Status of Seafarer CBT and Comparison of IMO CBT Guidance with U.S. CBT Standards

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Abstract

The Ship Operations Cooperative Program (SOCP) is a maritime industry cooperative organization that is sponsored by the United States Maritime Administration (MARAD). SOCP formed a working group concerning maritime Computer Based Training (CBT). The purpose of the SOCP CBT Working Group is two-fold. The first purpose is to identify potential uses of CBT for SOCP members. The second purpose is to provide recommendations on standards of CBT to the United States Coast Guard through SOCP and SOCP member participation in the Merchant Personnel Advisory Committee (MERPAC) to the United States Coast Guard.

This paper discusses findings of the SOCP CBT Working Group with respect to the state of maritime CBT availability and use in the United States and also on the working group's recommendations with respect to standards for CBT quality. Comment is made on STW 32/INF.7 Annex ISSUES TO BE CONSIDERED WHEN INTEGRATING COMPUTER BASED TECHNOLOGIES INTO THE TRAINING AND ASSESSMENT OF SEAFARERS. The requirements for CBT presented in United States Coast Guard Commandant Instruction 1554.1 – Development of Interactive Courseware (ICW) for Coast Guard Training, the Department of Defense Handbook, Development of Interactive Multimedia Instruction (IMI), and a checklist provided by the United States Coast Guard National Maritime Center (NMC) will be reviewed. All four documents are compared and contrasted. Conclusions and recommendations are made as to what should be the minimum acceptable design standards.

1. Introduction

The Ship Operations Cooperative Program (SOCP) was founded in 1993 and since that time has become a dynamic, forward thinking organization whose primary objective is "to bring U.S. based maritime organizations together to work in partnership to solve common problems and to develop products to satisfy the common needs of members."

The SOCP is sponsored by the U.S. Maritime Administration (MARAD) and, by using a "cost share" basis of membership, has evolved into the premier maritime industry forum for U.S. based organizations. SOCP's membership is comprised of U.S. based ship operators, ship managers, labor, government, classification societies, educational/training institutions, and other maritime organizations. This diverse membership allows the SOCP to be effective in many different areas of maritime interest, and provides the strength of a united consortium when making recommendations to state, federal, and international regulatory organizations.

The SOCP has been involved in the development of the International Marine Information Safety System (IMISS); and has studied and tested Alternate Watch Schedules. It has, jointly with the Gulf Coast Region Maritime Technology Center at the University of New Orleans, developed a unique machinery history tracking system called "Reliability, Availability, Maintainability (RAM) Information Management" system. The SOCP has completed a number of training videos with accompanying course booklets, a training CD-ROM, and has sponsored a project to test and evaluate a new vision enhancement system called Micro-FLIR Thermal Navigation System. In addition, the SOCP has conducted studies of shipboard management training, professional skills knowledge, crewmember cross training, and fitness for duty testing.

Currently, the SOCP is involved in studying the recruitment and retention of mariners including the production of videos to assist with bringing new people into the industry. The SOCP is conducting a survey of mariner training needs in light of STCW, and is working on a dry-docking project with the intent of assisting with the publication of dry-docking manuals and/or textbooks. The SOCP has commenced a program to test bunker fuels in various ports around the USA for quality, the results of which will be offered to members on the SOCP web site. Finally, the SOCP has developed a Ballast Water Management Information Center to provide updated information on technical and legislative developments as well as an on-line library of all relevant papers, reports and regulations.

The SOCP holds conferences 3 times a year and has covered such topics as Ocean and Great Lakes shipping, Gulf of Mexico maritime operations, mariner education and training, STCW, and ballast water regulations. The SOCP has enjoyed the participation and cooperation of the U.S. Coast Guard National Maritime Center and the various U.S. Coast Guard Districts at our conferences as well. The participation of the Coast Guard has provided a valuable means of exchanging information and views with the policy makers of the Coast Guard.

