	<p>Steven W. Villachica, Ph.D., CPT Chief Learning Officer DLS Group, Inc. 3773 Cherry Creek North Drive, Suite 575 Denver, Colorado 80209 fax 303/393.6320 303/333.4513 svillachica@dls.com http://www.dls.com</p>	<p style="text-align: center;">Snake Oil or Results? How You Can Improve, Validate (or Justify) Your HPT Practices</p> <p style="text-align: center;"><i>Using Cognitive Apprenticeships to Improve Decision Making and Problem Solving</i></p>
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Practice Targeted for Study

According to Brown (1999), knowledge work “represents the fastest growing segment of the workforce” (p. 3). Spira (2005) notes that knowledge workers are now the largest group in the workforce, comprising some 40 percent of all workers. Noting that such expertise is invisible and cannot be readily observed, Collins, Brown, and Holum (1991) advanced an instructional approach called a “cognitive apprenticeship.” Acting as a framework for providing performance solutions, a cognitive apprenticeship consists of strategies for addressing content, method, sequencing, and sociology in learning and job support environments that support knowledge work.

Literature Review

Medical Education	Workplace Learning and Job Support
<ul style="list-style-type: none"> ➤ Velmahos et al. (2004): surgical interns who conducted central venous catheterizations outscored counterparts receiving traditional medical training in a repeat test, observed performance measured using a checklist, attempts to find a vein, and time to complete the procedure. ➤ Roesch et al. (2003): a computer-assisted learning program based on a cognitive apprenticeship allowed dermatology students to outperform those who did not participate in the program, make 10 percent fewer errors in a knowledge test, and demonstrate increased abilities in applying acquired knowledge to diagnostic problems. ➤ Cope, Cuthbertson, and Stoddart (2000): found that mentoring techniques drawn from cognitive apprenticeships could be benefit nurses completing their practice placements (internships) in Scotland. 	<ul style="list-style-type: none"> ➤ Dunlap and Grabinger (2003): cognitive apprenticeships, along with problem-based learning and intentional learning environments, comprise one of three methodologies that prepare students for lifelong learning. ➤ Czech (1999): redesign of a U.S. Navy training program using blended learning cognitive apprenticeship techniques to prepare candidates for the aviation antisubmarine warfare operator rating. Subsequent evaluation revealed that students in the redesigned course outperformed their predecessors on knowledge and performance tests while requiring less time to demonstrate proficiency on the job. ➤ Schaper and Sonntag (1998): a training program that employed a cognitive apprenticeship to train maintenance technicians to troubleshoot problems appearing in a welding transfer line of an automobile production plant had a positive impact on individual performance.

Research Methodology

Hybrid approach using action-oriented research (Sagor, 1992) and rapid application development (RAD) (Martin, 1991). Using action research, DLS formulated the problem, collected data, analyzed them, reported the results, and planned subsequent actions. DLS also conducted a review of the cognitive apprenticeship literature and used RAD to work collaboratively with clients to specify performance requirements, prototype potential learning and job support solutions that employed a cognitive apprenticeship framework, conduct usability tests of the prototyped solutions, develop the solutions, pilot them, and (when possible) evaluate them.

Instrumentation

Given the potential effectiveness of cognitive apprenticeships, DLS began extending them to provide both learning and job support opportunities. To ensure the right **content** was addressed in training, information, and online tools, DLS specified:

- domain-specific knowledge consisting of facts, concepts, and principles;
- heuristics (rules of thumb) that guided experts’ performance;

- process controls that experts use that tell them where to begin solving a problem, how to make adjustments as they solve the problem, and when they have solved the problem; and
- tools and resources experts employ for lifelong learning and performance.

DLS employed a variety of *methods* to facilitate learning and workplace performance, including the video and in-person modeling of expert performance, formal coaching, scaffolding (akin to cognitive training wheels), articulation/reflection loops, and exploration.

DLS also *sequenced* learning opportunities and information to place global before local skills, increase task complexity over time, and increase task diversity. Finally, DLS utilized a variety of *sociological factors*, including situated learning, communities of practice, intrinsic motivation, and cooperation.

