

Competence Certification Model and Courses for Distance Technical Training

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The Starting Point: The Company's Request

In the summer of 2000 we received a request from a major bus and truck manufacturer: a solution was needed to assure that dealers' personnel had the necessary technical knowledge and abilities, following an internal study that showed that:

- a. Each position in the dealer organization had little clarity about the complete content of required and recommended training;
- b. Operating cost was high and benefits from the learning process were low;
- c. A noticeable decrease in attendance to training sessions, due to high transportation and lodging costs. This caused disorganized, out-of-sequence learning of complex topics;
- d. Low level of control of people trained and individual evaluations;
- e. High turnover, in part caused by the low success probability in their positions, due to limited knowledge about products, components, service or warranty procedures;
- f. Personal preferences of certified instructors dictated breadth and depth of instruction, causing large dispersion of content, instructional design and evaluation;
- g. Knowledge required to succeed in the workplace was not consistent with training, resulting in improper sequencing or lack of subject matter;

Population in need of training was initially estimated at 2,000, excluding turnover.

Our Proposal

We developed a proposal to address those issues based on this objectives:

- a. To define specific abilities required for each position in the organization;
- b. To determine learning objectives in terms of expected behavior as a result of the learning process;
- c. To develop a sequential learning model, to assure the development of abilities for success in workplace performance;
- d. To use an instructional structure based in the *methodology for adult learning*:
 - Significant learning*
 - From easy to hard*
 - From simple to complex*
 - From concrete to abstract*
 - From particular to general*
- e. Apply information technology to assist in real time control of scheduling, attendance and knowledge management;
- f. Low operating costs;
- g. Flexibility to adapt to individual learner's pace;
- h. No face-to-face sessions or student travel required;
- i. Online evaluation system; and

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- j. Field certification of the application of learned abilities.

Development

A team was formed with the responsibility to integrate all required information, formed by technical and training company executives and TecDigital: a group of instructional design specialists, multimedia programmers, language professors and graphics designers specialized in computer screen communications, forming a flexible production cell for distance learning media.

For each position, the team developed the training model, learning objectives, content section division, topics and evaluation criteria for each of the learning expected outcomes (See examples in the Annex).

Instructional design focused on a process centered on the concept of content knowledge and performance over simple attendance and/or memory evaluation. At the workplace the individual is expected to perform according to standards that require the application of specific content, so this is the basis for the design.

Production work centered in the development of key elements based on the graphical emphasis of learning objects, with the additional restrictions of ease of use and intuitive navigation.

The existing enrollment process was modified, so that dealers use the academic control system to register their personnel, and automatically allow students to request exams and show updated results.

A field verification process was established to award the final certification. When a person finishes all required courses, as reported in the online system, a specialist is scheduled to visit the dealer facilities to verify in-workplace performance. The final certification is awarded by the company, valid countrywide. As the control system is available everywhere, people may change workplaces, as records are transferred automatically.

Graphics Design

We started with the profile of the prospective student: young, with little experience and a high school education or less. Reading large blocks of text is not their preference, so we decided to use graphics as extensively as possible throughout the courses, explaining topics by the use of animation, color and stimuli change to attract and keep their attention.

Programming

Given the graphical and animation orientation of course materials, we selected software by *Macromedia*®, especially *Flash*®. The database and communications code uses open-source software for reliability and lower cost. Programs were developed for two-way communication between the course in *Flash* and the server, and an embedded program is sent along with each exam to keep control of time and automatic evaluation. All transmissions are encrypted to prevent confidentiality breaches.

Our audience does not have broadband connections available, company executives were clear to specify that all courses should be restricted to low-bandwidth connections. As graphical files tend to be large (even *Flash* scenes containing video clips are too large for these connections), we decided to focus on placing the courses on CDs and use the Internet connection to transmit only encrypted text files with access control information, exams and results.

The Courses

All courses were designed to be self-paced, requiring no tutorials or instructions, and an Internet connection only to sign-in, request and submit evaluations, thus opening the option to study at home. An intuitive navigation bar guides the student through content sections and the online exams.