The membership of the SOCP has grown from 5 members in 1993 to the current 42 members and continues to grow. It is an exciting time to be involved in the SOCP and the membership roster can be viewed on the SOCP web site at http://www.socp.org

The Nautical Institute's first annual CBT@Sea conference created guidance for the development of Computer Based Training (CBT) for seafarers that was published by the

International Maritime Organization's (IMO) Sub-committee on Standards of Training and Watchkeeping[1]. The Ship Operations Cooperative Program (SOCP) took note of the guidance and its CBT committee reviewed it with respect to guidance available in the United States. The United States Coast Guard (USCG) has cited three primary documents with respect to the development of CBT.

The first of these documents was USCG Commandant Instruction 1554.1 dated February 3, 1999 – Development and Management of Interactive Courseware (ICW) for Coast Guard Training. The second document was Development of Interactive Multimedia Instruction (IMI) published by the United States Department of Defense dated June 9, 1997. The third document was a Checklist for Web or Computer Based Training provided by Mr. John Bobb of the USCG National Maritime Center in the Spring of 2000. This checklist was developed by Dr. Badrul H. Khan, Ph.D. (an Associate Professor at The George Washington University, Washington, DC, USA). This paper reports on the status of CBT for seafarers in the United States and attempts to compare and contrast these various guidance documents.

2.Definition of CBT

Before we can begin to talk about the use of CBT in the United States, we need to define what we consider to be CBT. This is especially true in the shipping industry, where there are different types of products that are used for training mariners, and utilize computing technology.

CBT for mariners are courses which[2]:

1. Are used by students without the need for support or assistance by instructors.
2. Have built in assessment and produce records of the training time and the student identification.
3. Are interactive.
4. Use multimedia technology.
5. Are run on standalone PC's, networked computers, the Internet, or corporate Intranets.
6. Are run aboard ship or at shoreside locations.

This paper deals only with CBT which satisfies this definition.

3.Status of CBT in the USA

1. Basic Safety Training

By far, Basic Safety Training (BST) is the application receiving the greatest attention. MGI International of Vancouver, Canada produced the first CBT version of Basic Safety Training for a client, and then made enhancements to obtain US Coast Guard approval. MGI has partnered with 10 training centers in the United States to use their products and they expect this number to reach 20 by the end of the year.

[1] STW32/INF.7 dated 17 November 2000

[2] Oscar Johansen, Seagull AS, "Computer Based Training: What Can It Really Do For You?", ISF 2001 Conference

One of the major users is the Fleet of the National Oceanographic and Atmospheric Administration (NOAA), an agency of the Federal Government. The NOAA fleet is comprised primarily of oceanographic research vessels. NOAA contracted with MGI International about a year ago to provide BST training using a combination of CBT and on-site practical demonstrations at two NOAA facilities. These facilities are located in Norfolk, VA and Seattle, WA. To date, about 50% of the fleet personnel have been trained and NOAA has been very pleased with the results. They are planning to expand the use of the BST to scientists who are aboard the vessels doing research; however they will receive an abbreviated course. It is expected that the CBT portion of the training will be delivered over the web, and this is scheduled to begin shortly.

Another major user of Basic Safety Training is Houston Marine of New Orleans, Louisiana. Houston contracted with MGI International to license their Coast Guard approved CBT for Basic Safety Training and has been training all of the major offshore supply vessel operators since March 2001. Through the end of August of this year, Houston has had a total throughput of 276 students that have received their certificates for all of the Basic Safety Training modules, and is currently training 63 students per month using CBT for the cognitive part of the training. Houston has used both standalone configurations for delivering CBT, as well as networked systems using streaming video.

The STAR Center of Dania Beach, Florida has partnered with Lockheed Martin to offer distance learning on a worldwide basis, using the Internet and CD-ROM. Basic Safety Training will be the initial offering, and it is expected to be available by the end of this year. The STAR Center has formed a consortium of training providers to enable distance learning students to obtain their assessment and practical training at a school convenient to them. This will enable students to stay close to home when obtaining needed training. It will also reduce the travel costs expended by the student and his/her employer.