Results

DLS employed a cognitive apprenticeship to create CORNERSTONE, a large-scale performance support system used by National Association of Securities Dealers-Regulation (NASDR) examiners who conduct exams of over 7,000 Nasdaq firms. Consisting of 21 major components employing 10 different delivery strategies, CORNERSTONE produced the following results (Villachica & Stone, 1998):

- a reduction in new-hire ramp-up time from 2.5 years to 1 year,
- a reduction of training time by 85 percent,
- a reduction of time required to conduct examinations of securities firms by 20%,
- a substantial increase in the accuracy and consistency of examinations, and
- a return on investment of 229% with a 5 year payoff. (Within a 5-year period, every dollar spent yielded \$2.29 in benefits.)

CORNERSTONE also won both Microsoft's Outstanding Performance Support System and ISPI's Outstanding Performance Improvement Intervention awards.

Applications of the Research to Practice

The screenshot displays the CORNERSTONE e-learning interface. At the top, it says "Gather customer-related information." Below this is a central text box: "Let's compare our reasoning based on the information we've reviewed to date." To the right is a small video window showing a man in a white shirt pointing at a screen. Below the central text are two boxes for reasoning. The left box is titled "You indicated you could NOT yet make a determination because:" and contains the text "I don't have enough information yet." The right box is titled "I CANNOT yet make a determination because:" and contains three bullet points:

- The Wheelers are in their 70s, have a substantial liquid net worth and yearly income, and have their money in liquid investments such as CDs and treasuries.
- Nelson recommended limited partnerships, such as real estate and gas and oil, for diversification. Such investments match the objectives on Wheelers' new account form.
- We have not reviewed documentation about the transactions themselves.

 On the right side, there is a vertical navigation menu with icons and labels: "Cause Model", "File Cabinet", "Chronological Log", "Proof Checklist", "Menu", and "Exit". At the bottom, a status bar shows "NASD Determine if a violation occurred." and "Page 12 of 14".

Figure 1: Process Control, Articulation/Reflection, and Expert Modeling of Domain in E-Learning

