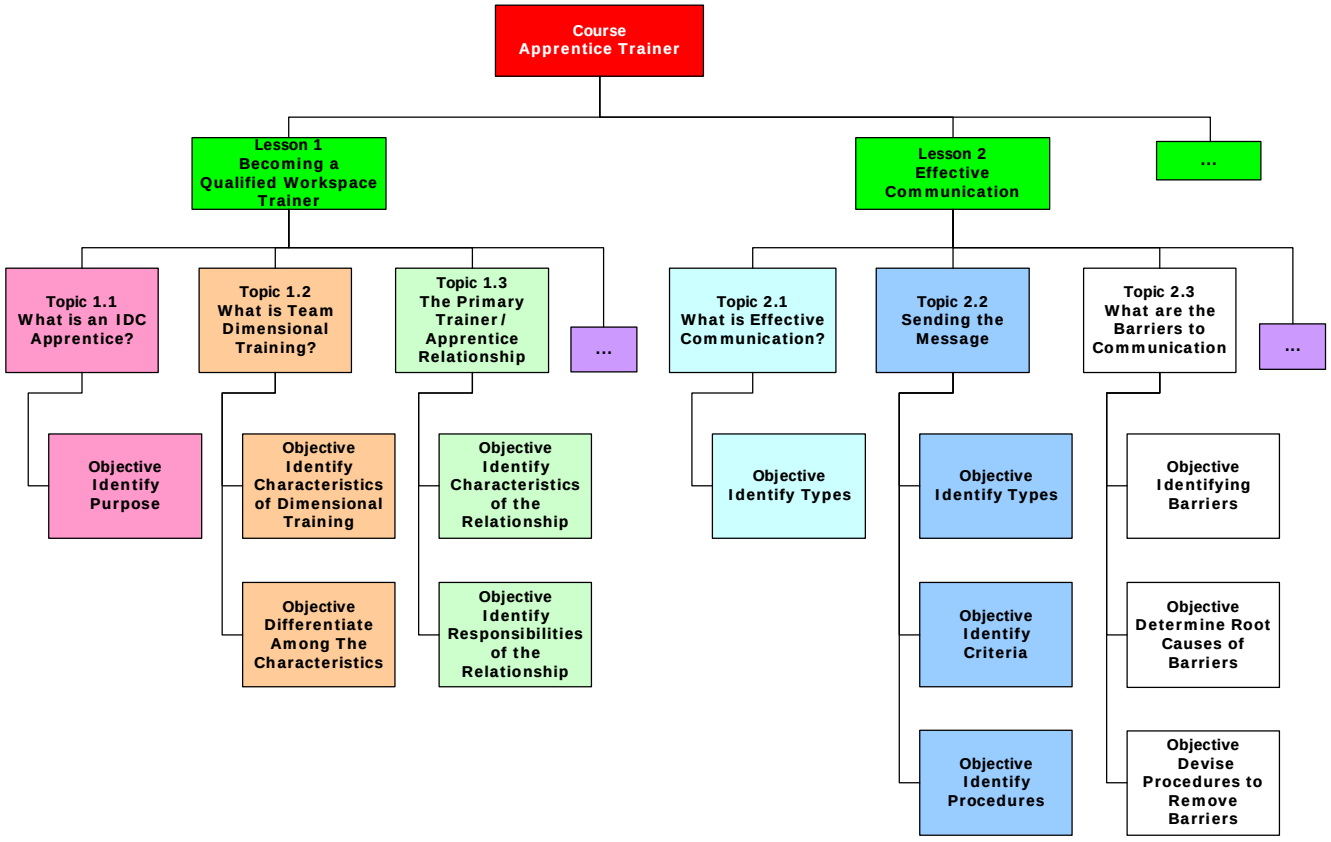


Figure 2.5: Example of a traditional course content structure diagram

In Figure 2.5 there are three topics in each lesson, each represented by a different color scheme. In the format presented, assume that in order to pass the topic, the learner would have to complete the entire subordinate learning objectives. As structured, an Apprentice Trainee who wants to learn specific information about the characteristics of team dimensional training would have to complete, at a minimum, the entire lesson on "What is Team Dimensional Training?" to see information on The Primary

Trainer/Apprentice Relationship. Likewise, if the trainee wanted to learn about "What are the Barriers to Communication?" she would have to see, at a minimum, both the entire What is Effecting Communication? and Sending the Message. This limits the ability of learners to access only the content they desire or the crucial objectives and limits the reusability of the instructional materials.

2.8.5. Designing ELOs from Existing Instructional Material

Navy training content exists that has been designed and delivered as instructor-led training (ILT). Most likely some of this content will be identified during analysis to convert to SCORM-compliant ILE materials using Navy-SCORM and this guide. When tasked with converting legacy ILT to SCORM-compliant NCOM content, it is essential to analyze the existing content to ensure the content is instructionally sound in its current form before trying to convert it to either e-learning or NCOM. The easiest way to do this is through the process of content "reverse engineering." Additional considerations for designing ELOs as new instructional materials are addressed in Designing ELOs for New Instructional Materials.

2.8.5.1. Evaluate the Existing Content

Does the content teach the stated objectives? You may find, after thoughtful and unbiased evaluation, that the objectives are unrelated to the content, or the content does not teach the required objectives. If this occurs, you should determine which if any of the following you need to do:

- Ø Add content to teach the existing objectives
- Ø Remove the irrelevant content
- Ø Re-design the organization of the content

2.8.5.2. Identify the ELOs

Once you've identified the target audience(s)—typically given to you in the GFI/M—you can begin to decide how the content should be "divided" into individual ELOs to make it optimally reusable while still meeting the needs of the audience for whom is was originally intended. When you look at your existing ILT materials, you may find one topic repeated throughout the course, lesson, or module. Determine if there is a better way to group the materials so that all aspects of one topic are presented together. In ILT, the instructor does all the sequencing and customization of the content as she presents it; in the Navy ILE, all the material needs to be thorough, accurate, well-designed, and well-written before it is presented to the learner, so think carefully about the best way to group, or regroup, what you already have. More often than not, you will be able to assume that you can maintain the existing structure of your content. If your content needs to be restructured, either for instructional reasons or to adhere to SCORM and Navy-SCORM refer to section Designing ELOs for New Instructional Materials and

Content Sequencing before attempting to identify your ELOs. The content structure diagram you create may require modifications or unique ELO structures to achieve the instructional outcomes you desire.

Assume you are working with the hypothetical "traditional" Apprentice Trainer Course depicted in Figure 2.5. Both SCORM and Navy-SCORM say an ELO should be context neutral and should stand-alone. In order to accomplish this with the Apprentice Trainer Course, you could structure the content outside of the context of an Apprentice Trainer. Figure 2.5 shows the individual objectives from the Apprentice Trainer Course (from Figure 2.6) divided into individual ELOs (yellow boxes), rather than created as comprehensive topics then aggregated into TLOs (green boxes). These diagrams are not intended to show the structure of the content, but rather to show an example of dividing existing content and lessons into individual pieces that will become ELOs.

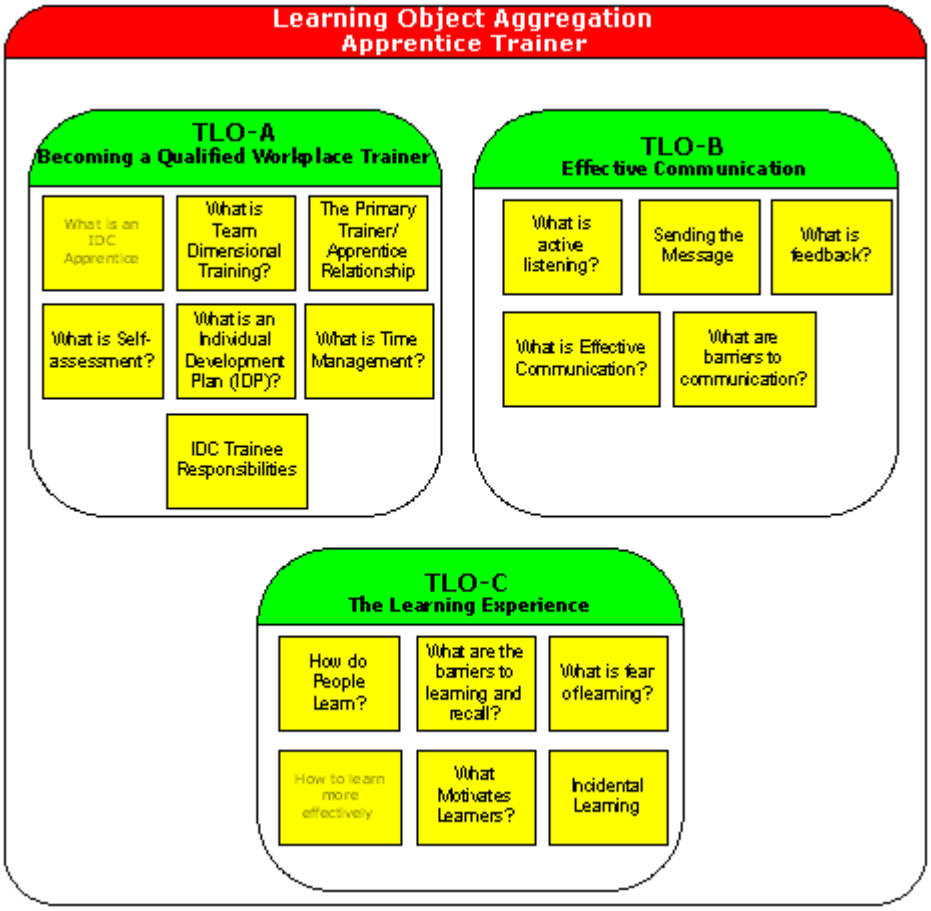


Figure 2.6: TLOs created from the existing course depicted in Figure 2.5

In this format, some of your ELOs may be too large and the content too comprehensive to meet the needs of an audience Apprentice Trainees. For example, the ELO called *What is Effective Communication?* might include *What is effective Communication?* as well as instruction on *Sending the Message*, *What are Barriers to Communication?,*

What is Active Listening? and *What is Feedback?* These topics could possibly reach a wider and different audience across various communities of practice. Review the content very carefully to determine if they can be broken down into several other enabling objectives. Often the topics covered in a ELO such as *What are Barriers to Communication?* can become enabling objectives that you could design as smaller ELOs, thereby making them more reusable.

So that you can quickly identify the difference between SCORM components, all of the diagrams in this guide have been created in corresponding colors. Yellow boxes represent ELOs. The green boxes above now represent what had been lessons in Figure 2.6; these boxes are now aggregations of content—TLOs. The red box, previously representing the course, now represents a Learning Object Aggregation.

2.8.5.3. Identify the TLOs

Each topic in each lesson of the Apprentice Trainer Course was identified as an ELO. As you can see in Figure 2.6, the ELOs identified to address the lesson objectives were grouped into three TLOs. The Apprentice Trainer Course actually has seven Lessons (Figure 2.6, and Table 2.2 show only three of the seven lessons for example sake). Therefore, there would be seven TLOs for this course, each TLO containing multiple ELOs representing the lesson topics for the course (see Table 2.2 for three of the seven lessons and their association to TLOs and ELOs). This example is just one way that the course could be organized.

Table 2.2: TLOs with Associative ELOs for the Apprentice Trainer Course

TLO	Lesson: Becoming a Qualified Workspace Trainer
ELO	• What is an IDC Apprentice?
ELO	• What is Team Dimensional Training?
ELO	• The Primary Trainer/Apprentice Relationship
ELO	• What is Self-assessment?
ELO	• What is an Individual Development Plan (IDP)?
ELO	• What is Time Management?
ELO	• IDC Trainee Responsibilities
TLO	Lesson: Effective Communication
ELO	• What is Effective Communication?
ELO	• Sending the Message
ELO	• What are barriers to communication?
ELO	• What is active listening?
ELO	• What is feedback?
TLO	Lesson: The Learning Experience
ELO	• How do people learn?
ELO	• What are the barriers to learning and recall?
ELO	• What is fear of learning?
ELO	• How to learn more effectively
ELO	• What motivates learners?
ELO	• Incidental learning

Remember that the ELOs shown in Figure 2.6 and Table 2.2 could become enabling objectives that you could design as smaller ELOs— aggregated into a TLO—thereby making them more reusable. It depends upon the instructional design intent and the amount of content. Assume the topic content in *What are Barriers to Communication?* (See Table 2.1: EOs Identified For One Lesson Of The Apprentice Trainer Course) does have numerous enabling objectives. Figure 2.7 shows how you could further divide that topic content into ELOs that correspond to the enabling objectives. Each ELO in the diagram represents one EO. The ELOs can now be sequenced in any manner desired by the instructional designer.

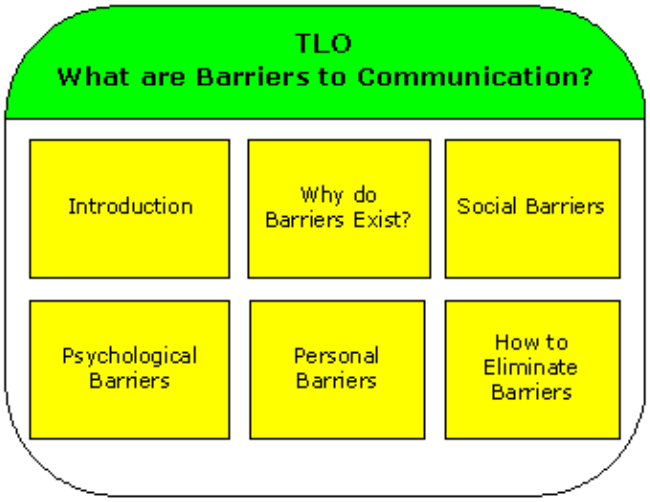


Figure 2.7: An additional TLO created

Content Sequencing, shows numerous ways you can structure the content from this example.

2.8.6. Designing ELOs for New Instructional Materials

It may appear easier to design new ILE instructional materials in accordance with Navy-SCORM rather than repurpose existing materials for NCOM. However, the repurposing process has one advantage: you know the scope of the task since you already know what the content is, how deep the content delves into the subject matter, and how the content was intended to be structured. When designing new ILE content with the NCOM, it will be very important to set some parameters for your design or development team.

Once you've determined the instructional strategy you think is most relevant to your learners, you can decide how many ELOs you will need, what content the ELOs will address, etc. You can do this in a way that will make the individual ELOs optimally reusable while still meeting the needs of the audience for whom you are designing the material. Review the guidelines in Designing ELOs from Existing Instructional Material, for more considerations about identifying your ELOs, and then follow the remainder of the development process outlined in that section.

2.9. Assessment Strategy

2.9.1. General Assessment Strategy

The assessment strategy) is integral to the overall instructional design is intended to serve as a guide for IDs as they select instructional design models and make decisions concerning instructional and assessment strategies.

Assessments make inferences regarding what learners know or can do. These inferences can be used to make decisions about (a) students, (b) curricula and programs, and (c) educational policy (Nitko, 2004; Pelligrino, Chudowsky, & Glaser, 2001). Within the context of ILE, the term, Assessment, will be used with measurement of the learner and performance. The term, Evaluation, will address measure of effectiveness of curricula, programs, or policy. Despite the various contexts for assessment, one common principle is that assessment always relies on the process of reasoning from evidence (Pelligrino, Chudowsky, & Glaser, 2001). Decisions about assessment (e.g., what questions to ask, what tasks must be performed) all seek to provide sufficient evidence that a learner has achieved the intended outcome.

Assessment plays a critical role in the design and development of learning activities and instruction. As previously stated in this document, most instructional design models begin with the development of learning objectives or descriptions of intended learning outcomes. At the time the learning objectives and outcomes are developed, the ID must decide how the learner will demonstrate attainment of each objective or outcome.

Assessment provides the means for making that determination. Decisions about what to assess and how to assess will not be afterthoughts. Although assessments often take place after instruction has been completed, the development of assessments should be part of the initial design process (Pellegrino, Chudowsky, & Glaser, 2001).

The ID must consider many factors, including the intended purpose of the assessment, the target audience, and the content. These factors will influence the specifications for each assessment, including the format and medium. Just as new technologies offer opportunities for learners to interact with content, they also offer opportunities to demonstrate understanding or skills in new ways. Assessment items need not be limited to multiple-choice questions, but should include responses to simulations, concept maps and open-ended questions. Innovative items can provide high levels of task complexity and interactivity while also reducing the likelihood of guessing.

2.9.2. Assessment Design Decisions

During the planning stages, the ID is faced with several decisions affecting assessments. This section raises several key questions to be considered.

2.9.2.1. What is the intended purpose?

Assessments serve multiple purposes. Assessment instruments can diagnose learner strengths and weaknesses, prescribe sequencing or alternatives, measure prerequisite knowledge, provide feedback on progress, assign rankings, measure performance, or certify mastery.

The purpose of an assessment should be identified during planning and design of instruction. The same items can be used to assess student understanding for various purposes. A simple way to illustrate the different purposes is to examine when assessment is given and the types of inferences that can be made based on the learner's performance. Separate types of assessments can be designed for different purposes (e.g., diagnosing student strengths, certification). The same assessment items can be used for different purposes but the reporting (e.g., to the learner, to the instructor) and the inferences made will differ (Baker, Aschbacher, Niemi, & Sato, 1992).

Table , Types of Assessments and Purposes, provides a summary of basic purposes for assessment and typical inferences made from each type of assessment.

Table 2.3: Types of Assessments and Purposes

When Administered	Purpose	Typical Examples	Typical inferences based on performance
Prior to instruction	Prescriptive or Diagnostic	Pretest	Has the student already achieved the intended learning outcomes? Does the student have the prerequisite skills needed to begin the instruction?
During Instruction	Formative Progress	Embedded question Practice test Self-assessment Quiz Module/Lesson Test	Is the student achieving the intended outcome? Is remediation needed? Where/when should remediation occur?
After Instruction is completed	Performance Measure	Posttest Exams PQS Board	To what extent has the student achieved the learning outcomes? Has the student met the expected standard? (criterion-referenced) How does the student rank relative to others? (norm-referenced) Has a learning intervention been effective?

2.9.2.2. Performance Standards

An assessment plan also provides information about the standards to which learner performance will be compared. To demonstrate attainment of the learning outcome, must a student correctly answer 80% of the questions on a test? Must a learner accurately describe each of steps that must be taken to secure a site? What actions must a learner take to satisfy learning objectives?

The standard is often set as a specific score or number correct on a test. Determining the accuracy of a multiple choice or matching item is typically straight forward and evidenced when the learner selects what is coded as the correct response. Determining the standard for an open-ended question or performance task requires the development of rubrics. A rubric may be a checklist or a specific breakdown of points to be awarded for each element included or the quality of the response.

To determine performance standards a modification of the Ebel method developed by SkillsNET, will be used.

4 Refer to Ebel, R. L. Essentials of Educational Measurement. Englewood Cliffs, N. J.: Prentice-Hall, 1972, pp. 492-494

Requirements for using this method include job analysis survey information that is obtained using the SkillsNET Job Task Analysis system. This survey information includes frequency and criticality ratings on each task, sub-task, unique knowledge, and tool. Based on these ratings, learning objectives will be placed in the Performance Standard matrix (see Table 2.4) to determine level of performance standard required. Modifying conditions such as level of expertise needed, time constraints for performance, etc. will adjust the placement of the learning objectives within the performance standard matrix. Modifying conditions include:

- Platform
- Level of expertise
- Weather/environment conditions
- Battle/normative conditions
- Time pressure
- Stress level
- Group/individual level
- Changing equipment / tools
- Quality of work/service produced
- Quantity of work/service produced

As a result of the placement of the learning objectives, the standard level (high, medium-high, medium, low-medium, and low standards) will be obtained and converted into more concrete standards including checklists and required scores on performance measures.

- Ø High standard = 100% Success rate
- Ø Medium-High Standard = 90% Success rate
- Ø Medium Standard = 80% Success rate
- Ø Low-Medium standard = 70% Success rate
- Ø Low standard = 60% Success rate

Table 2.4: Performance Standards Matrix

Criticality	Once per year or more often	More than once per month	More than once per week	Daily	Several times per day
Minor Consequences	Low	Low	Low-Medium	Medium	Medium-High
Moderate Consequences	Low	Low-Medium	Medium	Medium-High	High
Serious Consequences	Medium	Medium	Medium-High	High	High
Critical Consequences	Medium	Medium-High	Medium-High	High	High
Catastrophic Consequences	High	High	High	High	High

2.9.2.3. What Evidence Demonstrates Attainment of Intended Performance/Learning Outcome?

Will the student demonstrate knowledge by answering questions or by applying knowledge in a real-world or simulated setting with performance observed by experts? The assessment plan identifies the knowledge and behaviors (e.g., cognitive, motor, verbal, social, and affective/attitudinal) that must be attained and which indicators will best demonstrate attainment of the intended outcomes. An assessment may be a single item (e.g., a question or task) or it may be a collection of items (questions, tasks, performance on a simulation). Jonassen and Tessmer (1996) provide an extensive listing of outcomes and ways to assess them.

2.9.3. Assessment Items and Assessment Instruments

The term assessment often refers to the actual instrument or test designed to obtain information, whether a written test for determining what a student knows or a performance test requiring a student to demonstrate skills.

2.9.3.1. Assessment Items

Each individual question or task we ask the student to address is an assessment item. This item can stand alone within the instructional design of the course (e.g., a knowledge- or self-check during instruction or a question to test mastery at the end of the course). Assessment items can be developed in various formats, including closed-choice (e.g., multiple choice, matching) open-ended (e.g., fill-in, essay), and real or simulated performance tasks. See Table 2.5: Learning Outcomes and Assessment Types, for suggestions.

2.9.3.2. Assessment Instruments

Assessment instrument refers to items that are grouped together to form tests, quizzes, exams, or simulations. The designer must distinguish between recorded and unrecorded assessment instruments. Recorded instruments will be scored in an LMS. Unrecorded assessment instruments (typically self-checks or self-assessments) will provide feedback to the learner only and scores will not be reported.

2.9.4. Aligned with Learning Outcomes

Current learning science research includes assessment as one of the important elements affecting how people learn. Based on the How People Learn (HPL) reports, Bransford (2001) describes assessment as one of the lenses through which environments should be analyzed to facilitate learning. Using assessments in this manner means more than frequent testing. Learning environments should "provide multiple opportunities to make learners' thinking visible, provide them with feedback and offer opportunities for them to revise and learn about their own learning" (Bransford, 2001, p, 1). Feedback and the opportunity to learn from it foster the development of metacognitive as well as cognitive and performance skills. Decisions about the kind of feedback and when it should be given must be made during the design phases.

The intended learning outcome should drive decisions relating to the instructional strategy and the assessment strategy. For example, if the learner is expected to solve ill-structured problems, the instructional strategy should facilitate development of those skills. The assessment strategy should provide opportunities for the learner to demonstrate attainment of those skills.

An assessment instrument might ask the learner to act as a first responder to a chemical disaster, solve the complex problem of determining the number of helicopters needed for a mission given specified conditions, or create a concept map to describe the policy ramifications of an action. If the learner is expected to evaluate resources and select appropriate information, the assessment may be dynamic in order to provide varied resources. If the learner is expected to respond with appropriate air traffic control commands when given certain cues, instructional strategies should provide strategies and practice for developing rapid responses. Likewise, the assessment strategy should require precise and rapid responses. Assessments may also include hands-on tasks that are not computer driven.

Table 2.5: Learning Outcomes and Assessment Types, identifies several types of assessments that can be used to assess learning outcomes.

Table 2.5: Learning Outcomes and Assessment Types

LEARNING OUTCOMES	ASSESSMENT TYPES
Cognitive	• PQS • Practicum • Oral Board • Scenario • Simulation • Reporting • Writing Sample • Essay • Sample Work Product • Knowledge Check • Multiple Choice • True/False • Matching • Concept Mapping • Completion • Rank/Order (Sequencing) • Brief/Presentation
Motor	• Structured On-Demand Task • Projects • Portfolios/Jacket • Experiment • Oral Presentation • Simulation • Scenario • Demonstration • Checklist • PQS • Rating Scale • Observation (demonstration, simulation, workplace)
Verbal	SkillsNET - Under Development
Social	SkillsNET - Under Development
Affective/Attitudinal	• Questionnaire • Observation • Simulation • Scenario • Moral Dilemmas • Reflective Writing • Presentation

2.9.5. Feedback

Feedback is an important element in the learning process. The assessment strategy should include opportunities for learners to learn from their performance. In guidelines for developing good assessments, the Advanced Distributed Learning (ADL) states that tests given during instruction should provide feedback and motivation to the learner. Information obtained should indicate the degree to which the learner is achieving the intended skills, and content domains (Advanced Distributed Learning, 2003). Research further suggests that learners benefit by receiving feedback on their performance, guidance about how to improve, and training in self-assessment (Pellegrino, Chudowsky, & Glaser, 2001).

2.9.6. Remediation

Assessment results can identify knowledge or performance gaps in need of remediation. The ID determines the type of remediation the learner will receive and the methodology. Remediation in the ILE may (a) direct the learner to additional instructional materials or learning experiences; (b) instruct the learner to repeat certain portions of instruction; or c) suggest equivalent or alternative methods of learning. These distinctions have direct implications for content organization and content sequencing.

2.9.7. Aggregating Assessments

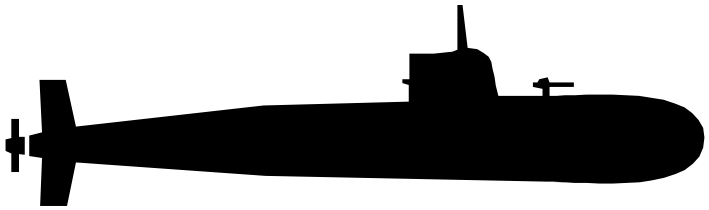
Navy-SCORM addresses issues related to the SCORM Content Aggregation Model (CAM). SCORM does not handle assessment issues via the CAM specification. At high levels of planning, however, IDs do consider how assessment content (i.e., assessment instruments) will be aggregated and sequenced. Therefore, this section provides high level guidance to IDs concerning options for aggregating and sequencing assessment instruments (e.g., how to plan for pretests or remediation).

Many of the functions of testing are addressed through the Run-time Environment (RTE) of SCORM. These include assessment behaviors, data tracking, item analysis, and random selection of test questions from item banks. These are issues that must be addressed within the context of the content runtime programming, the LMS environment and perhaps the LCMS.

2.10. Summary

2.10.1. Designing Content for the ILE

- Base the design of the content on instructional theory
- Cleary define terminal and enabling learning objects
- Identify the appropriate assessment methods



PART THREE - CONTENT DEVELOPMENT

The Navy-SCORM provides the flexibility to design instructionally sound and effective performance-based ILE learning activities that meet the specific needs of the target audience. Once the instructional design is complete (including the organization of the content), selection of instructional and assessment strategies, and delivery platform the design must be sequenced. It is important that the intent of the instructional design follows through during development and that in the process of development the intent of the instructional design is not compromised. Hence, in order to ensure the success of Navy ILE learning activities it is imperative that the ID collaboratively works with the developer/programmer during the development processes to ensure that the instructional design is properly interpreted.

3.0 APPLYING THE SCORM API TO NCOM

Content inside an ELO can be highly customized to a particular learner by using the SCORM Application Programming Interface (API) provided by an LMS. For example, a ELO can use the API to get the learner's name and insert it into the text so a learner might see "Welcome to the Apprentice Trainer Course, Malika" when she logs in. An ELO can also use the API to determine if the learner has seen a particular assessment ELO before and how she scored on previous attempts. Based on this information, the LMS could then present different materials to the learner or deliver a different test.

The most common use of the API is to record a learner's score on a test in an ELO and then record if the ELO was passed. The LMS stores all this information for use later in the course and for the learner's supervisor to see how well the learner did in the course. The API is the only way to track a learner's progress in a course delivered via an LMS.