2. GMDSS

A CD-ROM product for the Global Maritime Distress and Safety System, developed by Maritime Education of Sweden, is used by several training institutions in the United States. About a year ago, a request was made by one of these training schools to the US Coast Guard National Maritime Center to accept this CBT course for the knowledge portion of the GMDSS course. The Coast Guard subsequently sought the opinion of the National GMDSS Implementation Task Force in responding to this request, and recently the Task Force decided to recommend that 16 hours credit could be given for this CBT toward the total required hours for the resident training course. The Task Force will be making this recommendation in writing to the Coast Guard in the near future.

3. Exam Preparation Courses

Another category of CBT that has been used for several years is that of exam preparation courses. These courses started out as disk based systems and have progressed to web based training. The courses have also become more sophisticated in that they reinforce those areas where the student needs more work. Two schools that are using web-based exam preparation courses are Houston Marine of New Orleans, Louisiana and Louisiana Technical College of Houma, Louisiana.

4. Other (Seagull AS)

Seagull AS of Horten, Norway began offering their CBT products in 1997 on CD-ROM. Their penetration into the US market currently represents a large number of training courses for a few clients, but this number is growing. In addition they have developed specialized courses for one client and have partnered with another company to develop additional courses to be marketed under the Seagull umbrella. A total of 31 modules are currently in use in the United States; a few of the topics include:

Personal Safety
Safety Management System
Fuel Oil System
Maritime Communications
Voyage Planning
Fire Fighting
Crude Oil Washing
Stability
Tanker Operation

4.USCG Commandant Instruction 1554.1

The USCG Commandant Instruction establishes Coast Guard policy, prescribes procedures, assigns responsibilities, and establishes requirements for the development and management of interactive courseware. Among other things the instruction establishes that "The standard approved authoring tool for Coast Guard approved ICW development is Macromedia's Authorware." The instruction further states that "all ICW programs developed for or by the Coast Guard will follow the standards, styles and technical requirements documented in enclosure (1), ICW Standards and Styles Guide." A last requirement in the instruction is that the ICW "shall include the capability to export training data to an embedded training management system that captures at a minimum, student name, student SSN[2], test results, date of testing, course completion, and date of course completion."

The style guide that is included as an enclosure to the instruction is intended primarily as a decision tool and reference for Coast Guard ICW developers and purchasers. However, it contains a lot of useful information that can be applied to CBT development. The aim of the IMO guidance was to identify issues to be considered when integrating CBT into the training and assessment of seafarers. Appendix A compares the issues and guidance provided by the IMO guidance with that of the Commandant Instruction on ICW. The strength of the USCG Style Guide is "nuts and bolts" guidance on screen set-up, use of text, graphics, animation, and video provided in the guide. It also has a 175-question checklist in an appendix that is provided as an ICW evaluation checklist. It does not address the conceptual and management questions that the IMO guidance asks because the USCG Style Guide assumes that the necessary Instructional Systems Development front end analysis has been conducted and the decision to use CBT for training has already been made.

[2] SSN is the acronym for Social Security Number. This is a unique number assigned to all individuals enrolled in the United States Social Security System. All U.S. citizens must have a SSN assigned.

5.Department of Defense Guidance

The USCG Style Guide cites the Department of Defense (DOD) Development of Interactive Multimedia Instruction (IMI) as another reference for standards for CBT development. The DOD publication is a "cookbook" for the decision, analysis, design and implementation of CBT. It is a 100-page document that is filled with guidelines, job aids, and checklists. In Appendix B, the IMO guidance issues are contrasted against the list of tables from the DOD publication.

One area of particular note is the definitions of the levels of interactivity for CBT. The DOD guidance defines four levels of interactivity. These levels of interactivity are defined in Table 25, which is reproduced below for discussion purposes.

Table 25. Levels of Interactivity

Level	
1 – Passive	The student acts solely as a receiver of information.
2 – Limited participation	The student makes simple responses to instructional cues.
3 – Complex participation	The student makes a variety of responses using varied techniques in response to instructional cues.
4 – Real-time participation	The student is directly involved in a life-like set of complex cues and responses.