Four groups of courses were first developed and disseminated nationwide:

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1. Basic product knowledge (3)
2. Advanced product knowledge (3)
3. Diesel engine basic knowledge, operating principles and components (1)
4. Operating and maintenance manual for a specific truck model (2)

Dissemination of CDs is easy and inexpensive as dealers routinely receive parts from a central depot.

The Academic Control System

To support the courses and comply with company's requirements (the company and TecDigital are ISO 9001:2000 certified), we designed the Internet-based database system to keep accurate and updated records of all enrollment exams sent to students and all results received, in compliance with ISO and other strict quality certifications of the auto industry.

Each course has a button that communicates with a server that validates the student and generates a set of randomly selected questions from a database. In the student's computer a program embedded in the exam controls time and automatically evaluates results, giving the student the grade obtained and the correct answers to each failed question.

Results

A complete competence-certification program was developed and published nationwide, and the company implemented promotions based on awarded certifications.

Learning of basic (like the components of a passenger bus) or complex technical content (like the inner workings of a truck diesel engine) were found easier to accomplish due to the highly graphical nature of courses, self-pacing and the ease of navigation. Control over training was improved, dealers and company executives now have real time information everywhere, anytime.

During the first six months of operation we registered 1,022 students, 117 exam requests and 56 passed. By the end of May 2003 we have 3,652 student-courses with 31% requesting exams (this number is affected by people already approved, available promotions, turnover and dealer workload).

Operating costs were significantly reduced: according to company data, total investment per course was US\$20,000 or US\$5.48 average cost per enrolled or US\$17.47 per approved student. In face-to-face sessions total cost was US\$550 per student, including instruction, travel and lodging, and not including opportunity costs due to lost revenues and payroll.

Online control now keeps track of each person, reducing report delay, fax transmissions and paper use to zero.

Conclusions

Computer-based distance training of technical or product knowledge and abilities is feasible and economically sound. Consistent, standardized knowledge is available in a large geographical area, appropriate instructional design and the characteristics of the computer screen allow for self-paced, highly visual content that is easier to understand and apply to workplace conditions.

Using an integrated competence-certification program with graphical content over distance is an efficient method to increase customer satisfaction, competitiveness of the employee, the company and the manufacturer.

Biographical Sketches

Mario Doria is a professor of management at the Toluca Campus of ITESM and Director of its Center for International Competitiveness, encompassing consulting, extension programs, the Virtual University

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and TecDigital. He has taught executive education programs in Mexico, Ecuador and Venezuela, and has been actively involved in the design and implementation of tailor-made distance training programs for companies in Mexico, the United States and Ecuador.

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Rafael Santana has an Educational Science degree; in 2003 he was appointed Director of the Center for Distance Education at the Center for International Competitiveness in the Toluca Campus of ITESM, responsible for all instructional design at TecDigital. Previously he was a consultant in design and development of training programs, delivered both face-to-face and over distance. A close collaborator in TecDigital, he was responsible for the design of the learning model presented, and currently works in other distance programs. He has taught executive education programs in Mexico and Ecuador, and has over 20 years' experience in developing programs and teaching adults.

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Annex

Example of a design table for a product knowledge course

Ability	Required level	Learning media	Evaluation criteria	Certification media
Identify product characteristics and functions	<ul style="list-style-type: none"> • Knowledge • Discrimination 	<ul style="list-style-type: none"> • Interactive CD • Actual product presentation 	Online exam	Live demonstration in actual product
Identify product characteristics that satisfy customer's needs	<ul style="list-style-type: none"> • Knowledge • Discrimination • Evaluation • Application 	Interactive CD	Online exam	Live demonstration with several products

Example of a design table for the Commercial Body course for salespersons

Previous event	This event	Knowledge/Abilities	Next event
Commercial vehicle financing	Commercial Body	<ul style="list-style-type: none"> • Existing bodies • Technical characteristics • Applications • Warranty definitions • Paint alternatives • Std. equipment • Optional equipment • Capacity specification 	Data Book

Example of the competence-certification program for mechanics:

