# Decision-Making Objects

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## ABSTRACT

How can we integrate instructional technologies so that military leaders are able to creatively use what they learned in their warfighting specialties, doctrine, and professional military education domains to improve decision-making? A review of the principles in designing instructional products is required, especially when the goal is to enhance learners' performance in decision-making within such domains. By examining three theoretical questions concerning the what, when, and how of instructional design for decision-making, we can focus on principles to help learners direct their attention to conceptual information (how to acquire relevant information), organize information into coherent structures (how to build internal connections), and integrate information with their existing knowledge (how to build external connections). This will help design “object” that promote decision-making.

The quality and training value of practicing decision-making relative to interpreting certain information, doctrine, tactics, techniques, and procedures (TTPs), educational settings, and/or training situations. Military leaders continue to improve their ability to know and understand their warfighting specialty, doctrine, and TTPs for tactical combat as well as operational and strategic warfare and how doctrinal principles drive unit exercise training objectives as well as real-world operations. Such decision-making practice activities offer technology requirements to support, execute, and implement Training Transformation (T2), the Joint Training System, and Combatant Commanders and staffs.

Military leaders need an efficient and effective way to practice decision-making relative to interpreting certain information, doctrine, TTPs, educational settings, and/or training situations requirements. The methodology and strategies to develop objects for improvements in decision-making must support military leaders at their respective facilities as well as remote locations, to include individuals working on personal computers, even at home. This paper discusses the development of such highly interactive and engaging web-based decision-making objects for military leaders to practice decision-making to meet such cognitive requirements.

## ABOUT THE AUTHORS

**Dr. Wiley N. Boland, Jr.** is a Program Manager within L-3 Communication’s Government Services, Inc. division supporting the Marine Corps’ College of Continuing Education to provide innovative training solutions that will allow Marines to train anytime, anywhere. He has more than thirty years experience in instructional products development guiding learners to goals and skills mastery. He is an instructional systems designer with broad experience and background using current systems approaches to conduct task analyses, design, develop, implement, evaluate, and maintain program life cycle eLearning training and education curricula, advanced distributed learning, and conventional instruction media. He presently develops and manages curriculum assessments, strategic planning, and eLearning product development to support clients, customers, cohorts, and partners.

Dr. Boland specializes in eLearning/advanced distributed learning (ADL) interactive multimedia courseware, electronically delivered for various professionals including engineers, managers, administrators, maintainers, and operators. He has been involved in project management and directed staffing, performance evaluation, compensation, employee relations, safety/health, and employee morale requirements for numerous eLearning/interactive courseware development program startups within the eLearning community. He also has facilitated and developed marketing and business development initiatives/proposals and defined appropriate responses, developed management plans to meet schedules, and conferred with clients to design demonstrations/proofs of concept/experimentations/products. He holds an educational doctorate from Virginia Tech and is a Marine, currently on the retired list.

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## INTRODUCTION

How can we integrate instructional technology so that military leaders are able to creatively use what they learned in their Service specialties, processes, doctrine, and professional military education (PME) domains to improve decision-making? A review of the principles for the design of instructional products is required, especially when the goal is to enhance learners' performance on tasks of decision-making within such domains. By examining three theoretical questions concerning the what, when, and how of instructional design for decision-making, we can focus on principles to help learners to direct their attention to conceptual information (how to acquire relevant information), to organize the information into coherent structures (how to build internal connections), and to integrate the information with their existing knowledge (how to build external connections). This approach will induce instructional design of “objects” that promote decision-making.

The quality and training value of practicing decision-making relative to interpreting certain processes; doctrine; tactics, techniques, and procedures (TTPs), and/or training situations are directly related to learners and their ability to know and understand doctrine and TTPs for the tactical combat operations and how doctrinal principles drive unit exercise training objectives.

The user community needs an efficient and effective way to practice decision-making relative to interpreting certain processes, doctrine, TTPs, and/or training situations. The methodology and tools to develop “objects” for improvements in decision-making must support users at their facilities as well as remote locations, to include individuals working at home on personal computers (PC). This paper proposes to develop highly interactive and engaging decision-making objects for military leaders to practice improvements in decision-making to interpret specific processes, doctrine, TTPs, and training situations to meet such cognitive requirements.

