Science.

Technology.

Innovation.

Pacific Northwest National Laboratory (PNNL) is addressing the need to lower the cost and increase the effectiveness of training by applying principles of human cognition and learning to the development of student-centered, scenario-based training.

PNNL's Pachelbel Learning Management System is SCORM 1.2 conformant.

Pacific Northwest National Laboratory
Operated by Battelle for the
U.S. Department of Energy

Interactive, Scenario-Based *e*-Learning

Many online classes provide screens of text followed by a quick quiz. While relatively easy to implement, this approach works against the student's natural learning patterns. The Pacific Northwest National Laboratory (PNNL) has developed a cognitive-based, student-centered approach to training that is being applied to interactive, distributed learning system development. This innovative training approach integrates multimedia technology in realistic scenario-based examples that promote student participation rather than the passive "page-turning" used in conventional training.

CAISI *e*-Learning

The U.S. Army Project Office (PO) Combat Service Support Automated Information Systems Interface (CAISI) is fielding a new, wireless CAISI to support logistics communications. The role of CAISI is to provide communications capability that will allow the Standard Army Management Information Systems (STAMIS) to communicate across the battlefield through the Army's Tactical Internet. During deployment, the Army provides intensive classroom instruction for CAISI operators and maintainers. To meet recurring needs for refresher training, the CAISI PO requested that PNNL develop an interactive, distributed learning version of the CAISI training course.

The CAISI *e*-Learning course was implemented using Pachelbel, a web-based training development and delivery system developed at PNNL to provide an efficient and effective way to design, develop, and deliver tailorable training. An interdisciplinary design team at PNNL applied principles of cognitive psychology, human information processing, and learning to create the interactive, student-centered course. The training approach first conveys simpler concepts and then builds up to more complex problems. Frequent checks on learning, exercises, and optional quizzes reinforce the concepts using real-life examples and scenarios.
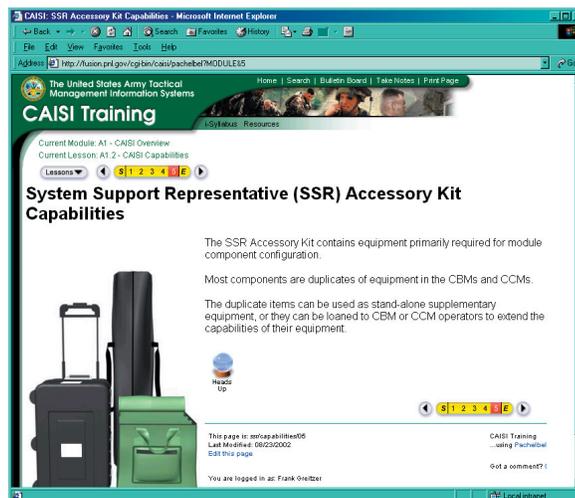
A sample from CAISI e-Learning program.

Features of the *e*-Learning approach include:

- Flash, Shockwave, and QuickTime VR technologies to provide virtual hands-on, interactive learning, such as the ability for students to rotate images of equipment 360 degrees.
- 3-D rendering to provide clear and detailed representations of equipment that support interactive learning.
- "Did You Know" interaction elements—facts that relate the information to everyday experiences.
- "Heads Up" interaction elements—pointing out important concepts that will be used later in the training.
- "Checkpoint" interaction elements—guided and worked examples that allow students to interactively apply what they learned.
- Quizzes and interactive exercises—randomly selected from pools of exercises—to assess student understanding and refine mastery of material.
- Access to supplementary documentation and material.
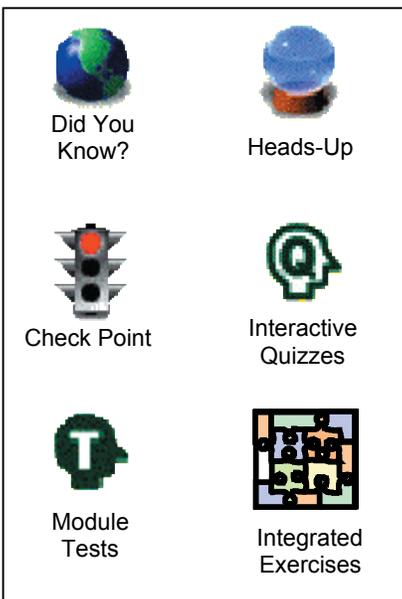
Interaction Elements used in CAISI e-Learning

Examples of Interaction Elements: 3-D rendered image of equipment (top left), Checkpoint Interaction element (right), Heads Up interaction element bottom).

Performance-Based Training

The CAISI course consists of a number of modules, which are in turn composed of lessons. Interactive quizzes provide optional practice on lessons. Students must pass a test to receive credit for each module. To receive credit for the CAISI course, students must pass a scenario-based integrated exercise that represents real problems in the field.

To vary the students' experiences in the CAISI training, quizzes, tests, and integrated exercises are sampled randomly from a large pool. This means that when students come back to review the course or retake tests, they will likely get different problems and learn more of the material.

Impact

PNNL's implementation of multimedia interaction features has had a strong influence on the materials used in the classroom: rendered objects developed for *e*-Learning have replaced the photographs used in the classroom.

The active learning approach employed here applies to a wide variety of training topics and promises to lower the cost of large training and education programs by augmenting or replacing portions of classroom training. Both innovative and effective, this approach to training may well influence the way classroom instruction is delivered.

As a U.S. Department of Energy multiprogram national laboratory, PNNL develops and deploys technology for national missions in energy, the environment, defense, and human health.

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