



EPA Training Delivery Format Evaluation

Developed for: U.S. Environmental Protection Agency

Submitted by: ICF

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1 INTRODUCTION

ICF, in collaboration with the U.S. Environmental Protection Agency (EPA), conducted an evaluation of training delivery formats using criteria and training delivery formats provided by EPA (refer to the [Criteria](#) section of this report). ICF reviewed and analyzed past and current research on instructional design and training delivery formats and consulted with instructional design and multimedia design experts.

2 BACKGROUND

2.1 Criteria

EPA provided the following criteria to guide the evaluation of the training delivery formats:

- Description
- Features/Components
- Portability (i.e., ability to view on different devices)
- Audience
- Accessibility (i.e., Section 508 compliance)
- Scalability (i.e., number of learners it could accommodate)
- Ease of Updating
- Resource Requirements (i.e., staffing/people)
- Development Costs (e.g., actual cost, Adobe Connect license, level of effort [LOE])
- Provider Computer and Other System and Equipment Requirements (e.g., development requirements)
- User System Requirements
- Timing and Recommended Length (i.e., does the class need to be taken all at once, or can you start/stop over a period?)
- Learning Management System (LMS) Platform Requirements
- Effectiveness as Adult Learning Tool (i.e., effectiveness at information retention/learner engagement, where it lands on the active-passive learning spectrum)

**Please note: This list is not comprehensive and factors such as complexity/stability of content/subject matter, timing, and other factors should be taken into consideration when selecting the optimal training delivery format.

2.2 Training Delivery Formats

EPA provided the following training delivery formats for evaluation:

- On-the-Job Training (OJT)
- Microlearning
- Packaged Training Video

- Online Web Conference (Webinars and Webcasts)
 - Recorded Webinar
- Live-Streamed Training (Synchronous Virtual Instructor-Led Training [vILT])
- Basic eLearning (Level 1)
- Enhanced eLearning (Levels 2 and 3)
- Classroom Training (Instructor-Led Training [ILT])
- Performance Aids and Tools
- Blended Learning

Using the provided criteria, we expanded each format to provide more detailed descriptions and comparisons between each type in the [Training Delivery Format Descriptions and Features/Components](#) section of this report.

2.3 Instructional Design Models and Terminology

In this section, widely used models and methods that guide instructional design processes are described briefly, along with common terminology used in this report. These instructional design models and methods are crucial for the success of any training project provided in any format.

2.3.1 ADDIE (Analysis, Design, Development, Implementation, Evaluation) Model

When beginning a training project, the traditional process includes use of the ADDIE instructional design model and framework. The ADDIE model has five phases: A—Analysis, D—Design, D—Development, I—Implementation, and E—Evaluation (see Exhibit 1: ADDIE Model). In the analysis phase, the instructional goals and learning objectives are determined, as are information about the audience, the learner’s existing knowledge and skills, and the behavioral outcomes.

During the design phase, the instructional delivery format is selected, which is the format used to deliver the instruction. The method of delivery can range from basic eLearning to classroom training, which ICF has outlined in this report.

A training project should not begin with a preconceived notion of what training delivery format to use, but rather the instructional designer(s) should select the most appropriate format based on a variety of factors, including learning objectives, corresponding content/subject matter, complexity/stability of the content/subject matter, timing, and budget.

2.3.2 Levels of Interactivity

When designing and developing eLearning training, three levels of interactivity and media richness can be used that increase in complexity. Each level is defined in Exhibit 2 below.

**Please note that there is a Level 4, which is not used as often as Levels 1–3, in which learners have full control over pace and content through use of high-level 3D simulations, avatars, virtual reality, gamification, etc.



Exhibit 1: ADDIE Model

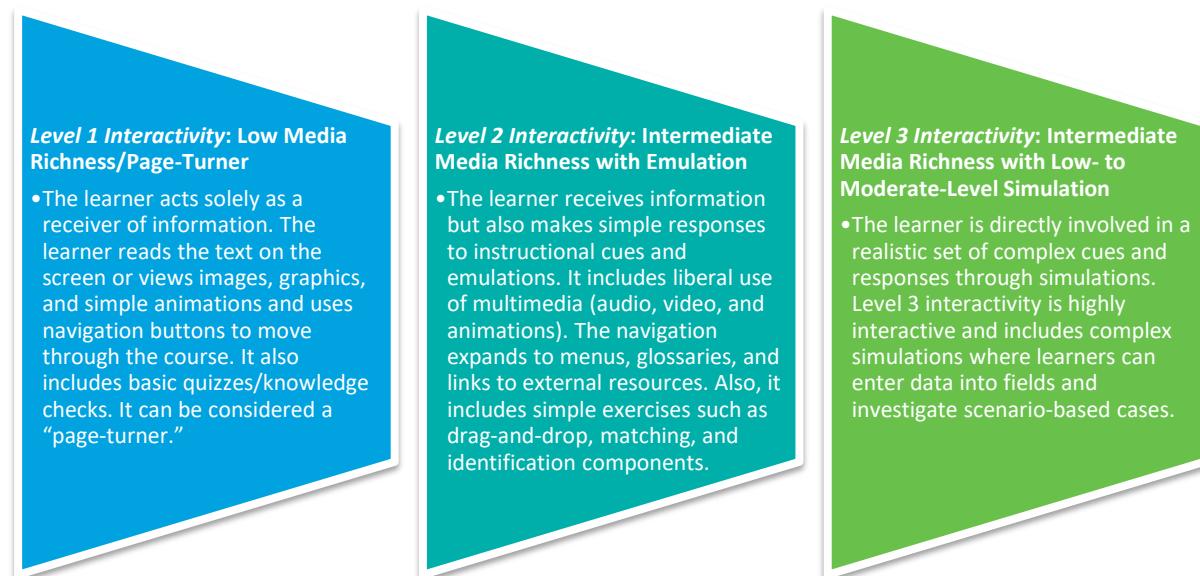


Exhibit 2: eLearning Levels of Interactivity

2.3.3 Active and Passive Learning

Passive learning involves content that is transmitted to learners who “absorb” the information, such as through a lecture or reading assignment, whereas **active learning** engages learners in activities in which they are exploring, communicating, creating, or practicing their new skills to gain experiences. **Active learning** can include hands-on exercises/activities, role playing, simulations, mentoring/job shadowing, and group discussions, to name a few.