## OBJECTIVE

The term *computer simulation* describes a technology that can be used to model the operational behavior of a system such as a manufacturing facility, production process, or military operation. Based on the nature of the system, a model can be static or dynamic (influenced by time), deterministic or stochastic (involving randomness), discrete or continuous. Today, simulation is one of the most frequently used system analysis methods and when supported by powerful desktop computers and software, it is becoming the tool of choice for evaluating systems performance. The benefits offered by this technology include:

- accounting for complex factors and relationships
- presenting performance changes over time dynamically
- experimenting and answering “what if” questions
- evaluating changes without disrupting the actual system
- stimulating ideas and promotes total system optimization
- using animation for “realistic” representation
- providing cost-effective ways to develop and evaluate system designs

One objective is to use COTS tools-based simulations to familiarize participants with the complexities of decision-making. Again, the infusion of computers especially for mediated communication strategies with simulation offers the potential for creating educationally rewarding learning experiences in a cost effective, flexible, and realistic manner. A low-cost, rapidly developed, simulation modeling process using text dialogue and simple visual animations about decision-making processes and then adding a hypothetical context is needed. Such a simulation could be an effective tool for supporting learning about particular process dimensions involved, for example in leadership. The participants would value the opportunity for acquiring not only the process of skill development within the simulation, but also the decision-making process as well.

The structure of the COTS tools-based simulation or the decision-making object (DMO) would ensure that the DMO is a quality structured instructional activity. The DMO structure includes:

- Introduction (short description of the situation and the decision process to be presented)
- Description of the objective to be met (in this phase participants familiarized themselves with the scenario)
- Interaction with the content (running the simulation)
- Assessment (as the simulation is running)
- Feedback (meaningful and presented immediately or at the end)

Another objective is to meet cognitive requirements for the participants within the DMO simulations and use methodologies and strategies to provide more effective decision-making aids.

### Cognitive Requirements

DMOs will provide the user community with highly interactive and engaging web-based scenarios for military leaders to practice decision-making to interpret specific processes, doctrine, TTPs, and training situations to meet such cognitive requirements:

- Familiarization with the Service specialties, processes, doctrine, and PME domains.
- Focused training on specific interpretation for specific processes, doctrine, TTPs, and training situations.

## METHODOLOGY and STRATEGIES

DMOs will provide a design methodology that supports highly interactive and engaging web-based scenario development.

- A priority methodology
- A technical architecture for easy authoring
- Provide the user community with an additional tool that supports individualized interpretation for specific processes, doctrine, TTPs, and training situations.

### Decision-making

Soldiers, sailors, airmen and Marines make decisions constantly from the time they wake up in the morning to the end of the day, bodies and minds are ruled by the decision-making process. However, to truly understand the role of decision-making we must first understand the difference between:

- Programmed decisions
- Non-programmed decisions

While it bears a rather formal name, the decision-making process is a common sense approach to a situation that usually affects more than one person. For the decision-maker he or she wants to ensure that a major decision that impacts upon the whole situation or event will involve the respective team members in the process. The decision-maker is the key to the decision-making process in the unit or organization and can play a dominant role or the role of catalyst depending on the nature of his or her leadership style. This style of leadership will position the leader in a certain way in the eyes of the team members. Therefore, the method of managing the decision-making process is also the process of managing people. Depending on the outcome of the decision; a decision-maker could be responsible for the success or failure of a situation or event. This is where the DMO can act as a tool for the soldier to acquire decision-making skills while at the same time learning to interpret certain processes, doctrine, TTPs, and/or training situations.

### Programmed Decisions

Programmed decisions are automatic and sometimes anatomical processes. The body is driven by programmed decisions that make the heart beat, channel food down the right avenue to the stomach in addition to other reflex "decisions." As humans, we may automatically brush our teeth and then lock the door on the way to work. All of these are automatic or programmed decisions that we are often not even conscious of making. On a more conscious level we engage in programmed decisions at our place of work. These are routine, frequent, and involve specific procedures developed for repetitive and routine problems.

Large organizations are staffed in a hierarchal structure, and programmed decisions drive many of their activities. These organizations require structure and introduce procedures and regulations as essentials to maintaining a smooth operation and avoiding confusion, such as standing operating procedures, desktop processes, and even job-aids. Examples in military organizations include certain processes, doctrine, TTPs, and training situations.