The ID, and the developer/ programmer must work closely together to ensure that the IDs design intent regarding the content organization, learner's navigation, and access to content is correctly interpreted in the production process. It is the programmer's responsibility to implement the API to achieve the intent of the instructional design. It is also the programmer's responsibility to educate the ID regarding what is allowed and not allowed according to SCORM and the API specifications. Working together they can produce effective and efficient ILE materials.

3.1. Content Sequencing

Because Navy-SCORM is a SCORM 2004-based model and development of all ILE content must adhere to both NCOM and SCORM, the following discussion references the SCORM 2004 sequencing rules and guidelines. It is important to remember the one-to-one correlation that Navy-SCORM has with SCORM 2004 (see Figure 3.1: SCORM and NCOM Hierarchies). Hence, within this section the terms SCO and ELO, aggregation and TLO, and root aggregation and Learning Object Aggregation are used interchangeably.

SCORM
- Root Aggregation
▪ Aggregation
▪ Sharable Content Object (SCO)
▪ Asset (with metadata)

NCOM
- Learning Object Aggregation
▪ Terminal Learning Object (TLO)
▪ Enabling Learning Object (ELO)
▪ Asset

Figure 3.1: SCORM and NCOM Hierarchies

In traditional multimedia and CBT (Computer Based Training), branching enabled (or sometimes forced) learners to move from one piece of content to another relatively seamlessly. Learners may or may not have known they were moving from one lesson to another or from one module to another. This was possible because robust authoring systems gave IDs nearly limitless programming options for structuring and branching their content.

The sequencing functionality within a lesson or between lessons, shown within the yellow box in 3.2, was hard-coded, rather than based on a linear or an adaptive model.

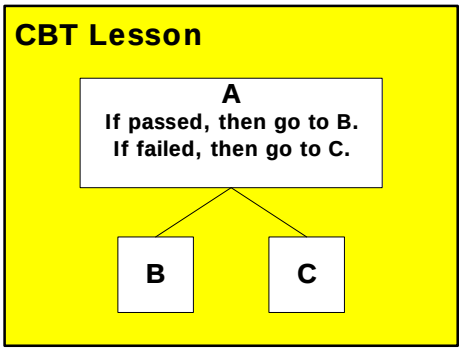


Figure 3.2: Sequencing in CBT Lessons

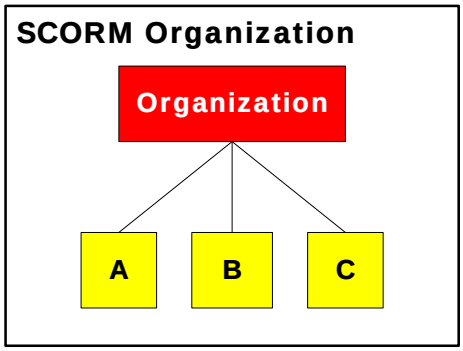


Figure 3.3: Sequencing in SCORM 1.2

In the early versions of SCORM, it was not possible to sequence content in an interoperable manner. SCORM-compliant content was presented to the learner, typically as a table of contents, and learners could select the content they wanted to see. Figure 3.3 shows a SCORM organization and several SCOs (ELOs). Learners could select any SCO (represented by the yellow boxes). IDs found this aspect of SCORM 1.2 frustrating, since in many instances they wanted to ensure that learners would receive certain content in the order they prescribed.

To overcome this limitation, IDs created very large SCOs (by making several CBT lessons like the yellow box in Figure 3.2 into SCOs like the ones shown as yellow boxes in Figure 3.3.) Alternatively, IDs used the sequencing functionality provided by their in-house LMS. Neither solution worked well. Since the goals of SCORM include interoperability and content reusability, hard-coding functionality within or between lessons made complying with the SCORM guidelines impossible:

1. Content was not interoperable when hard-coded sequencing rules were present or when sequencing rules were defined using one LMS's proprietary functionality because the sequencing functionality of one LMS could not be read by another LMS.
2. Content could not be reused when individual SCOs relied directly on other SCOs for their sequencing. Hard-coding SCOs results in one SCO "looking for" another SCO that may or may not be present. Hard-coding also limits the ability to create new or custom content structures from the same instructional materials, since each time a new structure is desired, the code attached to each individual SCO has to be updated.

3.1.1. Sequencing Functionality in SCORM 2004

SCORM 2004 prescribes nearly all functionality that occurs outside of the SCO/ELO itself. With the inclusion of the sequencing functionality in SCORM 2004, IDs have the capability to describe and prescribe the manner in which learners receive individual pieces of content from the LMS. Since the NCOM is a SCORM -based model it complies with the SCORM sequencing functionality and guidelines.

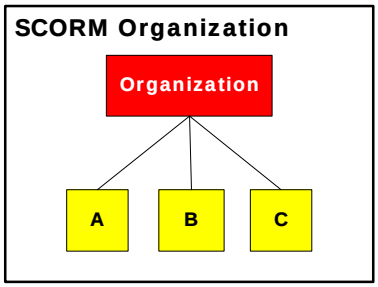


Figure 3.4: Sequencing in SCORM 2004

The individual pieces of tracked content the learner receives are sharable content objects (SCOs)—ELOs in the NCOM. SCORM does not permit one SCO/ELO to "call" or access another SCO/ELO directly. The LMS controls the movement of the learner from SCO/ELO to SCO/ELO with inter-SCO/ELO sequencing. The LMS performs all of the "branching" of the content based upon behaviors defined by the ID and input by a programmer. The resulting sequencing rules get stored in the LMS as part of the manifest. This allows the same set of SCOs/ELOs to be sequenced in many different

ways, depending upon the ID who structures the content and the learner to whom the content will be delivered.

It is the inter-SCO (inter-ELO) sequencing that allows the ID to specify what is presented to the learner, when it is presented, and the attributes or functions the SCOs/ELOs entail. Inter-SCO (inter-ELO) sequencing is also how SCORM allows IDs to monitor and record the learner's choices and performance. All of this functionality occurs outside of the SCO/ELO itself, as shown in Figure 3.6, so that content can be sequenced in an interoperable manner, unconstrained by coding within the SCOs/ELOs.

Intra-SCO (intra-ELO) branching (the hard-coded navigation occurring inside an individual SCO/ELO is not tied to the LMS or to the content package, so it does not constitute SCORM sequencing nor is it required to adhere to SCORM sequencing guidelines. As a result, intra-SCO (intra-ELO) branching is not tracked by the LMS, so there is no way to report the learner's progress on individual aspects of the SCO/ELO via the LMS. However, a comprehensive score for the learner's performance on the SCO/ELO as a whole may be reported to and stored in the LMS. The scores reported to the LMS include passed/failed or a normative score between -1 and +1. Note that IDs can combine intra-SCO (intra-ELO) branching and inter-SCO (intra-ELO) sequencing to create the most effective learning experiences for learners.

3.1.2. Preparing to Sequence Your Content

The instructional techniques you traditionally employ may have to change slightly as you create SCORM -compliant instruction. Since the sequencing of the content is now being controlled by the LMS (which will generally be programmed by someone other than the ID), you must carefully specify the actions and behaviors you desire for each ELO and each TLO, all the way back to the Learning Object Aggregation. If you fail to do this, the actions and behaviors of your content will be the default values defined by SCORM, which may not result in the type of learning experience you had planned or desired.

Since the NCOM adheres to the SCORM sequencing that is based on a tree structure, specifying the actions and behaviors you want for your learner requires the creation of a content structure diagram. To do this, return to the example from Identify the ELOs, where existing content was divided into ELOs (see Figure). The ELOs that were identified in Figure 3.5: ELOs organized for sequencing have now been partially organized with labels as Figure 3.6

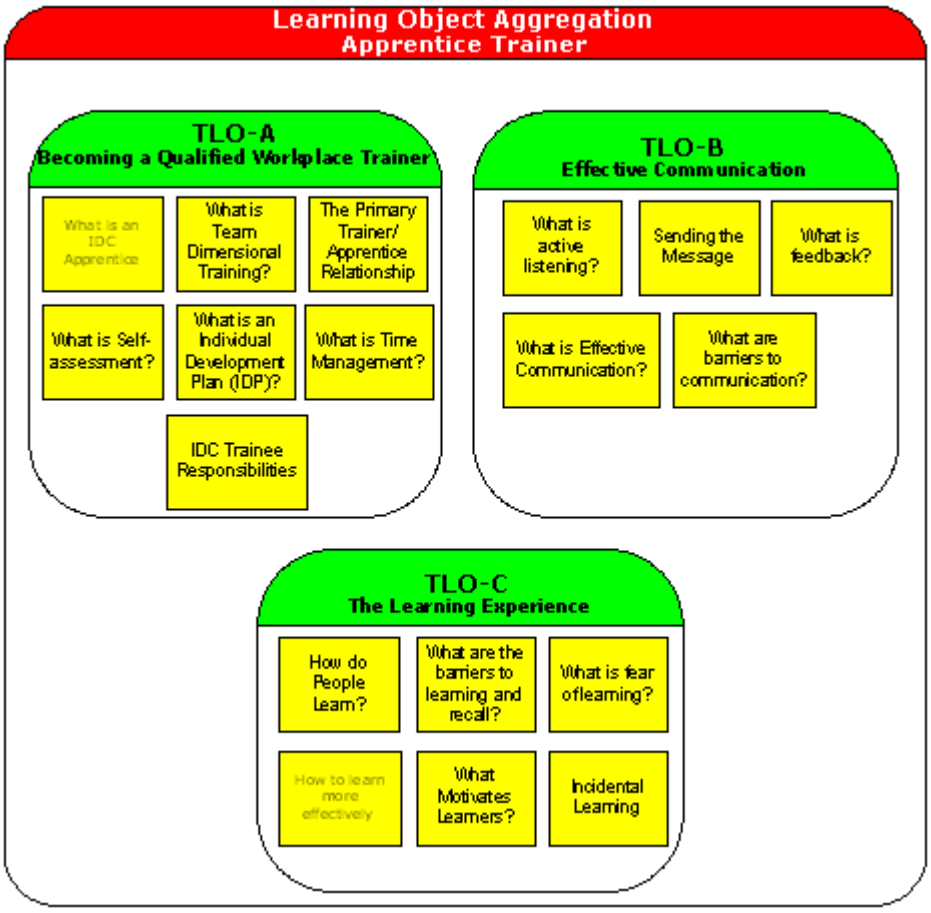


Figure 3.5: ELOs organized for sequencing

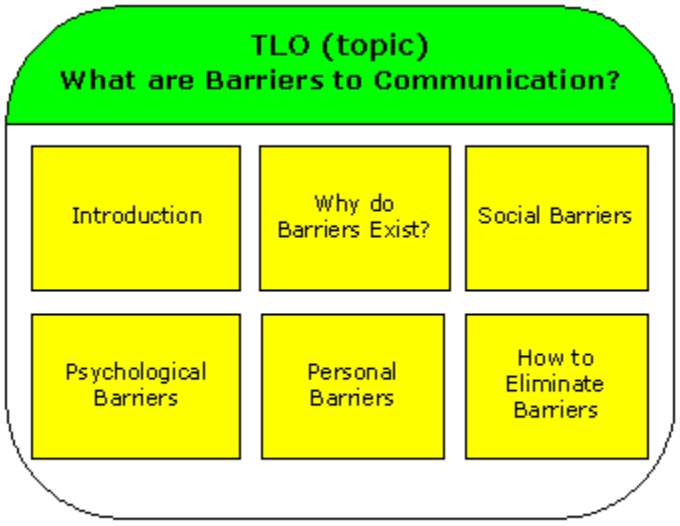


Figure 3.6: An additional TLO created from What are Barriers to Communication ELO

Remember that in "Identify the ELOs "you carefully scrutinized the Effective Communication ELOs you had identified and decided that some of them should be divided even further (see Figure 3.5 and Figure). Those ELOs will also have to be grouped before you can sequence them.

Once you have defined your ELOs, and considered some high-level groupings for them (TLOs or a Learning Object Aggregation), you can begin the process of determining the content structure diagram onto which you will apply content sequencing rules. The sequencing rules (generated by your developer/programmer) will apply the behaviors you describe for your instructional materials to ensure the instructional integrity of your content.

3.1.3. Understanding Sequencing Terminology

Some terms you may have used to signify a specific function of instruction may have different meanings in SCORM when you sequence your content. This requires careful use of these words, keeping in mind their definitions within the context of SCORM sequencing. One example is the word "objective" (OBJ). In traditional instructional design, an objective is used to measure the attainment of a knowledge, skill, or ability in accordance with a predefined behavior, a prescribed condition, and an achievement standard.

In SCORM, the objective (OBJ) refers to a convenient way that a SCO/ELO can pass MasteryStatus parameters to the LMS. There are two types of MasteryStatus parameters: PassFail and NormalizedScore. You determine the criteria the ELO will use to report all the objectives' PassFail or NormalizedScore values, which will be passed to the LMS. PassFail simply represents whether the ELO was passed or failed. NormalizedScore reports a value for an OBJ to any decimal value between -1 and +1. With either of these parameters, you can choose to set their values based on a response to a single question, a complete assessment, or simply whether the ELO has actually been viewed. Each ELO can set or read multiple objectives, and a single objective can be set by or read by multiple ELOs.

Other terms with different meanings in SCORM include complete and satisfied. Traditional uses of these words would mean the learner had seen all of the content related to a given topic. For an ELO that uses the Application Programming Interface

(API), you can decide the criteria that must be met for a ELO to be considered either complete and /or satisfied. For an ELO that does not use the API (a “non-communicative ELO”), the LMS will automatically set the ELO to complete as soon as the learner starts the ELO. As a consequence, complete for a non-communicative ELO does not necessarily mean that the learner saw any or all of the instructional material in the ELO. For example, the learner may have only seen the first page and then closed the ELO, thus marking the ELO complete. If you want to, or are required to, ensure the learner actually sees all of the content, then create ELOs that are single pages or do not have multiple assets.

3.1.4. Simplifying Content Sequencing

So that you do not have to devise a sequencing strategy from scratch for each lesson and learning experience you develop, this document provides several sequencing examples that describe potential behaviors of ELOs according to various instructional design strategies. Refer to Appendix H for these useful examples. The examples are designed to assist you in structuring your NCOM content to comply with SCORM sequencing guidelines. Since the NCOM is a SCORM -based model it complies with the SCORM sequencing functionality and guidelines.

The instances of the sequencing examples used as working examples in this document can be adapted to suit the needs of your desired learning outcomes. While the content design examples provided for discussion purposes in this section may show a limited number of HTML assets (pages) within the applied sequencing templates, there is no arbitrary limit to the numbers of HTML pages, Flash files, raw media files, etc., that may be included as assets in your individual instances of the sequencing templates.

In addition, any example or combination of examples can be “overlaid” on or combined with another example, creating a more complex instructional strategy for a course or a lesson. Combining the examples provided here will give you viable sequencing models that you can adapt to meet your particular training and educational requirements for ILE content. Examples that show several models for more complex instructional strategies are also provided in the appendix. Depending upon how you apply behaviors to the structures, you can achieve a variety of outcomes.

These examples are not intended to be exhaustive, but they should help you begin to identify new ways in which you can construct SCORM-compliant ILE content while adhering to sequencing guidelines, and the true intent of SCORM and the NCOM : creating R3, interoperable, durable, and accessible instructional materials.

Table 3.1 provides a summary of the sequencing examples and models that can be found in Appendix H.

Table 3.1: Summary of Sequencing Examples and Models

Example or Model	Description	Rule Applications
Example 1	Single TLOs with a Single Asset	1
Example 2	Single ELO with Multiple Assets	1
Example 3	The Black Box; single ELO with multiple assets and complex internal structure	1
Example 4	Multiple ELOs with Assets	2
Example 5	Remediating Using Objectives	2
Example 6	Pre- and Post-Test Sequencing	1
Example 7	Pre- and Post-Test Sequencing (2)	1
Example 8	Remediating Using Objectives (2)	1
Example 9	Basic Three-way Branching	2
Example 10	Pre- and Post-Test Sequencing with New Content for Remediation	1
Model 1	Remediating Multiple TLOs	2
Model 2	Mastery Testing Multiple TLOs	1
Model 3	Pre- and Post-Test Sequencing with TLOs	1
Model 4	Traditional CBT Branching with Multiple Decisions	1
Model 5	Customized Learning Using Three-Way Branching	1

3.2. ILE Content Metadata Requirements

To meet the Navy's short and long term plans and strategy for the ILE, the metadata approach is structured around an information-centric methodology. This methodology is the foundation of the ILE-ISA architecture that is a Services Oriented Architecture conforming to the DoD's Global Information Grid (GIG) initiative. A major component of this architecture is the definition of metadata for many aspects of the system and content, as well as the physical and logical components to store metadata and execute software actions using metadata.

The description provided in this section is a summary of the ILE-ISA metadata architecture, and the specification of metadata standards that must be followed for all ILE content design, development, and deployment. A complete description of the metadata registry and schema architecture and standards is presented in a separate document as part of the series of documents comprising the ILE Content Design and Development Specification.

3.2.1. Architecture Overview

Metadata is data about data. It provides additional information on context and characteristics of data and information items. Following this definition, we can describe the source of data, both human and machine, as well as time-sensitive issues like expiration of approval or legal standing. In addition, we can describe how the data is intended to be used, as well as the key business processes associated with the data and metadata. Consequently, an organized framework of definitions is needed to effectively identify, manage, and use metadata within the ILE.

The ILE metadata architecture uses distinct schema types and within each schema there are three primary categories of metadata elements. Every schema will have a different proportion of these three categories of elements, but all are typically included in a schema regardless of the type of schema. These metadata element categories are:

- **Administrative:** Describes the characteristics of the entity relating to what it is and where it came from as in a library's card catalog, e.g. author, title, date, security, etc.
- **Subject Matter:** Describes the topic of the entity or what it is about, such as METOC forecasting, Sonar LOFARGRAM analysis, physics, etc.
- **Process:** Describes the process state or attributes of a process such as being edited, approved for publication, student is taking a course, etc.

These schema and metadata element types represent the necessary metadata structure for content to be identified and distributed based upon Sailor specific data, including identified tasks, skills, knowledge levels, and other applicable information. The combination of the three schema types provides an integrated description of ILE components and content that allows the ILE to deliver learning content uniquely addressing the individual needs of each sailor. This metadata architecture is the glue that binds the ILE and ensures that it is a scalable framework accommodating emerging technologies, changes in strategic goals, and required adaptations of content and methods.

Development and configuration management activities are dependent upon the content schema elements and their affiliated metadata. This section describes the required schemas for all ILE content and defines their metadata elements, both mandatory and optional.

In an effort to maintain alignment with accepted standards, the content schema specification uses SCORM 2004 as its foundation. While SCORM 2004 is a highly optimized reference model for object-based content, it lacks certain specific definitions that are critical to the ILE. So the Navy has used the extensibility of the SCORM 2004 model to build upon its core schema using Navy required metadata elements and allowed values. This extension does not alter the basic structure or rule basis of SCORM 2004 since it uses the existing SCORM method for extensions (section 9 of reference model, Classification). This customized version is named Navy-SCORM which will be used throughout the specification series and within this document. In addition, SCORM is based on the IEEE Learning Object Metadata (LOM) specification which has a broader set of metadata element value spaces. If not otherwise stated in SCORM, these LOM value spaces will be used as the base set for each element in the Content schema as appropriate.

3.2.2. Content Schema Elements

There are three main ILE content objects:

- Asset: Per the SCORM 2004 specification, an asset is a file of learning content and the base component of a SCO. This file can be a text file, image, or other multi-media item in one of the allowed file formats specified elsewhere in this document (e.g. pdf, doc, ppt, htm, etc).
- Terminal Learning Object (TLO): Per Navy definition, the TLO serves as the smallest aggregation of content necessary to satisfy a specific Terminal Learning Objective.
- Enabling Learning Object (ELO): Per Navy definition, the ELO serves as the smallest aggregation of content necessary to satisfy a specific Enabling Learning Objective. The Navy ELO is equal to the Sharable Content Object (SCO). Per SCORM 2004 conventions, a SCO represents the smallest ***navigable and tracked*** piece of content addressed within the ILE. It is at the SCO level that a large percentage of content sharing occurs.

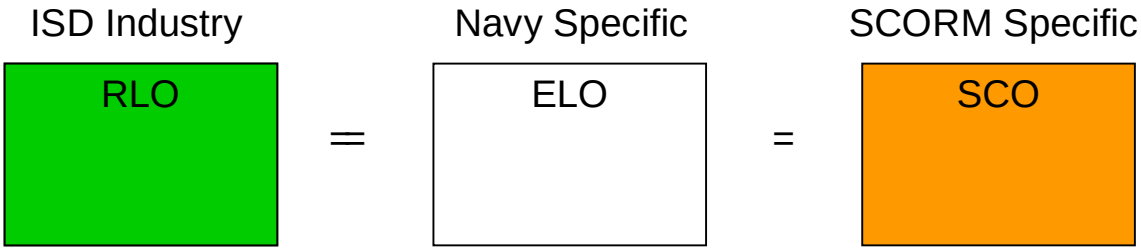


Figure 3.7 Content Element Terminologies

The following table lists the mandatory and optional metadata elements for each content object type.

Table 3.2 Content schema metadata elements. Mandatory (M) and optional (O) elements are noted.

NumericValue -Indicates element parent/child relationships	Element Name - For a complete description of each element name or data type, refer to the SCORM specification.	TLO	ELO / SCO	Asset
1	**<general>**	TLO	ELO/SCO	Asset
1.1	<identifier>	M	M	M
1.1.1	<catalog>	M	M	M
1.1.2	<entry>	M	M	M
1.2	<title>	M	M	M
1.3	<language>	O	O	M
1.4	<description>	M	M	M
1.5	<keyword>	M	M	M
1.6	<coverage>	O	O	O
1.7	<structure>	M	M	O
1.8	<aggregation Level>	O	O	O
2	**<lifeCycle>**	TLO	ELO/SCO	Asset
2.1	<version>	M	M	M
2.2	<status>	M	M	M
2.3	<contribute>	M	M	M
2.3.1	<role>	O	O	M
2.3.2	<entity>	O	O	O
2.3.3	<date>	M	M	M
3	**<metaMetadata>**	TLO	ELO/SCO	Asset
3.1	<identifier>	M	M	M
3.1.1	<catalog>	M	M	M
3.1.2	<entry>	M	M	M
3.2	<contribute>	O	O	M
3.2.1	<role>	O	O	M
3.2.2	<entity>	O	O	M
3.2.3	<date>	O	O	M
3.3	<metadataSchema>	M	M	M
3.4	<language>	O	O	O
4	**<technical>**	TLO	ELO/SCO	Asset
4.1	<format>	O	O	M

NumericValue -Indicates element parent/child relationships	Element Name - For a complete description of each element name or data type, refer to the SCORM specification.	TLO	ELO / SCO	Asset
4.2	<size>	O	O	M
4.3	<location>	O	O	O
4.4	<requirement>	O	O	O
4.4.1	<orComposite>	O	O	O
4.4.1.1	<type>	O	O	O
4.4.1.2	<name>	O	O	O
4.4.1.3	<minimumVersion>	O	O	O
4.4.1.4	<maximumVersion>	O	O	O
4.5	<installationRemarks>	O	O	O
4.6	<otherPlatformRequirements>	O	O	O
4.7	<duration>	O	O	O
5	**<educational>**	TLO	ELO/SCO	Asset
5.1	<interactivityType>	M	M	O
5.2	<learningResourceType>	M	M	M
5.3	<interactivityLevel>	M	M	O
5.4	<semanticDensity>	O	O	O
5.5	<intendedEndUserRole>	O	O	O
5.6	<context>	O	O	O
5.7	<typicalAgeRange>	O	O	O
5.8	<difficulty>	M	M	O
5.9	<typicalLearningTime>	M	M	O
5.10	<description>	M	M	M
5.11	<language>	O	O	O
6	**<rights>**	TLO	ELO/SCO	Asset
6.1	<cost>	O	O	M
6.2	<copyrightAndOtherRestrictions>	O	O	M
6.3	<description>	O	O	M
7	**<relation>**	TLO	ELO/SCO	Asset
7.1	<kind>	M	M	O
7.2	<resource>	O	O	O
7.2.1	<identifier>	O	O	O
7.2.1.1	<catalog>	O	O	O
7.2.1.2	<entry>	O	O	O
7.2.2	<description>	O	O	O
8	**<annotation>**	TLO	ELO/SCO	Asset
8.1	<entity>	O	O	O

NumericValue -Indicates element parent/child relationships	Element Name - For a complete description of each element name or data type, refer to the SCORM specification.	TLO	ELO / SCO	Asset
8.2	<date>	O	O	O
8.3	<description>	O	O	O
9	**<classification>**	TLO	ELO/SCO	Asset
9.1	<purpose>	M	M	M
9.2	<taxonPath>	O	O	O
9.2.1	<source>	O	O	O
9.2.2	<taxon>	O	O	O
9.2.2.1	<id>	O	O	O
9.2.2.2	<entry>	O	O	O
9.3	<description>	M	M	M
9.4	<keyword>	M	M	M

3.2.2.1. Navy-SCORM Extensions

The key extensions in Navy-SCORM involve domain specific definitions of subject matter and business process characteristics. These specific definitions are addressed through the application of accepted taxonomies of allowed values for the CLASSIFICATION element in the SCORM 2004 schema. The following table lists the mandatory and optional taxonomies for all ILE content.

Table 3.3 Taxonomies of allowed values for CLASSIFICATION metadata element from Navy extension to SCORM 2004. These are used for all ILE content. Their mandatory (M) and optional (O) use status is listed. The applicability to the metadata type is listed for administrative (A), subject matter (S), and process (P).

Taxonomy	Metadata type	Requirement
Standard Subject Identification Codes (SSIC)	S	M
Institute of Electrical and Electronic Engineers (IEEE) (all subjects)	S	M
CIA country codes	A, S, P	O
Library of Congress Classification (LOCC)	S	O
Department of Navy organization	A, P	O
Department of Navy functional areas	A, S, P	M

3.2.3. System Schema

Individual learning objects (ELO, TLO, SCO) will not need to use the System schema since it is targeted to applications and databases. However, any tool used by content developers, managers, or other roles must create a System schema using the following specification and register it in the ILE Integrated Metadata Registry that will be created as part of the ILE-ISA system. The ILE System schema is still in the process of being defined but the following metadata elements are the initial core set that are mandatory. The initial value list is shown although it is allowed to be extended or changed.

Table 3.4 Preliminary System schema for ILE content. The minimum and maximum number of occurrences of each element is listed.

Metadata Element	Values	Min	Max
Integration_entity_type	Application Database Software Service Format Protocol User interface External	1	1
Application_type	Compiled Runtime Script Agent	0	N
Database_type	Relational Object	0	N

Access_method	SQL Web services API Proprietary	1	N
Data_exchange_format	XML RDF ASCII Binary Proprietary	1	N
Location_datamodel	{URI}	1	1
Location_xmlnamespace	{URI}	1	1

In addition, the DoD DDMS must be used. The DDMS schema is listed below.

Table 3.5 DDMS core element set.

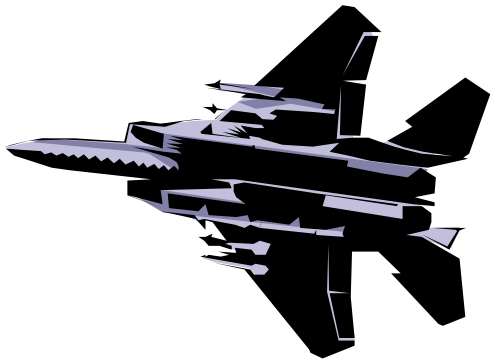
Core Layer Category Set	Primary Category	Obligation
The Security elements enable the description of security classification and related fields	**Security**	**Mandatory**
Resource elements enable the description of maintenance and administration information	**Title**	**Mandatory**
	Identifier	**Mandatory**
	Creator	**Mandatory**
	Publisher	**Optional**
	Contributor	**Optional**
	Date	**Optional**
	Rights	**Optional**
	Language	**Optional**
	Type	**Optional**
	Source	**Optional**
The Summary Content elements enable the description of concepts and topics	**Subject**	**Mandatory**
	Geospatial Coverage	**Mandatory unless not Applicable**
	Temporal Coverage	**Mandatory unless not Applicable**
	Virtual Coverage	**Optional**
	Description	**Optional**
The Format elements enable the description of physical attributes of the asset	**Format**	**Optional**

3.3. Summary

3.3.1. Developing Content for ILE

- Apply content sequencing to accomplish desired content outcomes.

Content developed in accordance with this document shall conform to the general ADL SCORM 2004 Conformance Requirements v1.1. Additional conformance requirements (business rules) specific to the Navy ILE are currently under development.



PART FOUR – CONTENT DEPLOYMENT

4.0 DEVELOPER RESPONSIBILITY

4.1. Testing

The sponsoring Navy activity is responsible for ensuring ILE conformance for all learning or knowledge materials intended to run from or within the ILE. Currently the testing process is determined by one of two classes of content development:

1. Externally developed
2. ILE internally developed

For content developed externally to the ILE but intended to be used within the ILE, unless stated otherwise in individual orders, a representative sample of all content will be tested using the ADL Test Suite (available at http://www.adlnet.org). All content submitted for hosting within the Navy ILE must be accompanied by an electronic version of the ADL Test Suite Log files. These three log files will provide the results for the Sharable Content Object (SCO) Run-Time Environment Conformance Test, the Meta-data Conformance Test, and the Content Package Conformance Test.

For content developed within the ILE using embedded authoring or assembling tools, resultant learning materials are native to the ILE and may be assumed to be in accordance with run time requirements. Content may be exported to SCORM standards if the need arises. Importantly, media assets must be in accordance with Navy Marine Corps Intranet requirements and learning object structure and functionality must meet SCO definitions provided in this document. A complete verification of the technical functionality and playability functionality of the courseware will be performed before submitting courseware to the Navy for final acceptance.

In special circumstances, developers can also request assistance relative to prototype-testing from the Navy ILE content manager. However, it is important to note that this support will be provided only as a means of validating the technical compatibility of content and will not be viewed as a means of exercising a quality control process that would normally be the responsibility of content developers.

4.2. Content Packaging

Once you have developed all of your physical ELO files, identified the metadata for each ELO and the metadata for the entire content package, and defined your Learning Object Aggregation, you can prepare to package your content for SCORM. The SCORM content package is a standardized way to exchange digital resources between different learning management systems (LMSs), authoring tools, content repositories, and operating systems.

In traditional instructional design terms, the content package would be everything needed to deliver the course, module, lesson, etc. to the learner. The size of your content package will depend on the structures you've created for your particular content and the manner in which you want them to be delivered to your learners. In SCORM, the content package contains two principal sections:

1. A manifest that lists all of the resources or assets you want to include in the package, the content structure diagram you created (called the organization), the sequencing rules, and all of the metadata for the ELOs, the TLOs, and the package itself
2. All of the actual ELO and asset files for the content package

Preparing your content package is an excellent time to organize all the files you've used during the development process, including your ELO and TLO design specifications. Delete or move any incomplete or unused materials, confirm all file names adhere to your naming conventions, and verify that all required metadata fields are complete. Once you've organized all of the files, ensure that the programmer can access them with relative ease. Depending on your process, use either a common file server or a CD-R.

Once the programmer has all of the necessary files, the programmer will create a manifest with your base TLO and sequencing rules and will store your metadata in the format required for SCORM. Finally, the programmer will create the package with the manifest and all of your ELO content files. Figure 5: The Object Relationship illustrates the parts of a content package. Once the package is ready, you can, and will, test the package the using the ADL Test Suite (available at http://www.adlnet.org). All content submitted for hosting within the Navy ILE must be accompanied by an electronic version of the ADL Test Suite Log files. These three log files will provide the results for the Sharable Content Object (SCO) Run-Time Environment Conformance Test, the Meta-data Conformance Test, and the Content Package Conformance Test.

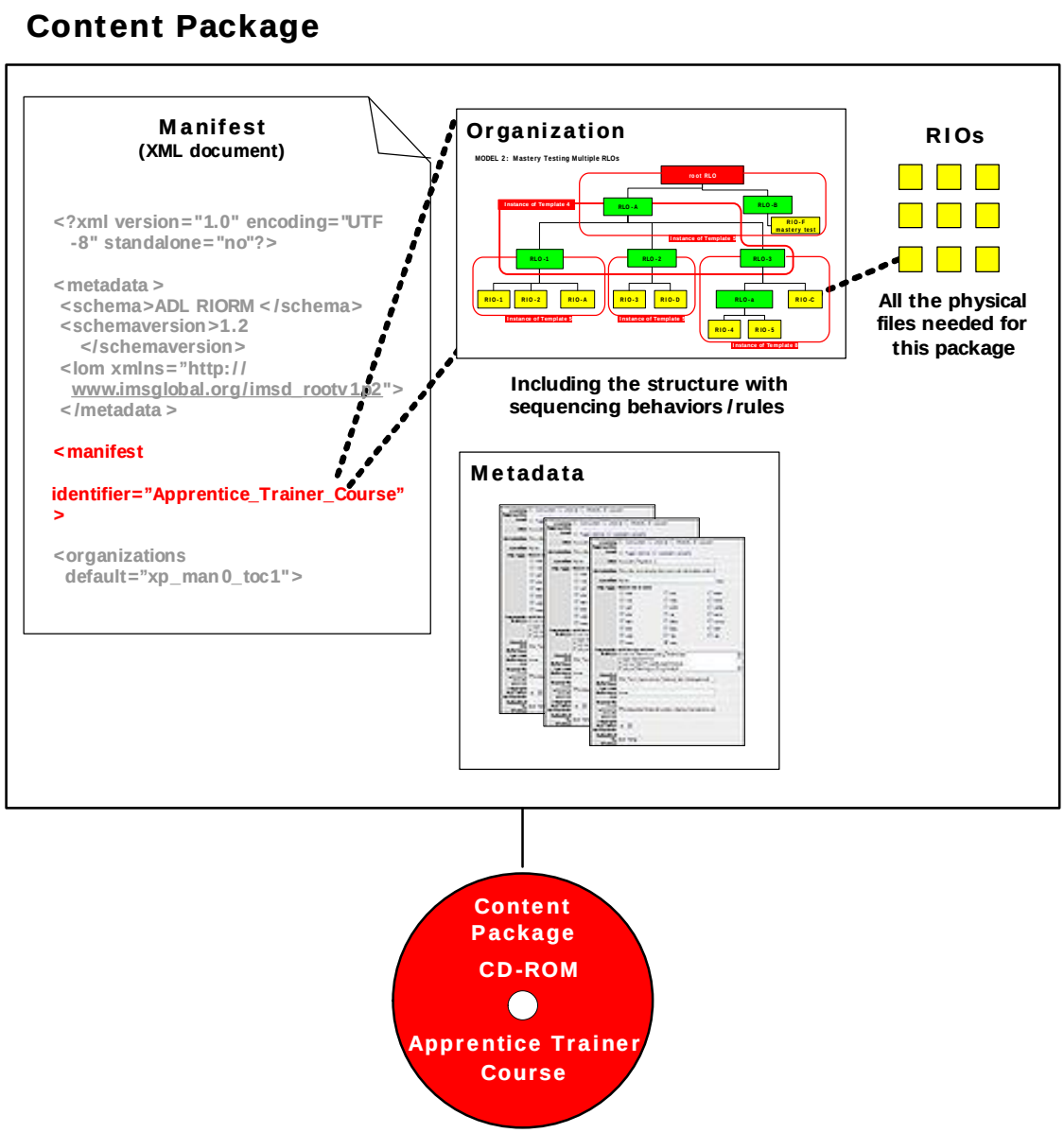


Figure 4.1: Parts of the Content Package

4.2.1. Manifest Properties

A well-formed and valid manifest must be verified before a content package is submitted for hosting. IMS has updated the Content Packaging Schema to support the Final Recommendation of the W3C XML Schema specification. Currently, several commercial tools support Schema validation including: Xerces, XML Authority, XML Spy, and Oracle parsers. A visible course title element must exist within the manifest.

Tools such as the Microsoft LRN Toolkit do not create a visible course title. If content developers use such a tool, the title element must be manually entered into the manifest. At least one content object or 'SCO' is required for a content package. All SCOs will be listed under the organization element.

The resources described in the manifest are physical assets such as web pages, media files, text files, assessment objects, or other pieces of data in file form. Resources may also include assets that are outside the Package but available through a URL, or collections of resources described by (sub) Manifests. The combination of resources is generally categorized as "content". Each resource may be described in a <resource> element within a manifest's XML. This element includes a list of all the assets required to use the resource, and listing of resources is necessary to ensure content interoperability. The files included in the Package are listed as <file> elements within such <resource> elements. For more information, refer to the IMS Content Packaging Best Practice Guide http://www.imsglobal.org.

4.3. Content Submission Method

Content is provided via FTP (File Transfer Protocol), CD-R or DVD as specified in individual delivery orders. In either case, SCORM content will be delivered as a conformant content package. For more information on the Content Packaging Conformance Requirements, refer to http://www.adlnet.org/

4.3.1. Deliverables

Content submitted for hosting on ILE will contain the following:

- Content package
- Verification of a Virus Scan on the extracted contents
- Content submission form and checklist (included in the Forms section of this document)
- Life Cycle Maintenance Guide
- Installation instructions for staging the content on a web server
- Assessment answer keys (only for content with assessments, tests, quizzes, etc.)
- Course instructions describing navigation and completion requirements

4.3.2. Directions for Completing the Content Submission Form

The Integrated Learning Environment (ILE) Support Team personnel use the technical support contact information submitted to assign unresolved content problems. Before content is submitted for hosting within the ILE it is the government sponsor's responsibility to ensure the content provided complies with ILE technical guidelines and all applicable Department of Defense (DOD), Department of Navy (DON), Navy Marine Corps Intranet (NMCI), or higher echelon's requirements such as accessibility or mobile code risk.

Please reference APPENDIX C: for more information regarding content submission guidelines.

Ø General Information

- **Full Content Title**: Provide the full title and complete spelling of all acronyms.
- **Content Identification Number**: If applicable, provide the Course Identification Number (CIN) or other identifier assigned.
- **Content Type**: For fully developed courses, select 'Complete Course' from the drop down menu. For one or more learning objects and/or modules that stand alone and could be aggregated into larger contexts, select 'Learning Object(s)' from the drop down menu. For resource packages consisting of only assets and meta data, select 'Learning Resource(s)' from the drop down menu.
- **Submission Type**: Select 'Initial Submission' if this is the first time the content is being submitted for hosting within the ILE. Select 'New Version' if the content was previously hosted on ILE or is presently hosted within the ILE and the content submitted is an update to an existing course (e.g. content subject matter, structure, or sequence has changed). Select 'Additional Version' if the content is being submitted as a separate instance of an existing version (e.g. Navy version of the content was already submitted, and this is the USMC version). Select 'Replacement Version' if the content was is presently hosted within the ILE and the content submitted is an update to an existing course (e.g. content subject matter, structure, or sequence is the same, but the content required technical fixes or other corrections, etc.).
- **Content Version**: Provide the version number of the content (e.g. initial submissions would start with 1.0; updates and revisions would continue at 1.x; new versions will be sequential 2.0, 3.0,etc.)
- **Instructional Hours:** Provide the estimated instructional hours for completion of the content.
- **Continuing Education Units**: If applicable, provide the total CEUs assigned. Continuing Education Units were established to quantify continuing education and training activities.
- **Objectives:** List all of the learning objectives the content satisfies.

- **Prerequisites**: Provide any curriculum activities (e.g. formal classroom training, web-based courses, etc.) to be completed before experiencing this content.
- **Target Audience:** Select the target audience to which the content is directed. If the target audience is not listed here, please add your target audience in the 'other' text field below the list. Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.
- **Content Category**: Select the content category from the list. If the category desired is not listed here, suggest a new category in the 'other' text field below the list. Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.

Ø Technical Information

- **Submission Method:** Content may be submitted via HTTP (Hyper Text Transfer Protocol) or FTP (File Transfer Protocol) to expedite testing. However, the final deliverable must include a CD (Compact Disc) copy.
- **Minimum System Requirements:** Specify content compatibility with operating systems and browsers. Specify content requirements for web technologies utilized during development, authoring tools, and any plug-ins required at run-time. Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.

Ø Functional Requirements

- **Content Format:** Select the content delivery format from the list. For generic web-based content, select other from the list and specify. Generic web-based content can be tracked through the ILE with a prompt that allows the user to determine the completion status.
- **Total Learning Objects**: Select the total number of learning objects (e.g. ELOs, TLOs, manifests, etc.) from the list.
- **Total Content Objects**: Select the total number of Learning Objects (e.g. SCOs, ELOs, TLOs, Assignable Units, etc.) from the list.
- **Total Scoring Objects**: Select the total number of scoring objects (e.g. Any SCOs or Assignable Units that set a raw score such as Assessments, Quizzes, Tests, etc.) from the list. An answer key is required for all assessments and must be included with each content submission package.
- **Completion Requirements (Roll up):** The process of determining the tracking status of a parent activity based on the tracking status of the child is supported by SCORM 2004 and ILE NCOM. There may be different methods to determine if a student has completed a course or not. The ILE has the ability to provide configuration options at the course level in order for the LMS to determine the appropriate completion status to set on a course transcript.
- **Completion Threshold**: This value allows the ILE administrator to set a completion threshold. SCORM 2004 supports multiple logic choices for course completion.
- **Bookmarking:** For each session, in accordance with SCORM 2004.

Ø Conformance & Validation

- **Content Certification**: Certification is independent testing that provides consumers of distributed learning products and content with the assurance that certified products have successfully implemented the SCORM 2004. For some highly desirable, commercial off the shelf media, content will be compliant with Aviation Industry CBT Committee (AICC) standard or earlier Sharable Content Object Reference Model (SCORM) specifications. The AICC certifies training products that comply with AICC Guidelines and Recommendations (AGR's) via its independent test labs.
- **Conformance Level:** (AICC or SCORM Content Only) Select the highest conformance level supported by any of the content being submitted.
- **Content Package Type:** (SCORM Content Only) Select the type of content package being submitted. Aggregation Packages are considered to be courses or content that is intended to be tracked. Resource Packages are packages consisting of assets that may be used to populate the ILE learning content repository.
- **Content Package Conformance:** (SCORM Content Only) Ensure that all SCORM content packages submitted are conformant. Non-conformant SCORM content packages are not acceptable and may be returned. Select 'ADLCP-PIF1' if the content has been certified. Select 'PIF Not Certified' if the content was placed into a Packaging Interchange File, but isn't certified by ADL. Select 'Non-PIF' if the content wasn't placed into a Packaging Interchange File.
- **Meta Data:** All content will conform to SCORM 2004 Learning Object Metadata (IEEE 1484.12.1-2002)
- **Course Meta Data:** Ensure that course description meta data is provided. For non-SCORM content, provide metadata to meet SCORM 2004 LOM.
- **Section 508 Accessibility Conformance Level**: Select the level of conformance (refer to http://www.w3c.org for conformance levels). All content should at a minimum meet all Priority 1 Checkpoints identified in W3C Web Accessibility Guidelines version 1.0. If content providers cannot meet all Priority 1 Checkpoints, they should provide written documentation identifying those checkpoints they were able to implement. For non-accessible content, select 'none satisfied.' A written waiver detailing the "undue burden" is required for all non-accessible content.
- **Accessibility Validation:** Select the Accessibility validation tools used. Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.
- **Validity Testing:** Select the level of web standards testing performed (refer to http://www.w3c.org). Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.

- **Interoperability Testing:** Select the level of interoperability testing performed prior to submission. Select multiple items from the list by left-clicking the mouse + SHIFT or left-clicking + CTRL.

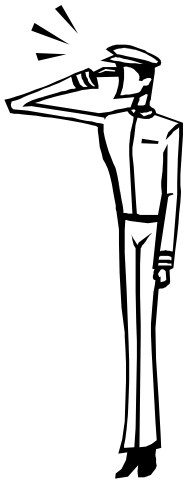
Ø Security Information

- **Security Classification:** Top Secret content will not be hosted within the ILE. Secret, Confidential, For Official Use Only (FOUO) content may be hosted within the SIPRNET site. Only unclassified content can be hosted within the ILE.
- **Content Segmentation:** Specify content access by segment (currently available to everyone).
- **Mobile Code Signed**: Mobile code content must be signed prior to submission for hosting within the ILE. Developers should review and refer to the following guides for building content destined to run in the ILE: DISA Mobile codeFAQs and the Developer's Guide for Using Mobile Code Technologies in Department of Defense and Intelligence Community Information Systems.
- **Mobile Code Risk**: If any object certificates were signed, specify the mobile code risk level.

4.4. Summary

4.4.1. Deploying Content

- Test all externally developed content using ADL test suites
- Validate rich media and other assets are NMCI compliant
- Package the content based on SCORM 2004 requirements
- Complete the Content Submission Form



PART FIVE - REFERENCES

5.0 REFERENCES

Advance Distributed Learning (2003). Retrieved March 15, 2004 from http://www.adlnet.org/index.cfm?fuseaction=DLGuidDeta&kbaseid=215&page=1&orderCategory=kbaseAddon&orderDirection=DESC&kbasecatid=107.

Baker, E. (1998, November). Understanding educational quality: Where validity meets technology. William H. Angoff Memorial Lecture Series. Princeton, NJ: Educational Testing Service. Retrieved March 1, 2004, from http://www.ets.org/research/pic/angoff5.pdf.

Baker, E. L., Aschbacher, P.R., Niemi, D., & Sato, E. (1992). CRESST performance assessment models: Assessing content area explanations. Los Angeles, California: National Center for Research on Evaluation, Standards, and Student Testing.

Bransford, J. Toward the development of a stronger community of educators: New opportunities made possible by integrating the learning and sciences and technology. Retrieved March 3, 2004, from http://www.pt3.org/VQ/html/bransford.html.

Biehler, R. F. & Snowman, J. (1977). Psychology applied to teaching. Boston: Houghton Mifflin.

Bransford, J. D., Sherwood, R. S., Hasselbring, T. S., Kinser, C. K., & Williams, D. M. (1990). Anchored instruction: Why we need it and how technology can help. In D. Nix & R. Spiro (Eds.), Advanced in computer-video technology, computer, cognition, and multimedia: Exploration in high technology. Hillsdale, NJ: Lawerence Erlbaum Associates, Publishers.

Clark, R. (1998). Building expertise: cognitive methods for training and performance improvement. Washington, DC: International Society for Performance Improvement.

Clark, R. & Wittrock, M. C. (2000). Psychological principles in training. In S. Tobias & J. D. Fletcher (Eds.), Training and retraining: A handbook for business, industry, government, and the military (pp. 51-84). New York: Macmillan Reference.

Clark, R. (2002). Applying cognitive strategies to instructional design. Performance Improvement, 41(7), 10-16.

Clark, R. (2003). Building expertise: Cognitive methods for training and performance improvement (2nd ed.). Silver Spring, MD: International Society for Performance Improvement.

Clark, R. (2003). E-Learning and the science of instruction. San Francisco: Jossey-Bass Pfeiffer.

Collins, A. Brown, J. S., & Newman, S. E. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. B. Resnick (Ed.), Knowing, learning, and instruction: Essays in honor of Robert Glaser (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Craik, K. (1943). The Nature of Explanation. Cambridge: Cambridge University Press.

Donovan, M. S., Bransford, J. D., Pellegrino(Eds.) (2000). How People Learn: Bridging Research and Practice. The National Academy Press. Retrieved February 28, 2004, from http://www.nap.edu/openbook/0309065364/html/R1.copyright , 2000.

Dick, W. and carey, L. (1996). The systematic design of instruction (Fourth Edition). New York: HarperCollins College Publishers.

Ebel, R. L. Essentials of Educational Measurement. Englewood Cliffs, N. J.: Prentice-Hall, 1972, pp. 492-494

Gagne, R. M., Briggs, L. J., and Wager, W. W. (1988). Principles of instructional design (3rd ed.). Chicago: Holt, Rinehart and Winston, Inc.

Gronlund, N. E. (1988). How to construct assessment tests (Fourth Edition). Englewood Cliffs, NJ: Prentice Hall.

Harckbarth, S. (1996). The Educational Technology Handbook: A comprehensive guide. Englewood Cliff, NJ: Educational Technology Publications.

Jonassen, D. & Tessmer, M. (1996). An outcomes-based taxonomy for instructional systems design, evaluation, and research. Training Research Journal, 3. pp 11-46.

Jonassen, D. (1999). Designing constructivist learning environments. In Reigeluth, C. M. (Ed.), Instructional-design theories and models, Volume II (pp 215-239). Mahway, NJ; Lawrence Erlbaum Associates.

Jonassen, D. H. (2004). Handbook of research on educational communications and technology (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Maki, W. S. and Maki, R. H. (2002). Multimedia comprehension skill predicts differential outcomes of web-based and lecture courses. Journal of Experimental Psychology: Applied, 8 (2), 85-98.

Mager, R. F. (1997). Preparing Instructional Objectives (3rd ed.). Atlanta: The Center for Effective Performance, Inc.

Mayer, R. E. (1999). Designing instruction for constructivist learning. In Reigeluth, C. M. (Ed), Instructional-design theories and models, Volume II (pp 141-159). Mahway, NJ; Lawrence Erlbaum Associates.

Merrill, M. D. (1997). Instructional Transaction Theory: An Instructional Design Model Based on Knowledge Objects. In R. D. Tennyson, F. Schott, N. Seel & S. Dijkstra (Eds.), Instructional Design:

International Perspective. Theory, Research, and Models. Vol.1 (pp. 381-394). Mahwah, NJ: Lawrence Erlbaum Associates.

Merrill, M. D. (2002). A pebble-in-the-pond model for instructional design. Performance Improvement, 41(7), 41-46.

Merriënboer, J. J. G. van (1997). Training complex cognitive skills: A four component instructional design model for technical training. Englewood Cliffs, NJ: Educational Technology Publications.

Nitko, A. J. (1996). Educational assessment of students. 2nd ed. Englewood, NJ: Merrill.

Parshall, C. G., Spray, J. A., Kalohn, J. C., Davey. T. (2002). Considerations in computer-based testing. New York: Springer.

Pellegrino, J. W., Chudowsky, N., Glaser, R. (Eds.). (2001). Knowing what students know: The science and design of educational assessment. Washington, D C: National Academy Press

Pressley, M. & Ghatala, E. S. (1990). Self-regulated learning: Monitoring learning from text. Educational Psychologist, 25, 19-33.

Ragan, T J. and Smith, P. L. (2004) Conditions theory and models for designing instruction. In D. H. Jonassen (Ed), Handbook of research on educational communications and technology (pp. 623-649). Mahway, NJ: Lawrence Erlbaum Associates.

Reigeluth, C.M. (1999). Instructional-design theories and models: A new paradigm of instructional theory, Volume II. Mahway, NJ: Lawrence Erlbaum Associates.

Reigeluth, C. M. and Moore, J. (1999). Cognitive education and the cognitive domain. In Reigeluth, C. M. (Ed.), Instructional-design theories and models, Volume II (pp 51-68). Mahway, NJ; Lawrence Erlbaum Associates.

Rotjwell, W. J. and Kazanas, H. C. (1992). Matering the instructional design process. San Francisco: Jossey-Bass Publishers.

Schank, R. C., Fano, A., Bell, B., & Jona, M. (1993/1994). The design of goal-based scenarios. The Journal of the Learning Science, 3(4), 305-345.

Schwarts, B. L., and Perfect, T. J. (2002) Introduction: toward an applied metacognition. In Perfect, T. J. & Swarts, B. L. (Eds.). Applied Metacognition. Cambridge: Cambridge University Press.

SCORM XML Controlling Document - SCORM CAM Version 1.3 Navigation XML XSD Version 1.0

SCORM XML Controlling Document - SCORM CAM Version 1.3 Sequencing Extensions XML XSD Version 1.0

SCORM XML Controlling Document - SCORM CAM Version 1.3 Content Packaging Extensions XML XSD Version

SCORM 2004 Photoshop Examples Version 1.1

Sharable Content Object Reference Model (SCORM) 2004 2nd Edition

SCORM 2004 Conformance Requirements Version 1.1

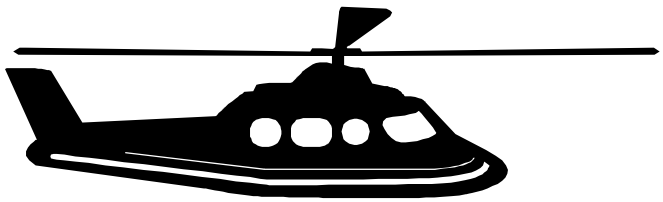
SCORM 2004 Sequencing Test Case Content Package Examples Version 1.1

SCORM 2004 Conformance Test Suite Version 1.3.1 (Self Test)

SCORM 2004 Sample Run-Time Environment Version 1.3.

Sharable Content Object Reference Model (SCORM) 2004 2nd Edition Addendum

Woolfolk, A. E. (1998). Educational Psychology. Boston: Allyn and Bacon.



PART SIX - APPENDICES

6.0 APPENDIX A: GLOSSARY

Below is a glossary of terms to assist you when reading this document.

Term	Definition
5VM	5 Vector model—defines the parameters around which a Sailor's personal and professional development is designed. The 5 Vectors are: Ø Professional Development Ø Personal Development Ø Leadership Ø Certifications & Qualifications Ø Performance
Ability	Enduring attributes of the individual that influence performance and enable the performance of tasks.
ADL	The Advanced Distributed Learning (ADL) Initiative—collaborative effort between government, industry and academia. Its goal is to establish a new distributed learning environment that permits the interoperability of learning tools and course content.
Aggregation	Content Aggregation is the process of aggregating resources (SCO /ELOs) into a defined structure (content structure) to build a learning event. An aggregation is a grouping of related ELOs, along with the rules that control the presentation of the grouped material to the learner. A learning event can be constructed recursively; hence a content structure has the shape of a tree, with ELOs/SCOs forming the leaves and aggregations (TLOs) representing the nodes.
API	Application Programming Interface
Asset	A single media element or text element (e.g. an image, audio file, or html file) that can be delivered to a Web client.
Assessment	The process used to systematically evaluate a learner's skill or knowledge level (ASTD).
Post Assessment	Any activity designed to be taken after a learning event to confirm that a learner has mastered either the enabling objective at the IO level or the terminal objective at the LCO level.

Assesment instruments	Items that are grouped together to form tests, quizzes, exams, or simulations for the purpose of assessment.
Assessment item	Each individual question or task the student is asked to address for assessment purposes.
CBT	Computer Based Training
CMI	Computer Managed Instruction
Cognitive Apprenticeship	Model where experts and novices interact while focusing on a realistic, job-related task to develop the learner's essential cognitive skills.
Community of practice	A self-organized, deliberate collaboration of people who share common practices, interests or aims and want to advance their knowledge. When the community proves useful to its members over time, they may formalize their status by adopting a group name and a regular system of interchange. www.sims.berkeley.edu/courses/is213/s99/Projects/P9/web_site/glossary.htm
Concept maps	A graph that represents knowledge, with nodes representing concepts and arrows representing relations between the concepts.
Content repository	Storage facility for digital objects and files made searchable by using metadata.
Enabling objective (EO)	Smaller objective that forms a part of a terminal objective. In our model one ELO addresses each enabling objective.
ELO	Enabling Learning Object—a collection of one or more Assets with instructional treatment applied to satisfy one and only one Enabling Objective.
GFI/M	Government Furnished Information/Material—materials provided to contracted designers and developers for the creation of ILE content
HPSM	Human Performance System Model—cyclical four step process of navy training: Define requirements Define solutions Develop components Execute and measure
ID	Instructional Designer—one who analyzes instructional problems and designs their solutions
IDC	Instruction Delivery Continuum—new framework for the delivery of instructional material for the purposes of Navy training.

