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GLOBAL AVIATION TRAINING
TRAINAIR PLUS™

TRAINING DEVELOPMENT GUIDE
COMPETENCY-BASED TRAINING METHODOLOGY

GUIDELINES FOR THE DEVELOPMENT OF ONLINE COURSES

International Civil Aviation Organization

Contents

1. INTRODUCTION

1.1. PURPOSE OF THE GUIDE

The rapid expansion of Internet access and development of media technologies have made online learning or eLearning accessible to many more trainees and increased course delivery options for training providers.

The evolution of distance learning, self-paced learning, online learning (web-based), eLearning (web-based or downloaded), hybrid or blended learning, the rapid and constant changes in computer technologies, software applications, and mobility, have created new possibilities as well as new challenges for Civil Aviation Training Centres (CATCs). The work of CATCs is becoming more complex. The understanding of the roles, tasks and responsibilities of employees involved in training are constantly evolving together with technology innovations and performance-based training demands.

According to Orbis research in 2018, the global eLearning market worldwide is set to surpass USD 275 billion value by 2022. The market size was estimated over USD 165.21 billion in 2015 and is predicted to grow at over 7.5% during the 2015-22 period. The 2018 statistics show that the number of Internet users ranges around 3.2 billion, which is 43 percent of the global population. Thirty-six percent of the world`s population own a smartphone (according to https://elearningindustry.com/). Therefore, most of training organizations and institutions consider online learning to be their critical long-term strategy.

This document is developed to provide

TRAINAIR PLUS Programme (TPP) Members with the guidance on the standards and best practices of development of online courses complementary to the *TRAINAIR PLUS Training Development Guide (TDG) Competency-based Training Methodology.*

This Guide contributes to help TPP members to successfully develop online training using the TRAINAIR PLUS Competency-based Training Methodology, following the Stages and Steps of the TDG and completing the online Steps as described herein.

Course developers using the TDG methodology and this Guide will be able to establish an optimal curriculum for a standardized training package delivered online through eLearning and in a classroom, or both, and maximize learning impact for a variety of learners.

This Guide sets forth the objectives, standards and requirements, examples and best practices, related to ICAO-recognized online courses. It addresses the specifics of online development in each of the Stages. Stage Reports are required for validation of the online course. When the course is relevant to ICAO provisions, the content will be validated. Tables, examples, checklists, and best practices are included in this Guide to support your decision-making when developing online courses.

The Guide is prepared for course developers, multimedia professionals, instructors, and managers of TPP CATCs.

1.2. RELATED MANUALS

The *TRAINAIR PLUS Training Development Guide, Competency-based Training Methodology* (Doc 9941) provides a methodology for developing classroom courses. It serves as a guide for developing training material in a consistent and systematic manner and also sets forth training development standards, making it practical for course material to be shared between participating TRAINAIR PLUS Members.

1.3. GLOSSARY

- **Animation:** the rapid sequential presentation of slightly differing graphics to create the illusion of motion. Animation can have greater purpose in illustrating a process than a static visual, but it requires more information to be processed by the computer and thus higher bandwidth.

- **Application methods:** instructional methods which emphasize the active processes learners use to perform or to build new knowledge. Application methods include project work, case studies, role plays.
- **Asynchronous online learning:** time-independent learning. A self-paced course, completed individually, is an example of asynchronous online learning; it takes place at any time of the learner's choosing.
- **Authoring tool (authorware):** software used by course developers to develop online courses.
- **Blended learning**: learning that combines aspects of online and face-to-face instruction.
- **Collaborative methods**: instructional methods which emphasize the social dimension of learning and engage learners to share information and perform tasks in a collaborative way. They include online guided discussions, collaborative work shared through internet and web-based technologies. These methods generate online communities of practice and eCommunities.
- **Community of Practice:** group of people who share a profession and form an online community.
- **Competency:** a combination of knowledge, skills and attitudes required to perform a task to a prescribed standard.
- **Competency-based eTraining:** online training designed to generate an outcome based on the required competencies.
- **Computer-mediated communication:** any human communication that occurs using two or more electronic devices.
- **Courseware:** the online course materials developed using an authoring tool.
- **Distance education:** educational situation in which the instructor and students are separated by time, location, or both. Education or training courses are delivered to remote locations via synchronous or asynchronous means of instruction, including written correspondence, text, graphics, audio- and videotape, CD-ROM, online learning, audio- and videoconferencing, interactive TV. The definition of distance education is broad and entails the definition of eLearning.
- **Distance learning**: the desired outcome of distance education. The two terms are often used interchangeably.

- **HTML or hypertext markup language:** refers to standard markup language for creating web pages.
- **eLearning:** the use of computer, Internet, web-based and mobile technologies to deliver learning solutions, particularly self-paced, individual modular courses.
- **eCommunity** of learners: a group of online trainees who achieve learning goals together. Participants in a eLearning community feel they are responsible for their own learning as well as for sharing best practices to support others' learning.
- **eLearner:** a person who assimilates information and temporarily or permanently acquires or improves skills, knowledge, and attitudes in an online environment.
- **Expositive methods**: instructional methods which emphasize explanation and "absorption" of new information. Expositive methods include presentations, worked examples, demonstrations. Learners are passive.
- **Learning Management System (LMS):** software application that automates the administration of training. The LMS hosts courses, registers users, tracks courses in a catalogue, records data from learners; and provides reports to management. An LMS typically manages courses created by a variety of authoring tools used by course developers.
- **Interactive methods:** instructional methods requiring actions from the learner.
- **Netiquette:** refers to a set of core rules of etiquette in an online environment.
- **Online learning:** the use of computer, Internet, web-based and mobile technologies to deliver a broad array of solutions that can take many forms such as virtual classrooms, online discussion forums, wikis, or full eLearning courses with exercises and exams.
- **Online learning with instructor/facilitator**: refers to learning where participation of an instructor/facilitator is available at specific time online, to teach knowledge skills or attitudes and provide necessary feedback.
- **Podcast:** a series of digital-media files which are distributed over the Internet using syndication feeds for playback on portable media players and computers. The term podcast, like broadcast, can refer either to the series of

content itself or to the method by which it is syndicated; the latter is also called podcasting. The term derives from the words "iPod" and "broadcast."