**Non-programmed Decisions**

Non-programmed decisions involve creative processes and problem solving skills. In many instances non-programmed decisions deviate from the normal routine problems and require new ideas, often from a variety of sources, while programmed decisions refer to a manual or doctrine/TTPs. Non-programmed decisions also require judgment and intuition. Making decisions and managing the decision-making process are two entirely different activities, both of which the decision-maker plays a pivotal role. However, often the inability to make a coherent decision may be based on a lack of experience. For some individuals programmed decisions can generally be made in isolation as a response to their own problem areas. For problems that fall outside their area of responsibility, individuals should meet with their leader who will then conduct the decision-making process.

The principles in non-programmed decision-making process:

- Identify a problem (a necessary condition for a decision to be made is that a problem must exist. Without problem(s) a decision is not necessary)
- Develop alternatives (ideas may range from the sublime to the ridiculous, feasible alternatives or potential solutions should be developed and the possible consequences of each decision should be considered)
- Evaluate alternatives (create a quick but reasonable criteria)
- Choose an alternative (after comparing, considering different ideas and go through a process to realize the best approach)
- Implement the decision (for a decision to be made, it must also be acted upon if the results are to be realized)
- Control and evaluate (once the decision has been made and someone has been designated to implement the idea, after a prescribed time, the decision-maker will evaluate the results of the decision)

**Decision-Making Principles**

Decision-making principles are intended to foster decision-making and conceptual retention rather than other measures of learning. An instruction design principle that supports meaningful learning as measured by improved retention of conceptual information and improved decision-making performance on such tasks is our concern. To successfully adapt instructional design principles for decision-making to a specific learning situation, instructional design should consider four elements:

- Instructional material (including both content and media that are potentially meaningful and convey information that can be used to make decisions, such as an explanation of how something works, not simply as a collection of random facts or descriptions where meaningful learning is lacking)
- Learner (in need of high-quality instruction, does not normally use productive learning strategies for processing expository instruction with instructional design manipulations intended to elicit productive process)
- Task (evaluation of the learning outcome must be sensitive to the goal of instruction, namely to promote conceptual retention and decision-making, not to simply measures overall amount retained, but a way to document the effects of the instructional design manipulations)
- Instructional manipulation (adapted in a way that is appropriate for instruction, learner, and task)

Previous analyses have shown that learning can be evaluated in many ways including:

- Verbatim retention (in which the goal is to remember information exactly as presented)
- Non-conceptual retention (in which the goal is to remember individual pieces of information that are not needed to support concepts)
- Conceptual retention (in which the goal is to remember information that is part of a system of conceptual knowledge needed for decision-making)
- Decision-making (in which the goal is to be able to solve problems beyond specific information presented)

There are three possible learning outcomes for a learner who completes instruction and only answers related questions:

- Non-learner (performs poorly on all four (verbatim retention, non-conceptual retention, conceptual retention, and decision-making) types of questions
- Rote learner (excels on verbatim retention and non-conceptual retention)
- Meaningful learner (excels on conceptual retention and decision-making)

**Cognitive Theories of Learning**

A basic tenet of cognitive theories of learning indicates that meaningful learning occurs when a person assimilates presented information to the learners' existing knowledge and/or accommodates knowledge to fit new incoming information. A model of cognitive processes involved in meaningful learning includes three memory stores:

- Sensory memory - sensory information from the eyes enters this rapidly fading, temporary store;
- Short-term memory - a limited amount of information transferred from sensory memory may be held and actively manipulated in this limited capacity store, and
- Long-term memory - this storehouse is where knowledge is permanently stored.

The meaningful learning model includes four cognitive processes:

- Selecting (pay attention to certain pieces of incoming information in sensory memory and transfers them to short-term memory for additional processing)
- Organizing (build connections among pieces of incoming information in short-term memory)
- Integrating (transfer relevant information from long-term memory to short-term memory and connects it with incoming information)
- Encoding (transfer the constructed learning outcome from short-term memory to long-term memory for permanent storage)

The meaningful learning model suggests three cognitive conditions where the learner must:

- Paying attention to relevant information (select the conceptual information from the instruction, such as the cause-and-effect events)
- Building internal connections (organize the information into a coherent structure, such as a chain of causes and effects in which one event serves as the cause of the next)
- Building external connections (integrate this information within a familiar context)

When the three conditions are met, learners will build a learning outcome containing conceptual information that supports decision-making; when the first condition is not met, the result is no learning, and when the first condition is met, but the second and/or third conditions are not met, the result is rote learning. Instructional design principles foster each of the following three cognitive conditions for meaningful learning.

The learner pays attention to the relevant information. To accomplish this goal, the instruction must:

- Actually contain potentially relevant information
- Must successfully employ a procedure for identifying the relevant information
- Must effectively draw the learner's attention to the relevant information

The conceptually relevant information consists of "cause-and-effect" statements about how a change in the status of one component affects a change in the status of another component. The goal of attention-guiding manipulations in the instruction is to tell the learner how to control intentional processing. Instead of fostering a default strategy of viewing the instruction as a list of equally important facts, attention-guiding manipulations help the learner allocate more attention to conceptually important information. Specific recommendations for guiding attention are given in the following three principles:

- Headings, bold/italics, fonts, bullets, underline, arrows, icons, margin notes, repetition, white space, and hyperlinks/hot-links (highlighting manipulations to draw learner's attention to specific relevant information)
- Adjunct questions (guide the learner's attention toward the conceptually relevant information (have both a "backwards effect" to draw the learner's attention back to the relevant information and "forward effect" to lead the learner's attention toward the conceptual type information in subsequent topics/information)
- Statements of instructional objectives (instructional objectives can be used to emphasize the conceptual information)

The first cognitive prerequisite for meaningful learning uses instruction manipulations that foster the building of internal connections. Selectively paying attention to the relevant information is the first step. Organize selected pieces of information into a coherent structure. Use cause-and-effect chains to build internal connections that signal to the learner how the internal connections organize the material into an appropriate structure.

The second cognitive prerequisite for meaningful learning is that the learner organizes the selected pieces or information into a coherent structure. The instructional materials should signal to the code, how to build internal connections that organize the material into the appropriate structure, as described in the following principles:

- Coherent structure for top-level topics
- Coherent structure for subordinate topic
- Preview outlines matched to sections
- Preview section outlines matched to topics
- Signals to clarify items
- Summaries
- Assessments

The third cognitive prerequisite for meaningful learning is that the learner builds external connections between the new incoming information and appropriate existing knowledge that is already stored in their memory. For a military leader to accomplish this goal, the military leader must have carried out the first two steps of paying attention to and coherently organizing the new information, and must have available appropriate existing knowledge into which the new information can be assimilated. In cases where the learner possesses appropriate existing knowledge, the instruction should include cues for how to integrate the presented information with existing knowledge; in cases where the learner does not possess relevant existing knowledge, the instruction should provide familiar background information as well as cues for how to assimilate new information. The following four principles provide specific examples of how to implement this general principle of conceptual advanced organizers for appropriate context within the instruction:

- Build external connections (between the new incoming information and appropriate existing knowledge)
- Analogical models or graphics for context (complete, concise, concrete, conceptual, correct, and considerate)
- Show work-out examples for procedures with annotations (focus on the process rather than the product of the decision-making)
- Elaborative questions to encourage knowledge integration (go beyond simple fact retrieval and apply information to new context/expand on certain aspect/relate to existing knowledge)

## DESIGNING and IMPLEMENTING DMOs

Our development methodology mirrors the instructional system development (ISD) process used by many military Services, with enhancements to expediting production, as well as incorporating extensive client involvement throughout the process. Equally important, for every project, we tailor our methodology to ensure that it works within your environment. This development methodology is the result of our experience developing many custom development projects. It is a methodology grounded in best practices and innovative approaches to developing learning technology. We also strongly encourage dedicated collaboration to support our disciplined, visible, and traceable methodologies for reliable results.

DMOs will be developed with Level 2-3 interactivity within the Macromedia Flash tool. The level of interactivity is the degree of learner involvement in the instructional activity. It should match the level of learning associated with each learning objective. Level 2 is defined as limited interaction and the learner makes simple responses to instructional cues and Level 3 is complex participation and the learner makes a variety of responses using varied techniques in response to instructional cues.

### Developing DMOs

The process for developing the DMOs will consist of distinctive plan and analysis, design, development, delivery and implementation, evaluation, and system support phases.