**Please note that the “Learning Retention Pyramid” or “Cone of Learning,” referenced in an article [here](#), puts active and passive learning on a spectrum that has been heavily disputed and is not based on research. Therefore, ICF did not assign the various formats to a position within a “active-passive learning spectrum.” It is important to note that active learning provides a more engaging experience for learners, but a mix of both active and passive learning in a blended learning solution can be very engaging and can increase knowledge retention.

2.3.4 Asynchronous vs. Synchronous Learning

**Please note that in this report, the term “synchronous” describes live-streamed training or vILT.

Synchronous learning refers to a type of training (primarily delivered online) that happens on a set schedule in which learners and instructor(s) meet at the same time. **Asynchronous learning** allows learners to complete the training on their own time, in a self-directed manner; typically, learners are provided a timeframe to complete the training.

These terms can also be used to describe components of a training. For instance, a live-streamed web conference or chat that happens during a web conference can be considered synchronous, whereas a discussion board or the materials provided to support a course, such as job aids, videos, etc., can be considered asynchronous.

2.3.5 Determining the Optimal Training Delivery Format

The optimal training delivery format can be determined through use of

ICF's Media Selection

Methodology/Blended Learning

Analysis Model (see Exhibit 3),

developed by Alice G. Hirzel.

Determining the best training delivery format to use can depend on many factors but using this model can help to determine the format that is best aligned with the learning objectives and corresponding content. The model is based on research that shows that blended learning solutions can maximize learner retention and real-world application.

For instance, if developing an ILT course, each course and lesson objective (along with its associated content) would be examined, and the following five-step process would be applied:

Step 1: Determine the type of learning (learning domain) required to achieve the course/lesson objectives.

The domains listed in Table 1 below specify a focal area of a training. This taxonomy is well known among the instructional design and training communities and is widely used in training development and delivery considerations.

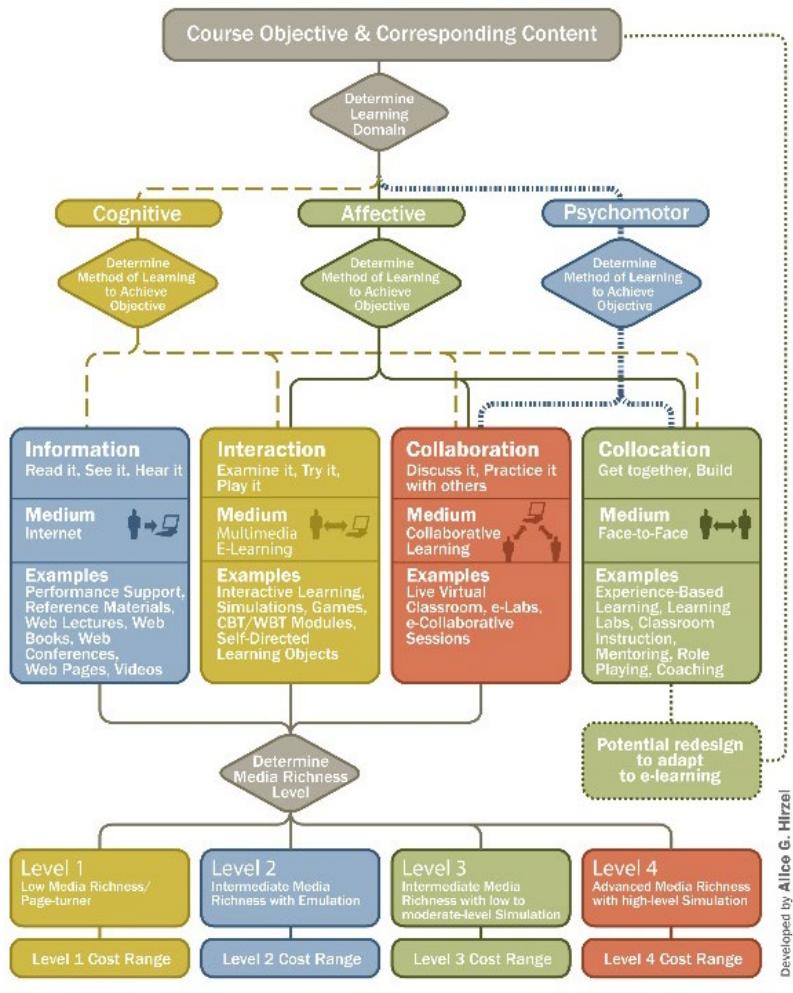


Exhibit 3: ICF's Media Selection Methodology/Blended Learning Analysis Model

Developed by Alice G. Hirzel

Table 1: Learning Domains

Learning Domain	Example
Cognitive Domain (mental skills/knowledge). The cognitive domain involves knowledge and the development of intellectual skills.	This includes the ability to recall, recognize, understand, apply in new situations, analyze, synthesize or evaluate specific facts, procedures, and concepts.
Affective Domain (feelings or emotional areas/attitude). The affective domain encompasses how people relate emotionally to their environment and to other people.	This includes the ability to selectively apply attention, willingness to hear, participate actively in the learning environment, ability to compare and understand different values and apply a value system to specific situations.
Psychomotor Domain (manual or physical skills). The psychomotor domain requires that the learner master technical, tactile and tactical skills, such as using a fire extinguisher, which require the learning to engage knowledge, judgment, movement and skill. Development of these skills typically requires practice in performing them.	This includes physical movement and the coordinated use of motor-skills.