- **Prototype:** a sample online working model of the course for the purpose of stakeholder's approval prior to full e-learning development. The primary goal of a prototype is to provide a sample of the course branding, navigation and functions.
- **Receptivity:** attitude and willingness of users to be engaged in online training.
- **SCORM, xAPI (Tin Can):** specifications for packaging online content to run seamlessly on an LMS and perform intended functions designed for the learning experience.
- **Serious games:** eLearning games developed for educational or training purposes. Challenges and rewards in a game environment highly motivate learners to achieve training objectives.
- **Simulations:** highly interactive applications that allow the learner to model or role-play in a real-life scenario. Simulations enable the learner to practice skills or behaviours in a risk-free environment.
- **Storyboard:** a detailed outline of an online course, providing directives to courseware author, multimedia specialists, or programmers, in which each page represents a screen to be designed and developed.
- **Synchronous online learning:** happens in a real time and involves technologies such as web-based video conferencing, and electronic white boards. All trainees are required to be present at the time of content delivery. Examples of synchronous activities are chat conversations and audio/video conferencing, and interactive Webinars.
- **Virtual live:** learning delivered by an instructor in real-time through a web-based programme, using a web-cam or technology so the instructor is seen and heard delivering the course.
- **Web 2.0**: the use of Internet technology and web design to enhance information sharing and collaboration among users. These concepts have led to the development and evolution of eCommunities and hosted services, such as social-networking sites, wikis, and blogs.
- **Wiki:** Wikis are hypertext tools that let one person or a group of people manage content. It is possible to create static websites, manage online

communities, connect businesses with their customers, and even write magazines and articles. The main purpose of wikis is to create a space where people can collaborate in writing a same text on a single topic and relate this text to other texts. The main purpose of many wikis is sharing knowledge for a common good (e.g. Wikipedia).

NOTE: This Guide uses the terms online learning, online training, eLearning, and eTraining interchangeably, unless otherwise specified.

2. ONLINE TRAINING USING THE *TRAINAIR PLUS* METHODOLOGY

The TRAINAIR PLUS Training Development Guide (TDG) Competency-based Methodology (Doc 9941) is based on the application of systems engineering methodologies for the design and development of competency-based training. When preparing TPP online courses, the TDG methodology is applied with additional considerations relevant to the requirements of the online learning environment. The systematic preparation of training packages for online courses follows the TDG closely and it consists of the same three Stages and seven Steps with additional activities during each stage. These activities are indicated in the development process schema as shown below.

Figure 1: Training Development Process

This Guide focuses on the standards and best practices in Analysis, Design/ Production, and Evaluation of online training development according to the TDG. The required course development stages and procedures are to be followed for online training. However, each Stage has its specific Steps and outcomes for online development that will be described in the following sections. TDG forms, annexes and Stage Reports , are required and will include material relevant to the online development process.

2.1. STAGE 1 – ANALYSIS

Not all performance problems can be addressed through eLearning. An analysis of whether eLearning is appropriate to effectively achieve the learning outcomes (knowledge, skills, attitudes) for the target audience is an important part of Stage 1.

Figure 2: Stage 1 - Analysis Steps for Online Training Development.

2.1.1. Step 1 - Preliminary Study - Selecting an Online Training Solution

The decision to select an online training solution is the main task at Stage 1, Step 1, Preliminary Study. Training is required to fill a gap in professional knowledge, skills and attitudes. The preliminary study answers the question: Are the training outcomes achievable through online training?

Selecting an online solution is driven by three criteria:

A. Rationale/ justification
B. Cost effectiveness
C. Technology capability.

2.1.1.1. A. Rationale/Justification

Many industries and businesses have transitioned to online training because it saves time; it is more accessible than traditional training; it is recognized as a fundamental tool for fostering a lifelong learning. eLearning allows the online delivery of training

can happen anytime and anywhere. This absence of time-space restrictions makes online training ideal support for such global industry as aviation.

The effectiveness of online training depends on a multiplicity of factors to be analysed before taking the decision to proceed with online training: instructional methods to be used in training, technology choices (availability of authoring tools and Learning Management System (LMS), training team's support for online teaching, organization's leadership, trainees' receptivity to online training and learning preferences. Properly organized online environments could contribute to professional community building and allow for increased professional collaboration even more efficiently than in regular traditional classes. It is particularly relevant to the upcoming generations of "digital native" (Prensky, 2001) professionals.

2.1.1.2. Challenges of Online Training

eLearning holds tremendous promise and potential, yet it remains a largely unexplored area of learning. If not analysed and designed effectively, eLearning will be ineffective both for training organizations and for trainees.

Along with technology barriers, feelings of isolation, time constraints, lack of reflective activities, language barriers, and lack of critique pose learning challenges. The use of technology in learning should justify the resources it requires.

These challenges can negatively influence achieving learning outcomes.

Best practices for choosing online training

While justifying the decision to proceed with online training, CATCs should take into consideration that eLearning is a good option when:

- there is a significant amount of content to be delivered to a large number of learners;
- learners are required to develop homogeneous background knowledge on the topic;
- learners come from geographically dispersed locations;
- learners have limited daily time to devote to learning;
- learners have limited travel ability to attend training;
- learning objectives can be achieved;
- learning effectiveness might be at least as good as for traditional (classroom) training;
- Internet and technology are robust enough for smooth eLearning deployment and access.

2.1.1.3. B. Analysing Cost Effectiveness.

Developing online training is more expensive than preparing classroom materials for training. eLearning, depending on the level of interaction, usually needs more hours of development to create one (1) finished hour of learning. Consult the following table prepared by Chapman Alliance research http://www.chapmanalliance.com/howlong/.

Table 1. Ratio of Numbers of Hours of Development

Level of Interaction in eLearning	Description	Ratio of Minimum Number of Hours of Development
Level 1 – Basic	Including content pages, text, graphics, simple audio, simple video, test questions. PowerPoint-to-eLearning often falls into this category. Basically pages with assessment.	49:1
Level 2 - Interactive	More than 25 % of interactive exercises, allowing learners to perform virtual "try it" exercises, use of audio, video, animations.	127:1
Level 3 – Advanced	Highly interactive, possibly simulation or serious game, use of avatars.	217:1

However, delivery costs for online training for wider target audiences are considerably lower than those for classroom because there are no expenses for classroom rent, host organization human resources, instructors, travel, and equipment use (see Table 2).

Table 2. Comparison of Classroom and Online Training Costs

Resources	Classroom Training Costs	Online Training Costs
Development		
Human resources	Course developer Subject matter experts (SME)	Course developer, SME, media designer, graphic designer, Web developer, programmer, courseware author
Facilities, material, equipment	Computers, software	Computers, software, authoring tool
Delivery		
Human resources	Course Administrator, Instructor	LMS Administrator Online instructor (if necessary)
Facilities, material, equipment	Classroom, data projector, computer, whiteboard, course material printed laboratory (if necessary)	LMS

2.1.1.4. C. Technology Capability (Delivery Requirements)

Online training can be developed and delivered in different forms. In some cases a downloadable application is provided, however most online training is accessed through a web-based portal available on the organization's Learning Management System (LMS). Some online courses consist of the presented content only, and in other cases participants can hyperlink to other content available on the LMS, or even on the Internet. Some eTraining offers virtual live instruction at scheduled times, and group forums and chats that are text-based or virtual live. In any of its forms, from a simple page-turner, to a sophisticated interactive program, or a highly sophisticated "serious game", online learning requires ready access to stable and dependable computers, up-to-date software, an LMS, and dependable computer networks.

2.1.1.4.1. Authoring Tools

Courseware authoring tools are special-purpose tools that help to create eLearning content. They add text, graphics audio, videos, but also provide a framework to organize pages and lessons for reliable navigation. While most of these tools are stand-alone packages that incorporate assessment and quiz capabilities, some integrate those functions from other programs. Authoring tools enable course developers to create and publish multimedia eLearning content. Most authoring tools are visually oriented, so the course developer doesn't need to have any special programming or coding skills. In addition, most authoring tools enable non-programmers to quickly and easily create content and then publish to HTML. Capabilities to look for in an Authoring Tool are: 1) ease of use; 2) multimedia support; 3) simulation capability; 4) assessment tools; 5) animation builder; 6) capability to build mobile friendly courses.

Table 3. Which Authoring Tool is Right?

Example Authoring Tool	Use it if:	Pros	Cons
PowerPoint Interactive PDF	You don't have access to anything else	Intuitive use Can be uploaded and downloaded as is	PowerPoint files do not use any eLearning standards like SCORM or xAPI. It can't track learners' progress
PowerPoint Add-in: *iSpring, Articulate studio*	Your eLearning needs to work through an LMS, but it is basic	The tools allow the finished files to follow eLearning standards, like SCORM,TinCan, xAPI. Learners' progress can be tracked	The tools are limited to basic level of interactivity, using content pages, graphics, simple video, test questions
Adobe Captivate, Articulate Storyline Articulate 360 *iTyStudio* (gamification) Gamification programming	Your eLearning needs to work in an LMS and you want a faster work flow with more capacities and more advanced level of interactivity	Follow eLearning standards like SCORM, TinCan, xAPI. The tools are not limited and they can create advanced interactions, eg simulations, use of avatars, custom interactions, serious games and simulations. Learners' progress and course processes can be tracked	Course developers need special training and experience to work with them.

What is the right tool depends on the rationale/justification, available human resources, budget, and desired training outcomes of the CATC.

2.1.1.4.2. Learning Management System (LMS)

LMS is a software application housed on a central server that automates the delivery of online training and tracking processes.

There are a variety of LMSs with different levels of complexity, and despite their differences, they also have many features in common. Their most important features include:

- learning content management: creation, storage, access to resources;

- curriculum mapping and planning: lesson planning, personalized learning paths, assessment;
- learner engagement and management: learner information, progress tracking; and
- tools and services: forums, messaging system, blogs, group discussions.

The selection and proper choice of LMS (see Table 4) is one of the most important steps when considering the online training. The following table provides guidance for selecting an LMS.

Table 4. Which LMS is Right?

Items	Examples
Platform Integration	
Integration	Supports integration of CRM and in-house developed systems
Recommended engine	Uses information from learner profiles, jobs, roles, service line, past courses, country to automatically suggest learning the user might be interested in
Reporting and analytics	Creates ad hoc reports including the ability to combine information from multiple processes
Global language support	Supports most of world languages including ICAO languages: English, French, Spanish, Chinese, Russian, Arabic
Access control	Supports single sign-on: SAML
Technical environment	Supports web browsers and operating systems: Internet Explorer, Google Chrome, Mozilla Firefox, Apple Safari, Opera
Security	Ability to manage security by role (administrator, manager) Security features of mobile apps, e.g. SSL (HTTPS) secure connection
Learning	
General aspects	Supports different learning activities: series of components in different formats (pre-test, Instructor led course, eLearning course) and rolls then up into a single course
User experience: Learners, Managers, Instructors, Administrators	Intuitive use of interface for Instructor, Trainee, Administrator
Competency and skills management	Flexible to handle unique competency models, gives possibility to create a personalized learning path

Items	Examples
Course and curriculum management	Administrator can add, update, reschedule, and remove courses from course catalog
Resource management	Ability to define prerequisites and restrict access Group notifications
Content management	Ability to organize, manage, distribute and track learning content
Bookmarking	Ability to log out and return to the same screen/page
On-the-job training and observational assessment	Facilitates and tracks on-the-job training activities and observational checklists
Testing and assessment	Offers built in assessments that allow to build quizzes, exams
Mobile learning	Supports mobile apps to browse the tailored version of course catalog and opt to download the course content
Collaboration	
Informal collaborative learning – communities of practice (CoPs)	Chat capabilities and Forum Users can be automatically assigned to communities
Virtual classroom	Provides online and recorded virtual classroom sessions from calendar
Social bookmarking	Users can share their articles, blog posters, images, and videos
Gamification	Supports reward systems, including points, badges, levels and rewards
Engagement	
Pulse surveys	Provides pulse survey functionality
Other Technical Capacities	
Cloud (software-as-a-service) environment	Offers SaaS solution
Support requirements	24/7, phone, live support, training ticket

2.1.2. Step 1 - Preliminary Study - Outcome

The preliminary study should reveal the technology development and delivery requirements and what solution is the best fit for the desired training outcomes. It is recommended to use the Tables 1-4 as guidance to choose the best online solution, showing the possible technology and human resources options. At this Step 1, of Stage 1 Report it is recommended to use:

- Form 7 – Evaluation Plan,
- Form 8 – Training Development Project Planning and Control Sheet.

The following checklist will help to evaluate whether your CATC has enough resources to proceed with online training.

Example Online Training Solution Checklist

Complete this short checklist to assess existing practices and improve strategies and support for future online courses and programmes. Identify any issues for future design and development of online courses.

Check human resources you have to support learning for online training

- ☐ Media designer
- ☐ Graphic designer
- ☐ Web developer
- ☐ LMS course administrator
- ☐ Programmer
- ☐ Online instructor

Check if you have an estimated budget for online training

- ☐

Check any technology/ tools you have to support online course development and deployment

- ☐ Authoring tool for media designer, graphic designer etc.
- ☐ Professional photo equipment/photo/icon accounts
- ☐ Internet capacity

LMS features

- ☐ Course material content management
- ☐ Audio/video recording
- ☐ Forums/chats
- ☐ Calendar
- ☐ Assessment functions
- ☐ Assignments/tasks
- ☐ Assignment drop boxes
- ☐ Grading/feedback/certificates
- ☐ Tracking by instructor, administrator, learner
- ☐ Security (administrator/learner)

2.1.3. Step 2 - Job Analysis.

Achieving Learning Outcomes: Knowledge/Skills/Attitudes Through Online Training

The aim of training is to facilitate behavioural change as well as to improve performance outcomes. Most online learning is designed to develop cognitive skills, such as acquiring new knowledge, applying thinking skills, and learning new attitudes. eLearning can be structured into different learning activities to acquire new knowledge, apply thinking skills and learn new attitudes and behaviours. It can be used to present content; guide learners through drill and practice exercises; engage them in discussion; or develop more advanced skills through simulations, asynchronous or synchronous online collective work or case studies. Using eLearning does not exclude using a qualified instructor (via online) to guide learning in Webinars or virtual classes. eLearning can be used before, after or outside the classroom to complement classroom instruction.

If the CATC training team decides in favour of online training in Step 1, the course development team should indicate in the Task Description Form whether or not each K/S/A is suitable for online training in Step 2. As TDG suggests, it can be done by putting a small letter (e) in brackets after K/S/A deemed suitable for online training. During the DACUM session, complete Form 1 and Form 2, indicating (e) after the suitable K/S/A.

It is recommended to use the following Table 5 to match the level of accomplishment (LoA), identified on the Task Description Form, with the necessary technology and human resources in order to identify which K/S/A can be achieved through online training.

Table 5. Achieving Level of Accomplishment

Type of Accomplishment	LoA Verbs	Description of Level with Examples	Human and Technological Support and Tools
Remembering	Define List State	This level is one of the easiest to implement in the online environment. **Example:** Page-turner consisting of lessons with text, images, and final tests delivered by email.	Course developer Media designer Administrator *PowerPoint* Interactive PDF
Understanding	Describe Explain	The level is also easy to implement with added features. **Example:** Lessons with texts, images, recommended reading, Glossary, job aids, with progress and mastery tests.	Course developer Media designer LMS Administrator PowerPoint Add-in: *iSpring,* *Articulate studio*
Applying	Apply Execute Record Use	This is a more complex to implement. If you are training people how to use software, then an online simulation would work. If you are teaching flight attendants how to interact with customers, you could test how they react in certain situations through animation or video scenarios or you could ask the group to get together via virtual classroom/lesson (on webcam) to discuss certain scenarios. **Example:** Interactive simulations to immerse the learner in a real-world situation.	Course developer Media designer LMS Administrator *Adobe Captivate,* *Articulate Storyline* *Articulate 360*
Analysing	Differentiate Organize Relate Examine	This is a complex level for which you need advanced technology functions. **Example:** Course based on case study that implies performing a task to analyse a topic or process with interactive problem solving.	Course developer Media designer LMS Administrator Trained online instructor *Adobe Captivate,* *Articulate Storyline* *Articulate 360*
Evaluating	Appraise Argue Support Value	This is a high level of complexity. It involves branching and layers of interaction, assignments, discussion forums, and virtual classroom sessions	Experienced course developer Media designer LMS Administrator

Type of Accomplishment	LoA Verbs	Description of Level with Examples	Human and Technological Support and Tools
		Example: Cases, scenarios or data presented for problem solving or proposal development	Trained and experienced online instructor *Adobe Captivate,* *Articulate Storyline* *Articulate 360* *iTyStudio*
Creating	Design Develop Formulate Investigate	This is the level of highest complexity for design and development. It is difficult to apply this level to an online learning environment. At this stage, trainees need to put together original work based on the concepts that they have learned through the online environment. Use online learning to provide the parameters and instructions for the assignment. Schedule virtual 'group meetings' where each trainee or group of trainees is asked to present the results of their work. **Example:** Course with design activities based on assignments to develop new results or products using scheduled virtual meetings.	Experienced course developer Media designer LMS Administrator Trained and experienced online instructor *Adobe Captivate,* *Articulate Storyline* *Articulate 360* *iTyStudio*

2.1.4. Step 2. Job Analysis – Outcome

If all or a majority of K/S/A in a task are suitable for online training, then an online training solution is feasible.

At this Step 2, of Stage 1 Report it is required to use:

- Form 1 – Task List,
- Form 2 – Task Description.

2.1.5. Step 3 – Population Analysis

Analysing the target audience receptivity (see Glossary) and suitability for online learning is another crucial step. The course design and delivery of eLearning will be influenced by key characteristics of learners. While analysing the target audience for eLearning the following factors should be taken into consideration:

Demographic factors: • Attitude towards online training • Digital literacy • Age • Sociolinguistic receptivity • The amount of time available for eLearning	Technological factors: • Network bandwidth • Accessible technology in region or geographical area in which learners reside • Accessible technology in training center

Various metrics and data gathering tools can be used to collect data about target audience: web surveys, online questionnaires, online diagnostic tests, data about engagement statistics from previous courses (statistics about login, course access, enrollment, device assess etc.) and performance statistics (participation in courses, in online discussions, grades etc.).

In order to find out how your future trainees learn best online, you can adapt Annex 4 of TDG.

The following questions can be added (see the following page):

Example Questions

➢ **Attitude towards online training**

I am self-motivated and able to work alone
☐ Yes
☐ No

I like new technologies which may require new approaches to learning and problem solving
☐ Yes
☐ No

I do not mind if I never actually meet my instructor or classmates in person
☐ Yes
☐ No

I like the idea of not traveling in order to receive training
☐ Yes
☐ No

➢ **Digital literacy**

I am comfortable using computers'
☐ Yes
☐ No

I am capable of studying online
☐ Yes
☐ No

I am comfortable participating in a in "virtual environment" – Webinars, Forums, Skype, chat rooms
☐ Yes
☐ No

➢ **Sociolinguistic receptivity**

I am comfortable with training delivered in English

☐ Yes
☐ No

I prefer training to be delivered in my native language

☐ Yes
☐ No

➢ **Time available for online training**

I am comfortable with spending several hours at a time on a computer

☐ Yes
☐ No

I can dedicate approximately per week for online courses

☐ 1-3 hrs
☐ 4-6 hrs
☐ 7-10 hrs

➢ **Accessible/reliable technology**

I am able to get access the Internet from my personal computer

☐ Yes
☐ No

I have a microphone and headphones for my computer

☐ Yes
☐ No

2.1.6. Step 3 - Population Analysis – Outcome

The target audience analysis should reveal whether the training solution is suitable for your particular type of target audience.

2.1.7. Stage 1 – Analysis – Outcome - Stage 1 Report

The main outcome of the Stage 1 Analysis is the Stage 1 Report which indicates whether online training poses resource limitations and constraints for the CATC, and whether it is accessible and beneficial for the target audience. Analysing all data collected should lead to an informed decision about the suitability of online training for the desired outcome, and the decision whether to proceed or not with an online training solution.

The Report includes any decision tables used to analyse the technology and human resources as well as:

- Form 1 - Task List,
- Form 2 – Task Description,
- Form 7 – Evaluation Plan,
- Form 8 – Training Development Project Planning and Control Sheet.

3. STAGE 2 – DESIGN AND PRODUCTION

3.1. Step 4 – Design of Curriculum

The design and production of online learning requires expertise covering several specialties including: subject matter expert, course developer, multimedia developer, programmer, graphic designer, learning management system (LMS) expert, and courseware author. Further, if the course design requires virtual live instruction, an instructor must be specially trained in delivering online courses. The course developer will create a learning structure and flow; the graphic designer will create the look and branding for the course, and the courseware author will determine the technical design. Working together, all team members contribute to creating a prototype and delivering a storyboard for final production. A prototype is a sample working model with a brief course outline, developed for the purpose of obtaining the stakeholders` approval, before scaling up eLearning development. In other words, it a partially constructed course that includes placeholders for tentative content but still gives everyone an idea of how the course will look and behave.

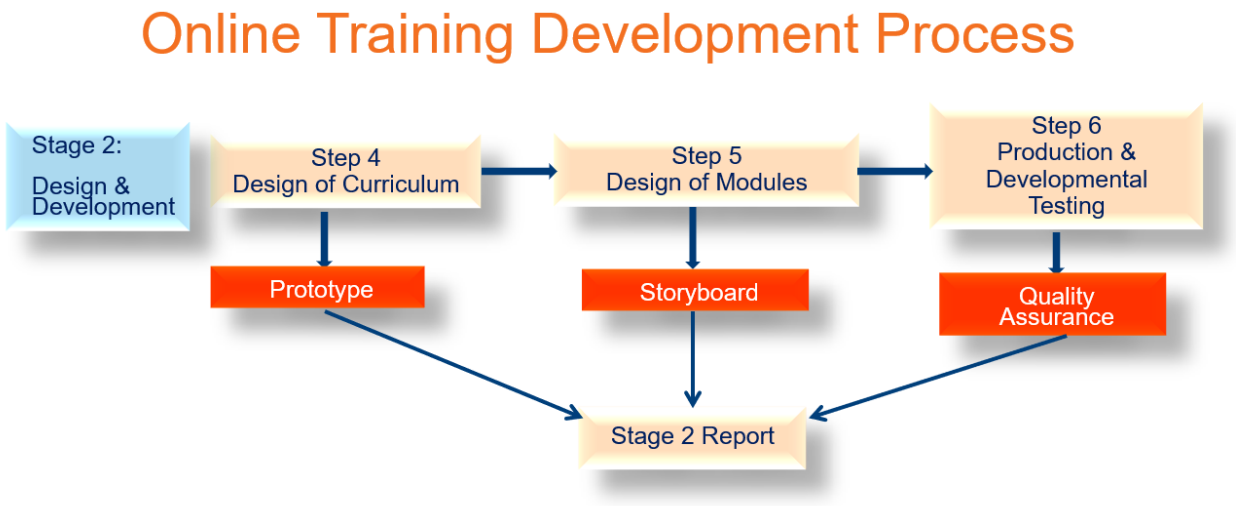

Figure 3: Stage 2 - Design and Production Steps for Online Training Development.

3.1.1 Design of the Prototype

Following the TDG, Step 4 will result in a prototype of the course. Table 6 below provides guidance to matching the design elements with the level of accomplishment stated in the learning objectives. Like classroom learning, online learning can be composed of expositive, interactive or collaborative instructional methods. Use Table 6 as guidance to assist in completing the Module Outline in order to write course objectives, to decide about teaching points, and sources of content. The design elements directly relate to achieving the Learning Objectives. Design elements need to adequately deliver the content through the selected method associated with the LoA.

Table 6. Design Considerations

LoA	Learning Objective	Instructional Method	Online Design Elements
0	Familiarize, Gain general awareness	Expositive methods: content is presented through static tools	Embedded files in PDF, PowerPoint presentations, recorded lecture Questions to test knowledge
1	Define, State, List, Recognize	Expositive methods: content is presented using some interactive tools	Tutorial, drag and drop activity , visuals exercises, movable onscreen elements, button clicks
2	Characterize, Consider, Describe, Explain	Expositive methods : content is presented using some interactive (dynamic) tools	Visual demonstration, video, animations, webinar (instructor-led), audio, scenarios with examples, drag and drop activity, bullet selection, button clicks, movable onscreen elements
3	Apply, Check, Identify, Inform, Record	Interactive methods: content is used to demonstrate; trainees are required to apply learning through interactions	Any of the above elements with more complexity and learner interactions required including animated visuals, comparative charts, hyperlinks, video clips, avatars, progressive cases asking learner for onscreen calculations, serious games

LoA	Learning Objective	Instructional Method	Online Design Elements
4	Analyse, Design, Justify, Organize	Interactive methods Collaborative methods: content is shared, discussed; problems are solved in a team	Serious games, animations, avatars Discussion forums, assignment dropbox, shared online tools, collaborative applications
5	Assess, Resolve, Evaluate, Troubleshoot	Interactive methods Collaborative methods	Serious games, simulations, Wiki

Prototypes

Best practices for developing a prototype

Include :

- Introduction page (splash page – title, logos, branding)
- Navigation page (tutorial)
- Navigation elements (eg buttons, tabs, arrows)
- Visual layout and branding elements
- Content elements (eg course goal, learning objectives, text examples, animations, hyperlinks, embedded media links etc.)

3.1.2 Design of Tests

Consistent with TDG, online assessments need to be aligned with the learning objectives.

Diagnostic (pre-tests), and formative assessments (progress tests) are usually more widely used in online training than in classroom training.

Diagnostic assessment is used to identify current knowledge of a trainee prior to online training. This assessment helps to provide timely feedback if the trainee meets entry requirements. Progress tests provide feedback necessary for isolated eLearners during an online course.

When choosing between the timing and the volume of tests, consider the following:

- Use a series of small tests (knowledge checks) during online courses for learners` recall
- Assess learning at regular intervals to provide continuous progress to the learner (once in 15-20 minutes)
- Use mastery tests to conclude modules or serve as a final exam for the course.

Types of online tests: true/false questions, multiple-choice questions, drag and drop activity, visual selection, completing sentences, scenarios with item selection, ordering and ranking. Collaborative methods include uploading and document sharing with instructors.

All these types of tests are embedded in authoring tools.

Feedback: Always provide automatic feedback for all progress and mastery test responses. For incorrect answers, prepare explanations with the references to where the information is in the course section or module.

Best practices for design of online tests

Check:

1. Do questions test attainment of the stated learning objectives for the module/section/course that they cover?
2. Is the wording of the questions consistent with the guidelines in the Training Development Guide (eg avoiding double negatives)?
3. Are the answers to the questions contained in the presented content?
4. Are learners guided through the online exercises/questions so that they know how far along they are, for example, Question 1 of 10 etc?
5. Are the requirements for the test clearly stated (eg if it is scored, how many times can you take it etc.)?
6. Is feedback given on the results of the test, and an opportunity to retake it provided?
7. Are all elements of the questions visible on one screen, to avoid learners missing important elements (eg, if they have to scroll to see all the options, it should be very clear, and ideally avoided)?

3.1.3. Selecting Media

The selection of media to be integrated in the course is driven by the information from the Stage 1 Analysis: preliminary study, learning objectives, specific features of target audience.

Online learning media consist of videos, audios (narration or music), still images, photos, graphics, animations, interactive whiteboards, blogs, and social media including Wikipedia, Facebook, etc. The decisions on how to use media will depend on the resources available, desired learning outcomes, complexity of the content, and on the capacity of media.

Properly selected and designed media support clarification of ideas, improve trainees` motivation and engagement, and reduce cognitive overload. Media in eLearning is proven to increase information retention by 25% to 60%. 54% of young trainees (`digital natives`) confirm that they get more involved in classes that use media (Bates, A.W., 2015).

Online trainees learn better if media design follows **four principles**:

- ✓ Keep it simple: focus on one idea at a time
- ✓ Keep it short: keep videos to a length of 3-4 minutes to maximize attention
- ✓ Keep it real: use examples of problem solving processes from real life
- ✓ Keep it good: ensure good quality of media products.

3.1.4. Visual Design

eLearning is an active process of filtering, selecting, organizing and integrating information presented in pictures, text, audio and video according to Clark & Mayer, 2005. Communicating ideas with the correct balance of visual, audio and textual content in eLearning is required.

Three important visual design elements to keep in mind when putting together an eLearning course are

- consistency,
- simplicity,
- readability.

Best practices for visual design in online training

Check:

1. Are the standard conventions for navigation used (eg. Menu, Help etc.)
2. Are presentation screens laid out with good use of space and consistency between sections?
3. Are text and graphics clear, of adequate size and free of visual clutter?
4. Are icons, logos, and graphics appropriate to the content and to the culture of the learners?

4. Are colours well chosen, considering potential for colour blindness in learners (eg, distinction between red/green)?

5. Do all graphics, videos, etc. have appropriate caption or labeling?

3.1.5. Step 4 - Design of Curriculum – Outcome

The prototype is the product of Step 4 - Design. It should be approved by stakeholders before moving to the next step. The link to prototype should be provided to the course validator.

3.1.6. Step 5 – Design of Modules

eLearning content must be accurately prepared and presented in order to be effective. The development of content starts when the course developer uses the storyboard to create a course and expand on the prototype.

A storyboard is a sequence of screens (pages) that describes screen by screen what will happen in eLearning module, lesson, or section. A storyboard is not a final product; it is intermediate product between Design and Production Steps.

Note that each training organization can develop its own storyboard template based on the needs of multimedia designers, capacities of its LMS and authoring tools.

The following templates will help you to develop your own storyboard.

Template 1: Storyboard. Example of Course Page

<table>
<tr><th colspan="2">Onscreen Display</th><th>Screen Text:</th><th>Media Script:
(narration)</th></tr>
<tr><td colspan="2">Example: Slide begins with intro background music

Three buttons appear in sequence.

Audio narration begins</td><td rowspan="6">[Any text that appears on the slide. This could be narration script or other text.

Does not include any text embedded in images or buttons.]</td><td rowspan="8">Welcome to this course on…

if narration is separate document, insert .doc file as reference</td></tr>
<tr><td colspan="2">Media:</td></tr>
<tr><td>Images</td><td>background.jpg,

image_1 jpg, image 2_jpg.

button_choice1.gif

button_choice2.gif</td></tr>
<tr><td>Audio</td><td>narration.mp3</td></tr>
<tr><td>Music</td><td>background.mp3</td></tr>
<tr><td>Video</td><td>Video_1.mp4 or video_1.wmv</td></tr>
<tr><td colspan="2">Interaction:</td><td>Quiz/Test (if applicable):</td></tr>
<tr><td colspan="2">Describe interaction here.</td><td>Indicate type of Quiz here [Insert name of .quiz here]</td></tr>
<tr><td colspan="2">Branching:</td><td>Advance:</td></tr>
<tr><td>Next:</td><td>Slide 2</td><td>By User</td></tr>
</table>

Template 2: Storyboard. Example of Course Introduction

Slide title: • **Welcome and Course Goal**

Course name/ MODULE Number

DEVELOPER NARRATION SCRIPT	LEARNER / END USER SCREEN	DEVELOPER MEDIA / LINKS / INTERACTION / TEST
Welcome to the course [description]. *This online course is* [description]. At the end of the course, you will be able to identify the requirements and steps in the process of …. *The course consists of* [description: elements, modules, tests etc]. *You are encouraged to* [description: behaviour]. *After completing the online course you will be able to:* • *Define the process of …* • *Describe the advantages and disadvantages of…* • *Identify the requirements for …* • *Identify the steps …*	**Welcome to the course** **Course Goal:** At the end of the course, you will be able to identify the requirements and steps in the process of …. **Course Objectives:** • *Define the process of …* • *Describe the advantages and disadvantages of…* • *Identify the requirements for …* • *Identify the steps …*	Play background audio Display background image/branding image Size of image: 800*600 pixels Insert logo in the upper left corner

3.1.7. Step 5 - Design of Modules – Outcome

Along with the Module Plan, the main outcome of Step 5 - Design of Modules, is the storyboard for each module, approved by all relevant stakeholders, team members, and subject matter experts. Once the storyboard is approved, it can be transmitted to courseware developers for production.

3.1.8. Step 6 – Production and Quality Assurance Testing

Prior to release, an online course should undergo quality assurance testing. The test should include various elements, and as such may be done at different stages of production, with different personnel required for each type of test, as recommended below:

- **Editing/proofing**

Storyboard and final production stages / experienced editor or other team member (not the person who wrote the material)

- ✓ Verifies that the language make sense, and grammar, spelling and punctuation are correct
- ✓ Checks consistency across all sections in presentation of content (quantity of text, style of graphics, templates, length of modules, etc.)
- ✓ Verifies that the text, technical terms, numbers, abbreviations etc. conform to a consistent style (see style guide if it is provided).

- **Instructional integrity**

Storyboard and module or section production stages / methodology validator who has not been closely involved in the creation of the course.

- ✓ Assesses whether the program contains all the essential elements as requested in TDG and this Guide such as:
  - Course and module objectives
  - Logical flow for the subject matter, learning goals, and audience
  - Appropriate media within each section, module
  - Appropriate testing/assessments and scoring schemes.

- **Functionality**

Final production (on all intended devices/platforms) technical tester / end user to test for usability and ease of learning

- ✓ Checks that all buttons and click/tap interactive elements work correctly
- ✓ Verifies that the course can be launched and exited appropriately
- ✓ Verifies that scrolling, display areas, etc. are shown as designed on all platforms it is intended for (e.g. laptop, mobile device, iPad, etc.)
- ✓ Verifies bookmarking (logging out and returning to the same screen/page) works properly.

- **Usability and ease of learning**

Final production / representatives of the target audience/ end users

- ✓ Verifies the ability to navigate, interact, and follow the flow of the course without spending time looking for a function, getting stuck, or getting confused about what to do next.

Best practices for online production

1. Logo: Always check the policy of logo usage. The use of logos provides the identification, ownership and branding and should be consistent. Logos should not interfere or distract from the content.
2. NEXT or PREVIOUS buttons/arrows should be clearly visible and help trainees to navigate through the course.
3. Start with an explanation of navigation buttons. Provide tutorial page explaining navigation and course features. Narration is recommended.
4. Include a copyright page explaining the rules for using the course materials, photos, rules of behaviour online (Netiquette).
5. Always present the module objective at the beginning of each module.
6. The Menu should have screen titles and numbers. Numbers on each screen are necessary for reference and for trouble shooting.
7. Break content segments or change media after each 15 or 20 minutes with

question(s), quiz, any reflective or self-assessment activity, video, or offline exercise to maintain motivation and avoid learning fatigue.

8. Narration can be used in combination with on-screen text to summarize or expand key points or to accompany video sequences. Use narration or relevant audio to complement the visual elements of the screen. For example, during a procedural demonstration, audio can be used to explain animated steps. When using narration to comment on graphics and animations, present corresponding graphics and spoken words at the same time so as to not split the learner's attention. Use written text for key messages.
9. Video sequences should always be accompanied by comments in either written text or audio narration.
10. Online tests: allow trainees more than one attempt to pass tests.
11. Images: It is important to reflect the target audience though images of aviation personnel.
12. Gating: Depending on the course goal and exam requirements, decide whether the course should be gated or not. Gating disallows the trainee to jump forward if previous sections are not completed, does not allow skipping videos or other elements in the course.

3.1.9. Quality Assurance (QA) Checklist

The following checklist will help you to conduct online course quality control during the Design and Production Steps. Conduct quality assurance testing with two to three reviewers from diverse areas. Select from subject matter experts, technology experts, target audience users, other course developers. An experienced editor should also complete proof reading of the course at this Step.

The overall purpose of QA testing is to determine the extent to which the course can achieve its intended instructional goals for the desired target audience.

The evaluation covers various elements, categories and criteria, and should be done at different Steps of Design and Production, with different personnel required to gain the optimal information for each type of evaluation, as recommended below:

Quality Assurance Checklist for Online Courses

Items	Yes/ No	Comments/ Issues
Editing/proofing *Evaluated by an experienced editor or other team member (not the person who wrote the material).* *The language makes sense, and grammar, spelling and punctuation are correct* *All sections in presentation of content are consistent (quantity of text, style of graphics, templates, length of modules, etc.)* *The text, technical terms, numbers, abbreviations etc. conform to a consistent style (see style guide if it is provided).*		
Instructional integrity *Evaluated by an instructional designer or course developer who has not been closely involved in the creation of the course.* *The course contains all the essential elements of an instructionally sound design and covers such elements as:* • *Course and module objectives* • *Structure and flow appropriate for the subject matter, learning goals, and audience* • *Essential elements within each section, module, or chapter* • *Appropriate testing/assessments and scoring schemes.* **Overall course structure/design** Is the primary target audience clearly stated in the introduction? Are the pre-requisites (if relevant) clearly stated (eg, completion of a previous course, section or activity)? Is the course goal stated? Is the nature of the learning experience clearly described before the learner enters the first learning section (type of study activities, expected study duration, testing etc.) Are the modules or sections clearly listed, with the recommended learning pathway and any options shown, eg linear flow or selective flow?		

Items	Yes/ No	Comments/ Issues
Within modules or sections Are module objectives clearly stated? Does the module have an introduction (including expected study duration, activities, testing)? Does the presented content align with the stated objectives without superfluous content? Does the presented content align with the needs and level of the target audience (complexity, use of terminology, etc.)? Does the module contain opportunities to apply, practice, and review the content (eg, quick quiz, scenarios, exercises)? Is feedback and explanation provided around the practice activities to facilitate learning? Does the module include a summary of the presented key points that align with objectives? Is it clear when the module is complete – eg by an end page, or invitation to return to the menu, or review module material? Is there an end of module assessment/test? (if not, there should be one at the end of the course) **Tests, quizzes, and assessments** Do questions test attainment of the stated learning objectives for the module/section/course that they cover? Is the wording of the questions consistent with the guidelines in the TDG (eg, avoiding double negatives)? Are the answers to the questions contained in the presented content? Are learners guided through the exercises/questions so that they know how far along they are? Are the requirements for the test clearly stated? (eg if it is scored, how many attempts are allowed etc.) Is feedback given on the results of the test, and an opportunity to retake it provided? Are all elements of the questions visible on one screen, to avoid		

Items	Yes/ No	Comments/ Issues
missing important elements (eg, if they have to scroll to see all the options, it should be very clear, and ideally avoided)?		
Functionality *Evaluated by technical tester, or by end user as part of the test for usability and ease of learning.* All buttons and click/tap interactive elements work correctly. The program can be launched and exited appropriately. The scrolling, display areas, etc. are shown as designed on all platforms it is intended for (eg laptop, mobile device, iPad, etc.). Bookmarking works properly.		
Usability and ease of learning *Evaluated by a member(s) of the target audience/end user.* Standard conventions for Home menu, Help etc. are used It is easy to navigate, interact, and follow the flow of the course without spending time looking for a function, getting stuck, or getting confused about what to do next. Are navigation controls intuitive (eg, next/previous buttons in logical positions)? Are elements such as *Help, Notes* or *Resources* easily accessible from anywhere within the course? Are text and graphics clear, of adequate size and free of visual clutter? Is it clear how to enter and exit the course from any point within it? Titles and screen numbers are shown (eg, Module title is shown on screen, screen 4 of 12, etc.)? Can a learner easily navigate within and between sections of the course without undue distraction from searching or many clicks/taps? If scrolling or interaction is required, is it clearly indicated with prompts?		

Items	Yes/ No	Comments/ Issues
Are presentation screens laid out with good use of space and consistency between sections? Are icons and graphics appropriate to the content and to the culture of the learners? Is a transcript for the narration provided, either as an on-screen option, or as a printable (PDF) option? Is the narration at the correct pace for the target audience (eg non-native speakers)? Are any links to external sites clearly indicated? Are colours well chosen, considering potential for colour blindness in learners (eg, distinction between red/green)? Do all graphics, videos, etc. have appropriate caption or labeling?		

Notes:

If external links are used, they should be regularly verified, as there is no guarantee that they will remain stable. Repeat the checklist for all devices on which the course will run: laptop (Windows, Mac), iPads, mobile phones.

Example of Completed Quality Assurance Checklist for Online Courses

Items	Yes/ No	Comments/Issues
Editing/proofing *Evaluated by an experienced editor or other team member (not the person who wrote the material)* The vocabulary, grammar, spelling and punctuation are correct All sections in presentation of content are consistent (quantity of text, style of graphics, templates, length of modules, etc.) The text, technical terms, numbers, abbreviations etc. conform to a consistent style (see style guide if it is provided).	 No Yes No	 Slide 4: spelling mistake in the word `pre-requisite` Slide 67: Explain the abbreviation ADS

Instructional integrity *Evaluated by an Instructional designer or course developer who has not been closely involved in the creation of the course* *The course contains all the essential elements of an instructionally sound program and covers such elements as:* • *Course and module objectives* • *Structure and flow appropriate for the subject matter, learning goals, and audience* • *Essential elements within each section, module, or chapter* • *Appropriate testing/assessments and scoring schemes*		
Overall course structure/design: Is the primary target audience clearly stated in the introduction?	Yes	
Are the pre-requisites (if relevant) clearly stated (eg, completion of a previous course, section or activity.)	No	Define the pre-requisites at Section 1
Is the overall course goal clearly stated?	No	State the course goal
Are module objectives stated correctly?	No	Use action verb for objective 2
Is the nature of the learning experience clearly described before the learner enters the first learning section (type of study activities, expected study duration, testing etc.)	No	Define approximate duration of the Module 3 eg 30 minutes
Are the modules or sections clearly listed, with the recommended learning pathway and any options shown? Etc.	No	Add text and narration to tell learners they must complete the section before starting the next one

Provide this QA Checklist for testers to note if any items of the Checklist do not comply. Then submit the completed Checklists to course developers to make necessary changes.

3.1.10. Step 6 - Production and Quality Assurance Testing – Outcome

The main outcome of the Production and QA Testing Step is the results of Quality Assurance Checklist. Make the necessary changes to the course according to the results.

3.1.11. Stage 2 – Design and Production – Outcome – Stage 2 Report

The overall outcome is a tested online course available for the validation delivery to representatives of target audience. In the Stage 2 Report include:

- Form 3 – Module Outline,
- Form 6 –Module Plan,
- Storyboard,
- Link to course or demo testing site.

It is recommended to use Form 9 – Course Description to support publicity of the online course.

4. STAGE 3 - EVALUATION

The purpose of evaluation of online training is the same as for the final stage in TDG:

- ✓ Evaluate effectiveness of training by determining if all the learning objectives have been accomplished according to test scores
- ✓ Diagnose any failures
- ✓ Revise training material and course functionality if necessary.

Figure 4: Stage 3 - Evaluation Steps for Online Training Development

4.1. Step 7 - Validation and Revision

Once the quality assurance testing has been completed, it is recommended to deploy the course to a group of participants that represent the target audience for a validation. Although they may pass the course, the purpose is not only to evaluate their learning, but the overall quality of the course.

Participants will be asked to provide additional feedback on their learning experience beyond the course assessments, usually with a structured questionnaire format.

Post-training evaluation follows implementation. Apart from test scores (Level 2), it is important to evaluate learners' reaction (Level 1) to the course on a continuous basis. A satisfaction questionnaire should be available at the completion of the course.

Learners' reactions (Level 1)

The following questions provide an example questionnaire to evaluate trainees' satisfaction with online learning experience.

Example

Online Trainee Satisfaction

How satisfied are you with your online course?
Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied

Have you taken an online course before?
Yes
No

I found access to the course material flexible and convenient
Yes
No

Please indicate your level of agreement with the following statement:
"*The online course was easy to navigate***."**
Strongly agree Agree Neither agree or disagree Disagree Strongly Disagree

The workload for the online activities was manageable
Yes
No

Please indicate your level of agreement with the following statement:
"The online activities made studying the course interesting and engaging"
Strongly agree Agree Neither agree or disagree Disagree Strongly Disagree

How satisfied are you with the trainee support services (technical support) associated with your online course?
Very satisfied Satisfied Neutral Dissatisfied Very dissatisfied

Please indicate the level of agreement with the following statement:
"*I would recommend this online course to my colleagues***"**
Strongly agree Agree Neither agree or disagree Disagree Strongly Disagree

As per TDG, prepare to deploy a Post-training Evaluation (PTE) survey to your online course trainees to determine training effectiveness – impact on work and professional performance.

4.1.1 Step 7 – Validation and Revision – Outcome

The main outcome of the Validation Step is a validated online course with minor revisions noted for finalization and release.

4.1.2. Stage 3 - Evaluation – Outcome

Stage 3 – The Evaluation Stage outcome is a validated online course, deployed and accessible to the target audience.

5. CONCLUSION

Online training can greatly support the training needs emerging with aviation growth, rapid advancements in new technology, and the demand for innovations and new skills at work. However, eLearning is not ideal for all purposes. The most cost effective application of online training may be that it is a complement to traditional training (classroom) in order to reach as many performance goals and trainee needs as possible.

Online training should be selected according to the CATC resource capacity for development and deployment, the training needs, the performance objectives, and the receptivity of the target population, in order to achieve an optimal learning experience and meet goals. In many cases it is best used, not as a standalone, but in combination with a live training component where real performance can be evaluated.

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7. RECOMMENDED WEB SOURCES

https://elearningindustry.com/

https://elearningindustry.com/free-storyboard-templates-for-elearning

https://elearningindustry.com/the-ultimate-elearning-course-design-checklist

https://onlinelearningconsortium.org/

https://wiki.ubc.ca/Documentation:Design_Principles_for_Multimedia