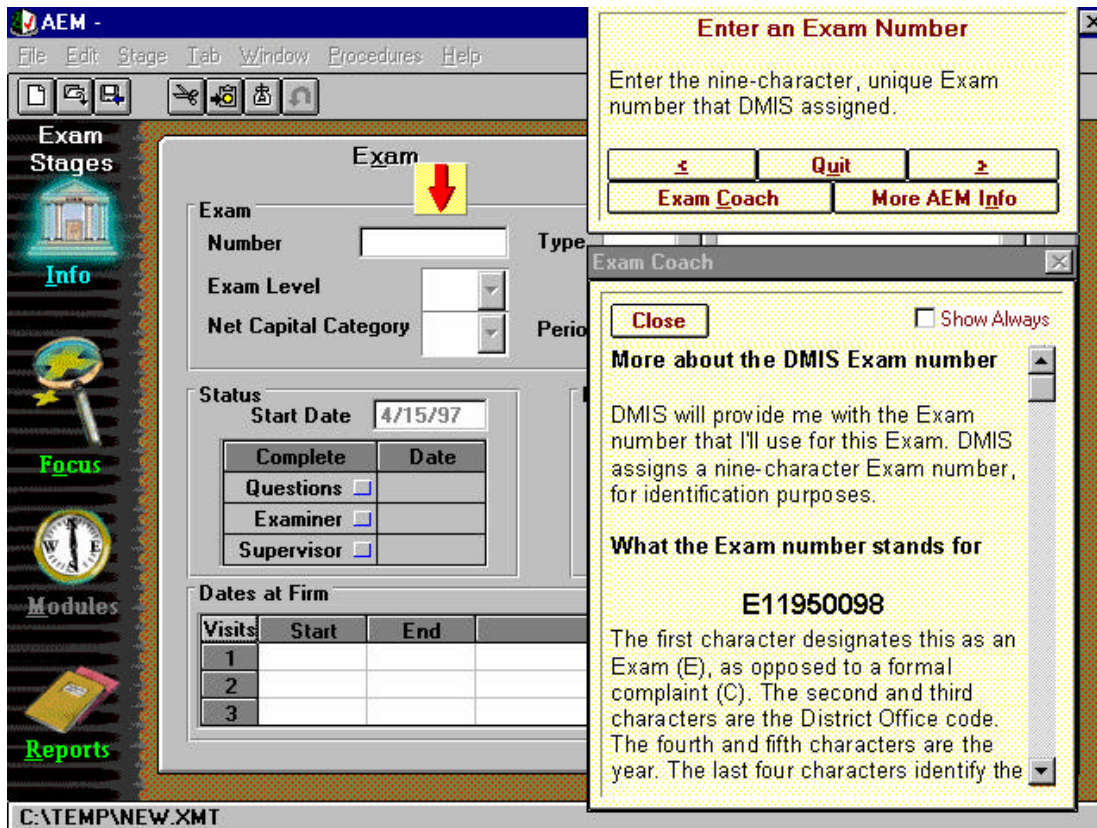


Figure 2: Process Control, Scaffolding, and Domain-Specific Knowledge in an Online Tool

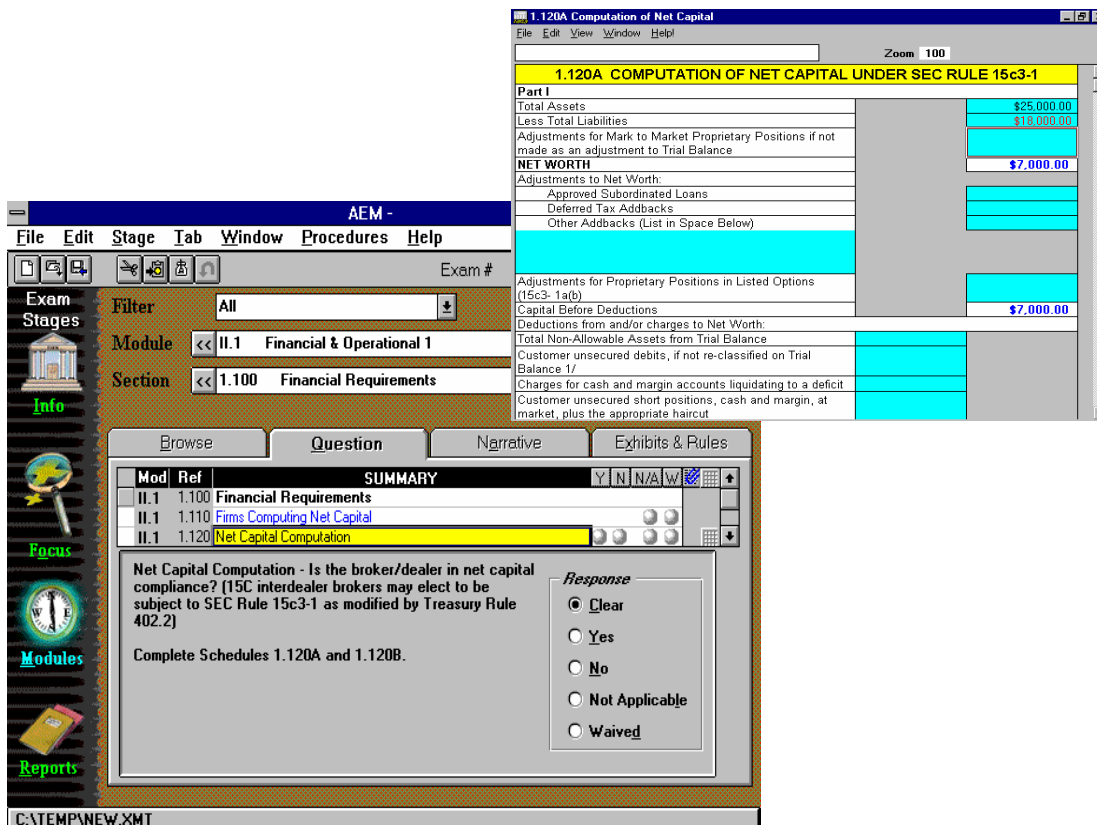


Figure 3: Process Control and Tools for Life-Long Performance

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