Table 26 maps the levels of interactivity against associated levels of learning. An excerpt of Table 26 is reproduced below.

Table 26. Interactivity levels and associated levels of learning

Interactivity Level	Level Description	Knowledge	Skills	Attitudes
Level 1 Passive	Capable of computer generated multimedia presentations of intellectual skills (facts, rules, procedures)	Fact Learning The learning of verbal or symbolic information (e.g., names, formulas, facts).	Perception (Encoding) Perception of sensory stimuli that translate into physical performance	
	Capable of showing a procedure with computer generated multi media explanations of equipment operation	Rule Learning Learning to use two or more facts in a manner that will provide regularity of		
	Student interaction limited to those required to advance presentation	behavior in an infinite variation of situations		

Table 26. Interactivity levels and associated levels of learning (continued)

Interactivity Level	Level Description	Knowledge	Skills	Attitudes
Level 3 Complex participation	Capable of providing complex branching paths based on student selections and responses Capable of presenting or emulating complex procedures with explanations of equipment operation. Capability for student participation in emulation of psychomotor performance and extensive branching capability. Capability for limited real-time simulation of performance in the operational setting. Computer evaluation of student performance and intellectual skills by computer-based predictive and performance test items. Computer evaluation of student procedural performance includes the capability to generate time and error scores for performance text items.	Procedure Learning Learning to perform step by step actions in the proper sequence. Discrimination Learning Learning to group similar and dissimilar items according to their characteristics. Problem-Solving Learning to synthesize lower levels of knowledge for the resolution of problems.	Perception (Encoding) Perception of sensory stimuli that translate into physical performance. Readiness Learning to have readiness to take a particular action. Guided Response Learning of a complex physical skill by copying a demonstration. Mechanism Learning to perform a complex physical skill with confidence and proficiency. Adaptation Learning to modify a complex physical skill to accommodate a new situation Origination Learning to create a new complex physical skill to accommodate a new situation. Continuous Movement Learning to track, make compensatory movements based on feedback.	Receiving The ability to perceive the normal, abnormal, and emergency cues associated with the performance of an operational procedure. (Situational Awareness). Responding The mental preparedness to encode operational cues as indicators of normal, abnormal, and emergency conditions associated with the performance of an operational procedure. Valuing The ability to judge the worth or quality of normal, abnormal, and emergency cues associated with the performance of an operational procedure. Competence The mental preparedness to make decisions by using prioritized strategies and tactics in response to normal, abnormal and emergency condition cues associated with the performance of an operational procedure. Innovation The ability to make decisions by generating the results expected upon completion of a prioritized strategies or tactics in response to normal abnormal, and emergency cues associated with the performance of an operational procedure, and the ability to generate new prioritized strategies and tactics in response to abnormal or emergency cues.

Most CBT available today is Level 1 CBT. They are often referred to as “automatic page-

turners." The Coast Guard is trying to set standards for CBT that require at least Level 2 interactivity and may approach Level 3 interactivity. However, one size does not fit all in CBT. The keys to effective CBT are the front-end analysis, which answers the questions: "What are the objectives?" and "Who is the target audience?" Then the various job aids and decision matrices that are presented in the DOD guidance may be put to good use in the design of effective CBT.

6. USCG National Maritime Center Guidance

The National Maritime Center (NMC) provided a Checklist for Web or Computer Based Training. This checklist was provided as the tool, which the Coast Guard would use to determine approval of CBT programs submitted to the NMC. This checklist is included as Appendix C. This checklist was developed by Dr. Badrul H. Khan of The George Washington University, Washington, DC, USA. There are six headings in the checklist. They are 1. Pedagogical, 2. Technological, 3. Interface Design, 4. Evaluation, 5. Management of Learning Environment, and 6. Resource Support. The main weaknesses of the checklist are that it is multi-functional and it does not cite design conventions. It is a checklist for both CBT and Web Based Training (WBT). There are many differences in approach between CBT and WBT. CBT is often designed to be "Stand-alone" where WBT design usually assumes a certain amount of facilitation is provided by an online instructor. Section 1.22 of the checklist emphasizes this difference with the questions "Facilitative?", and then a list of web based interactive capabilities including e-mail, mailing list, chat room, audio conference, and video conference. Section Four of the Checklist addresses Assessment of Learners (which is an IMO guidance issue). The checklist asks, "Is testing secure?" and "How is learner's assessment administered?" It then lists as the possible assessment vehicles as multiple choice, true/false, fill-in the blanks, essay questions, papers, projects, assignments, proctored tests, portfolio development, case studies, lab report, journal, and other. The first three assessment vehicles and proctored tests are appropriate for CBT. The remaining assessment vehicles are more appropriate for WBT or blended learning. The NMC guidance is more specific than the IMO guidance. However, it is still too broad as it identifies issues and areas to be considered and does not establish specific standards. An issue raised by both the IMO guidance and the NMC checklist are security of assessment. That is of primary concern to the maritime authorities.

7. Issues Affecting CBT Implementation in the USA

US Coast Guard Guidance and Approval – Because many of the original applications of CBT are for courses necessary for STCW 95 compliance, the regulatory authorities (i.e., US Coast Guard) play a major role in defining how these courses are implemented, and at a very detailed level. (See prior discussion of the CBT standards.) The direction that CBT applications will take will be largely based on policy decisions made by the Coast Guard with respect to how STCW 95 is implemented. Because there are limited funds for CBT development, the initial priority will be given to STCW 95 relevant courses.

The evolution of standards has prevented end users from developing applications on their own. The costs are too great to risk using proprietary software that may become obsolete as standards continue to evolve.

8. Future CBT Applications in the USA

It is predicted that there will be two primary areas of focus for seafarer CBT development in the USA.

1. STCW 95 Training Needs – Initially, future CBT applications will continue to address STCW 95 requirements. Among the areas of interest are:

    a. Bridge Resource Management
    b. Crowd Management
    c. Crisis Management and Human Behavior
    d. Vessel Familiarization
    e. Upgrade from Operational to Management Level (STCW 95) – traditional program at schools requires 17 weeks; it is estimated this can be reduced to between 9 and 11 weeks on-site by the use of CBT/internet training for knowledge based elements. This CBT training focuses mainly on Dangerous Cargo and Navigation. US Coast Guard has given conceptual approval for this upgrade training.
    f. Rules of the Road/Collision Avoidance

2. University Degree Programs (Already being done in UK but new to US in maritime field.)

The STCW establishes three primary levels for competency based training. They are the support level, the operational level and the management level. CBT is effective for knowledge and limited skills training depending on the level of interactivity obtained. It might be useful to establish different CBT level requirements for various competencies. For example, CBT level 2 might be best for entry level basic training such as Basic Safety Training, Crowd Management, and Vessel Familiarization. Higher level interactivity and facilitation would be required for training involving decision-making skills and management level competencies. Level 4 CBT, as defined by the DOD guidance, is essentially simulation training. Ultimately, the training system must be designed to have a blend of Level 2, 3, and 4 CBT that is augmented by traditional face-to-face training and competency demonstration for physical skills.

9. Conclusions

Relatively little CBT is being used in the United States for seafarer training. Only one company has an approved program for Basic Safety Training. All training meeting STCW competency requirements must meet USCG approval standards. CBT standards are still evolving. The U.S. Coast Guard has concerns that parallel many of the issues raised in the IMO guidance. However, detailed instructions with specific design conventions are available for the development of CBT. All CBT efforts should begin with a front-end analysis of the target audience and the objectives of the training. It is recommended that target audience and objective analyses be conducted for the STCW 95 competency tables at the support, operational, and management levels. It is further recommended that the results of these analyses be used to establish the specific requirements for CBT, WBT, and blended learning for each competency.