IDP	Individual Development Plan—A document that includes an assessment of current skills, and a timeline and sources for development to achieve future goals. Outlines the way in which the employee will develop the knowledge, skills, and abilities needed to meet changing organizational needs and environmental demands and/or prepare to achieve future career goals (www.goer.state.ny.us/workforce/glossary.html).
ILE	Integrated Learning Environment—The Navy Integrated Learning Environment has been established to provide the technical and administrative infrastructure for the acquisition, development, storage, maintenance, and distribution of learning content.
IMS	Worldwide non-profit organization which develops and promotes the adoption of open technical specifications for interoperable learning technology
Instructional Strategy	All materials, methods, activities, and assessments chosen to support a specific learning goal.
ISD	Instructional Systems Design—an arrangement of resources and procedures so as to promote learning
JTA	Job Task Analysis - Is the standardized process that examines a specific job to identify all the responsibilities and task requirements of a job in an organization. It is a systematic procedure used by Industrial and Organizational Psychologist, Human Resource, or Personnel Managers to describe important aspects of the job regardless of the person in the job.
Learner-centric	Learning designs which allow the learner to have control of the learning experience by making choices as to what will be learned, the order of material presentation, and/or the method of delivery, and which ideally support a wide range of learning needs or styles; also, learning designs which adjusts the presentation materials in response to the learner's knowledge or skill level.
Learning event	Any event or activity planned with the goal of learners acquiring new knowledge, gaining or improving skills or abilities, and/or changing behaviors or attitudes. A learning event will include either an enabling or a terminal objective.
Learning Object	"Any digital resource that can be used to mediate learning." (Wiley and Edwards, 2002)
LOM	Learning Objects Metadata IEEE Standard for Learning Object Metadata, IEEE-SA Standard 1484.12.1-2002, http://ltsc.ieee.org/wg12 See also SCORM LOM.
Mental Models	Representations in the mind of real or imaginary situations.(Craik, 1943).
Metacognition	The process of monitoring and controlling our cognitive processes, or the process of thinking about thinking (Schwarts & Perfect, 2002)

Metadata	Descriptive information about a piece of data that is not usually visible to the user for "purposes of description, administration, legal requirements, technical functionality, use and usage, and preservation (Getty)." Metadata is designed to help locate, organize, access, and use data effectively.
Metatag	Identifies metadata.
NMETL	Naval Mission Essential Task List
NCOM	Navy Content Object Model—a reusable object model having a primary goal to maximize the reuse, repurpose and reference (R3) value of objects.
OJT	On the Job Training.
Performance-based outcomes	Learner outcomes that are observable with demonstrated objectives or behaviors that are based on standards.
PQS	Personnel Qualification Standards—a compilation of the minimum knowledge and skills that an individual must demonstrate in order to qualify for watch standing or perform other specific routine duties necessary for the safety, security, or proper operation of a ship, aircraft, or support system.
R3	Reuse, Repurpose, and Reference—overarching tri-fold goal for learning objects within the Navy ILE
Reuse	The reuse of an existing learning object in a new context without any modification to its instructional treatment, context, or content, and is able to "stand-alone." It can be used across communities for many different learners.
Repurpose	The reuse of an existing learning object in a new context after modifying its instructional treatment, context, or content.
Reference	A validated information source in the form of a learning object for generating ideas or simply as a resource in the similar manner that one would use a reference in a traditional development effort.
Repository	See content repository.
RiT	Revolution in Training
SCO	A Shareable Content Object within SCORM . Generally equivalent to a ELO.
SCORM (2004)	The Sharable Content Object Reference Model (SCORM 2004) defines a Web-based learning "Content Aggregation Model" and "Run-Time Environment" for learning objects. The SCORM is a collection of specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of Web-based learning content.
SCORM CAM	SCORM Content Aggregation Model—describes the assembly, description, and packaging of content as SCORM Assets, SCOs, and higher aggregations. This task is accomplished through the creation of XML documents according to the SCORM meta-data requirements (LOM).

SCORM LOM	SCORM Learning Object Meta-Data (LOM)—inline XML specification for the description of aggregations of content as well as individual media. LOM meta-data provides the means for the identification retrieval and subsequent reuse of content.
SCORM RTE	SCORM Run-time Environment— technical specifications in SCORM for the content launch process, standardized communication between content and LMSs and standardized data model elements used for passing information relevant to the learner's experience with the content
SCORM SN	SCORM Sequencing and Navigation (SN)—describes how SCORM - conformant content may be sequenced to the learner through a set of learner or system-initiated navigation events.
Sequencing	Describes and prescribes the manner in which the learner receives content
Skill	Developed capacities that facilitate learning or the more rapid acquisition of knowledge or that facilitate performance of activities.
SkillObject	A re-usable detailed description of what people do in accomplishing work. A SkillObject contains logically grouped knowledge, skills, abilities, tools and tasks (2-10) that are required to successfully perform a job.
SME	Subject Matter Expert—a person who helps to formulate or verifies domain-specific instructional content in his or her area of expertise
Task	The most specific level of behavior in a job that describes the performance of a meaningful job function in terms of a specific action applied to a particular object. The behavior must be observable, have a definite beginning and end, and result in a completed work action or a measurable work product (either the performance can be observed or the results of the performance can be seen and measured).
Task Force EXCEL (TFE)	The Task Force for Excellence through Commitment to Education and Learning (EXCEL)—body in charge of overseeing the implementation of the pilot programs designed enhance and strengthen the Navy's training and education structure.
TLO	Terminal Learning Object—a collection of one or more ELOs which satisfy one and only one Terminal Objective.
Terminal objective	Desired final outcome (e.g., knowledge or performance-based) of the designed instruction/learning experience. Made up of enabling objectives.
TO	See terminal objective.
Unique Knowledge	The enduring information including processes, procedures, or intellectual capital that are not transitory or temporary and are required to perform the SkillObject™. SkillsNET is mainly interested in the Unique Knowledge that is associated with the tasks that are central to the STARs job.
WBT	Web-based Training

XML	Extensible Markup Language—universal format for exchanging structured documents and data on the Web. XML uses HTML-like tags to delimit bits of data, but unlike HTML, leaves interpretation of that data to the applications that read it.

6.1. APPENDIX B: Additional Resources

6.1.1. SCORM Resources for Instructional Designers

For complete and explicit information on implementation of the SCORM CAM, the SCORM RTE, and the SCORM SN IDs and developers should consult the ADL Web site www.adlnet.org to download and review The SCORM Implementation Guide (IG): A Step by Step Approach. The SCORM IG is written specifically for IDs responsible for SCORM implementations. The SCORM IG document is available in PDF format on the ADL Website via the ADL Resource Center. It can be found within the "SCORM" pull-down menu under the heading "Guidelines."

Additionally, IDs and content developers should consult the Carnegie Mellon Learning Systems Architecture Lab http://www.lsal.cmu.edu/lsal/expertise/projects/developersguide/ to download the SCORM Best Practices Guide for Content Developers. Specifically, IDs and content developers should completely read and understand this guide prior to beginning the ISD process. This will allow IDs and content developers to design and develop content using many different sequencing options that are compliant with the SCORM 2004 standards.

6.2. APPENDIX C: Sample Forms

6.2.1. NCOM Content Submission Form

This form is intended to guide Navy Content Object Model (NCOM) content providers through the ILE D3 Content Submission Process. It should be used for newly-developed or revised content for Web delivery via the Navy Integrated Learning Environment (ILE) . Legacy (i.e., existing) content will be addressed on a case-by-case basis. The use of any specific content authoring tools, plug-in requirements, content functionality, etc. must be in accordance with ILE D3 guidelines and meet the most recent Navy Marine Corps Intranet (NMCI) requirements. These can be found on the NPDC Web site at https://www.npdc.navy.mil/default.cfm?fa=ile.documentation under the "Documentation" section. It is the Government Contracting Agency's and Sponsor's responsibility to ensure the content provided complies with required ILE D3 standards and all applicable Department of Defense (DoD), Department of the Navy (DON), Navy Marine Corps Intranet (NMCI), or higher echelon's requirements, such as accessibility (compliance/conformance to Section 508 of the Rehabilitation Act of 1973), risk mitigation, et al. For information, contact the NCOM Content Manager at nln.administrator@navy.mil.

POINT OF CONTACT (POC) INFORMATION

Government Sponsor:	
Full name and title:	
Organization and address:	
E-mail address:	
Commercial telephone (area code/extension):	
DSN:	
Fax:	
Technical Content (government or contracting firm):	
Full name and title:	
Organization and address:	
E-mail address:	
Commercial telephone (area code/extension):	
DSN:	
Fax:	
Content Support (Life Cycle Maintenance):	
Full name and title:	
Organization and address:	
E-mail address:	
Commercial telephone (area code/extension):	
DSN:	
Fax:	

CONTENT OVERVIEW INFORMATION

Full Content Title:	Clinical Investigation Program	
Content Identification: Enter unique Course Identification Number (CIN), NAVEDTRA, or other content identifier, if applicable.		
Version Number (of this content):		
Does the content submission update a version currently hosted on ILE?	☐ Yes ☒ No	If yes, provide current ILE Content Title and Identification:
Estimated Total Instructional Hours:	1	
Is the content recommended for Naval Reserve Retirement points? **NOTE:** If yes, the point recommendation will be computed by dividing the content instructional hours by three.	☐ Yes ☒ No	If yes, indicate recommended Naval Reserve Retirement points: 0.00 Date recommended (yyyy-mm-dd):
Are assigned Continuing Education Units (CEU) recommended for the content?	☐ Yes ☒ No	If yes, indicate recommended CEU credits: 0.00 Date recommended (yyyy-mm-dd):
Has the content been evaluated by the American Council on Education (ACE)?	☐ Yes ☒ No	If yes, indicate ACE-recommended credits: 0.00 Date recommended (yyyy-mm-dd):
What type of certificate will be issued (e.g., Completion, Job Qualifications Requirements (JQR), CEU)?		
Content Security Classification: **NOTE:** Top Secret material **CANNOT** be hosted on ILE. Secret, Confidential, Unclassified, and For Official Use Only (FOUO) material can be hosted on the ILE SIPRNET Web site. ONLY unclassified, non-FOUO material can be hosted on the ILE .com and .mil Web sites.	☐ Secret ☐ Confidential ☐ FOUO ☒ Unclassified	
Other Certifications/Licenses (e.g., OSHA, federal certifications, Master Electrician):	List all certifications/licenses to be awarded:	
Content Description to be included in the ILE Content Catalog: **NOTE:** This 100-200 word description should state the content's purpose, intent, and primary target audience. It must also indicate whether it replaces, or is intended to replace, resident or equivalent content. Also, provide other pertinent information (e.g., Awards Navy Enlisted Classification (NEC) Code).		

Content Prerequisites to be included in the ILE Content Catalog: **NOTE:** Prerequisites should be identified by their full title.	
ILE Content Catalog Placement: State in which category the content should be listed in the ILE Content Catalog. Use an existing Catalog/Curriculum Title, if applicable. Contact the ILE Administrators at nln.administrator@cnet.navy.mil if it is a new curriculum. Content can be placed within multiple curriculum categories, or with other	Catalog Title: Curriculum Title:

similar or associated content, if appropriate. Check either the www.navylearning.com or www.navylearning.navy.mil Web site catalogs for current listings. Examples include: General Military Training • Anti-Terrorism Force Protection Level III Anti-Terrorism Force Protection • Anti-Terrorism Force Protection Level III General Shipboard Training • Damage Control Petty Officer (DCPO) Military Leadership/Management • Department of the Navy System's Thinking Course	

Target Audience: **If the Government Sponsor requires that the content be accessible ONLY to the target audience, indicate specific audiences below.** **NOTE:** Identifying an intended target audience for given content, by itself, may NOT restrict content access only to those individuals included in the intended audience. Ultimately, decisions regarding user access to ILE-hosted content, while taking into consideration the indicated audience, will be made at a higher level. The current Authorized User Access List is located in the "Getting Started" section of the ILE Web sites.		
Military Branch/Government Agencies (e.g., DoD, DON, USN, USMC. List all that apply in specific terms.):		
Status (e.g., Active Duty, Reserves, Retired, Civil Service, family members. List all that apply in specific terms.):		
Pay grade (List all that apply in specific terms.):		
☐ Enlisted (e.g., E3, E1-E4, E6, E5-E7, All.):		
☐ Chief Warrant Officer (e.g., CWO2, CWO4, CWO3-CWO4, All.):		
☐ Commissioned Officer (e.g., O1, O4, O1-O3, 06, All.):		
☐ Government Service (GS) (e.g., GS-05, GS-14, GS-7-GS-9, All.):		
☐ Wage Grade (WG) (e.g., WG-1, WG-3, All.):		
☐ Senior Executive Service (SES) (e.g., ES-1, ES-2, ES-1-ES-3, All.):		
☐ Other Civilian Grades:		
Specialty/Occupation (List all that apply in specific terms.):		
☐ Enlisted Rating/Military Occupation Specialty (MOS)/Air Force Specialty Code (AFSC):		
☐ Enlisted Navy Enlisted Classification Code (NEC)/Additional MOS (AMOS)/Additional Skill Identifier (ASI):		
☐ Officer Designator/MOS/Branch/AFSC:		
Should access to the content be restricted solely to the Target Audience?	☐ Yes ☐ No	If yes, why?

CONTENT TECHNICAL AND FUNCTIONAL DETAILS

NOTE: The contracting agency and content developer must review the most current NMCI gold disk standards at http://www.nmci-isf.com/gold_disk_contents_11.doc before developing content. Content that cannot run on a NMCI client site may be rejected for hosting on ILE.

NOTE: The following information is required for hosting content on ILE. Contact the ILE Administrators to discuss blocks checked "No."

Content conforms to Sharable Content Object Reference Model (SCORM) standards and guidelines.	☐ Yes ☐ No ☐ N/A	Version:
SCORM Manifest File: Per the World Wide Web Consortium (W3C), the code was parsed against a W3C parser and determined to be well-formed and valid.	☐ Yes ☐ No	If yes, what parser tools were used?
Content is Aviation Industry CBT Committee (AICC) compliant.	☐ Yes ☐ No ☐ N/A	Explain in detail the content AICC reporting criteria for LMS integration:
Content meets LMS-required Run Time Environment (RTE) level of compliance (i.e., RTE1, RTE2, or RTE3).	☐ Yes ☐ No	Level: Comments:
Content contains: ☐ HTML ☐ XML ☐ XHTML ☐ N/A ☐ Other (explain):		
Content Validity Testing: The code has been parsed against a W3C parser and determined to be well-formed and valid.	☐ Yes ☐ No	If yes, what parser tools were used?

Authoring Software: List all authoring software/tools used to create the content (e.g., Dreamweaver, Authorware, Real Media)?	Provide details and versions:	
Emerging Technologies: **Are any emerging technologies incorporated into the content?** **NOTE:** These are the technologies NOT listed in the SECDEF Memorandum dated November 7, 2000, titled "Policy Guidelines for Use of Mobile Code Testing in DoD Information Systems." **NOTE:** The use of emerging technology in and of itself is not discouraged. However, a System Security Authorization Agreement (SSAA) will be required and the time lag for NMCI/IT21 certification and integration with ILE can be 6 to 12 months.	☐ Yes ☐ No	Provide details:

Content Mobile Delivery Options (Check all that apply):

NOTE: Delivery options depend on the content and LMS integration functionalities (i.e., SCORM, RTE level, and AICC compliance). ILE is concerned primarily with running Web-enabled content. However, downloadable content will be accepted if already integrated with the ILE. For clarification:

1. On-line (Web) indicates the content is accessed and completed while connected via the Internet, and user computer status is reported to and maintained by the LMS.
2. Off-line indicates the content is downloaded from ILE via the Internet to the user computer, then accessed and completed while disconnected from the Internet. The user computer status is uploaded to the ILE the next time the user accesses ILE via the Internet.

☐ On-line only (content completed on-line)
☐ Off-line (content will be downloaded from ILE to the user computer)
☐ On-line and/or Off-line
☐ CD ROM. Provide details above in the AICC Compliant block for LMS integration requirements.
☐ All options **NOTE: Checking this may require the content to be delivered in multiple formats.**

☐ Content writes data to an external (floppy) drive. Is this a requirement? ☐ Yes ☐ No
Provide details here and above in the AICC Compliant block for LMS integration requirements.
☐ Other mobile delivery options. Provide details:
Comments:

Intended Hosting Domain(s) (Check all that apply): ☐ ILE .com site ONLY **NOTE: Only unclassified material not FOUO can be hosted on the .com site.** ☐ ILE .mil site ONLY **NOTE: Only unclassified material not FOUO can be hosted on the .mil site.** ☐ ILE SIPRNET site ONLY **NOTE: Material classified up to and including Secret, as well as unclassified and FOUO material can be hosted on the SIPRNET site.** ☐ Both the ILE .com and .mil sites **NOTE: Only unclassified material not FOUO can be hosted on the .com and .mil sites.** ☐ All ILE sites **NOTE: Only unclassified material not FOUO can be hosted submitted using this option.** Comments:	
NOTE: Content developed for the ILE must meet specific standards. The areas below marked with an asterisk (*) must comply with the "NMCI Gold Disk Standards" found at http://www.nmci-isf.com/gold_disk_contents_11.doc, which is updated periodically.	
***Browser Compatibility:** Specify all browser types, versions, and service pack requirements under which the content will run. Identify any browser compatibility problems.	***Internet Explorer:** ***Netscape:** Others: Comments:
***Operating System(s):** Specify all operating systems and versions on which the content will run. Identify any known operating system compatibility problems.	☐ *Win 2000 ☐ Win XP ☐ Win ME ☐ Win 98 ☐ Linux ☐ Unix ☐ Mac - indicate version(s) Comments:
Are Java Applets required? **NOTE:** Content will not download and install a Java Virtual Machine to a NMCI client site.	☐ Yes ☐ No Comments:
Does content contain Macro Languages (e.g., VBA)?	☐ Yes ☐ No Comments:
Scripts: If the content contains any of the Scripts named in the block to the right, identify their location and purpose in the associated comment blocks.	☐ Java Script - Netscape (IE uses JScript) ☐ Embedded Java ☐ Stand-alone Java Comments: ☐ Visual Basic: ☐ Embedded VB scripts ☐ Stand-alone VB scripts Comments: ☐ Jscript Comments:

***Active X Controls:** If the content contains or requires Active X Controls, identify which controls are marked as Safe for Initialization and/or Safe of Scripting in the associated comment blocks.	☐ Macromedia Flash – Swflash.ocx ☐ Read ☐ Write - Version Comments: ☐ Macromedia Authorware – Awswax.ocx ☐ Read ☐ Write - Version Comments: ☐ Apple QuickTime – QTPlgin.ocx QuicktimeCheck.ocx ☐ Read ☐ Write - Version Comments: ☐ Adobe Acrobat – pdf.ocx ☐ Read ☐ Write - Version Comments:	
***Media Player(s) (e.g., Windows Media Player, Real Media, Authorware Web Player):** Are media players required? **NOTE:** If yes, ILE will supply the URL requirements for media files. ILE uses Real Media Server streaming software for both audio and video. Content developers should use media streaming production software **sparingly** in the content development process.	☐ Yes ☐ No	Provide details including media file types, names, and versions:
External Links: Are there Active External Web Links embedded in the content? **NOTE:** If yes, an SSAA must be submitted listing external links and their location within the content. It must state (1) the requirement for all links, (2) that all linked sites have been reviewed for mobile code risk mitigation, and (3) the method or process by which the Government Sponsor will maintain and update the accuracy of all links within the content. Contact the ILE Administrators at nln.administrator@cnet.navy.mil for help.	☐ Yes ☐ No	Comments:

Web Site Policies and Procedures: Have the DoD Web Site Administration Policies and Procedures (dated 10/25/1998 and updated 1/11/2002) been reviewed to ensure that the content meets all applicable requirements (e.g., Privacy Act and FOIA information, external links, cookies)? A copy can be found at: http://www.defenselink.mil/webmasters/policy/	☐ Yes ☐ No	Comments:
Cookies: Does the content set cookies on the user computer? Identify all specific cookie requirements including purpose, which information is stored and its location, storage length, file types, etc.	☐ Yes ☐ No	If yes, are they: ☐ Persistent (persistent cookies can be cause for content rejection) ☐ Session/Temporary Comments:
Are Executable files required? **NOTE:** Binary files (e.g., exe, .com, .bat, .vbs files)	☐ Yes ☐ No	If yes, do any of these files use Windows Scripting Host?

can be invoked by the end user and executed inside a given operating system.		☐ Yes ☐ No Comments:
Does the content require an Open Database Connectivity (ODBC)/database interface?	☐ Yes ☐ No	If yes, as a minimum, provide: database required, version, purpose, and software licensing information. Comments:
Virus Scan: Has the content been virus scanned and determined to be virus free?	☐ Yes ☐ No	If yes, provide virus software name, version, and date of the virus definition file(s) used? Comments:
Section 508 of the Rehabilitation Act Compliance Standards: Does the content comply with Section 508 standards? **NOTE:** Information concerning Section 508 compliance standards can be found in the ILE Accessibility Help and Information section, at http://www.access-board.gov/sec508/guide and in the W3C.	☐ Yes ☐ No	If no, list and explain non-compliance: Comments:
Section 508 Compliance Software Tools: What 508 compliance standards software tools were used to verify content compliance?	List tools and provide details: Comments:	
***Collaboration Tools:** Does the content use collaborative tools, instant messaging, etc.?	☐ Yes ☐ No	If yes, provide details including ports required, asynchronous/ synchronous capabilities, etc. Comments:

Content Compiled: Were the original source files/assets included as part of the deliverables?	☐ Yes ☐ No	Comments:
Meta Data: Were the content meta data fields populated per the Meta Tag Guide?	☐ Yes ☐ No	Comments:
Copyright: Does the content contain copyright material? **NOTE:** The Government Contracting Agency/Sponsor is responsible for ensuring that all required copyright procedures, authorization, and documentation meet all established legal requirements.	☐ Yes ☐ No	If yes, include in deliverables all copyright release documentation. Comments:
Bookmarking: Does the content have internal bookmarking capability?	☐ Yes ☐ No	Explain in detail the LMS/content bookmarking expectations (e.g., does the content bookmark users to the lesson/RLO/SCO level, to a page within a lesson/RLO/SCO?). Comments:
Assessment Requirements: Does the content require external assessment/testing software?	☐ Yes ☐ No	If yes, include name, version, other software details, and requirements. Comments:
Content Completion Requirements/ Expectations (e.g., content assessment, testing, and completion criteria): Content submitted MUST generate a completion status to the LMS for record-keeping purposes, and feedback to users, when content is completed. **NOTE:** This does not apply when users access only portions of the content solely for informational purposes.	Explain in DETAIL user requirements for successfully completing the content (individual SCOs/lessons/ELOs/TLOs) and why (e.g., "Content premeditates user until a 100% score is achieved. Content requires the user to earn a minimum score of 75% on all lessons. There is no passing score required, but the user must navigate through the entire content before a completion is granted."). NOTE: This statement will also be included in the	

	course description section of ILE. Comments:

6.3. Navy Integrated Learning Environment (ILE) Content Submission Checklist

This document must be submitted as required in the *Content Submission Procedures* described on the Integrated Learning Environment Web sites for newly developed or revised content that will be delivered via the ILE. Strict adherence to specific standards and restrictions found under the "ILE Design, Development, and Delivery Guidelines" section that can be found under "Documentation" at https://www.npdc.navy.mil/default.cfm?fa=ile.documentation. The Government Contracting Agency and Course Sponsor are responsible to ensure the content provided complies with required ILE standards and all applicable Department of Defense (DoD), Department of the Navy (DON), Navy Marine Corps Intranet (NMCI), or higher echelon's requirements, such as accessibility (compliance/conformance to Section 508 of the Rehabilitation Act of 1973), risk mitigation, et al. For more information, contact the NCOM Content Manager at nln.administrator@cnet.navy.mil.

Signatories of this form certify that **all of the following tasks have been completed** and **associated documentation is provided** with this package. Packages, including the actual content, in part or whole, should not be forwarded to the Naval Education and Training Command (NETC) for review and hosting until all statements are verified as correct.

Packages completed by commercial content providers should be routed to the content's government sponsor for review, verification, and submission to:

Naval Education and Training Command (NETC)
Learning and Strategies Division (N9)
250 Dallas Street
Pensacola, Florida 32509
ATTN: ILE Content Manager

CONTENT PROVIDER POINT OF CONTACT INFORMATION	
Name:	
Title:	
Organization:	
Mailing address:	
City, State, Zip Code:	
E-mail address:	
Commercial telephone (area code/extension):	
DSN:	
Fax:	

GOVERNMENT SPONSOR POINT OF CONTACT INFORMATION	
Name:	
Title:	
Organization:	
Mailing address:	
City, State, Zip Code:	
E-mail address:	
Commercial telephone (area code/extension):	
DSN:	
Fax:	

CONTENT SUBMISSION PACKAGE INFORMATION		
DELIVERABLE	**COMMENTS**	**SIGNATURE/DATE**
The content (courseware) is provided on compact disc or digital video disk.	Comments:	
The deliverables mentioned throughout this document are provided on hardcopy.	Comments:	
A completed ILE Content Submission Form is provided.	Comments:	
Test results for successful LMS integration testing on the LMS Provider's Courseware Compatibility Center (C3) site or the Advanced Co-Lab's SCORM Conformance Test Suite, or through other test methods (as described in the Comments section) are provided.	Comments:	
Copies of licensing agreements are provided.	Comments:	
Copies of proprietary restrictions are provided.	Comments:	
Copies of all special installation directions are provided.	Comments:	
Answers to examinations, tests, quizzes, pre-tests, practical exercises, and others are included.	Comments:	

I hereby certify that I have reviewed this courseware and to the best of my knowledge it is error-free. Additionally, all required deliverables listed on this checklist are provided.

_____

(Content provider printed name, signature, date, and contact information)

I hereby certify that I have reviewed this courseware and to the best of my knowledge it is error-free. Additionally, all required deliverables listed on this checklist are provided.

_____

(Government sponsor (content SME) printed name, signature, date, and contact information)

6.4. APPENDIX D: Instructional Design and Assessment Strategy for the Apprentice Trainer Course

Because the Apprentice Trainer Course is part of the larger Instructional Delivery Continuum (IDC), the instructional design of the Apprentice Trainer Course was done in conjunction with the design of the IDC. The designer used information from a job task analysis to fully understand the job requirements of the trainee. In the case of the Apprentice Trainer Course, the designer wrote objectives based on the results of the job task analysis. As a result of understanding the job requirements, the objectives, the target audience, and the learning environment, the following instructional design was developed:

The instructional design of the Apprentice Trainer Course will be based on guided discovery architecture. Throughout the continuum participants will engage in situations (sometimes simulated and sometimes real) in which they create and implement a solution, experience the consequences of their choices, reflect on the results, and revise their approach to instruction. This design architecture will help participants build the appropriate mental models necessary to become exceptional instructors and managers of training.

Participants will engage in a variety of learning activities where they will process information in light of their expanding knowledge base and experiences. Providing appropriate support scaffolding is a critical component of guided discovery architecture. IDC participants will find support in a variety of elements including a combination of web-based instruction (WBT), required readings and other professional activities, practice exercises with feedback in actual performance settings, a process of self-assessment to encourage continuous improvement, and interaction with other participants in the course and the IDC. Trainees will be guided by a training mentor, a senior trainer who, by sharing their own experiences and by supporting or challenging the underlying beliefs of the participant in the context of each learning experience, assists participants in generating meaningful relationships between the concepts and principles they are learning and their experiences in training.

The delivery of the Apprentice Trainer Course will be a combination of self-paced web-based training (WBT), on-the-job training, and communication within their community of practice. The WBT will be designed with practical application in mind. The WBT will not simply convey information to students. It will encourage students to think about practical application of these concepts as they engage in their own practice. A menu of practice exercises appropriate for the apprentice level will be provided to accommodate the variety of operational environments in which students will be learning. The WBT will also present students with practical problems that they can use as a vehicle to discuss learning issues with experienced instructors at their command or other continuum participants via email or other web-mediated communication. To further encourage interaction within the participant's professional community and increase the transfer of

learning, learning and practice will, whenever possible, occur within the operational environment where the student has a requirement to apply these new skills.

An important professional aspect of the IDC is the development of the reflective practitioner. This means the student is always evaluating his or her own progress. An Individual Development Plan (IDP) will facilitate the development of this skill as well as the development of the participant. Core competencies from the job task analysis will be identified in the IDP, so participants have a tool to self-assess their strengths and weaknesses and help them set realistic goals throughout the continuum. As they evaluate their progress and set goals, they will identify appropriate knowledge and experiences they need to meet their developmental goals. Training mentors will assist in the IDP process.

As part of the assessment strategy, a Practice is included at the end of each topic throughout the WBT. However, Practices are not just to assess student knowledge, but to challenge students to think about how they would apply what they are learning to a situation. This will help students to make the information they are learning meaningful to them in terms of the job they will be performing. In addition to Practices, there are Skill Tests throughout the Apprentice Trainer Course that identify specific competencies being tested, the tasks the student must complete with required mentor review and sign off, and the final skill that will be demonstrated. Students are evaluated by their mentors using an evaluation sheet. Performance is informally assessed throughout the course through practical exercises where students demonstrates skills they are learning, receiving naturalistic feedback from their own students and from their mentors. A final knowledge test is administered when the student feels they have mastered the course.

The instructional strategy includes the organization of the content by Lessons and Topics and objectives written for each. These appear in the Table 2.1: EOs Identified For One Lesson Of The Apprentice Trainer Course.

6.5. APPENDIX E: Instructional Design Theories

6.5.1. Conditions-based Theories

While there is no one learning taxonomy that has been thoroughly tested and accepted in the instructional design community, Gagne's Conditions-based Theory (different types of learning requires different types of conditions) is often used as a basis for other instructional design theories. Essentially, the Conditions-based Theory assumes that there are different types of learning and learning outcomes that can be classified and described in discrete groups primarily distinguished by the cognitive requirements of the learning and learning outcomes placed on the learner. These requirements are usually reflected in the learning objectives and can be supported by discrete instructional methods. The job of the ID is to determine the goals of instruction, categorize goals by outcome category, and select strategies that have been suggested as being effective for the category of learning outcome. These theories serve a critical foundational function in determining the overall design and more specifically, the approaches to address individual objectives within a learner-centered design.

6.5.2. Gagne's Five Categories of Learning Outcomes

Gagne (1988) identified five categories of learning outcomes. These outcomes represent different learning capabilities, intellectual skills, verbal information, cognitive strategy, attitudes, and motor skills. Gagne argues that there is a difference in how each outcome should be taught, particularly in terms of the kind and amount of practice required and the role of meaningful context. Gagne and Glaser (1987, in Ragan & Smith, 2004) suggest different external learning conditions be designed for the different types of learning. For example, learning intellectual skills requires learning conditions that promote retrieval of prior knowledge, guidance, demonstration of application by students, feedback to student on student performance, and periodic review of the information. Verbal information requires conditions that require students to retrieve context, allow students to demonstrate they have constructed new knowledge, and provides feedback on the students' performance. Cognitive strategies call for retrieval of context of meaningful information, increasingly difficult novel problem situations, student demonstration of their problem solutions, and feedback to students (Ragan & Smith, 2004).

6.5.3. Bloom's Taxonomy

Bloom's taxonomy is an early example of a conditions-based design approach and one which most IDs are familiar with. Bloom identifies three types of learning: cognitive, affective, and psychomotor. Within each is a taxonomy of learning. The cognitive taxonomy is probably the most recognizable. Cognitive learning can be categorized in the following levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. Each level describes the cognitive processing that is required of the student and instructional activities should be selected according to the level at which learning has been identified. For example, if students must apply content they are learning, then activities are built into instruction that require the learner to use the content in different ways (e.g., solving practical problems or completing a practical exercise).

6.5.4. Merrill's Component Display Theory

Merrill uses content by performance matrix to classify learning outcomes. There are four content types in the matrix (facts, concepts, principles, and procedures) and three levels of performance (remember, use, and find), making twelve distinct categories of objectives. This matrix allows the ID to determine what level of performance is required for each level of content. Component Display theory also classifies presentation forms as primary or secondary. There are four Primary presentation forms—rules, examples, recall, and practice. Secondary presentation forms generally expand on the primary presentation form and include prerequisites, objectives, helps, and feedback. A combination of primary and secondary presentation forms provides the best mix to ensure the acquisition of the skills and knowledge available to meet each component in the matrix.

6.5.5. Learner-centered Approaches

The basis of learner-centered approaches is constructivist thinking which says that learners construct their own meaning by interpreting new experiences in context of the learning environment, what they already know, and their prior experiences. General constructivist instructional design guidelines include:

- Learning activities promote active construction of knowledge.
- Learning is situated in a relevant and realistic context for the learner.
- Different perspectives on the same issues should be presented to the learner for consideration. The same information should be provided in different contexts.
- Feedback is essential between the learner and the instructor and between learners through cooperation and collaborative activities.

Constructivist approaches are learner-centered and require the ID to create a learning event where learners interact with the content in a meaningful way to help them construct a mental model of the content. By focusing the instructional event on the process of learning rather than the product (frequently some measure of what the learner has learned), cognitive processing of the content is encouraged. Mayer (1999) identifies three primary cognitive processes the learner needs to engage in: selecting the relevant information, organizing the information, and integrating the information into existing knowledge structures.

There are many ways to engage the learner in these cognitive processing activities. Mayer (1999, p. 154) suggests the following instructional methods to engage the learner in selecting the appropriate material:

- Font changes to show organization and highlight important points
- Questions and objectives to focus attention
- Summary paragraphs prior to a reading

To help students organize material Mayer (1999, p. 154) suggests:

- Outlines
- Headings
- Text structure

- Pointing words
- Clearly identifying steps

To help students integrate material Mayer (1999, p. 155) suggests

- Advance organizers
- Illustrations and animations
- Worked-out examples
- Elaborative questions

In a constructivist learning environment, coaching and scaffolding to support learner construction of understanding is essential. Jonassen (1999) suggests that scaffolding can be integrated into instruction through the use of:

- information resources,
- collaboration tools,
- consideration of familiar and related cases,
- tools to facilitate problem solving (e.g., help learners represent or organize the problem or help them automate some aspects of the solution),
- providing hints and cues,
- tutorials,
- providing advice from experts, and
- guiding questions

Two examples of learner-centered designs are problem-centered designs and cognitive apprenticeship. Both are briefly explained below.

6.5.6. Problem-centered Designs

Generally, problem-based learning requires presenting the problem scenario, forming teams (if possible), providing support for the teams' efforts, and reflecting on the results of the individuals' and teams' efforts, etc. Problem-based learning is a constructivist approach in that students construct understanding as they solve the problem. The problem and how students solve the problem drive the learning. Merrill (2002) describes four phases of effective problem-centered instruction that should be incorporated into the design:

- Activation of prior experience
- Demonstration of skills
- Application of skills
- Integration of these skills into real-world activities

Problem-based learning centers problems that are relevant and realistic to learners. All learning occurs in the context of solving this problem. The selected problem should be at an appropriate level of difficulty for the learner and subsequent problems should build in difficulty and complexity. As instruction is designed, activities must be included to promote the acquisition of essential foundational knowledge if necessary (e.g., through tutorials and demonstrations).

Reflection on the processes used by the learner is an essential part of a problem-based learning strategy (Reigeluth and Moore, 1999). Learners need to reflect on the learning process: consider the effectiveness of the problem solving process they used, how this process could be improved, how other students solved the problem and the advantages and disadvantages of those approaches, and how expert problem solvers have approached the problem. This can be accomplished by asking learners to: (Jonassen, 1999)

- list and explain their assumptions
- list and explain their problem solving strategies
- explain how and why they used a tool to solve the problem
- explain alternative responses and why these responses were not selected
- rate how confident they are in their responses

Merrill (2002) goes further to suggest principles of instruction to follow when using a problem-centered approach. Merrill presents these principles in the form of questions IDs can ask themselves as the instructional event is being designed. If the answer to these questions is “yes”, then learning (and performance) is likely being promoted by the problem-based design (Merrill, 2002, p. 40):

- Is the content presented in the context of real-world problems? Are learners shown the problem, engaged at the task as well as the operation level, and involved in the progression of problems?
- Does the content attempt to activate relevant prior knowledge or experience? Are learners directed to recall relevant past experience or provided relevant experience? Are they encouraged to use some organized structure?
- Does the content demonstrate what is to be learned rather than merely telling information about what is to be learner? Are the demonstrations consistent with the instructional goals? Is learner guidance employed? Do media enhance learning?
- Do learners have an opportunity to apply their newly acquired knowledge or skill? Is the application consistent with the instructional goals, and does in involve a varied sequence of problems with feedback? Are learners provided with gradually diminished coaching?
- Does the content provide techniques that encourage learners to integrate (transfer) the new knowledge or skill into their everyday life? Do learners have an opportunity to publicly demonstrate their new knowledge? reflect on their new knowledge, and create new ways to use their new knowledge?

6.5.7. Cognitive Apprenticeship

Cognitive apprenticeship capitalizes on the age-old apprenticeship model to promote learning in the cognitive domain. Essentially, experts and novices interact while focused on completing a realistic, job-related task to develop essential cognitive skills. Collins et al. (1989, p. 456) define cognitive apprenticeship as “learning-through-guided-experience on cognitive and metacognitive, rather than physical, skills and processes.” There are several cognitive apprenticeship models that exist, but most share the

following features (Biehler & Snowman, 1977; Clark, 1998; Hackbarth, 1996; Woolfolk, 1998).

- Ø Many learning activities are problem-centered.
- Ø Problems are presented in a real-world context.
- Ø Students observe experienced personnel model job behaviors.
- Ø Student learning is supported through mentors or coaches.
- Ø Support to learners gradually fades as learners become more competent and proficient.
- Ø Students continually articulate what they are learning.
- Ø Students reflect on their progress toward developing expert-like cognitive structures.
- Ø Students observe and make their own errors in the real world environment and receive naturalistic feedback.

These features suggest that a blending of methods (beyond computer-based) be incorporated into a cognitive apprenticeship design including:

- Ø Learners shadow Subject Matter Experts (SMEs) during their normal work routine
- Ø SMEs articulate their thinking to learners as they solve a problem
- Ø Learners use a checklist to identify specific behaviors, steps, or tasks, as they observe a SME completing a task
- Ø Learners perform a task under instruction, being allowed to succeed or fail as appropriate (and safe) to gain naturalistic feedback
- Ø Learners talk to several SMEs to gain their perspective on solving a real-world problem.
- Ø Learners discuss what they are learning with a SME

Other constructivist based design theories include anchored instruction (Bransford et al., 1990), Goal-Based Scenario's (Schank, Fano, Bell, & Jona, 1993), and the Four Component Instructional Design Model (van Merriernboer, 1997). No one theory is the best choice all the time, IDs must ask themselves when does each theory work best and what theory, or combination of, is appropriate for the instructional event being designed, taking into account all of the variables affecting instructional design decisions (e.g., audience, learning location, content, and requirements of the job).

6.5.7.1. Performance-based Approach

Regardless of the instructional design theory (or theories) employed, the resulting instructional design should emphasize a performance-based approach. Of course, the reason for training is to better prepare learners for their jobs. This requires that IDs go beyond helping the learner to acquire knowledge, and address job performance requirements. There is likely to be a wealth of knowledge learners must know to do their jobs, but they must learn the knowledge in the context of performance. How will the learner use this information? Why do they need to know this? How does it help them do their jobs better? How can job performance be integrated into the instruction?

To integrate job performance issues into the design of the instructional solution, performance objectives must be carefully written to go beyond just the information learners need to do their jobs. Ideally, performance objectives will be based on the tasks of a job. IDs are trained to write objectives based on the information learners must acquire (which is usually based on a job task analysis) and create instruction to make sure learners get that information (Mager, 1997). Often, the "performance" part of a "performance objective" requires the student to answer a test question correctly.

However, IDs have to take performance farther than simply selecting the correct answer on a test. Performance should address job performance. How will the student use the information they are learning? How will they apply it on the job? How will we know they can apply it correctly on the job? The answers to these questions must be reflected in the design of the learning solution created for the Navy's Integrated Learning Environment.

For example, an OS may be able to perform calculations to plot the ship's course on a maneuvering board, but they also need to understand how what they are doing works in relation to the other jobs on the bridge. The OS receives information from several stations and must report information to several stations. Teaching situational awareness is much different than teaching how to perform calculations. And, how is this aspect of performance tested? All learning activities should support this approach. Another example is the use of gaming. If a game is integrated into the learning event, then the cognitive processing required to play the game should mirror those required by the job.

The ID must find ways to integrate job-specific tasks into the design of the learning event. Not everything must be learned on the computer. Activities can be designed to get the student away from the computer and actually applying the information they have just learned. A practical exercise takes students into the operational environment where they can see how what they are learning is applied. For example, students may be asked to observe an evolution with the important aspects of the evolution pointed out to them, complete a procedure under instruction, or talk to an expert and get a tour or explanation of a specific procedure. In most Navy operational environments, there will be mentors to provide students with the required feedback on practical exercises, and the naturalistic feedback they receive while on the job is valuable. A practical problem is a short scenario that represents real-world situations students may not normally find themselves in, but are real enough that students should be prepared to solve. Practical problems provide students an opportunity to apply what they are learning in a problem situation where the answer is not always obvious and there may not be one single acceptable solution. Students should talk over their answers with experts or mentors in the respective fields to get feedback on their solutions, and they should probe experts for their approach to solving the problem.

6.6. APPENDIX F: Mecognitive Strategies

6.6.1. Instructional Methods for Promoting Better Metacognitive Skills

The following methods can be included into the instructional design of an Integrated Learning Environment (ILE) learning event to promote the development of metacognitive skills. Including this list in this document is not meant to imply that all methods must be used or that these are the only methods to choose from. There are many methods, and as with all instructional strategies and methods, their application is dependent on the learning situation. Information about the learners, performance requirements, and learning environment should all be considered when selecting methods to promote metacognitive skills.

- Ø Help students focus their attention on important elements. Use highlights, bullets and other features to highlight important points.
- Ø Students create a graphic organizer for themselves (or it could be provided to them) to help structure topics and subtopics or organize information for effective and efficient storage and retrieval.
- Ø Students engage in activities that enable them to process information in a deep and meaningful way. Students should process the information in a manner that is consistent with the way they will process it on the job. For example, if they need to apply the concept of hydraulics in many different situations a problem solving exercise requiring that understanding may be more appropriate than a game to see if they can spell the word correctly. These activities are particularly important for novices or students with poor metacognitive skills.
- Ø Students compare the new information to what they already know – how is it alike or different? How does this change what they know and what they are doing on the job?
- Ø Students describe their problem solving process. Have them compare their process to that of a student who used a different process.
- Ø Students solve a problem then compare their problem solving process to that of an expert.
- Ø Students create outlines, flow charts, or summaries of portions of the content.
- Ø Students put meaning of the content into their own words (e.g., paraphrase).
- Ø Encourage students to create a mnemonic for specific information.
- Ø Provide opportunities for student to check their understanding of the material in ways other than the end of unit tests. Pre-tests are particularly important in helping students assess their knowledge, make good decisions about what material to study, and create appropriate learning goals prior to study.
- Ø Students consider what they learned from the activity (e.g., how they might use what they learned in their jobs) and articulate it to a mentor or fellow student.
- Ø Provide students with an Individual Development Plan (IDP) to help them evaluate their progress and set goals. It is Important for students to learn to identify a goal, intentionally implement a strategy to meet that goal, monitor progress toward the goal, and recognize when they have achieved the goal.

6.6.2. Learner Control

Learners' metacognitive skills should be considered when making decisions regarding the strategy for learner control of an instructional event. Learners may control how fast they progress through instruction, the path they take through the learning event, or what support tools they decide to accesses. Learners generally prefer to have full control over their instructional options but often don't make good judgments about their instructional needs (Schnackenberg, Sullivan, Leader, and Jones, 1998 as cited in Clark, 2003). Learners who are new to the content and/or have poor metacognitive skills have more difficulty in high learner-controlled learning environments than learners with good metacognitive skills. (Clark, 2003).

Decisions concerning the navigational design of a learning event can greatly impact the success of the instruction. Although learners report more satisfaction when they maintain control, it is important for the ID to consider all of the tradeoffs of learner control, including the prior knowledge and metacognitive skills of the target learners, the cost of designing learner-controlled instruction, and the criticality of the skills being taught.

Clark (2003) makes the following recommendations regarding design for learner control:

- Use learner control for learners with extensive prior knowledge or good metacognitive skills and/or in lessons or courses that are advanced rather than introductory (learners will have more knowledge of the content in advanced lessons).
- Design the default navigation to lead to important instructional elements, otherwise, learners may decide to skip them.
- Advise learners on how to proceed based on their responses to test questions to help learners make effective instructional decisions.
- Use links sparingly to supplement a lesson. Links should not be an essential instructional element, as learners may decide not to access them. Also, limit the number of links. Having to select a link and relate the information to the main content may increase learners' cognitive load and negatively impact learning.
- Allow learners to control the pacing of instruction.
- Use course maps to provide an overview and orient learners

6.7. APPENDIX G: Characteristics of Good Assessment Practices

6.7.1. Characteristics of Good Assessment Practices

Within the NCOM the connection between learning events and assessment must be aligned so that instruction can be customized for the learner and support flexibility of sharable content objects. The following overarching characteristics guide the development of all types of assessments for the NCOM. Assessments should:

- Be ongoing and integral to the instructional process
- Measure intended outcome, competencies, or mission capabilities
- Be consistent with the learning system and performance goals
- Utilize what we know about the science of learning
    - Develop deep foundation of factual knowledge and strong conceptual frameworks
    - Promote transfer of learning
    - Promote development of mental models
- Provide feedback to learner, instructor, supervisor, course/content manager
- Use methods that match the objectives or intended learning outcomes.
    - Use multiple methods and technologies to emulate or approximate desired performance
    - Select from the array of strategies and methodologies to support the intended outcome
    - Optimize available strategies and techniques to provide feedback
- View technology as an enabler, not a focus
- Incorporate strategies to assess Individuals and teams
- Promote development of metacognitive skills by providing learners with information to facilitate self-monitoring and self-regulation (e.g., strategies to guide learners in examining their processes for problem solving or their strategies for achieving goals).
- Represent essential elements of domain in question (e.g., concepts, definitions, and principles that indicate the learner understands or can apply content).
- Contain adequate sampling of items or tasks that are representative of the content domain to be assessed.

(Based on Gronlund, 1988; Donovan, Bransford, & Pellegrino, 2000; Nitko,1996; Pellegrino, Chudowsky, & Glaser, 2001).

6.8. APPENDIX H: NCOM Examples of Model of Content Sequencing

Each example section includes an introduction of the example, a content structure diagram representing the example, and the instructional strategy and sequencing rules for the example. The rules are presented in both non-technical language (called Behavior to describe what you want the learner to experience) and technical language (called Sharable Content Object Reference Model (SCORM) Function to describe what will be coded to enable the behavior).

(IDs) can follow the Behaviors in the examples provided, and developers and programmers can follow the SCORM Functions to program the sequencing commands specified by the ID. In some instances, the SCORM Function says “No Unique SCORM Function” for the programmers. This occurs because the ID specifies a behavior that is either internal to the Enabling Learning Object (ELO) or is not impacted by SCORM. Several examples include multiple applications of the rules so you will understand that identical content structure diagrams (or courses, lessons, etc.) can be sequenced in numerous ways.

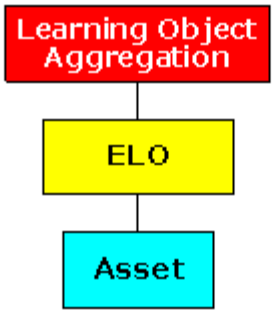
In this document and in the sequencing rules, we refer to halting the learning in training and requiring manual intervention by the instructor. You might want to use this type of an instructional strategy if you need to prevent the learner from seeing additional content because they require face-to-face interaction with an instructor to ensure they have grasped the material, need assistance beyond that which is available in the remaining content, or will be unable to understand the remaining content without a strong understanding of the content they have completed.

You can accomplish this by creating rules that result in the learner being prevented from seeing any ELO. The way in which manual intervention is implemented will vary by LMS; it is not specified by SCORM, so ensure that you carefully test this functionality before using it.

6.9. Sequencing Examples

6.9.1. Example 1: Single ELO

This is the most basic Navy Content Object Model (NCOM) structure. A Learning Object Aggregation contains a single Terminal Learning Object (TLO). The ELO may be any size and have any amount of intra-ELO branching or an assessment. This ELO contains one Asset.

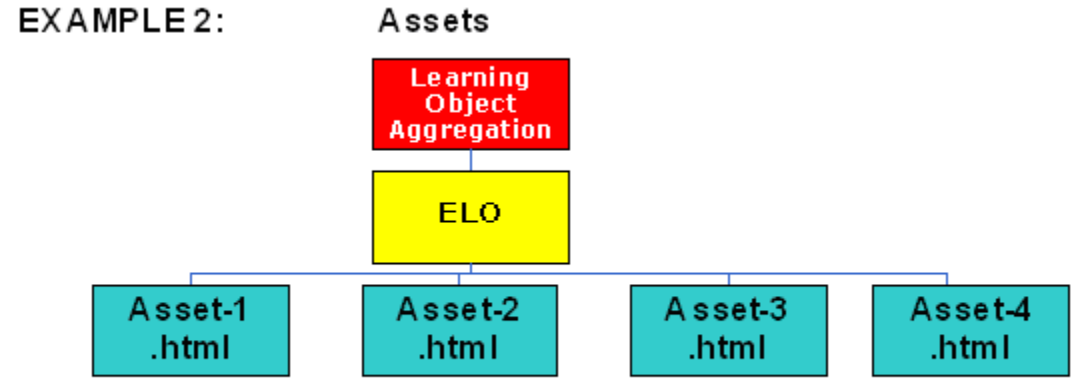


Example 1 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must complete the ELO.	Learning Object Aggregation Rollup: If All Satisfied, satisfied.

6.9.2. Example 2: ELO with Assets

This example represents an ELO composed of multiple “pages” of assets. The ELO in this example might represent a course comprised of several lessons and an assessment. If you have no instructional requirement to track the learner’s performance in each of the individual lessons (the Assets), then creating your lessons as Assets within a single ELO may meet all of your reusability needs. Within this ELO, the presentation of the Assets does not impact SCORM in any way.

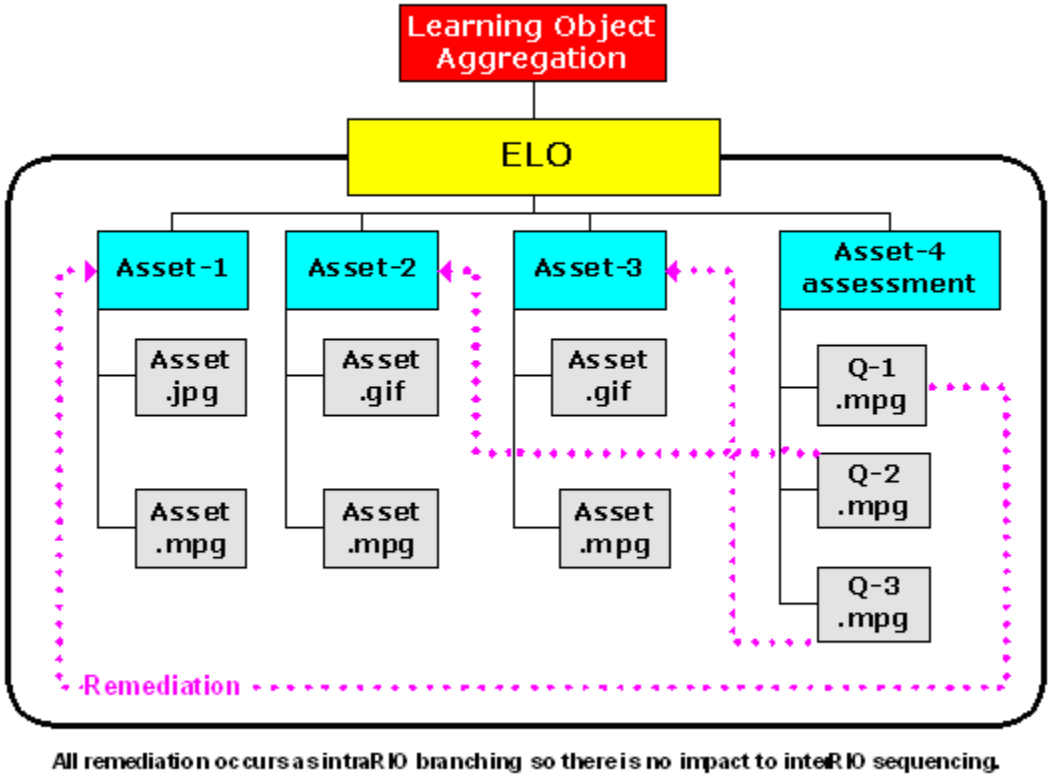
Example 2 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must complete the ELO.	Learning Object Aggregation Rollup: If All Satisfied, satisfied.
To complete the ELO, the learner must complete the assessment in Asset-4 within the ELO.	*No SCORM function*



6.9.3. Example 3: The Black Box

Example 3 contains *no sequencing*. It is a single ELO with intra-ELO branching. The intra-ELO branching may be as complex or as simple as the ID defines. With this type of intra-ELO branching, the LMS does not know what happens inside the ELO. This means the LMS cannot track or report the learner's progress through the content. While this is an effective way to control the learner's instructional experience, it does not permit the flexibility SCORM seeks to provide.

EXAMPLE 3: The Black Box



All remediation occurs as intraRIO branching so there is no impact to interRIO sequencing.

This example could be viewed as a CBT lesson packaged as a single ELO. None of the behaviors occurring inside the "black box" is tracked by the LMS. To complete the "lesson," the learner must receive a score of 100% on the assessment. The learner is remediated from the missed question to the corresponding asset (if Q-1 is missed, the learner remediates to Asset-1, etc.). The learner is allowed two attempts. If the learner fails attempt two, the learner receives the correct answer, and the ELO is marked as passed. Again, this example does not require SCORM sequencing, so these behaviors are not described in the table below.

Example 3 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must complete the ELO.	Learning Object Aggregation Rollup: If All Satisfied, satisfied.

6.9.4. Example 4: Multiple ELOs with Assets

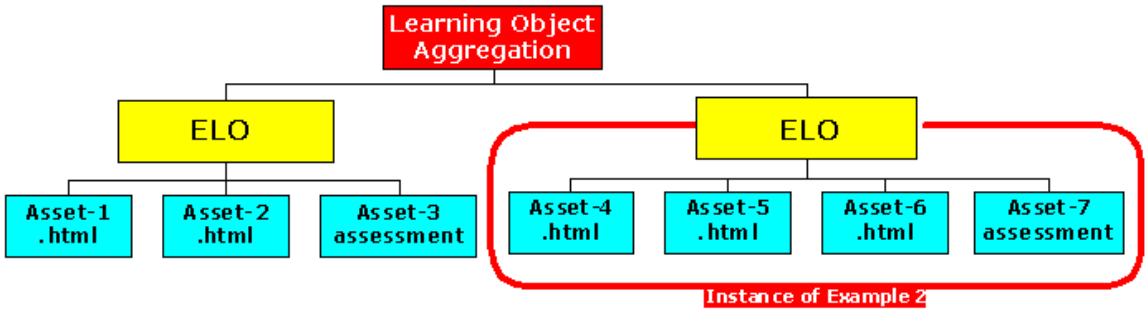
You can view an ELO, a TLO, or a Learning Object Aggregation as any “traditional” instructional design component such as a lesson, a module, a unit, a segment, or a course. As a result, you could use Example 4, or any other example in this guide, in several different ways. Example 4 shows two ELOs in Learning Object Aggregation. Here are some of the ways you could interpret the content structure diagram in Example 4:

- Two assessed learning objectives (the ELOs) in a lesson (Learning Object Aggregation)
- Two assessed segments (the ELOs) in a lesson (Learning Object Aggregation)
- Two assessed lessons (the ELOs) in a module (Learning Object Aggregation)
- Two assessed modules (the ELOs) in a course (Learning Object Aggregation)
- Two assessed lessons (the ELOs) in a course (Learning Object Aggregation)
- Two assessed units (the ELOs) in a course (Learning Object Aggregation)

ELO-2 in Example 4 is identical to the ELO in Example 2, showing how these examples can be overlaid to create additional functionality or complexity in a given structure. So, with the ability to “equate” SCORM structures to the traditional instructional design components you are accustomed to working with, and the ability to overlay the examples in this guide, you can essentially create limitless structures of your own.

The rules provided in Application A of Example 4 provide designer-controlled learning while the rules in Application B allow for more learner control of the experience. The set of rules you choose to apply to any example will depend on the learner experience you are trying to create as well as the tracking and training documentation requirements you have.

EXAMPLE 4: Multiple with Assets



Example 4 Rules *(Application A)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must complete ELO-1 and ELO 2	Learning Object Aggregation Rollup: If All Satisfied, satisfied.
To complete each ELO, the learner must complete the assessments within the ELOs.	*No SCORM function*
The learner cannot start ELO -2 until ELO -1 is complete.	ELO-1: Choice=false; Flow=true
The learner can return to ELO -1 from ELO -2 at any time.	Learning Object Aggregation: Forward Only=false

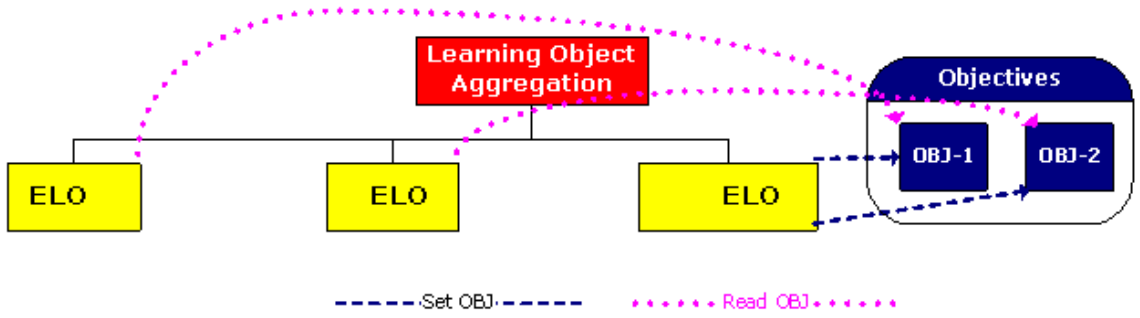
Example 4 Rules *(Application B)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must complete ELO-1 and ELO-2.	Learning Object Aggregation Rollup: If All Satisfied, satisfied.
To complete each ELO, the learner must complete the assessments within the ELOs.	*No SCORM function*
The learner can view the ELOs in any order.	Learning Object Aggregation: Choice=true; Flow=true

6.9.5. Example 5: Remediating Using Objectives

Example 5 presents a sequencing option for learner remediation when you have multiple instructional ELOs. This inter-ELO remediation is tracked by the LMS using objectives (OBJ). The test for this structure exists as a single ELO with two test items (the Assets). The post-test (ELO-3) uses objectives to link each test item to its corresponding instructional ELO. Based upon the learner's response to the test item, the objectives for that item is set to *passed* or *failed*. For failed objectives, the LMS shows the learner the list of corresponding instructional ELO and the learner can select the ELO to view the remediation.

Suppose the learner fails OBJ-1 and passes OBJ-2. Once the post-test in ELO-3 is complete, the LMS would show the learner the ELOs that should be seen again in order for the learner to retake the post-test. In this example, the learner would only see ELO-1 (the ELO corresponding to OBJ-1) listed in the LMS since the learner passed the objective for ELO-2. The learner should then select ELO-1 to complete the remediation and retake the post-test. In the rules, we allowed the learner two attempts to complete this Learning Object Aggregation. Once the learner passes ELO-3, the Learning Object Aggregation is complete. See Example 5 Rules *(Application A)* for specific details.

EXAMPLE 5: Remediating Using Objectives



Example 5 Rules *(Application B)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-3.	Learning Object Aggregation Rollup: If All Satisfied, satisfied. ELO-1: isRolledup=false ELO-2: isRolledup=false ELO-3: isRolledup=true
The learner must complete ELO-1 before attempting ELO-2. The learner must complete ELO-2 before attempting ELO-3.	Learning Object Aggregation: Choice=false; Flow=true
To complete ELO-3, both objectives must be passed.	*No unique SCORM function*
If the learner fails OBJ-1 in ELO-3, then present ELO-1.	ELO-3: set OBJ-1 ELO-1: skip if OBJ-1 satisfied
If the learner fails OBJ-2 in ELO-3, then present ELO-2.	ELO-3: set OBJ-2 ELO-2: skip if OBJ-2 satisfied
Allow two attempts for ELO-1, ELO-2, and ELO-3.	ELO-1, ELO-2, ELO-3: Attempt Limit=2
If the learner fails ELO-3 on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*

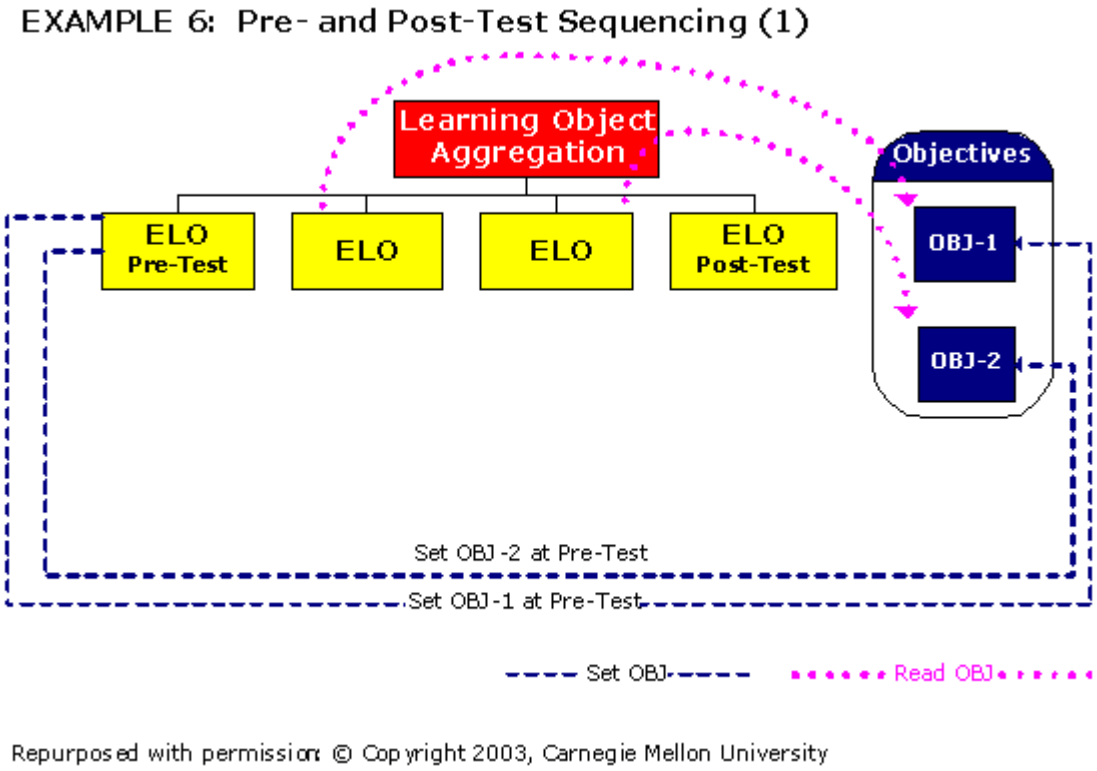
Some examples can be applied in different ways using different behaviors. In Example 5 Rules *(Application B)*, we've given the learner more control over the learning experience. The learner now has the choice to view the content in any order. The learner could even complete the post-test in ELO-3 without first viewing ELOs 1 and 2. The objectives and remediation work the same way in Application B as they do in Application A; however, the learner is now permitted as many attempts as needed to pass the post-test in ELO-3. The table below, Example 5 Rules *(Application B),* has specific details.

Example 5 Rules *(Application B)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-3.	Learning Object Aggregation Rollup: If All Satisfied, satisfied. ELO-1: isRolledup=false ELO-2: isRolledup=false ELO-3: isRolledup=true
The learner can complete the ELOs in any order.	Learning Object Aggregation: Choice=true; Flow=true
If the learner fails OBJ-1 in ELO-3, then present ELO-1.	ELO-3: set OBJ-1 ELO-3: skip if OBJ-1 satisfied
If the learner fails OBJ-2 in ELO-3, then present ELO-2.	ELO-3: set OBJ-2 ELO-2: skip if OBJ-2 satisfied
Allow as many attempts as needed to complete ELO-3.	*No unique SCORM function*

6.9.6. Example 6: Pre- and Post-Test Sequencing

This example presents sequencing option for pre- and post-tests of learner knowledge or skills. The pre- and post-tests for this structure exist as individual ELOs. Each post-test item is an individual asset. The testing ELOs are linked to objectives that correspond to test items within the ELOs. Based upon the learner's response to the pre-test item, the OBJ is either set to *passed* or *failed*. When the pre-test in ELO-1 is completed, the LMS shows the learner the ELOs corresponding to the missed test questions so the learner can complete the instruction before taking the post-test.

Suppose the learner passes both pre-test items in ELO-1. OBJ-1 and OBJ-2 would be set to passed. The learner then has the choice to either skip or complete the instructional ELO (ELO-2 and ELO-3). However, the learner is required to pass the post-test, so once the pre-test objectives (OBJ-1 and OBJ-2) are *passed*, the post-test (ELO-4) becomes available to the learner.



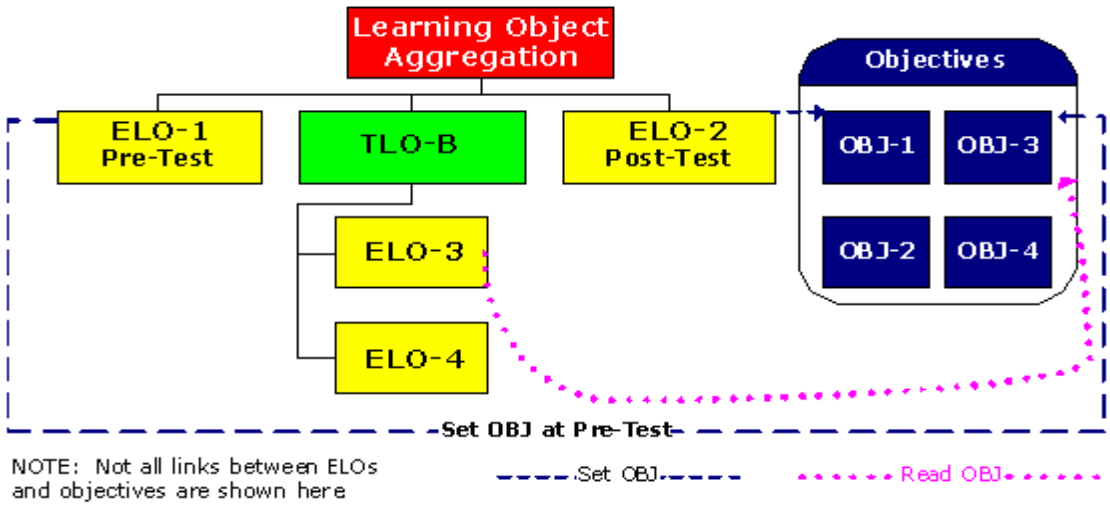
To further expand upon the use of objectives in this example, suppose the learner fails a pre-test item in ELO-1. OBJ-1 (used as a variable) would be set to *failed*, and the LMS would show the learner ELO-1 (the corresponding instruction). Once the learner completed the instructional content in ELO-1, the learner would be able to take the post-test.

Example 6 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-4.	Learning Object Aggregation Rollup: If All Satisfied, satisfied. ELO-1: isRolledup=false ELO-2: isRolledup=false ELO-3: isRolledup=false ELO-4: isRolledup=true
The learner must complete the pre-test in ELO-1 before attempting ELO-2 or ELO-3.	Learning Object Aggregation: Choice=false; Flow=true
The learner can return to ELO-1 from ELO-2 at any time.	Learning Object Aggregation: Forward Only=false
If the learner fails OBJ-1 in ELO-1, then present ELO-2.	ELO-1: set OBJ-1 ELO-2: skip if OBJ-1 satisfied
If the learner fails OBJ-2 in ELO-1, then present ELO-3.	ELO-1: set OBJ-2 ELO-3: skip if OBJ-2 satisfied
To complete ELO-4, both test items must be passed.	*No unique SCORM function*
If the learner fails ELO-4, then the learner is halted in training and requires manual intervention.	*No unique SCORM function*

6.9.7. Example 7: Pre- and Post-Test Sequencing (2)

Example 7 shows a simple way to construct a pre- and post-test "course" (the Learning Object Aggregation) without remediation. The pre-test sets the objectives (OBJ-3 and OBJ-4) to *passed* or *failed* depending upon the learner's response to the individual test items. If you assume the learner fails OBJ-3 in the pre-test, then the learner would be presented with a list in the LMS showing ELO-3. The learner would select ELO-3 to view the instruction that was not passed in the pre-test. The rules for the diagram require the learner to master the post-test by passing both OBJ-1 and OBJ-2.

EXAMPLE 7: Pre- and Post-Test Sequencing (2)

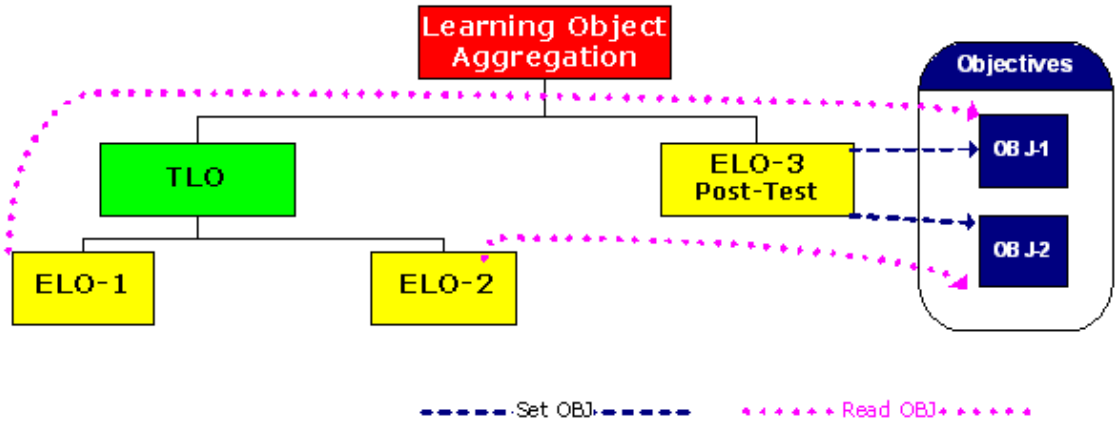


Example 7 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-2.	Learning Object Aggregation Rollup: If All Satisfied, satisfied. ELO-1: isRolledUp=false TLO-B: isRolledUp=false ELO-2: isRolledUp=true
The learner must complete the pre-test in ELO-1 before attempting TLO B or ELO-2.	ELO-1: Choice=false; Flow=true
The learner can return to ELO-3 from ELO-4 at any time.	TLO-B: Choice=true; Flow=true; Forward Only=false
If the learner fails OBJ-3 in ELO-1, then present ELO-3.	ELO-1: set OBJ-3 ELO-3: skip if OBJ-3 satisfied
If the learner fails OBJ-4 in ELO-1, then present ELO-4.	ELO-1: set OBJ-4 ELO-4: skip if OBJ-4 satisfied
The learner cannot return to ELO-1 or ELO-2 once TLO-B is attempted.	Learning Object Aggregation: Flow=true; Forward-Only=true; Choice=false
To complete ELO-2, OBJ-1 and OBJ-2 must be passed.	*No unique SCORM function*
If the learner fails OBJ-1 or OBJ-2, then the learner is halted in training and requires manual intervention.	*No unique SCORM function*

6.9.8. Example 8: Remediating Using Objectives (2)

Example 8 allows you to control when the learner can access the post-test. In this example, the learner cannot attempt the post-test in ELO-3 until the instruction in TLO-1 is complete. If the learner fails either objective in the post-test, the learner will be remediated to the corresponding instructional materials in TLO-1.

EXAMPLE 8: Remediating Using Objectives (2)



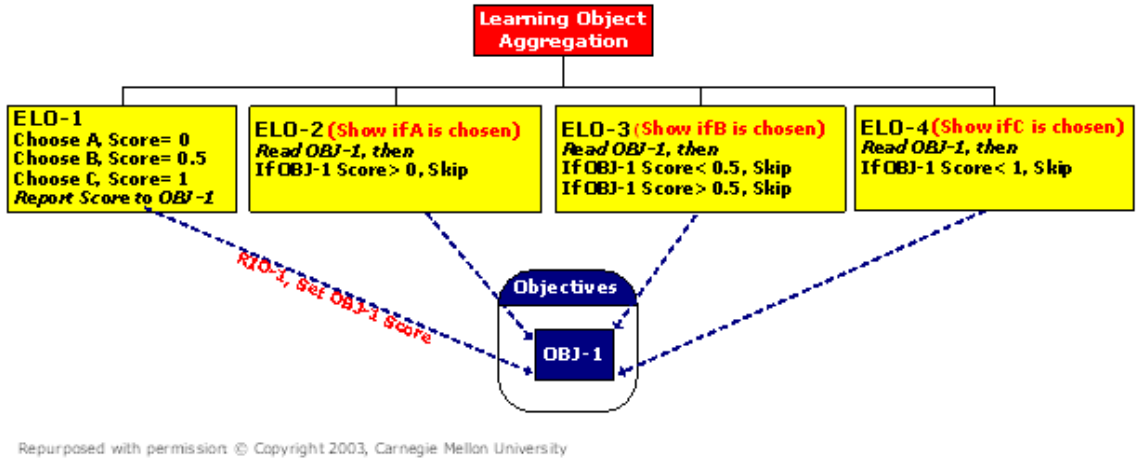
Example 8 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-3.	Learning Object Aggregation Rollup: If All Satisfied, satisfied. TLO-1: isRolledup=false ELO-3: isRolledup=true
The learner must complete TLO-1 before attempting ELO-3.	Learning Object Aggregation: Flow=true
The learner can return to ELO-1 from ELO-2 at any time.	TLO-1: Forward Only=false
To complete ELO-3, both objectives must be passed.	*No unique SCORM function*
If the learner fails OBJ-1 in ELO-3, then present ELO-1.	ELO-3: set OBJ-1 ELO-1: skip if OBJ-1 satisfied
If the learner fails OBJ-2 in ELO-3, then present ELO-2.	ELO-3: set OBJ-2 ELO-2: skip if OBJ-2 satisfied
Allow two attempts for ELO-1, ELO-2, and ELO-3.	ELO-1, ELO-2, ELO-3: Attempt Limit=2
If the learner fails ELO-3 on the second attempt, then halt the learner in training and require manual intervention.	*No unique SCORM function*

6.9.9. Example 9: Basic Three-Way Branching

Example 9 shows how you can use simple sequencing rules to accomplish basic adaptive inter-ELO sequencing that is similar to the branching you might have used in traditional CBT lessons. Based upon the learner's choice or decision, represented as a normalized score between –1 and +1, the learner would be directed to another ELO.

Suppose your "course" (the Learning Object Aggregation) is an adaptive scenario that teaches customer service skills. ELO-1 is the introductory scenario. After reading or viewing the scenario (ELO-1), the learner must make a decision about how to handle the situation with a particular customer. The learner chooses Choice B, which sets the ELO score for ELO-1 to 0.5. Based on the 0.5 ELO score, the learner is directed to ELO-3 for further instruction. This example could be replicated to create as many learner decision points as you desire. For more information on replicating the example, see Model 4. The rules for Example 9 (*Applications A* and *B*) have the same behaviors, but show two alternatives for programming the behaviors.

EXAMPLE 9: Basic Three-Way Branching



Example 9 Rules *(Application A)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass two ELOs (ELO-1 and the *one* other ELO that is chosen by the sequencer). Rule 2 will ensure that ELO-1 is one of the two that is completed.	Learning Object Aggregation: Completed if at least two children completed
The learner must do ELO-1 first.	Learning Object Aggregation: Flow=true; Forward Only=true
Based on the learner's performance on the pre-test, branch to only one of the other three ELOs.	Learning Object Aggregation: Choice=false ELO-1: set OBJ-1 ELO-2: skip if OBJ-1.score > 0 ELO-3: skip if OBJ-1.score < 0.5 or OBJ-1.score > 0.5 ELO-4: skip if OBJ-1.score < 1

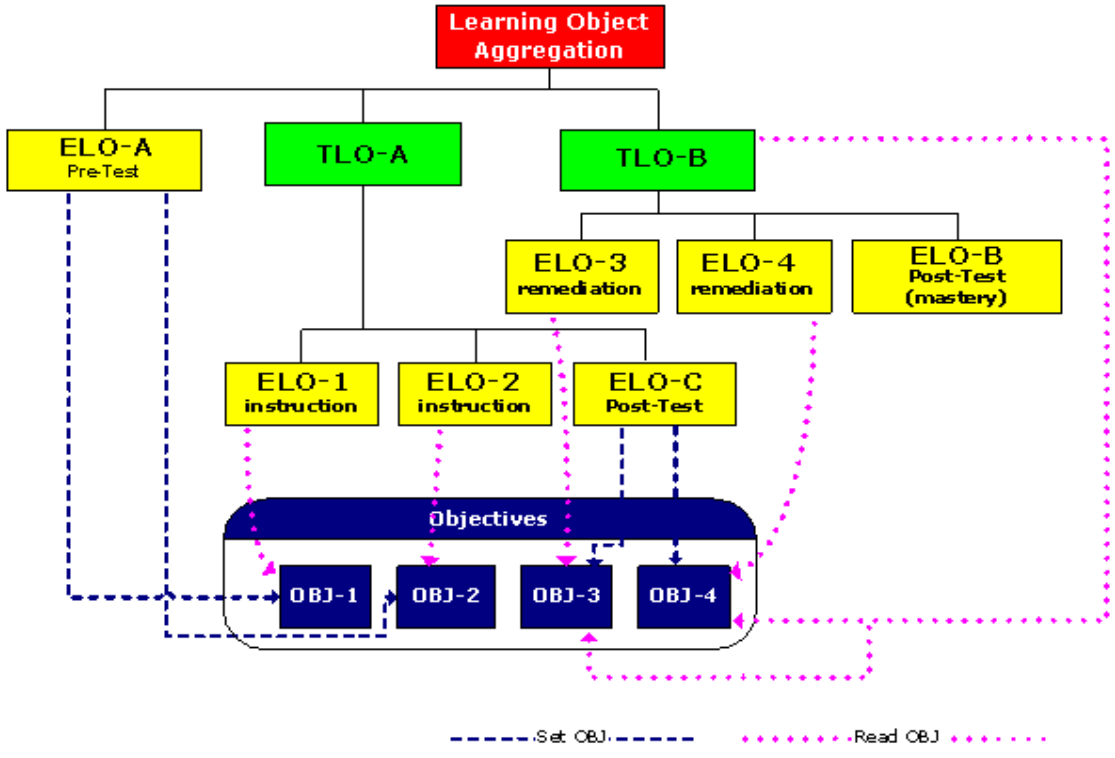
Example 9 Rules *(Application B)*:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass two ELOs (ELO-1 and the *one* other ELO that is chosen by the sequencer).	Learning Object Aggregation: At least two completed, completed
The learner must do ELO-1 first.	Learning Object Aggregation: Flow=true; Forward Only=true
Based on the learner's performance on the pre-test, branch to only one of the other three ELOs.	Learning Object Aggregation: Choice=false ELO-1: set OBJ-2, OBJ-3, OBJ-4 ELO-2: skip if OBJ-2 satisfied ELO-3: skip if OBJ-3 satisfied ELO-4: skip if OBJ-4 satisfied

6.9.10. Example 10: Pre- and Post-Test Sequencing with New Content for Remediation

Example 10 provides a more complex pre- and post-test structure that enables learners to remediate to content that is hidden until needed for remediation. Both the pre- and post-tests are required. Based on the learner's responses to the pre-test in ELO-A, OBJ-1 and OBJ-2 will be set to *passed* or *failed*. Assume the learner fails OBJ-2. A typical LMS will then show ELO-2 on a list. The learner will choose ELO-2 and then take a post-test (ELO-C) to ensure they understand the content from both ELOs 1 and 2. If the learner passes both OBJ-3 and OBJ-4 from ELO-C, then the learner will complete TLO-B, thereby completing the Learning Object Aggregation.

Assume the learner failed OBJ-4 in ELO-C. The LMS will present the learner with ELO-4. ELO-4 contains new instructional material (remediation) that is an enhancement of the content from ELO-2. Since the learner initially struggled with the content, and the learner is required to master the content, the learner must now pass the post-test in ELO-B to complete the Learning Object Aggregation. If the learner fails ELO-B, then the learner will be halted in training according to these rules. (You could also structure the rules such that the learner passed after a defined number of attempts.) If the learner passes the post-test in ELO-B, then the Learning Object Aggregation is considered complete.

EXAMPLE 10: Pre- and Post-Test Sequencing With New Content for Remediation



Example 10 Rules:	
Behavior	**SCORM Function**
To complete the Learning Object Aggregation, the learner must pass the post-test in ELO-C ***OR*** the post-test in ELO-B.	Learning Object Aggregation: Satisfied if one child satisfied ELO-A: isRolledup=false TLO-A: isRolledup=true TLO-B: isRolledup=true
The learner must complete the pre-test in ELO-A before attempting TLO-A. The learner cannot return to the Pre-Test from TLO-A.	Learning Object Aggregation: Choice=false; Flow=true; Forward Only=true
If the learner fails OBJ-1 in ELO-A, then present ELO-1.	ELO-A: set OBJ-1 ELO-1: skip if OBJ-1 satisfied
If the learner fails OBJ-2 in ELO-A, then present ELO-2.	ELO-A: set OBJ-2 ELO-2: skip if OBJ-2 satisfied
The learner can return to ELO-1 from ELO-2 at any time.	Learning Object Aggregation: Choice=true; Flow=true; Forward Only=false
To complete TLO-A, ELO-C must be passed.	ELO-1: isRolledup=false ELO-2: isRolledup=false TLO-A Rollup: If All Satisfied, satisfied.
The learner will skip TLO-B if TLO-A is passed.	TLO-B: skip if OBJ-1 satisfied and OBJ-2 satisfied
If the learner fails OBJ-3 in ELO-C, then present ELO-3.	ELO-C: set OBJ-3 ELO-3: skip if OBJ-3 satisfied
If the learner fails OBJ-4 in ELO-C, then present ELO-4.	ELO-C: set OBJ-4 ELO-4: skip if OBJ-4 satisfied
If the learner fails ELO-B, then the learner is halted in training and requires manual intervention.	*No unique SCORM function*

6.10. Building Instructional Models from the Examples

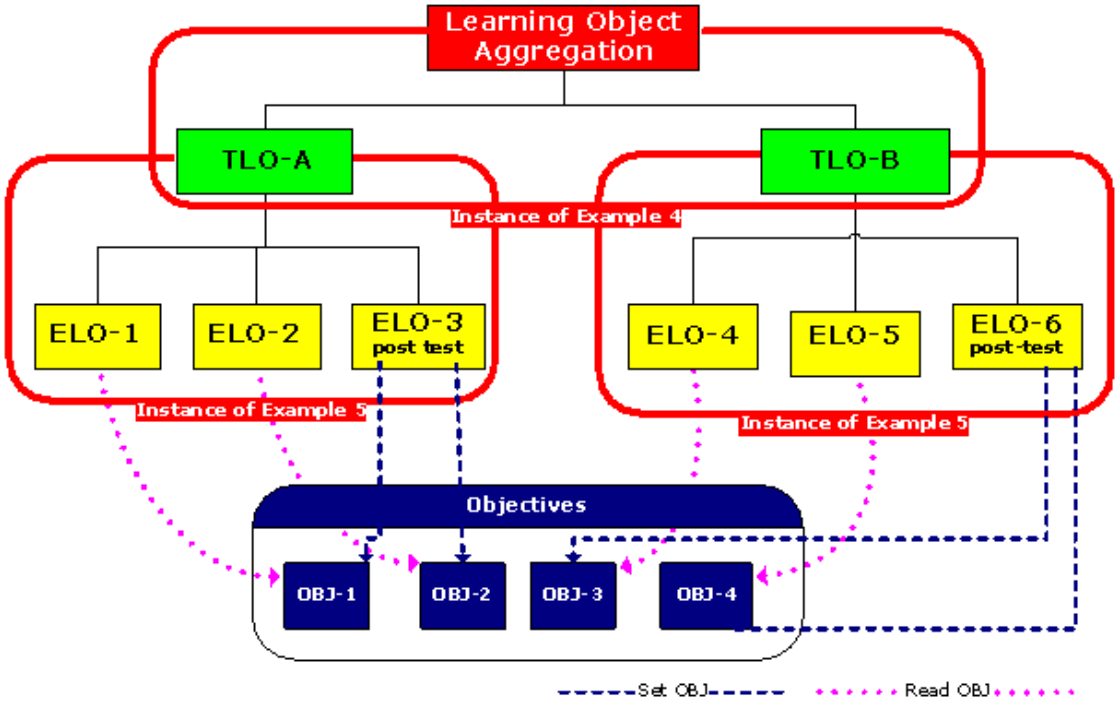
Any example or combination of examples can be “overlaid” on or combined with other examples, creating increasingly complex instructional strategies for courses or lessons. The models that follow show unique combinations of the examples presented in the previous section. The models show the reusability of the examples by labeling each as an instance of an example. In addition, the rules for each model specify from which example, as well as which application of the example, they were obtained. Depending upon how you apply behaviors and rules to the structures, you can achieve a variety of outcomes. These examples and models will provide you with viable sequencing options you can adapt to meet your particular training and educational requirements. For very complex instructional strategies, you can also apply any model or combination of models to another model as was done with the examples.

6.10.1. Model 1: Remediating Multiple TLOs

Model 1 represents two instances of Example 5 and once instance of Example 4. Example 4 contains two ELOs in a Learning Object Aggregation. For Model 1, the two ELOs are replaced by TLO-A and TLO-B that now represent the Learning Object Aggregation from Example 5. Each TLO contains three ELOs, one of which is a post-test. The inter-ELO remediation for each TLO is tracked by the LMS using objectives (OBJs) as global variables.

Each post-test item is linked to an OBJ. Based upon the learner’s response to the test item; the OBJ is either set to *passed* or *failed*. In this example, suppose the learner fails a test item in ELO-3. OBJ-1 would be set to *failed* and the LMS would show the learner ELO-1, the ELO that corresponds to OBJ-1. If the learner passes both test items in ELO-3, then the objectives would be set to *passed*, and the learner would proceed to TLO-B.

MODEL 1: Remediating Multiple RLOs



This guide shows two possible applications for Model 1, since each example used to create the model had two possible applications. However, the applications could be combined in any fashion resulting in several more applications for this one model. Suppose you want to create a "course" (the Learning Object Aggregation) with two units (TLO-A and TLO-B) each containing two lessons and a post-test (the ELOs). You want the learner to be remediated on a lesson-by-lesson basis, so you create test items tied to their corresponding instruction by objectives. If the learner fails one of the modules, the learner will not be able to complete the course without manual intervention. The rules for Model 1, *Application A* apply.

Model 1 Rules *(Application A)*:		
Behavior	**SCORM Function**	**FROM Example**
To complete the Learning Object Aggregation, the learner must complete TLO-A and TLO-B.	Learning Object Aggregation Rollup: If All Satisfied, satisfied	4 (A)
The learner cannot start TLO-B until TLO-A is complete.	TLO-A: Choice-false; Flow=true	4 (A)
To complete TLO-A, the learner must pass the post-test in ELO-3.	TLO-A Rollup: If All Satisfied, satisfied ELO-1: isRolledUp=false ELO-2: isRolledUp=false ELO-3: isRolledUp=true	5 (A)
The learner must complete ELO-1 before attempting ELO-2. The learner must complete ELO-2 before	TLO-A: Choice=false; Flow=true	5 (A)

Model 1 Rules *(Application A)*:		
attempting ELO-3.		
To complete ELO-3, both objectives must be passed.	*No unique SCORM function*	5 (A)
If the learner fails OBJ-1 in ELO-3, then present ELO-1.	ELO-3: set OBJ-1 ELO-1: skip if OBJ-1 satisfied	5 (A)
If the learner fails OBJ-2 in ELO-3, then present ELO-2.	ELO-3: set OBJ-2 ELO-2: skip if OBJ-2 satisfied	5 (A)
Allow two attempts for ELO-1, ELO-2, and ELO-3.	ELO-1, ELO-2, ELO-3: Attempt Limit=2	5 A)
If the learner fails ELO-3 on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	5 (A)
To complete TLO-B, the learner must pass the post-test in ELO-6.	TLO-B Rollup: If All Satisfied, satisfied ELO-4: isRolledUp=false ELO-5: isRolledUp=false ELO-6: isRolledUp=true	5 (A)
The learner must complete ELO-4 before attempting ELO-5. The learner must complete ELO-5 before attempting ELO-6.	TLO-B: Choice=false; Flow=true	5 (A)
To complete ELO-6, both objectives must be passed.	*No unique SCORM function*	5 (A)
If the learner fails OBJ-3 in ELO-6, then present ELO-4.	ELO-6: set OBJ-3 ELO-4: skip if OBJ-3; Flow=true	5 (A)
If the learner fails OBJ-4 in ELO-6, then present ELO-5.	ELO-6: set OBJ-4 ELO-5: skip if OBJ-4; Flow=true	5 (A)
Allow two attempts for ELO-4, ELO-5, and ELO-6.	ELO-4, ELO-5, ELO-6: Attempt Limit=2	5 (A)
If the learner fails ELO-6 on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	5 (A)

Now, suppose you want to use discovery learning to teach the learner how to start a gas turbine engine. You want to slightly restrict the learner's control because the content includes two types of learning. Assume TLO-A presents knowledge-based information about the gas turbine engine and tests the learner's knowledge of the components. Assume TLO-B shows two different procedures for starting the gas turbine engine (ELO-4 and ELO-5). The learner can select the TLOs in any order, since they can start the gas turbine engine before completing the basic instruction, but the learner has to see both TLOs in order to complete the course.

In TLO-A, the learner can select the presentation order of the ELOs or take the post-test in TLO-A at any time because the order in which the materials are presented is not crucial to understanding the instruction. Since TLO-B teaches a procedure, the learner must see the procedures in a predefined order, so ELO-4 is presented before ELO-5 and ELO-5 before ELO-6 (the post-test simulation). The rules for Model 1, *Application B* apply to this example.

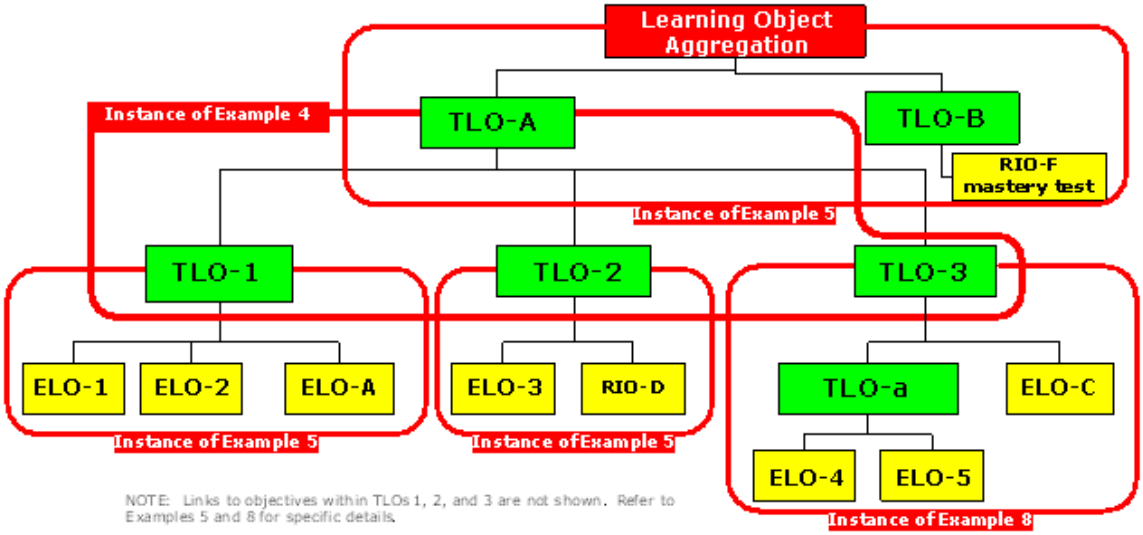
Model 1 Rules *(Application B)*:		
Behavior	**SCORM Function**	**FROM Example**
To complete the Learning Object Aggregation, the learner must complete TLO-A and TLO-B.	Learning Object Aggregation Rollup: If All Satisfied, satisfied	4 (B)
To complete each TLO, the learner must complete the post-tests within the TLOs. (See rules 4 and 9).	*No unique SCORM function*	4 (B)
The learner can view the TLOs in any order.	Learning Object Aggregation: Choice=true; Flow=true	4 (B)

Model 1 Rules *(Application B)*:		
To complete TLO-A, the learner must pass the post-test in ELO-3.	TLO-A Rollup: If All Satisfied, satisfied ELO-1: isRolledup=false ELO-2: isRolledup=false ELO-3: isRolledup=true	5 (B)
The learner can complete the ELOs in any order.	TLO-A: Choice=true; Flow=true	5 (B)
If the learner fails OBJ-1 in ELO-3, then present ELO-1.	ELO-3: set OBJ-1 ELO-1: skip if OBJ-1 satisfied	5 (B)
If the learner fails OBJ-2 in ELO-3, then present ELO-2.	ELO-3: set OBJ-2 ELO-2: skip if OBJ-2 satisfied	5 (B)
Allow as many attempts as needed to complete ELO-3.	*No unique SCORM function*	5 (B)
To complete TLO-B, the learner must pass the post-test in ELO-6.	TLO-B Rollup: If All Satisfied, satisfied ELO-4: isRolledup=false ELO-5: isRolledup=false ELO-6: isRolledup=true	5 (A)
The learner must complete ELO-4 before attempting ELO-5. The learner must complete ELO-5 before attempting ELO-6.	Learning Object Aggregation: Choice=false; Flow=true	5 (A)
To complete ELO-6, both objectives must be passed.	*No unique SCORM function*	5 (A)
If the learner fails OBJ-3 in ELO-6, then present ELO-4.	ELO-6: set OBJ-3 ELO-4: skip if OBJ-3 satisfied	5 (A)
If the learner fails OBJ-4 in ELO-6, then present ELO-5.	ELO-6: set OBJ-4 ELO-5: skip if OBJ-4 satisfied	5 (A)
Allow two attempts for ELO-4, ELO-5, and ELO-6.	ELO-4, ELO-5, ELO-6: Attempt Limit=2	5 (A)
If the learner fails ELO-6 on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	5 (A)

6.10.2. Model 2: Mastery Testing Multiple TLOs

Model 2 demonstrates how Examples 4 and 5 can be combined into multiple assessed TLOs with a mastery test (ELO-F) for the entire Learning Object Aggregation. The links to objectives for remediation within TLOs 1, 2, and 3 are not shown in this model, but they are identical to those shown in Example 5.

MODEL 2: Mastery Testing Multiple RLOs



Suppose you wanted to create a course (the Learning Object Aggregation) with several critical lessons (TLOs 1 – 3). Each lesson builds upon the instruction of the previous lesson, so the lessons must be completed in order. Each of the lessons has several objectives (the ELOs) that are tested and remediated independently. You decide to allow the learner two attempts in each lesson to pass the post-test by providing remediation between the attempts. If the learner successfully passes each of the lessons (thereby completing TLO-A), then you allow the learner to attempt the mastery test (ELO-F) in TLO-B. If the learner passes the mastery test, then you consider the course complete. However, since each of the lessons are critical, if the learner cannot pass one of the lessons (TLOs 1 – 3) after two attempts, you decide they should be automatically halted in training and require manual intervention to proceed. The rules for Model 2 would apply.

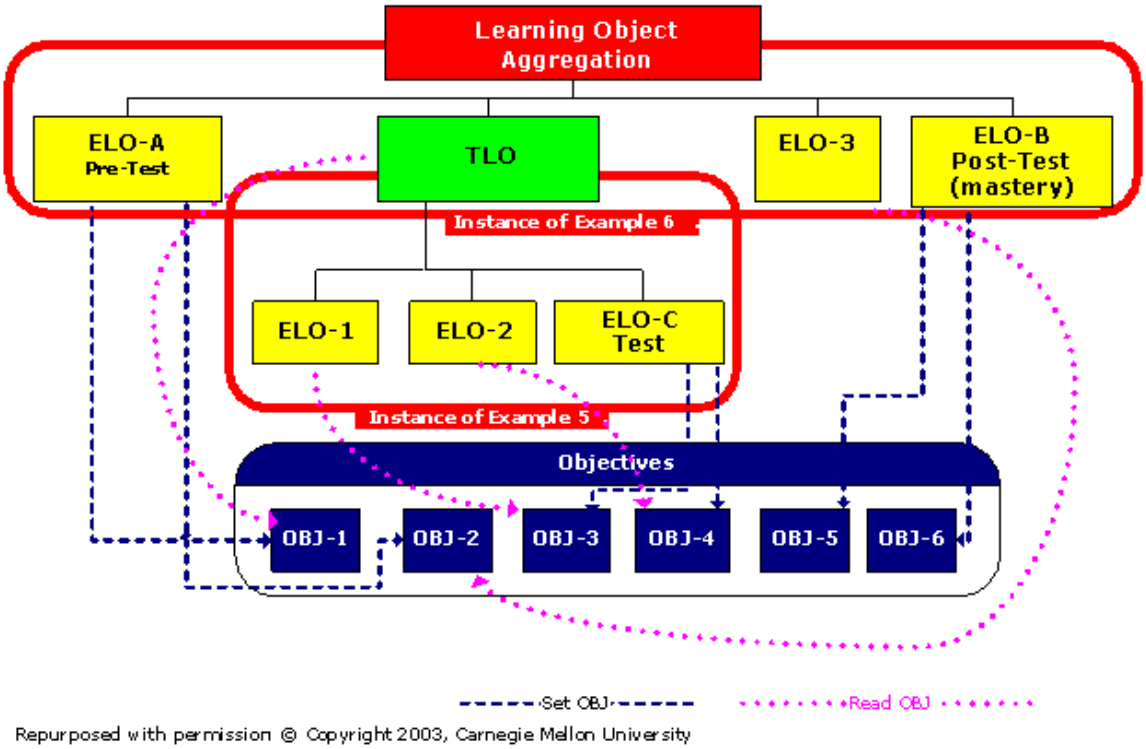
Model 2 Rules:		
Behavior	**SCORM Function**	**FROM Example**
To complete the Learning Object Aggregation, the learner must pass the mastery test (ELO-F) in TLO-B.	Learning Object Aggregation Rollup: If All Satisfied, satisfied TLO-A: isRolledup=false TLO-B: isRolledup=true	5 (A)

Model 2 Rules:		
The learner must complete TLO-A before attempting TLO-B.	Learning Object Aggregation: Choice=false; Flow=true	5 (A)
To complete TLO-A, the learner must complete TLO-1, TLO-2, and TLO-3 in order.	TLO A: Choice=false; Flow=true	4 (A)
To complete TLO-1, the learner must pass the post-test in ELO-A.	TLO-1 Rollup: If All Satisfied, satisfied ELO-1: isRolledup=false ELO-2: isRolledup=false ELO-A: isRolledup=true	5 (A)
The learner must complete ELO-1 before attempting ELO-2. The learner must complete ELO-2 before attempting ELO-A.	TLO-1: Choice=false; Flow=true	5 (A)
The learner can return to ELO-1 from ELO-2 at any time.	TLO-1: Forward Only=false	5 (A)
The learner cannot return to ELO-1 or ELO-2 once TLO-a is attempted.	TLO-1: Forward Only=true	5 (A)
If the learner fails OBJ-1 in ELO-A, then present ELO-1.	ELO-A: set OBJ-1 ELO-1: skip if OBJ-1 satisfied	5 (A)
If the learner fails OBJ-2 in ELO-A, then present ELO-2.	ELO-A: set OBJ-2 ELO-2: skip if OBJ-2 satisfied	5 (A)
Allow two attempts for ELO-1, ELO-2, and ELO-A.	ELO-1, ELO-2, ELO-A: Attempt Limit=2	5 (A)
If the learner fails ELO-A on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	5 (A)
To complete TLO-2, the learner must pass the post-test in ELO-D.	TLO-2 Rollup: If All Satisfied, satisfied ELO-3: isRolledup=false ELO-D: isRolledup=true	5 (A)
The learner must complete ELO-3 before attempting ELO-D.	TLO-2: Choice=false; Flow=true	5 (A)
The learner cannot return to ELO-3 once ELO-D is attempted.	TLO-2: Forward Only=true	5 (A)
If the learner fails OBJ-3 in ELO-D, then present ELO-3.	ELO-D: set OBJ-3 ELO-3: skip if OBJ-3 satisfied	5 (A)
Allow two attempts for ELO-3 and ELO-D.	ELO-3, ELO-D: Attempt Limit=2	5 (A)
If the learner fails ELO-D on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	5 (A)
To complete TLO-3, the learner must pass the post-test in ELO-C.	TLO-3 Rollup: If All Satisfied, satisfied TLO-a: isRolledup=false ELO-C: isRolledup=true	8
The learner must complete TLO-a before attempting ELO-C.	TLO-3: Choice=false; Flow=true	8
The learner can return to ELO-4 from ELO-5 at any time.	TLO-a: Forward Only=false	8
If the learner fails OBJ-4 in ELO-C, then present ELO-4.	ELO-C: set OBJ-4 ELO-4: skip if OBJ-4 satisfied	8
If the learner fails OBJ-5 in ELO-C, then present ELO-5.	ELO-C: set OBJ-5 ELO-5: skip if OBJ-5 satisfied	8
Allow two attempts for ELO-4, ELO-5, and ELO-C.	ELO-4, ELO-5, ELO-C: Attempt Limit=2	8
If the learner fails ELO-C on attempt 2, the learner is halted in training and requires manual intervention.	*No unique SCORM function*	8

6.10.3. Model 3: Pre- and Post-Test Sequencing with TLOs

Model 3 is a combination of Examples 5 and 6. In this model, a single ELO from Example 6 was replaced with the Learning Object Aggregation from Example 5. That Learning Object Aggregation is now TLO-B.

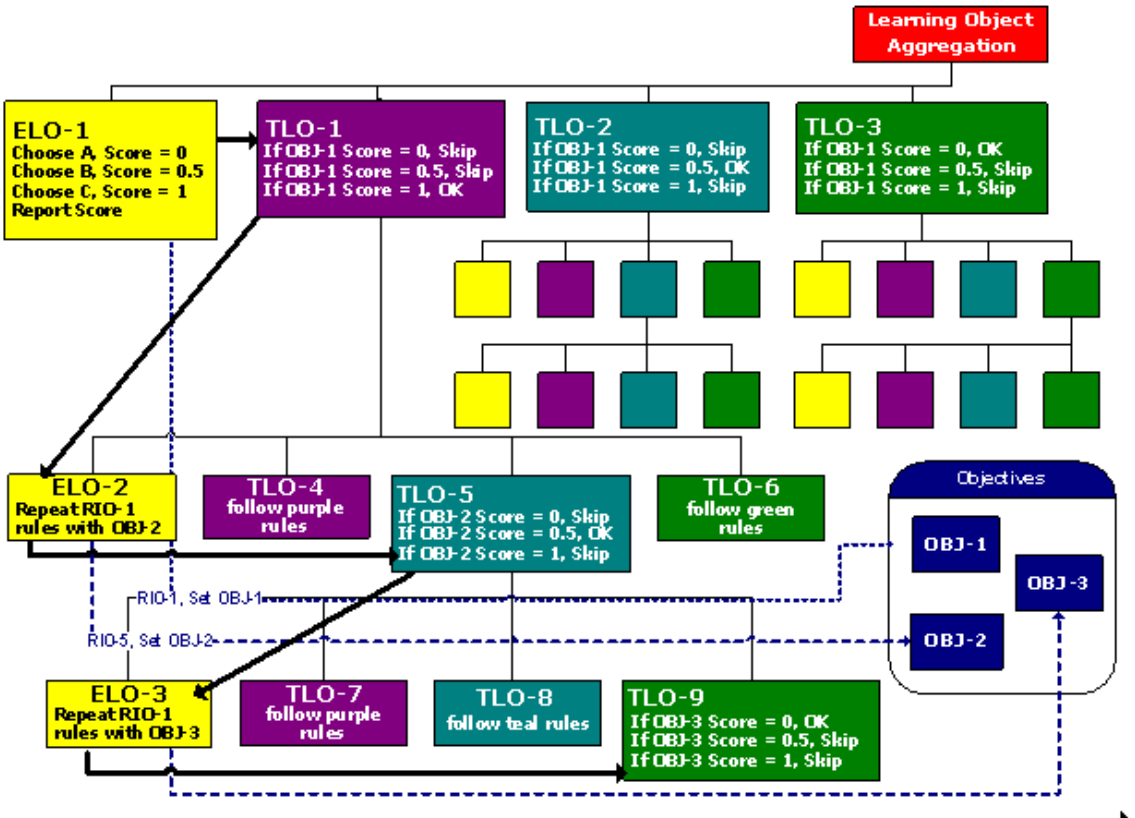
MODEL 3: Pre- and Post-Test Sequencing with RLOs



6.10.4. Model 4: Assigning Competencies

Suppose you need to create a course (the Learning Object Aggregation) that assigns competencies (knowledge, skills, or abilities) to the learner upon successful completion.

Model 4: Traditional CBT Branching with Multiple Decisions



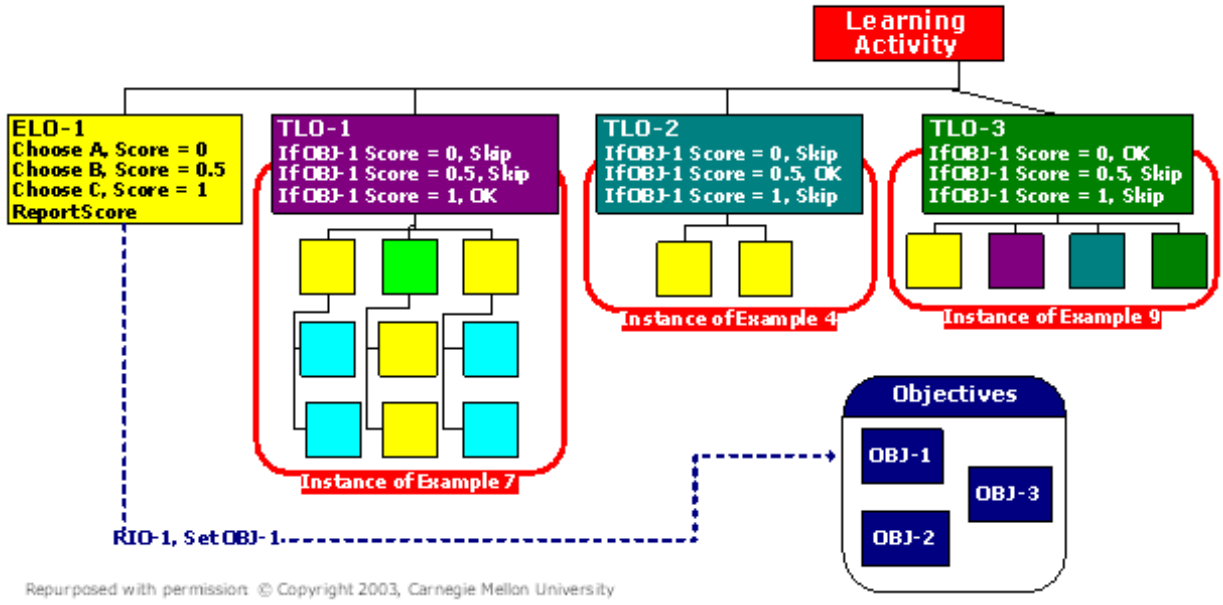
6.10.5. Model 5: Customized Learning Using Three-Way Branching

This model shows how the initial level of Model 4 (or Example 9) can be used to customize learning experiences by presenting learners with a series of choices about who they are, what they do, or what they know. The choices for this type of customization would be predefined learner roles, positions, or competencies.

Using the Apprentice Trainer example presented in Model 4, the learner could select *Becoming a Qualified Workplace Trainer*, *Effective Communication*, or *The Learning Experience*. Based on the role the learner selects in ELO-1, TLO-1, TLO-2, and TLO-3 would represent different content structures for the three different lessons. Model 5 could remain 3-way branching examples (as show in Model 4) or it could become TLOs of the other examples presented in this guide, thereby giving each role a unique instructional strategy. For Model 5, we've shown the latter using other examples presented in this guide.

Let's assume TLO-1, shown in purple, contains the content for a *Becoming a Qualified Workplace* Trainer. TLO-1 is an instance of Example 7. It has a pre-test, content, and a post-test, since Apprentice Trainers may be required to see all activities in a strictly prescribed sequence and must show mastery of the content. TLO-2 is an instance of Example 4 that was designed specifically for *Effective Communication*. A Trainee might be able to choose the activities she wants to see, since she already has advanced product knowledge. TLO-3 was designed for *The Learning Experience*. It reuses the Example 9 for 3-way branching (like in Model 4) to question Trainees about their knowledge and to target areas where they need improvement.

Model 5: Customized Learning Using 3-Way Branching



Model 5 can be recreated for customized learning using any of the example or models in this guide. You can also create your own unique content structure.

6.11. APPENDIX I: SkillObject Graphics

6.11.1. The Object Relationship

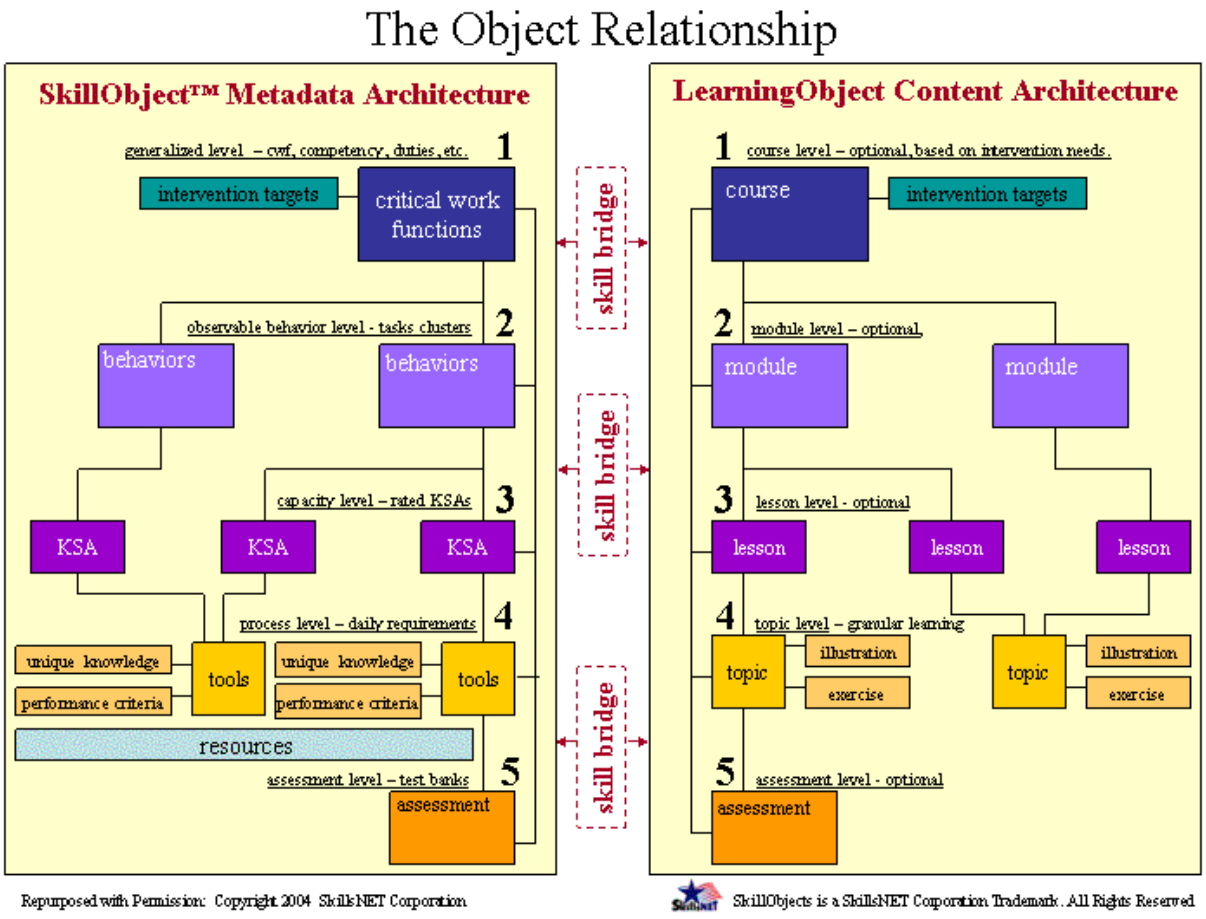


Figure 5: The Object Relationship

6.11.2. Intelligent Training Network

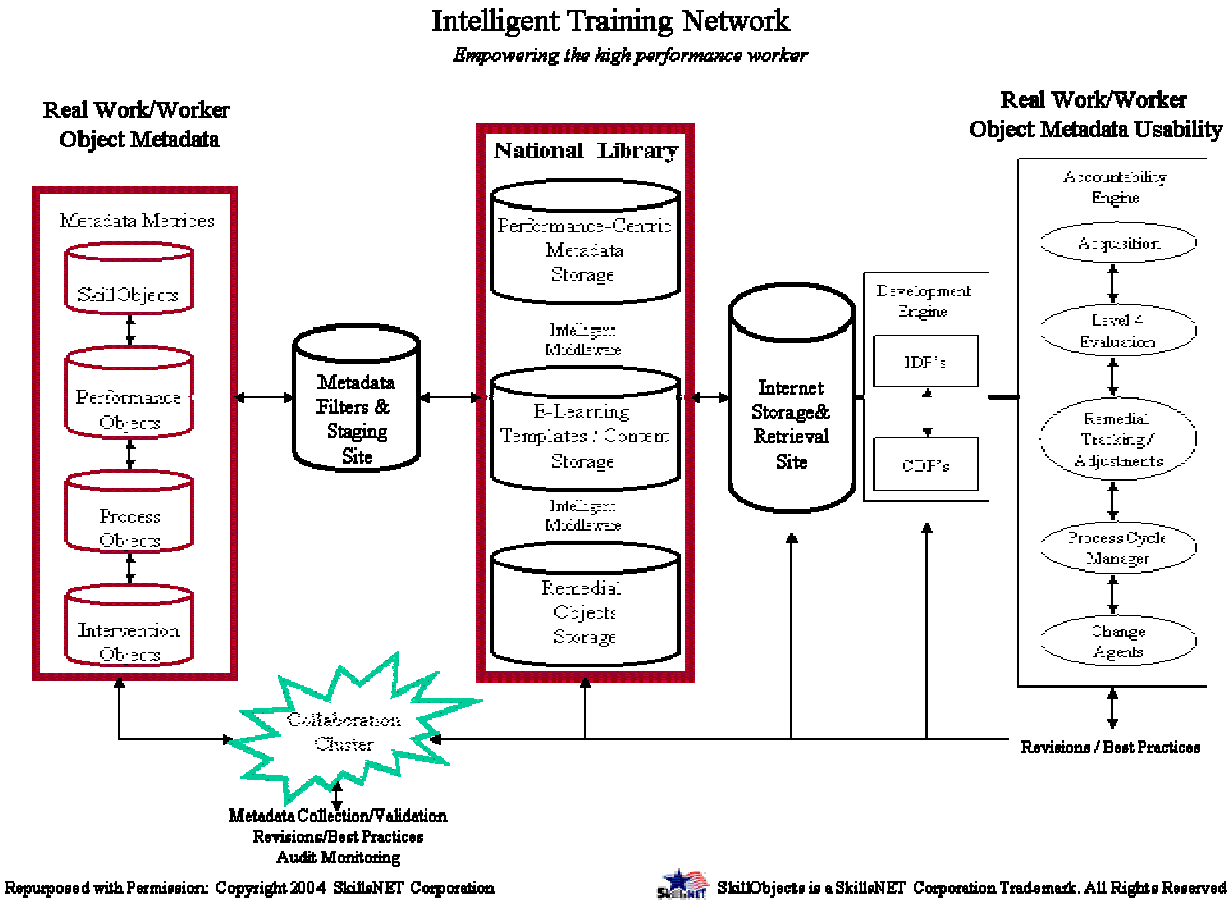


Figure 6: Intelligent Training Network

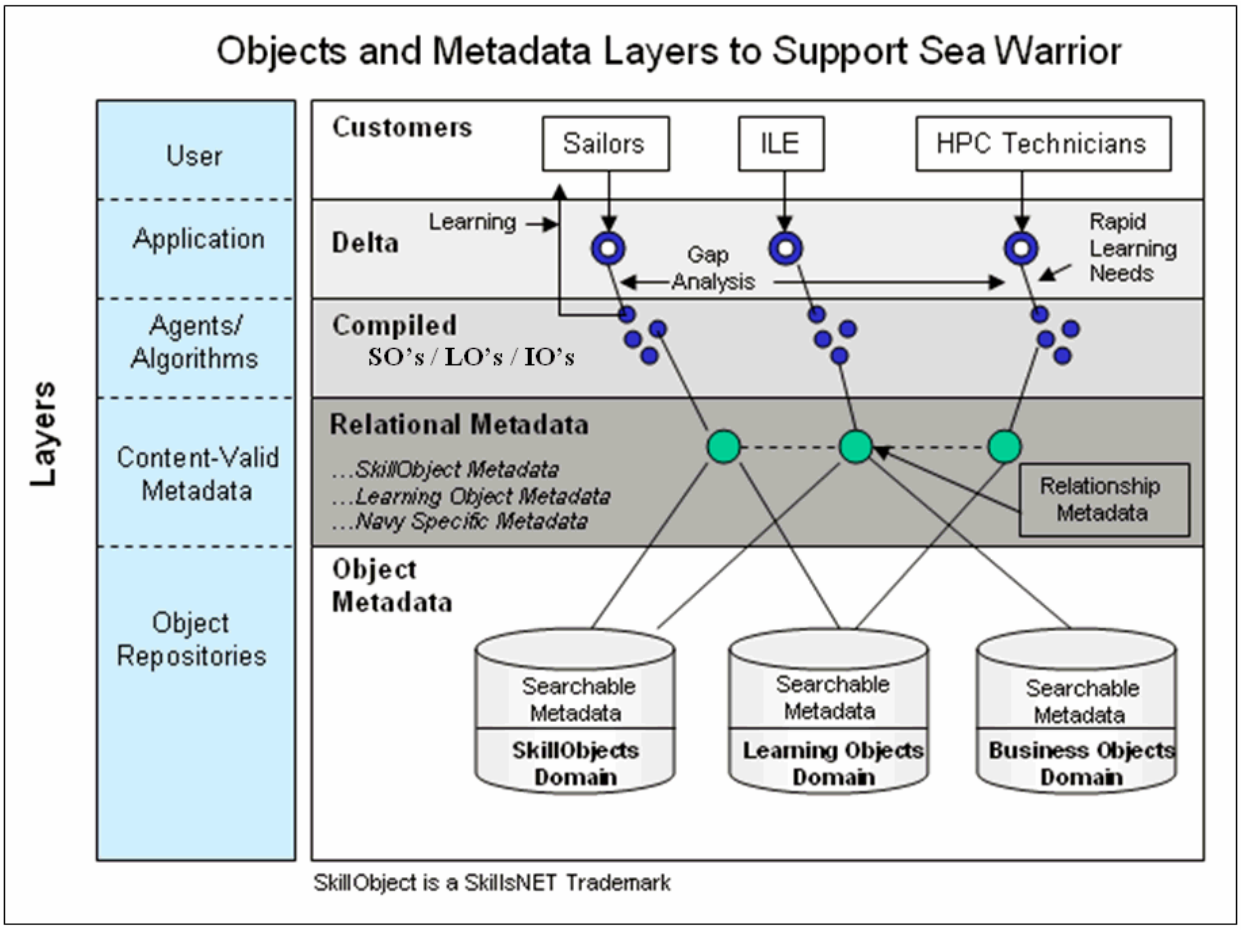


Figure 7: SkillObject Metadata

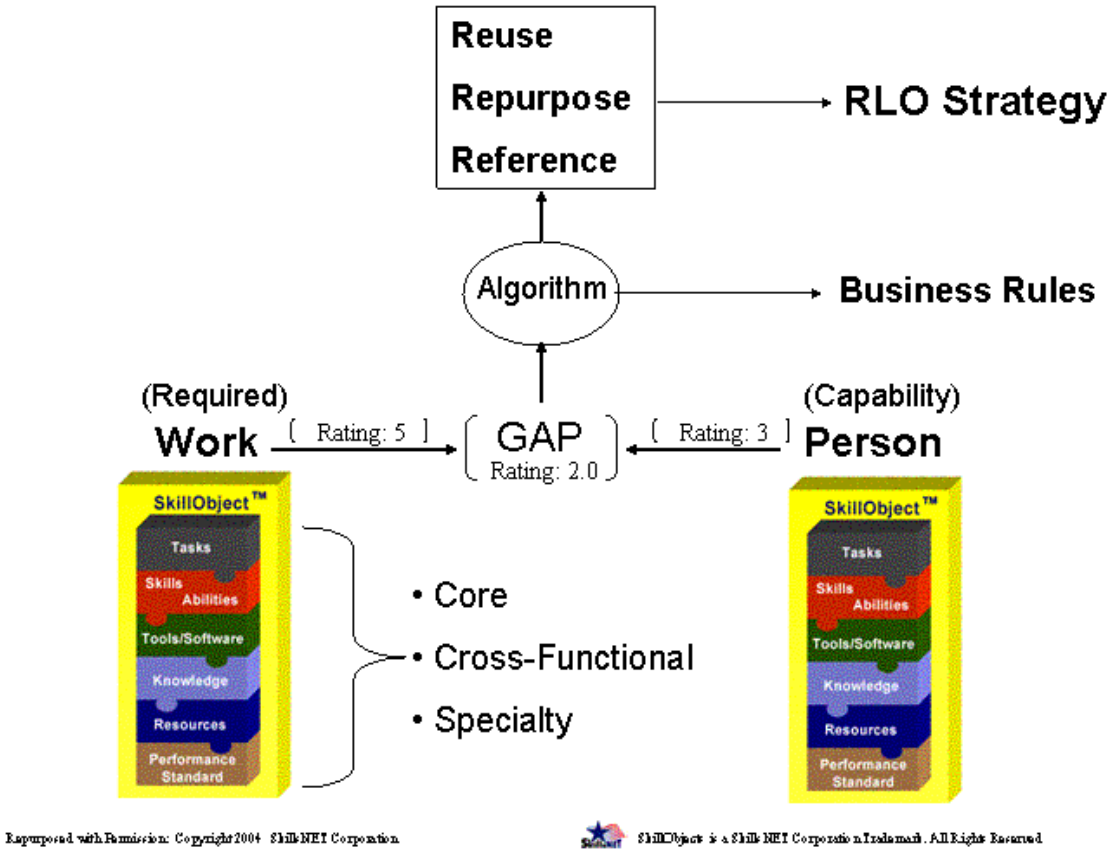


Figure 8: Work-Sailor Gap

6.12. APPENDIX J: SkillsNET Taxonomies

6.12.1. The Taxonomy of Knowledge

1.	**Administration and Management**	a. Business Administration	e. Food Service and Lodging Management
		b. Construction Management	f. Medical Service Management
		c. Engineering	g. Public Administration
		d. Mathematical and Sciences Management	
2.	**Clerical**	a. Banking Support	g. Medical Secretarial
		b. Bookkeeping	h. Office Clerical
		c. Computer Operations	i. Receptionist
		d. Data Entry	j. Stenography
		e. Health Unit Coordinating	k. Stock and Warehousing
		f. Legal Secretarial	
3.	**Economics and Accounting**	a. Accounting	c. Financial Management
		b. Economics	d. Securities and Investments
4.	**Sales and Marketing**	a. Advertising and Public Relations	f. Real Estate
		b. Fashion and Apparel	g. Retailing and Wholesaling
		c. Food Marketing	h. Vehicle Sales and Service
		d. Insurance	i. Food Service
		e. Purchasing	
5.	**Customer and Personal Service**	a. Barbering and Cosmetology	g. Hospitality Service
		b. Bartending	h. Housekeeping and Custodial
		c. Cashiering	i. Laundry and Dry Cleaning
		d. Child Care and Home Management	j. Meat Cutting and Butchering
		e. Flight Attending	k. Travel Service
		f. Food Preparation	
6.	**Personnel and Human Resources**	a. Human Resources Management	d. Management Analysis
		b. Interviewing and Hiring	e. Personnel Research
		c. Labor Relations	f. Training
7.	**Production and Processing**	a. Production	e. Metal Production and Processing
		b. Processing and Production	f. Printing and Publishing
		c. Furnishing Production	g. Quality Control and Inspection
		d. Supervision	
8.	**Food Production**	a. Agricultural and Business Management	e. Crop Production
		b. Agricultural Sciences	f. Fishing and Wildlife Management
		c. Animal Husbandry and Production	g. Food Sciences
		d. Animal Sciences	
9.	**Computers and Electronics**	a. Computer Programming	d. Electrical and Electronics Technology
		b. Computer Science	e. Systems Analysis
		c. Computer Technology	
10.	**Engineering and Technology**	a. Aeronautical and Aerospace Engineering	f. Materials Engineering
		b. Chemical Engineering	g. Mechanical Engineering
		c. Civil Engineering	h. Mining, Petroleum, and Nuclear Engineering
		d. Electrical Engineering	
		e. Industrial Engineering	i. Surveying
11.	**Design and Architecture**	a. Architecture	d. Interior Design
		b. Drafting	e. Technical Theater Design
		c. Industrial Design	
12.	**Building and Construction**	a. Bricklaying	f. Drywall and Plaster

		b. Carpentry	g. Electrical Power
		c. Concrete	h. Painting and Paperhanging
		d. Construction and Building Inspections	i. Plumbing
		e. Construction Equipment Operations	j. Structural Metal
13.	**Mechanical**	a. Agricultural Mechanics	f. Engine Repair
		b. Aircraft Mechanics	g. Heavy Equipment Repair
		c. Appliance Repair	h. Instrument Repair
		d. Automobile Mechanics	i. Light Equipment Repair
		e. Building Maintenance	
14.	**Mathematics**	a. Accounting	d. Operations Research
		b. Actuarial Sciences	e. Statistics
		c. Applied Mathematics	
15.	**Physics**	a. Astronomy	f. Geology
		b. Astrophysics	g. Nuclear Physics
		c. Atmospheric Sciences and Meteorology	h. Oceanography
		d. Earth and Planetary Sciences	i. Optics and Acoustics
		e. General Physics	
16.	**Chemistry**	a. Analytical Chemistry	e. Organic Chemistry
		b. Biochemistry	f. Physical and Theoretical Chemistry
		c. Inorganic Chemistry	g. Polymer Chemistry
		d. Medicinal and Pharmaceutical Chemistry	
17.	**Biology**	a. Biochemistry	f. Marine and Aquatic Biology
		b. Botany	g. Microbiology and Bacteriology
		c. Cell and Molecular Biology	h. Nutritional Science
		d. Ecology	i. Physiology
		e. Genetics	j. Zoology
18.	**Psychology**	a. Clinical Psychology	f. Experimental Psychology
		b. Cognitive Psychology	g. Industrial/Organizational Psychology
		c. Community Psychology	h. Physiological/Biological Psychology
		d. Counseling Psychology	i. Social Psychology
		e. Developmental Psychology	
19.	**Sociology and Anthropology**	a. Anthropology	d. Sociology
		b. Criminology	e. Urban Affairs
		c. Demography and Population	
20.	**Geography**	a. Cartography	b. Geography
21.	**Medicine and Dentistry**	a. Chiropractic	f. Pharmacology
		b. Community and Home Health	g. Psychiatric and Mental Health Counseling
		c. Dentistry	h. Speech Pathology and Audiology
		d. Medicine	i. Surgery
		e. Nursing	j. Veterinary Medicine
22.	**Therapy and Counseling**	a. Educational Counseling	e. Recreational Therapy
		b. Occupational Therapy	f. Speech Pathology and Audiology
		c. Physical Therapy	g. Social Work
		d. Psychiatric and Mental Health Counseling	h. Vocational Counseling
23.	**Education and Training**	a. Educational Administration	f. College and University Education
		b. Instructional Design	g. Special Education
		c. Pre-School Education	h. Adult and Continuing Education
		d. Elementary Education	i. Professional Training
		e. Secondary and Vocational Education	
24.	**English Languages**	a. Editing	d. Journalistic Writing
		b. English Literature	e. Linguistics

		c. Creative Writing	f. Technical and Business Writing
25.	**Foreign Languages**	a. Foreign Language Interpretation	d. Linguistics
		b. Foreign Language Literature	e. Specific Languages
		c. Foreign Language Translation	
26.	**Fine Arts**	a. Arts and Crafts	d. Film-Video Making and Cinematography
		b. Dance	e. Music
		c. Dramatic and Theatrical Arts	f. Photography
27.	**History and Archeology**	a. African History	e. European History
		b. American History	f. General History
		c. Archeology	g. History of Science and Technology
		d. Asian History	
28.	**Philosophy and Theology**	a. Ministry	d. Philosophy
		b. Missions and Missionary Studies	e. Religious Education
		c. Pastoral Counseling	f. Theology
29.	**Public Safety and Security**	a. Corrections	e. Military Technologies
		b. Criminal Investigation	f. Police Patrol
		c. Fire Fighting	g. Security Services
		d. Fire Inspection and Investigation	
30.	**Law, Government, and Jurisprudence**	a. Jurisprudence	c. Paralegal and Legal Support Services
		b. Legal Representation	d. Political Science and Government
31.	**Telecommunications**	a. Central Office and Switches	c. Radio and Television Broadcasting Tech
		b. Electrical and Electronics Engineering	d. System Installation and Repair
32.	**Communications and Media**	a. Archival Science	e. Printing and Publishing
		b. Creative Writing	f. Radio and Television Broadcasting
		c. Journalism	g. Technical and Business Writing
		d. Library Science	
33.	**Transportation**	a. Airplane Piloting	d. Truck and Bus Transportation
		b. Air Traffic Control	e. Water Transportation
		c. Railroad Operations	

6.12.2. The Taxonomy of Resources

1.	**Policy Documents**	a. Guiding Instructions
		b. Doctrine
		c. Regulatory
		d. Standards
		e. Standard Operating Procedures
2.	**Technical Documents**	a. Equipment Specific Manuals
		b. Computer Based
		c. Blueprints
		d. Schematics
		e. Procedural Manuals
		f. Users Guides
		g. Maintenance Requirements
		h. Checklists
		i. Charts
3.	**Training Documents**	a. Training Manuals
		b. Handbooks
		c. Guidelines
4.	**Manpower/Material Documents**	a. Equipment/Resource Listings
		b. Personnel/Manpower
5.	**General Informational Documents**	a. Handbooks
		b. Messages
		c. Informational Manuals/Books
		d. Websites
		e. Plans
6.	**Administrative Documentation**	a. Administrative Manuals
		b. Forms
		c. Records
		d. Catalogs
		e. Qualifications
7.	**External Organization**	a. Military
		b. Civilian

6.12.3. The Taxonomy of Skills

Content Skills	1. Reading Comprehension	Understanding written sentences and paragraphs in work related documents.
	2. Active Listening	Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
	3. Writing	Communicating effectively in writing as appropriate for the needs of the audience.
	4. Speaking	Talking to others to convey information effectively.
	5. Mathematics	Using mathematics to solve problems.
	6. Science	Using scientific rules and methods to solve problems.
Process Skills	7. Critical Thinking	Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions or approaches to problems.
	8. Active Learning	Understanding the implications of new information for both current and future problem-solving and decision-making.
	9. Learning Strategies	Selecting and using training/instructional methods and procedures appropriate for the situation when learning or teaching new things.
	10. Monitoring	Monitoring/assessing performance of yourself, other individuals, or organizations to make improvements or take corrective action.
Social Skills	11. Social Perceptiveness	Being aware of others' reactions and understanding why they react as they do.
	12. Coordination	Adjusting actions in relation to others' actions.
	13. Persuasion	Persuading others to change their minds or behavior.
	14. Negotiation	Bringing others together and trying to reconcile differences.
	15. Instructing	Teaching others how to do something.
	16. Service Orientation	Actively looking for ways to help people.
Complex Problem Solving Skills	17. Problem Identification	Identifying the nature of problems.
	18. Information Gathering	Knowing how to find information and identifying essential information.
	19. Information Organization	Finding ways to structure or classify multiple pieces of information.
	20. Synthesis Reorganization	Reorganizing information to get a better approach to problems or tasks.
	21. Idea Generation	Generating a number of different approaches to problems.
	22. Idea Evaluation	Evaluating the likely success of an idea in relation to the demands of the situation.
	23. Implementation Planning	Developing approaches for implementing an idea.
	24. Solution Appraisal	Observing & evaluating the outcomes of a problem solution to identify lessons learned or redirect efforts.
Technical Skills	25. Operations Analysis	Analyzing needs and product requirements to create a design.
	26. Technology Design	Generating or adapting equipment and technology to serve user needs.
	27. Equipment Selection	Determining the kind of tools and equipment needed to do a job.
	28. Installation	Installing equipment, machines, wiring, or programs to meet specifications.
	29. Programming	Writing computer programs for various purposes.
	30. Testing	Conducting tests to determine whether equipment, software, or procedures are operating as expected.
	31. Operations Monitoring	Watching gauges, dials, or other indicators to make sure a machine is working properly.
	32. Operation and Control	Controlling operations of equipment or systems.
	33. Product Inspection	Inspecting and evaluating the quality of products.

	34.	Equipment Maintenance	Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
	35.	Troubleshooting	Determining causes of operating errors and deciding what to do about it.
	36.	Repairing	Repairing machines or systems using the needed tools.
Systems Skills	37.	Visioning	Developing an image of how a system should work under ideal conditions.
	38.	Systems Perceptions	Determining when important changes have occurred in a system or are likely to occur.
	39.	Identification of Downstream Consequences	Determining the long-term outcomes of a change in operations.
	40.	Identification of Key Causes	Identifying the things that must be changed to achieve a goal.
	41.	Judgment and Decision Making	Considering the relative costs and benefits of potential actions to choose the most appropriate one.
	42.	Systems Evaluation	Looking at many indicators of system performance, taking into account their accuracy.
Resource Management Skills	43.	Time Management	Managing one's time and the time of others.
	44.	Management of Financial Resources	Determining how money will be spent to get the work done, and accounting for these expenditures.
	45.	Management of Material Resources	Obtaining and seeing to the appropriate use of equipment, facilities, and materials needed to do certain work.
	46.	Management of Personnel Resources	Motivating, developing, and directing people as they work, identifying the best people for the job.

6.12.4. The Taxonomy of Abilities

Verbal Abilities	1. Oral Comprehension	The ability to listen to and understand information and ideas presented through spoken words and sentences.
	2. Written Comprehension	The ability to read and understand information and ideas presented in writing.
	3. Oral Expression	The ability to communicate information and ideas in speaking so others will understand.
	4. Written Expression	The ability to communicate information and ideas in writing so others will understand.
Idea Generation and Reasoning Abilities	5. Fluency of Ideas	The ability to come up with a number of ideas about a topic (the *number* of ideas is important, not their quality, correctness, or creativity).
	6. Originality	The ability to come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.
	7. Problem Sensitivity	The ability to tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
	8. Deductive Reasoning	The ability to apply general rules to specific problems to produce answers that make sense.
	9. Inductive Reasoning	The ability to combine pieces of information to form general rules or conclusions (includes finding a relationship among seemingly unrelated events).
	10. Information Ordering	The ability to arrange things or actions in a certain order or pattern according to a specific rule or set of rules (e.g., patterns of numbers, letters, words, pictures, mathematical operations).
	11. Category Flexibility	The ability to generate or use different sets of rules for combining or grouping things in different ways.
Quantitative Abilities	12. Mathematical Reasoning	The ability to choose the right mathematical methods or formulas to solve a problem.
	13. Number Facility	The ability to add, subtract, multiply, or divide quickly and correctly.
Memory Abilities	14. Memorization	The ability to remember information such as words, numbers, pictures, and procedures.
Perceptual Abilities	15. Speed of Closure	The ability to quickly make sense of, combine, and organize information into meaningful patterns.
	16. Flexibility of Closure	The ability to identify or detect a known pattern (a figure, object, word, or sound) that is hidden in other distracting material.
	17. Perceptual Speed	The ability to quickly and accurately compare similarities and differences among sets of letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
Spatial Abilities	18. Spatial Orientation	The ability to know your location in relation to the environment or to know where other objects are in relation to you.
	19. Visualization	The ability to imagine how something will look after it is moved around or when its parts are moved or rearranged.
Attentiveness Abilities	20. Selective Attention	The ability to concentrate on a task over a period of time without being distracted.
	21. Time Sharing	The ability to shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).
Fine Manipulative	22. Arm-Hand Steadiness	The ability to keep your hand and arm steady while moving your arm or while holding the arm and hand in one position.

Abilities

23. Manual Dexterity	The ability to quickly move your hand, your hand together with your arm, or your two hands to grasp, manipulate, or assemble objects.
24. Finger Dexterity	The ability to make precisely coordinated movements of the fingers of one or both hands to grasp, manipulate, or assemble very small objects.

6.13. APPENDIX K: SkillsNET Learning Objectives Overview

6.13.1. What is a Learning Objective?

The first step in designing training is developing a learning objective. A *Learning Objective* is a formal description of what a trainee should be able to do after training is completed. Therefore, a set of well-defined learning objectives serves as a road map for training designers and instructors who have to decide what is to be taught in the training program.

6.13.2. Purpose of Learning Objectives

- Convey training goals
- Provide framework for course content development
- Provide basis for assessing trainee achievement

6.13.3. Content of Learning Objectives

A Learning Objective includes three major characteristics:

Desired terminal behavior. A training objective starts with a verb that indicates the action that a trainee should be able to perform once training is completed. For example, *record medical histories of patients.*

Conditions under which the behavior will be performed. A training objective specifies the tools and equipment used while performing the task, physical and environmental conditions surrounding the task, as well as certain restrictions imposed on the trainee while performing the task. For example, *assemble and fasten materials, using hand tools and wood screws, nails, dowel pins, or glue, to make framework or props.*

Criterion for acceptable performance. The criterion indicates how well the trainee must be able to perform a particular task. It can include information on time necessary to perform a task, and quantity and/or quality of work produced. For example, *take the temperature of five patients to within 0.1 degree of accuracy.*

Note: Learning Objectives will differ based on how much information will be included in each of them. Generally, the tasks that are more complex and performed under non-normative conditions require more specific Learning Objectives. As a rule, the more specific a Learning Objective is, the easier it is for a training designer to develop an appropriate training program and choose the most effective training methods.

6.14. Learning Objectives Flow Chart