Step 2: Identify the learning environment, as listed in Table 2 below, appropriate for achieving the course/lesson objectives.

Table 2: Learning Environment

Learning Environment
Information. The learner interacts with the material at only a basic or very simple level (e.g., solitary reading, watching a video). No human interaction is necessary. The interaction is one-way between the learner and the learning environment.
Interaction. Some level of participation of the learner with the material occurs (e.g., demonstrations and simple exercises that can be completed by a single person). No human interaction is necessary. The interaction is two-way between the learner and the learning environment.
Collaboration. Learners interact not only with the material but with other learners (e.g., delivery that centers on case studies and scenarios with discussion with other learners). Human interaction is necessary, and the interaction is among students and between students and instructors is two-way through a learning environment.
Collocation. Learners move into another arena to re-enact certain circumstances as they would exist in the real world (e.g., simulation drills either in sophisticated computer programs or outdoor activities). Human interaction is necessary, and the interaction is face-to-face among students and instructors.

Step 3: Within each learning environment, identify the corresponding delivery medium.

Within each learning environment identified in Step 2, identify the corresponding delivery medium that will enable learners to meet the learning objective. Please note that the categories below are

generalized, and the specific types of training delivery formats listed in this report could fit under one or more of these categories:

- Synchronous (instructor and learner interact in real time) or asynchronous (instructor and learner interactions are separated in time) delivery. In asynchronous delivery, the course developer may be the “instructor.”
- Internet/web-based, CD, or DVD delivery medium.
- Multimedia eLearning. Blending of multiple media that can be delivered over the internet/web and/or CD/DVD (e.g., streaming video/audio, simulations, gaming).
- Collaborative learning. Asynchronous (e.g., email feedback from fellow learners or the instructor) or synchronous interactions with other learners (e.g., study group, online discussion boards, conference calls).
- Face-to-face. In-person experiential/hands-on learning/classroom.

Step 4: Determine the media richness (level of interactivity) necessary to achieve the course/lesson objectives.

Step 5: Identify course and lesson objectives that are and are not adaptable to eLearning. Based on the results of previous steps in the analysis, identify the degree to which the course and lesson objectives can be adapted to an eLearning environment.

3 TRAINING DELIVERY FORMAT DESCRIPTIONS AND FEATURES/COMPONENTS

3.1 On-the-Job Training

OJT provides an opportunity for learners to practice actual required behaviors needed to complete a task on an immediate basis and is provided in the same environment in which they will be working. OJT can include:

- Mentoring
- Coaching
- Observation
- Job rotation
- Job instruction
- Committee assignments
- Internships



Typically, OJT is divided into two types: structured (formal) and unstructured (informal). Unstructured OJT does not have any planning involved, such as assigning a new employee to observe an experienced employee. Structured OJT is planned and usually led by experienced employee(s).

Refer to the following website(s) for example(s) of OJT materials:

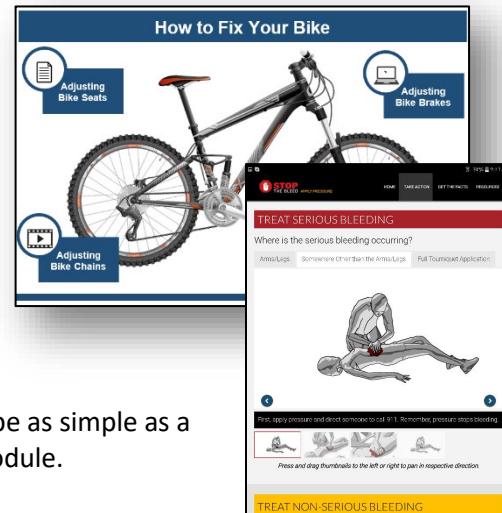
- <https://www1.maine.gov/mdot/civilrights/docs/ojt/OJTMManual2016.pdf>

3.2 Microlearning

Microlearning provides training that delivers content in short, focused bites that fit naturally into a learner's workflow.

Microlearning is short in duration and focuses on a single learning objective. Also, it is usually accessed more than once when learners need it, so that it can serve as refresher training.

It can be delivered in a variety of formats, including infographics (static and interactive), videos (animated, interactive live action, instructive, webinars), webcasts and podcasts, educational games, and software applications. It can be as simple as a PowerPoint (PPT) presentation or a shorter eLearning (WBT) module.



Refer to the following website(s) for example(s) of microlearning:

- <https://www.youtube.com/watch?v=YprN025suBY>
- <https://www.youtube.com/watch?v=y81aj81In5Q#action=share>

3.3 Packaged Training Video

A packaged training video provides one-way communication and instruction through use of video. Videos can include:

- Live actors
- Presentations or vignettes
- Simple 2D or 3D animations/graphics
- Static images
- Demonstrations/role-plays
- Screencasts (e.g., showing how to use a new software)



Refer to the following website(s) for example(s) of packaged training videos:

- Simple 2D animation video: <https://vimeo.com/229322628>
- Live actor video:
https://www.youtube.com/watch?v=xkpftmVL7MA&index=3&list=PLvrp9iOILTQYPA_9rg3DFsG56BjUzOWFi

3.4 Online Web Conference (Webinars and Webcasts)

An online web conference is a live event or broadcast in which all learners attend online, and audio, video, and visuals are streamed. It can either be a webinar or a webcast. A webinar facilitates two-way

communication with interactivity, whereas a webcast facilitates one-way communication with little to no interactivity.

Typically, a webinar provides a live, instructor-led presentation or seminar (through a PPT) at a single point in time that can be coupled with:

- Discussions
- Polling/surveys
- Exercises/activities
- Breakout sessions
- Video

In contrast, a webcast broadcasts a live or pre-recorded presentation in which learners can view but not interact. Both bring large groups together for consistent messaging.