Appendix A

STW 32/INF.7 Issue/Topic	COMDTINST 1554.1
Issues for Developers	
	Team versus individual recommended.
	Screen layout – z pattern. Primary information or graphic on left, secondary on the right.
	Consistency of design
	Frequent feedback
	Lesson title on top of page
	Navigation Icons on bottom or bottom right of page
	Four or fewer colors per screen
	Three or fewer fonts per screen
	Avoid use of acronyms
	Six or fewer lines of text per screen
	Use of graphic preferred over photo
	Learner controlled video and graphic animations
	Learner option to repeat videos and graphic animations
	Audio augmentation of the text
	Use of Call outs and/or Blow ups
	Screens simple and not cluttered
	Backgrounds and visual elements contrast
	Enough animation and/or video to keep program interesting
	Each screen presents one main point, idea, concept, step, or action
	Does the program include a paper-based or print-available workbook for students to keep
	Comprehensive multi-lesson testing provided
Issues for Maritime Administrations	
Tutor support load.	
Certification path.	
Quality of assessment.	
Prevention of cheating.	
Security of system.	
Process for updating questions in the database.	
Demonstration of competence through practical exercise	

STW 32/INF.7 Issue/Topic	COMDTINST 1554.1
Validation of examination results.	
Issues for Trainers and Assessors	
Assessment of how CBT can improve existing training	Front end analysis of type of training needed assumed
Consideration of the target audience	
Consideration of the learning objectives	
Consideration of the tutorial support requirements for CBT	
Understanding of parameters related to syllabus, training, reviewing, self assessment and formal assessment	
Security of information and needs of formal assessment	
CBT Applications Review	
Training objectives	User friendly interface
Legal requirements	Consistent lesson structure
Safe working practices	“Bite-sized” instructional blocks
A method for verifying the learning objectives	Rapid exit and bookmarking
The relevance of the storyboard/script	Extensive use of help routines and remediation
The reliability and compatibility of the software	Diagnostic pre-tests
The clarity of the instructions on how to use the program	Individualized , tailored instruction based on pre-scores
The integrity of the assessment process	Confirmation of learning by progress check and/or post-test
The way results of tests are held and communicated to the individual and the training or examination center	Provisions for easy review of selected sections once all mandatory work is completed
	Post-tests identify user weaknesses based on learning objectives
	Availability of hardware and software for both user and developer that can support the program
Issues for Users	
Type and level of the training	Course Material is relevant to the target audience. Course material is relevant to course objectives.
Computer literacy of the users	
Required hardware	Course is designed to run on platforms available to the intended audience.
How the cost benefit is to be assessed	
Whether onboard use of CBT compromises safe working hours	
Whether onboard use of CBT distracts from crew responsibilities	
Impact on off-duty time/manning levels	
How assessment is managed	
Does CBT produce an official record.	
Supervision of assessment.	

STW 32/INF.7 Issue/Topic	COMDTINST 1554.1
Role of officers onboard.	
Level of shoreside support offered	

Appendix B

STW 32/INF.7 Issue/Topic	DOD Guidance
Issues for Maritime Administrations	Table 1 – General rules for using IMI as an instructional media delivery system
Tutor support load.	Table 2 – IMI development team
Certification path.	Table 3 – IMI implementation team
Quality of assessment.	Table 4 – General types of management support
Prevention of cheating.	Table 5 – Decision aid – evaluation of organizational support for IMI
Security of system.	Table 6 – Modification of support level
Process for updating questions in the database.	Table 7 – Decision aid – organizational support re-evaluation
Demonstration of competence through practical exercise	Table 8 – Decision aid – contractor support determination
Validation of examination results.	Table 9 – Decision aid – exportable IMI feasibility checklist
Issues for Trainers and Assessors	Table 10 – Job aid – Hardware Data Collection
Assessment of how CBT can improve existing training	Table 11 – Types of costs
Consideration of the target audience	Table 12 – Variables affecting IMI development
Consideration of the learning objectives	Table 13 – Configuration control decision matrix
Consideration of the tutorial support requirements for CBT	Table 14 – Example of a development list
Understanding of parameters related to syllabus, training, reviewing, self assessment and formal assessment	Table 15 – Sample format for IMI review and approval
Security of information and needs of formal assessment	Table 16 – Quality Control responsibilities of IMI development team
CBT Applications Review	Table 17 – Sample format for courseware design review
Training objectives	Table 18 – Sample format for quality specialist final lesson review
Legal requirements	Table 19 – Sample format for a discrepancy report
Safe working practices	Table 20 – Sampling rates/storage requirements tradeoffs
A method for verifying the learning objectives	Table 21 – Hardware/software considerations
The relevance of the storyboard/script	Table 22 – Impact of digital audio features
The reliability and compatibility of the software	Table 23 – Contrasting video technologies
The clarity of the instructions on how to use the program	Table 24 – Knowledge, skills, and attitudes
The integrity of the assessment process	Table 25 – Levels of interactivity
The way results of tests are held and communicated to the individual	Table 26 – Interactivity levels and associated levels of learning

STW 32/INF.7 Issue/Topic	DOD Guidance
and the training or examination center	
Issues for Users	Table 27 – Instructional delivery mode cost impact
Type and level of the training	Table 28 – Categories of ICW presentations
Computer literacy of the users	Table 29 – Job aid – ICW presentation category selection data consolidation
Required hardware	Table 30 – Guidelines for increasing user interactivity
How the cost benefit is to be assessed	Table 31 – Guidelines for designing student control of ICW
Whether onboard use of CBT compromises safe working hours	Table 32 – Guidelines for designing feedback for ICW
Whether onboard use of CBT distracts from crew responsibilities	Table 33 – Guidelines for designing ICW tests
Impact on off-duty time/manning levels	Table 34 – ICW events of instruction
How assessment is managed	Table 35 – Programming standards considerations
Does CBT produce an official record.	Table 36 – Guidelines for programming elements of a storyboard
Supervision of assessment.	Table 37 – Steps involved in storyboard development
Role of officers onboard.	Table 38 – Guidelines for storyboarding ICW
Level of shoreside support offered	Table 39 – Guidelines for storyboarding visual elements
	Table 40 – Guidelines for storyboarding video elements
	Table 41 – Guidelines for storyboarding text elements
	Table 42 – Guidelines for storyboarding graphics and animation elements
	Table 43 – Guidelines for storyboarding audio
	Table 44 – Storyboard checklist
	Table 45 – Prototype lesson development elements
	Table 46 – ICW programming guidelines
	Table 47 – Video production guidelines
	Table 48 – Audio production guidelines
	Table 49 – ICW display convention guidelines
	Table 50 – Sample job aid for internal review
	Table 51 – Sources of individual tryout information

Appendix C

Checklist for Web or computer Based Training

Developed by Badrul H. Khan, Ph.D., Associate Professor & Program Director
Educational Technology Leadership Graduate Cohort Program
The George Washington University

1.0 Pedagogical
- 1.1 Goals/Objectives
  - 1.1.1 Are course instructional goals clear?
  - 1.1.2 Are lesson instructional goals clear?
- 1.2 Design Approach
  - 1.2.1 Appropriate for the learning domain?
    - 1.2.1.1 Is the content well-structured?
    - 1.2.1.2 Is content ill structured?
  - 1.2.2 What is instructor's role?
    - 1.2.2.1 Facilitative?
      - 1.2.2.1.1 E-mail
      - 1.2.2.1.2 Mailing list
      - 1.2.2.1.3 Chat room
      - 1.2.2.1.4 Audio conference
      - 1.2.2.1.5 Video conference
    - 1.2.2.2 Didactic?
- 1.3 Organization
  - 1.3.1 Clarity?
  - 1.3.2 Style?
  - 1.3.3 Readability?
  - 1.3.4 Usage of content relevant graphic?
  - 1.3.5 Multimedia components?
  - 1.3.6 Clear directions for learners at every stage of the course?
  - 1.3.7 Sense of continuity for learners?
- 1.4 Methods and Strategies
  - 1.4.1 Presentation
  - 1.4.2 Demonstration
  - 1.4.3 Drill and Practice
  - 1.4.4 Tutorials
  - 1.4.5 Games
  - 1.4.6 Simulations
  - 1.4.7 Role Play
  - 1.4.8 Discussion
  - 1.4.9 Interaction
  - 1.4.10 Modeling
  - 1.4.11 Facilitation
  - 1.4.12 Collaboration
  - 1.4.13 Field Trips
  - 1.4.14 Apprenticeships
  - 1.4.15 Case Studies

1.4.16 Generative Development
1.4.17 Motivation

1.5 Medium
1.5.1 Is a mixture of media used to create a rich environment?
1.5.2 Does course exploit hypertext/hypermedia environment of the web?