**Table 1.** DMO Phases of Development

| Phases of Development | |
|---|---|
| Planning Phase | DMO planning begins at tasking and the Decision-Making Object Design Plan (DMODP) is developed to drive analysis, design, development, and delivery schedules. |

| | |
|---|---|
| Analysis Phase (as required) | DMO development is based on a time-tested approach with a text-based learning specification as the basis for appropriate instructional technology, structure, and treatment. The learning specifications are developed for the DMOs based on the requirements, analysis, and data collected from discussions as well as the content from the existing products and associated materials. The learning specification is the product result of an analysis of other material and incorporates the main points for the DMO products. The learning specification(s) are approved before the Design Phase begins. |
| Design Phase (structure the DMO) | Storyboards (derived from the learning specifications) are developed with appropriate screen description, text, directions, screen audio/narration scripts, button/hypertext, graphics, animation/video, and programming notes. The storyboards for the DMOs are reviewed for final approval. On-line storyboards describe what is on each screen to include text, media, hot spots, and hyperlinks. The Design Phase provides the approved "look and feel" format for use in the Development Phase. |
| Development Phase (DMO development) | DMO media elements are created and integrated with other authoring and programming tasks. Graphics, animation, photography, video/photo stills, and audio bring the DMO a feature-rich design. The Development Phase populates storyboards and provides the look and feel as well as the learning interactivity. |
| Implementation Phase (delivery/ implementation as required) | The Implementation Phase is where the DMOs begin to do their jobs as a decision-making aid and become part of the training curricula. The selected draft DMO product files and storyboards are delivered in increments for review and comments. Thorough documentation of all programming and code in detail will facilitate future maintenance and updates. Delivered software is developed in architecture to allow access to any part of the software. |
| Evaluation Phase (summative evaluation if required) | All DMOs will be reviewed and corrected based on feedback. Quality assurance and internal reviews are of the utmost importance. Any deviations from the specifications in the tasks are made by mutual understanding. Other evaluation requirements are derived from the task(s) assigned. Formative evaluation is continuous throughout the process. |
| System Support Phase (if required) | The System Support Phase is ongoing throughout the development process. In Process Reviews (IPRs) are suggested to help determine the status of the DMOs being developed. IPRs are scheduled to discuss the product deliverables, review comments, correction requirements, scheduling problems, and other pertinent topics and the IPR results should be documented. |

## DMO Design Strategies

Our recommended approach to DMO design strategies and related instructional events focuses on two key elements, structure and context. We know that a well-designed DMO must be carefully sequenced, and content presentation reflects concept and knowledge acquisition principles. Establishing a learning hierarchy for the materials will enable the sequencing of scenarios and the material within the DMOs appropriately for ease of learning.
The context in which the material is learned is a critical component of recall and retention. Teaching content in a job-related context helps maintain the adult learner's attention. The scenario portion of the knowledge object will ensure the content in each scenario is in the appropriate context.

## General Courseware Design Specifications

Interactive, Shareable Content Object Reference Model (SCORM) conformant DMO products will be designed to instruct the learner on how to improve decision-making. The following general design specifications pertain to all DMO products developed:

**Table 2.** General Design Specifications

| General Design Specifications | |
|---|---|
| **a.** | Using government furnished information (GFI), develop a final instructional design strategy, which shall include an assessment and feedback design strategy, scenario strategies, and an overview of content in each DMO. |

| | |
|---|---|
| **b.** | List all final learning objectives and ensure that all material covered in each scenario shall be contained in each scenario. Government approval is required for any proposed changes in learning objectives as listed throughout the GFI material. |
| **c.** | Provide a flowchart for the interactive, DMO products development that outlines the connections among all the various areas of the content. Include a chart showing the logical flow of the DMO that describes interfaces and controls to support the learners' input/actions/reactions. |
| **d.** | Make maximum use of advanced technology to develop DMOs. |
| **e.** | Instructional systems development (ISD) processes will be easily adaptable for DMO products. |
| **f.** | DMO products will require no increase in skill requirements. |
| **g.** | DMO product will be delivered by web browser on desktops. |

**Performance-oriented Learning Objectives**

The DMOs will be developed using the existing materials. To ensure effectiveness the content will address foundation level material and the terminal objective (the objective the learner is expected to accomplish when they have completed the instruction). Additionally, a performance-oriented objective will be developed for each DMO. Working with subject matter experts (SMEs), we will determine the best "way" to reach these terminal objectives by writing a subset of performance oriented objectives. Performance-oriented objectives will be written with action verbs and language that ensures the content can measure the effectiveness of the training. We will work with SMEs to develop criterion-referenced assessment items, as required, from the performance-oriented objectives to directly measure the skills and competencies stated in the terminal objectives.

**Learner Actions/Exercises**

A learner-friendly interface is crucial to effective training. These on-screen interactions serve as the building blocks for the DMOs and allow learners to participate and become more engaged in the learning, as opposed to being passive viewers. Most of the interactions within the content will utilize "context" as a powerful learning tool (e.g., content presented in the context of a realistic tactical and/or operational environment).

Interactive actions/exercises are specialized interactions that allow for practice and measurement of competency, as well as allow learners to practice certain skills and knowledge. These assessment items will appear in the content as embedded interactive actions/exercises and validate comprehension of the content with both positive and prescriptive feedback. Incorrect answers are as important a learning experience as correct answers. In each case, the learner is provided meaningful and constructive feedback based on their selection/action, reinforcing their input. As a design feature, the user is allowed multiple attempts to respond correctly and after a determined amount of responses, the correct answer and prescriptive feedback may be provided. Correct answers provide positive reinforcement, and always provide a rationale to help learners who may have just "guessed correctly." We recommend a variety of question types, including multiple-choice questions, short answers, drag and drop exercises, hot spot selections (for exercises) and selected scenario-based evaluation.

**Authoring in Flash**

Media elements will be created to integrate with all authoring and programming tasks. Attention, external expectations, relevance, professional advancement, confidence, cognitive interests, stimulation, and satisfaction are the tenets of establishing a motivating environment for adult learners. These strategies are keys to learning and improving performance. When designing the scenarios content, it is important to gain the learner's attention through an attractive with an easy-to-use standard user interface, using metaphors, screen interactions, and effective segments to grab the learner's attention and hold it. The presentation of content will be concept-focused and relevant to the learners. We will explore areas of content that are *true-to-life* and expose them in the DMOs. "War stories" or anecdotal information/scenarios are good sources of relevant content. As learners progress through the scenarios, they will build confidence in the concepts and themselves. Building confidence comes through keeping information concept-specific. Putting learners in real-life scenarios and asking them to perform in a simulated environment builds this confidence. They will perform, and if they do not, effective feedback and remediation strategies will support them until they are successful. Ultimately, upon completion of the DMO, learners will be satisfied. They will be satisfied because they learned relevant skills, knowledge, and decision-making at their own pace and on their own terms, in a conducive environment, which only technology-based training can provide.

In summary, by using the tenets of attention, external expectations, relevance, professional advancement, confidence, cognitive interests, stimulation, and satisfaction, we immediately open the door to learning and maintain a motivating experience along the way. For instance, the content can contain challenges in the form of real world situations. "*What would you do?*" type activities can act as a "hook" to grab the learner's attention. Embedded exercises can also build relevance by utilizing real world examples for questions, in which learners gain confidence by receiving feedback and remediation, which helps drive competition and motivation. This in turn begins to build a level of satisfaction in learners by either reinforcing what they already know, or giving them a chance to learn what they do not know without feeling insecure about relating this to their peers. The chart below describes the process to "build" a scenario for a DMO:

**Table 3.** Notional Scenario Builder

| Notional Scenario Builder | | |
|---|---|---|
| **Guide attention** | | Draw learner to relevant information within the instruction |
| Acquire isolated facts | Manipulate & guide attention | Employ procedure for identifying the relevant information and draw learner's attention to the relevant information |
| | Headings, bold/ italics, fonts, bullets, underline, white space, hyperlinks/hot-links, etc. | Highlighting manipulations to draw learner's attention to specific relevant information |
| | Adjunct questions | Guide the learner's attention toward the conceptually relevant information (both a "backwards effect" to draw the learner's attention back to the relevant information and "forward effect" to lead the learner's attention toward the conceptual type information in subsequent topics/information) |
| | Instructional objectives | Statements of instructional objectives can be used to emphasize the conceptual information |
| **Internal Connections** | | Organize selected pieces of information into a coherent structure |
| Cause-and-effect | Build internal connections | Signal to learner how to build internal connections that organize the material into appropriate structure |
| | Coherent structure for top-level topics | Learner cannot discover structure if instruction is incoherent (basic top-level structures: cause-and-effect, compare-and-contrast, categorization, enumeration, and generalization) |
| | | Cause-and-effect (describe logical connected series of events or steps in process, in which one event or step enables/causes the next) |
| | | Compare-and-contrast (examine the similarities and differences between two or more things along one or more dimensions) |
| | | Categorization (present a classification system for grouping items into classes or categories) |
| | | Enumeration (list items that all belong in the same topic) |
| | | Generalization (provide an assertion along with statements that clarify, extend, exemplify, or support the assertion) |
| | Coherent structure for each subordinate topic | Each section should have a clear structure |
| | Preview outlines matched to sections | Straightforward way to clarify the top-level organizers at the beginning of a topic by stating the topics and their relations to one another (outline or introductory paragraph of text) |