Both webinars and webcasts can be recorded and posted to a server or LMS for learners to access anytime.

Additional Characteristics	
Setting	Online
Instruction Type	Live, Instructor-Led Training
Optimal Number of Trainees/Learners	Limited to number of spaces on the web conferencing license or the server or LMS, if previously recorded and posted to a server or LMS.
Optimal Course Timing	Two hours or less

Refer to the following website(s) for example(s) of online web conferences:

- https://www.youtube.com/watch?v=J3akt3SmGY&list=PLw9VVPnm_6xePWiXKKRTiSo_TNKakD1Q

3.5 Live-Streamed Training (Synchronous Virtual Instructor-Led Training)

Live-streamed training or synchronous virtual instructor-led training (vILT) provides training where learners are accessing the instruction (provided by an instructor) over the web/phone in real time. It is a live, in-person classroom event broadcasted online to include remote trainees/learners that are not located in the same place.

vILT offers training sessions online, to replicate a classroom course, across a certain period of time (e.g., a week or month). vILT is also supplemented with various components, such as:

- Online discussions
- Polling/surveys
- Exercises/activities
- Breakout sessions
- Readings

Additional Characteristics	
Setting	Virtual classroom that uses web conferencing or other synchronous eLearning media to provide access to trainees/learners at remote locations
Instruction Type	Live/Virtual, Instructor-Led Training
Optimal Number of Trainees/Learners	Variable but limited to 30 people or fewer
Optimal Course Timing	Hours to days

Refer to the following website(s) for example(s) of vILT:

- <https://ppls-portfolio.learning-transformation.com/> (navigate to “Virtual Instructor-Led Training for Emergency Response Personnel”). Chrome works best to view this website.

3.6 Basic eLearning (Level 1)

Basic eLearning (Level 1) provides training via the internet or digital device that is typically asynchronous. Level 1 is passive and has little to no interactivity (refer to the [Levels of Interactivity](#) section of this report).

Typically, the term eLearning is synonymous with web-based training (WBT).



Additional Characteristics	
Setting	Online through an LMS or other learning content server
Instruction Type	Self-directed
Optimal Number of Trainees/Learners	Unlimited
Optimal Course Timing	Hours to days

Refer to the following website(s) for example(s) of basic eLearning (Level 1):

- https://modsim01.ifcconsulting.com/PUBLIC/HHI/proto/story_html5.html

3.7 Enhanced eLearning (Levels 2 and 3)

Enhanced eLearning (Levels 2 and 3) provides training via the internet or digital device that is typically asynchronous. Levels 2 and 3 interactivities include more complex animations and graphics than does Level 1.

Most basic eLearning at Level 2 includes liberal use of multimedia (e.g., audio, video, and animations) and a more expansive navigation including menus, glossaries, and links to external resources. It also includes quizzes and knowledge checks that are more extensive than multiple choice questions

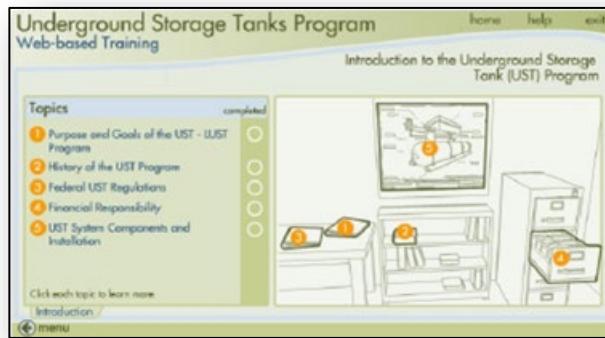
(e.g., matching). An eLearning course can also include elements of adaptive learning in which the learning adapts to the learner's needs and responses. For instance, a quiz will select questions based on the learner's previous responses or topics are selected based on the learner's input to a survey.

Level 3 interactivity is more complex, and the learner has more control. It usually includes sophisticated scenarios, animated videos, and custom animations. It is highly interactive, and participants are immersed in scenario-based cases in which they can enter data into fields.

Level 4 interactivity, which is employed less often, encompasses high-level 3D simulations, avatars, virtual reality, gamification, etc.

Refer to the following website(s) for example(s) of basic eLearning (Levels 2 and 3):

- Level 2 eLearning: https://www3.epa.gov/swerrims/re-powering-training-module/story_html5.html?lms=1
- Level 3 eLearning: <https://ppls-portfolio.learning-transformation.com/> (navigate to “Solar Geometry Online Training”). Chrome works best to view this website.
- Level 3 eLearning: http://cdc-infection-control.s3-website-us-east-1.amazonaws.com/Index/story_html5.html



3.8 Classroom Training (Instructor-Led Training)

Classroom training or instructor-led training (ILT) provides training that is face-to-face and delivered in a live format. It is an in-person event at which learners and instructor(s) are collocated. ILT can include a combination of one or more:

- Lectures
- Exercises/activities
- Role playing exercises
- Group discussions
- Guided practice
- Pre- and post-work (planned reading)
- Case studies



Additional Characteristics	
Setting	Classroom, laboratory, auditorium, or other physical training facility
Instruction Type	Live, instructor-led training
Optimal Number of Trainees/Learners	Variable, but it is best to limit to 30 people or fewer
Optimal Course Timing	Hours to days

Refer to the following websites for example(s) of ILT materials:

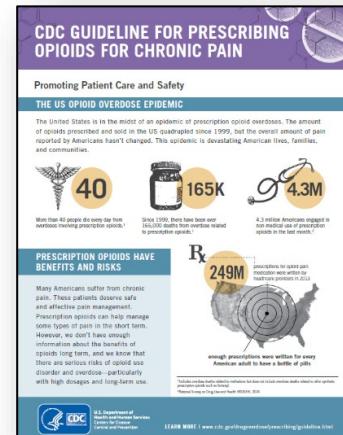
- <https://ppls-portfolio.learning-transformation.com/> (navigate to “Exercise-Based Instructor-Led Training for U.S. Marshals Service”). Chrome works best to view this website.