2.0 Technological

2.1 Infrastructure Planning
2.1.1 Are there personnel to help online learners get started?
2.1.2 What are the Internet service requirements?

2.2 Hardware
2.2.1 What are the hardware requirements?
2.2.1.1 Are they made clear to prospective students?

2.3 Software
2.3.1 What are the software requirements?
2.3.1.1 Are they made clear to prospective students?
2.3.1.1.1 Do students need support to send e-mail attachments?
2.3.1.1.2 Install required software?
2.3.1.1.3 Scan?
2.3.1.1.4 Print within web page frames?
2.3.1.1.5 Create on-line presentations?
2.3.1.1.6 Other?

3.0 Interface Design

3.1 Page and site design
3.1.1 Does it look good in a variety of browsers?
3.1.2 Are standard type fonts used?

3.2 Content Design
3.2.1 Does course follow one idea per paragraph?
3.2.2 Is text chunked and presented in a way that allows scanning and comprehension?

3.3 Navigation
3.3.1 Does course provide structural aids or site map?
3.3.2 Does course use large audio, video and graphic files?
3.3.2.1 Is download or streaming time reasonable?

3.4 Usability Testing
3.4.1 Was course tested for usability?
3.4.2 How quickly can users find answers to FAQ's?
3.4.3 Are terms easy to understand?

4.0 Evaluation

4.1 Assessment of Learners
4.1.1 Is testing secure?
4.1.2 How is learner's assessment administered?
- Multiple Choice
- True/false

- Fill-in the blanks
- Essay questions
- Papers
- Projects
- Assignments
- Proctored tests
- Portfolio development
- Case studies
- Lab report
- Journal
- Other

4.2 Evaluation of instruction and learning environment

4.2.1 How will students critique instruction and learning environment?

4.2.1.1 Online?

4.2.1.2 Does evaluation include?

- Content
- Instructor
- Learning environment
- Course design
- Technical support
- Other

5.0 Management of learning environment

5.1 Maintenance of learning environment

5.1.1 How is site or CD maintained

5.1.2 Does any content require reprint permissions?

5.1.3 Does course require permission to use copyrighted material?

5.1.4 Can students store notes and resources?

5.1.5 Can you keep track of student submissions, online quizzes, tests, etc.

5.2 Distribution of information

5.2.1 Can students be notified of changes?

- E-mail
- Announcement page
- Alert boxes
- Phone call
- Mail
- Running footer added to page?

5.2.2 Are there provisions for back up if Web is not accessible?

- Courseware
- Discussion forum
- Chat room
- E-mail and mailing list
- Books
- Library materials
- Online resources

- Study guide
- Tutor
- Instructor
- Technical support

6.0 Resource Support

6.1 Online Support

6.1.1 Is there a way to get help online?

- Toll free telephone numbers available?
- Are clear guidelines given on what support is or is not available?

6.1.2 Are student advised on how long lessons will take the average learner?

6.1.3 Is any advice given on how to become successful online learners?

6.2 Resources

6.2.1 Does the course provide library resources on-line?

6.2.2 Can student research its databases via the Internet?

6.3 Off-line Support

6.3.1 Can students get information on where to get books, journals, magazines, documents, and other reference works?

6.3.2 Can students get them through and interlibrary loan?

6.3.3 Can documents be faxed to students?

6.4 Student services

6.4.1 Re instructors and technical staff available during online orientation?

6.4.2 Can students purchase packages of course related supplemental material on-line?