| | | |
|---|---|---|
| | Preview outlines matched to topics | Clearly articulated structure - begin with a preview of the section, parallel subheadings and wording |
| | Signals to clarify items | Words or short phrases inserted in the instruction that clarify structural organization (“first”, “second,” and “third”; or “because of this” “the result is”) |
| | Summaries | Tables, figures, or words |
| | Summary questions | Ask learner to summarize the instruction by writing a short organized summary or apply information to new context/expand on certain aspect/relate to existing knowledge in a summary |
| **External Connections** | | Conceptual advanced organizers for appropriate context within the instruction |
| Relate to principle | Build external connections | Learner must build external connections between the new incoming information and appropriate existing knowledge |
| | Analogical models or graphics for context | Complete (essential elements, states, and actions of the system are represented), concise (level of detail is minimal), coherent (operation of the system is intuitively transparent), concrete (level of familiarity and visualization is high), conceptual (system is potentially understandable), correct (elements, states, and actions correspond to the actual system), and considerate (appropriate) |
| | Show work-out examples for procedures with annotations | Help learner focus on the process rather than the product of the problem solving |
| | Elaborative questions encourage knowledge integration | Require learner to go beyond simple fact retrieval and apply information to new context/expand on certain aspect/relate to existing knowledge |

**Specifications & Standards**

The interactive DMOs will be developed in conformance with the Shareable Content Object Reference Model (SCORM) specification established by the Advanced Distributed Learning (ADL) initiative to develop a DoD wide strategy for using learning and information technologies to modernize education and training. To leverage existing practices, promote the use of technology-based learning and provide a sound economic basis for investment, the ADL initiative has defined high-level requirements for learning content such as content reusability, accessibility, durability and interoperability. The purpose of the ADL initiative is to ensure access to high-quality education and training materials that can be tailored to individual learner needs and made available whenever and wherever they are required. ADL maintains a set of guidelines under the acronym SCORM to accomplish their purpose.

The SCORM defines a Web-based learning “Content Aggregation Model” and “Run-time Environment” for learning objects. At its simplest, it is a reference model that references a set of interrelated technical specifications and guidelines designed to meet DoD’s high level requirements for Web-based learning content. These requirements include, but are not limited to, reusability, accessibility, durability and interoperability. The shareable object “building blocks” will be as small as possible to facilitate interoperability among various courses. The SCORM, simply stated, is for learning objects and references interrelated technical specifications to bring together diverse and disparate learning content and products to ensure reusability, accessibility, durability, and interoperability. The SCORM, now in its latest release (SCORM 2004), has picked up momentum due to ADL’s diligent efforts to bring together vendors, trainers, academics, and standards groups.

## CONCLUSION

The quality and training value of practicing decision-making relative to interpreting certain processes, doctrine; TTPs, and/or training situations is directly related to learners and their ability to know and understand doctrine and TTPs for the tactical combat operations and how doctrinal principles drive unit exercise training objectives.

The ROI for any design of instructional products must consider the effectiveness not only of the leaner but also the larger organization. DMOs can enhance learners' performance on tasks of decision-making within training and education domains by focusing on principles that help learners direct their attention to conceptual information (how to acquire relevant information). Additionally DMOS help organize information into coherent structures (how to build internal connections) and help integrate information with existing knowledge (how to build external connections).

The user community needs an efficient and effective way to practice decision-making relative to interpreting certain doctrine; TTPs, and/or training situations. The improvements in decision-making methodology and tools must support users at remote locations, to include individuals working at home on personal computers (PC). This paper proposes a means to develop highly interactive and engaging web-based scenario objects for military leaders to practice improvements in decision-making to interpret specific processes, doctrine, TTPs, and training situations to meet such cognitive requirements.