3.9 Performance Aids and Tools

Performance aids or tools provide a repository for information, processes, or perspectives that are external to the individual and that support work and activity by directing, guiding, and enlightening performance (Rossett, Gautier-Downes, 1991).

Performance aids are sometimes referred to as "Job Aids."

Performance aids can be technical manuals, flowcharts, or other documents that aid or list steps of a task that can easily be integrated into a learner's workflow.



Additional Characteristics	
Setting	Office, library, online
Instruction Type	Passive, self-directed
Optimal Number of Trainees/Learners	Unlimited
Optimal Course Timing	Unlimited

Refer to the following website(s) for example(s) of performance aids and tools:

- https://www.cdc.gov/drugoverdose/pdf/prescribing/Guidelines_Factsheet-a.pdf
- https://www.hud.gov/sites/documents/DOC_11609.PDF

3.10 Blended Learning

Blended learning provides a mix of different training delivery formats (i.e., classroom, instructor-led training supplemented with eLearning, and/or self-paced asynchronous formats). Typically, it is a formal

learning experience such as an ILT course combined and enhanced with self-paced asynchronous formats such as eLearning, webinars, videos, etc.

Blended learning can include a mix of components across all the training delivery formats listed in this report. It could be an eLearning course enhanced with interaction with an instructor or other learners (through discussion boards, email, webinars, video, etc.).

Additional Characteristics	
Setting	Dependent on the format used because it is a mix of different training delivery formats
Instruction Type	A mix of different training delivery formats, such as both active, instructor-led training and passive, self-directed learning
Optimal Number of Trainees/Learners	Depends on the training delivery format; would be constrained by the classroom sections of the course; online sections could serve multiple classroom sections
Optimal Course Timing	Depends on the training delivery format

Refer to the following website(s) for example(s) of blended learning:

- <https://ppls-portfolio.learning-transformation.com/> (navigate to “Management Development Program for Fortune 500 Casual Dining Company”). Chrome works best to view this website.

4 COMPARISON OF TRAINING DELIVERY FORMATS

In this section, the training delivery formats are compared based on portability, audience types, accessibility (e.g., Section 508 compliance), scalability (i.e., number of learners it could accommodate), ease of updating, resource requirements, average development costs, provider and user system requirements, timing, LMS platform requirements, and effectiveness as an adult learning tool.

4.1 Portability

Portability is the ability for users to access training materials and/or courses on modern devices and browsers. Refer to Exhibit 4 for list of various training formats categorized on a scale from low to high portability.

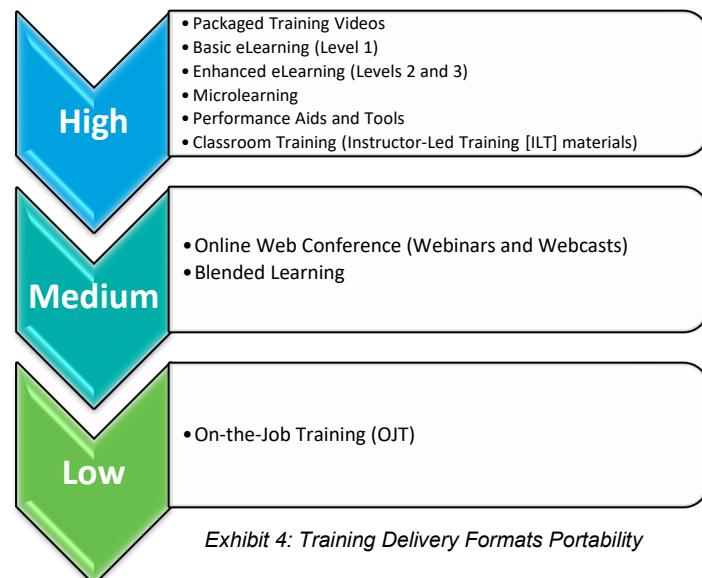


Exhibit 4: Training Delivery Formats Portability

High portability: Can be accessed and developed to work on all modern devices (e.g., computer, phone, iPad) and browsers, depending on the requirements and multimedia and/or software used.

Medium portability: Can be accessed and developed to work on some modern devices and browsers, depending on the requirements and multimedia and/or software used.

Low or no portability: Cannot be accessed or developed to work on most modern devices and browsers.

In terms of portability for OJT, it is considered low because the job site may have physical constraints (for instance, a field office with no computer) to access OJT materials or there may not be sufficient equipment available for learners to practice on. In addition, you need experienced coworkers/employees, managers, or human resource (HR) staff to be available and it can depend on their schedules and availability, which makes portability lower.

For medium portability, online web conferences and blended learning, depending on the components used, may not be able to be accessed or developed to work on some modern devices and browsers, due to any constraints accessing the webinar software. For instance, Adobe Connect requires a flash player and a certain connection speed for learners to access a web conference.

Packaged training videos, basic and enhanced eLearning, microlearning, performance aids and tools, and ILT materials can be customized and developed to work on all modern devices, which makes them highly portable.

4.2 Audience

As a best practice, an informal audience analysis should be conducted to determine the most effective training delivery format, by asking the following questions:

- Who is the audience? What are their current levels/roles and backgrounds? What are their skills?
- How many participants/learners will attend?
- What motivates them?
- What are their expectations for the training?
- What type of learning do they prefer?
- Where are they located?
- How well do the participants know each other?
- What successes or difficulties have this audience encountered with this training topic?
- Are there any other audiences that need to be considered?

The answers to these questions can help guide you in determining the optimal training delivery format for your audience.

Typically, the audience for OJT is new hired employees, interns, or someone new to a position. For microlearning, packaged training videos, online web conferences, vILT/ILT, and basic and enhanced eLearning, the audience can be any but depends on factors such as:

- Learner level/background/seniority/skill set
- Type of learning preferred
- Learner expectations
- Learner availability to take the training
- Size of the audience

For instance, according to the 2019 Training Industry *What Learners Want: Strategies for Training Delivery* report, learners preferred ILT over all other types of training delivery formats. The next

preferred type of training delivery format was OJT, followed by eLearning and vILT. Also, learners whose jobs may be considered more complex prefer informal training that can be online/virtual. Learners with more direct reports prefer self-paced methods of learning such as basic and enhanced eLearning, performance aids and tools, microlearning, packaged training videos, or online web conferences (that are recorded).

In addition, microlearning can cater to learners who might have competing demands in the workplace and reduced attention spans. ILT can be an effective training delivery format for learners who may be averse to technology and change. For blended learning, the audience would depend on the answers to the questions listed above and what components would be used.

4.3 Accessibility (i.e., Section 508 compliance)

All training products must be developed to be Section 508 compliant, but it can depend on the complexity of interactions and media used especially for vILT and eLearning products. Section 508 is part of the Rehabilitation Act of 1973 to require all Federal agencies to make their technology and electronic products accessible to individuals with disabilities.

For videos to be Section 508 compliant, they must include the following:

- Synchronized closed captioning that is overlaid on top of the video frame and encoded within the video
- Audio descriptions and audio track that describes the video
- Section 508-compliant player that displays the closed captioning below the video file

For online web conferences, the webinar and webcast tools used would need to meet the accessibility requirements of the audience. In addition, any handouts or resources provided would need to be Section 508 compliant.

It is also important to note that for eLearning with Level 3 interactivity, Section 508 compliance may not be possible with highly complex interactions; therefore, a product that is instructionally equivalent would need to be created.

All performance aids and tools can be developed to be Section 508 compliant. Most performance aids and tools use Microsoft Word, but PPT, Excel, and/or PDF may be used, which also have specific rules (e.g., adding alternative text, adding column headers to tables) about Section 508 compliance.

For more information, refer to: <https://section508.gov/create>.

4.4 Scalability (i.e., number of learners it could accommodate)

Scalability refers to the number of learners a training delivery format could potentially accommodate. Refer to Table 3 below.

Table 3: Scalability for Each Training Delivery Format

Training Delivery Format	Scalability
On-the-Job Training	Dependent on EPA division/office/organization capabilities and staffing resources
Microlearning	Unlimited, but dependent on LMS and other server space where hosted

Training Delivery Format	Scalability
Packaged Video Training	Unlimited, but dependent on LMS and other server space where hosted
Online Web Conference (Webinars and Webcasts)	Typically, up to 1,500 people but dependent on the license; for breakout sessions, five or fewer
Live-Streamed Training (Synchronous Virtual Instructor-Led Training)	25 to 30 or fewer; for breakout sessions and/or activities, five or fewer
Basic eLearning (Level 1)	Unlimited, but dependent on LMS and other server space where hosted
Enhanced eLearning (Levels 2 and 3)	Unlimited, but dependent on LMS and other server space where hosted
Classroom Training (Instructor-Led Training)	Dependent on training requirements, cost, and facilities used, but ideal to limit size to 25 to 30 or fewer; for breakout sessions/activities, five or fewer
Performance Aids and Tools	Unlimited
Blended Learning	Dependent on components used

For OJT, scalability is dependent on EPA's division/office/organization capabilities and staffing resources.

For microlearning and packaged training videos, scalability can be unlimited in theory, but depends on the LMS or other server space where the microlearning is hosted.

Webinar and webcast software (such as Adobe Connect) can accommodate up to approximately 1,500 people. If a webinar is used and it includes interactivity such as breakout sessions to conduct exercises/activities, it is recommended that the class size be limited in size. Specifically, it is ideal to keep a breakout session limited to groups of five or fewer. In general, if using a webcast, more people can attend without affecting the experience. A webinar or a vILT (as explained below) tends toward more interactivity (e.g., breakout sessions, chats) so fewer participants are ideal unless you have co-facilitators who can handle a larger class size.

vILT sessions can be challenging if there are many participants, so it is ideal to keep the size limited to 25 or fewer. If conducting a breakout session and/or activity as part of a vILT, it is ideal to keep it limited to groups of five or fewer.

For Levels 1–3 eLearning, scalability can be unlimited, in theory, but it depends on the LMS or other server space where the eLearning is hosted.

For ILT, small class sizes are ideal to increase engagement, pace, and the interaction between the instructor(s) and learners. Class size can also depend on the training requirements, cost, and facilities used, but it is ideal to keep size limited to 25 or fewer.

For performance aids and tools, scalability is also unlimited; for blended learning, it depends on the training requirements and components used.

4.5 Ease of Updating

For all formats, the ease of updating (the ability to easily revise and maintain training courses and/or materials) can be dependent on the complexity and/or stability of the material/content and interactions, if used. Refer to Exhibit 5.

Microlearning is typically easier and quicker to update than eLearning and videos. In general, videos are harder to update than microlearning or eLearning because they are more complex. If using live actors, it can be harder to update than if animations, images, or graphics (depending on the complexity) were used. Typically, webinars and webcasts use a PPT presentation to deliver instruction, which can easily be updated, along with the script. The ease of updating an eLearning course depends on the amount of interactivity, narration, and animation used. The more these are integrated in the course, the harder the content is to update.

Many vILT programs offer their content (through Microsoft PPT and Word) in shorter, incremental modules that are intended to be completed in combination with other curricula, so they can be easily updated. Typically, OJT materials, ILT materials, and performance aids and tools are the easiest to update because they usually include handouts, instructor/participant guides, job aids, etc. that are static and originally created using Microsoft Word and PPT.

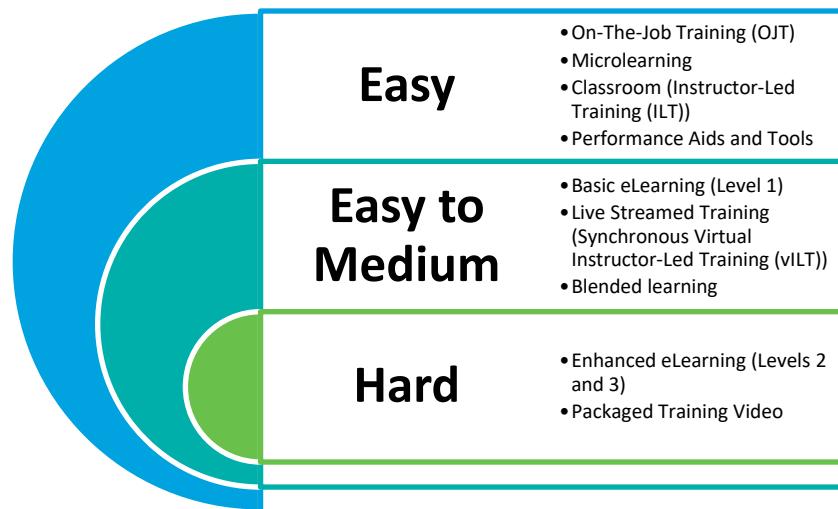


Exhibit 5: Training Delivery Formats Ease of Updating

4.6 Resource Requirements

Resource requirements can vary widely among the different training delivery formats. Table 4 below provides information on the recommended staffing resources needed to manage, design, and develop the training delivery formats outlined in this report.

Table 4: Recommended Resources/Staffing for Each Training Delivery Format

Training Delivery Format	Recommended Resources/Staffing
On-the-Job Training	<ul style="list-style-type: none"> Peers (experienced coworkers/employees) Managers Sometimes human resource team members
Microlearning	<ul style="list-style-type: none"> Project manager/training lead Instructional designer(s) Multimedia programmer(s) Graphic designer(s) Voiceover artist(s) Subject matter experts (SMEs)

Training Delivery Format	Recommended Resources/Staffing
Packaged Video Training	<p>If using video, refer to the column below.</p> <ul style="list-style-type: none"> • Media producer/director and/or project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • 2D artist(s) • 3D modeler(s) and 3D animator(s) • 2D animator(s) (for motion graphics) • Voiceover artist(s) • Sound engineer(s) • Camera operator (for live action video) • Music director/composer (optional) • Production assistant(s) (for live action video) • SMEs <p>Note that 1–2 people can take on multiple roles, depending on the budget and need. Also, these roles are dependent on the type of video developed (for instance, if using 3D animation, a 3D modeler and/or animator would be needed).</p>
Online Web Conference (Webinars and Webcasts)	<ul style="list-style-type: none"> • Project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • Facilitator(s)/Instructor(s) • Webinar/webcast moderator(s) • Webinar/webcast technical support • SMEs
Live-Streamed Training (Synchronous Virtual Instructor-Led Training)	<ul style="list-style-type: none"> • Project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • Facilitator(s)/Instructor(s) • Webinar/webcast moderator(s) • Webinar/webcast technical support • SMEs
Basic eLearning (Level 1)	<ul style="list-style-type: none"> • Project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • Voiceover artist(s) • SMEs

Training Delivery Format	Recommended Resources/Staffing
Enhanced eLearning (Levels 2 and 3)	<ul style="list-style-type: none"> • Project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • 2D artists, 3D modeler(s), and 3D animator(s) for Level 3 • Voiceover artist(s) • SMEs
Classroom Training (Instructor-Led Training)	<ul style="list-style-type: none"> • Project manager/training lead • Instructional designer(s) • Multimedia programmer(s) • Graphic designer(s) • Facilitator(s)/Instructor(s) • SMEs
Performance Aids and Tools	<ul style="list-style-type: none"> • Project Manager/Training Lead • Instructional designer(s) • Graphic designer(s) • SMEs
Blended Learning	<p>Depends on the type of components that will be part of the blended learning solution. Refer to the other rows for recommended resources/staffing, per delivery format.</p>

4.7 Average Development Costs and Level of Effort

Cost and development hours (or LOE) can vary greatly depending on the training delivery format that is chosen. In addition, costs can be dependent on a multitude of factors, as listed below.

4.7.1.1 On-the-Job Training

For OJT, costs can vary and be dependent on EPA's capabilities, staffing resources, employee skill sets, and the type of OJT component used.

4.7.1.2 Microlearning

Costs and development hours can vary greatly depending on the length and format of the microlearning, interactivity, complexity/stability of content, and LMS administration (if hosted on an LMS). Typically, microlearning can be a quarter of the cost and development hours of a Level 1 eLearning course.

4.7.1.3 Packaged Training Videos

For training videos, cost and development hours can vary greatly depending on the training need, budget, special effects, complexity/stability of the content/material, LMS administration (if hosted on an LMS), and the length and complexity of the script. Costs can include:

- Pre-production tasks (e.g., scriptwriting, concept development, casting talent if live action)
- Production tasks
- Post-production tasks (e.g., video editing, motion graphics, captioning for Section 508 compliance)
- Deliverables (e.g., uploading to YouTube, hosting)

4.7.1.4 Online Web Conferences

For online web conferences, costs and development hours can vary greatly depending on the training need, budget, complexity/stability of the content/material, LMS administration, and size of the audience.

In addition, webinar/webcast software/licenses would be needed, and prices would vary depending on EPA's need. Multiple platforms can be used, including Adobe Connect, GoToMeeting, and Zoom:

- Costs for Adobe Connect can be found here: <http://buyconnect.adobe.com/>
- Costs for GoToMeeting can be found here: <https://www.gotomeeting.com/meeting/pricing>
- Costs for Zoom can be found here: <https://zoom.us/pricing>

4.7.1.5 Live-Streamed Training (Synchronous Virtual Instructor-Led Training)

The cost of vILT can be less than ILT because travel and lodging costs are not involved for the learners and facilitator(s)/instructor(s).

The cost and development hours are similar to ILT without the travel or lodging costs; refer to the [ILT section](#) for more information.

4.7.1.6 Basic and Enhanced eLearning

For eLearning, costs and development hours can vary based on the level of interactivity, as outlined in Table 5 below. Please note that these costs and LOE estimates do not include the costs/hours for reviews, revisions, LMS administration (backend database communication), consulting fees, graphic user interface (GUI) development, meetings, and consultation with SMEs. Refer to Table 5 below for estimated development hours and average costs depending on the level of interactivity.

Table 5: Estimated Development Hours and Cost for eLearning Courseware

Level of Interactivity	Estimated Development Hours	Estimated Average Cost
Level 1	Development hours can range from 49 to 125 (not including reviews and revisions), depending on the amount of interactivity. On average, it can take 79 development hours per 1 hour of Level 1 WBT.	On average, 1 finished hour of WBT (Level 1) can cost approximately \$10,054 but can be cost-effective for large scale deployments.
Level 2	Development hours can range from 127 to 267 (not including reviews and revisions), depending on the amount of interactivity. On average, it can take 184 development hours per 1 hour of Level 2 WBT.	On average, 1 finished hour of WBT (Level 2) can cost approximately \$18,583 but can be cost-effective for large scale deployments.

Level of Interactivity	Estimated Development Hours	Estimated Average Cost
Level 3	Development hours can range from 317 to 716, depending on the amount of interactivity. On average, it can take 490 development hours per 1 hour of Level 3 WBT.	On average, 1 finished hour of WBT (Level 3) can cost approximately \$50,371 but can be cost-effective for large scale deployments.

4.7.1.7 Classroom Training (Instructor-Led Training)

For ILT, development hours can range from 22 to 82—not including reviews, revisions, LMS administration (backend database communication), consulting fees, meetings, and consultation with SMEs—depending on the complexity of the subject matter and amount of classroom materials. On average, it can take 43 development hours per 1 hour of ILT. Refer to Exhibit 6 to review how average development hours differ between ILT and eLearning courses.

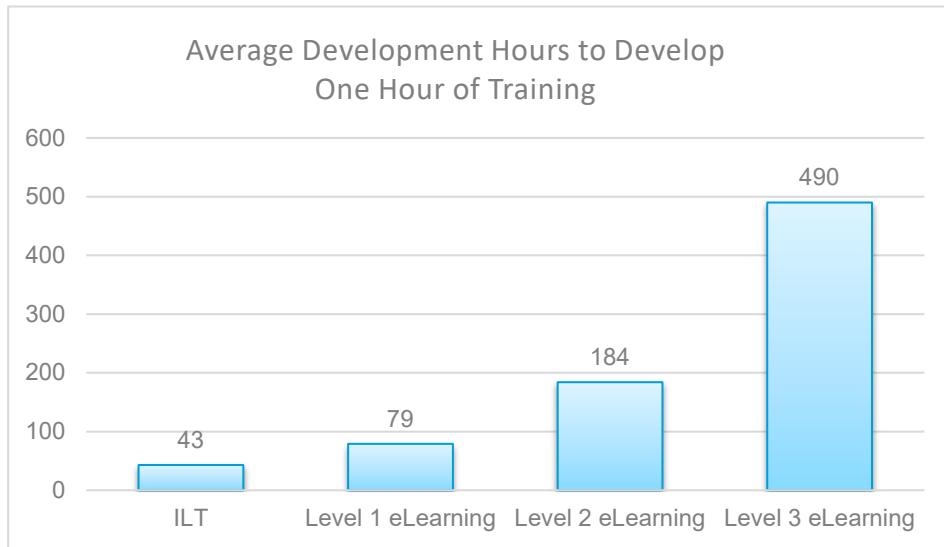


Exhibit 6: Average Development Hours to Develop One Hour of Training

. As previously mentioned in the [Scalability section](#), ILT and vILT should ideally be constrained to 25-30 learners or fewer since its challenging facilitating activities and exercises if there are many participants. So, microlearning, packaged training videos, basic and enhanced eLearning could be more cost effective if you have a lot of participants since scalability is unlimited.

4.7.1.8 Blended Learning

Cost and development hours depend on the type of components that will be part of the blended-learning solution.

4.8 Provider Computer and Other System and Equipment Requirements

The provider and other system requirements and equipment can vary depending on the type of training delivery format. Refer to Exhibit 7 for a list of software that could be used to design and develop each type of training delivery format. Refer to Table 6 for a list of suggested equipment for each type of training delivery format.

For OJT, the materials developed would be similar to what might be included in an ILT but with a structured approach as to when the learner participates. Thus, Microsoft Word and PPT could be used to create any supporting materials to accompany OJT coaching, mentoring, etc.

For microlearning and eLearning, the requirements depend on the format and level of interactivity. Development software, such as Articulate Storyline 360, Trivantis Lectora, Adobe Captivate, Custom Code, and Adobe Creative Cloud (Illustrator, Photoshop, Audition, and Premier Pro) can be used. If creating static microlearning, Microsoft Word and PPT could be used.

For video development, development software can include, but is not limited to: Adobe Creative Cloud (Illustrator, Photoshop, Audition, Premier Pro, After Effects, and Character Animator), 3D Studio Max, or whiteboard animation software such as Videoscribe or PowToon.

For facilitation of webinars and vILTs, webinar/webcast software such as Adobe Connect, GoToMeeting, and Zoom can be used. It also requires use of a video camera, microphones, and speakers, as well as a high-speed processor and internet connection with high bandwidth to stream live video. To create presentations used in webinars and vILTs, Microsoft PPT and Word typically are used. If providing a live or virtual course, it may be necessary to have a video camera, microphones, and speakers situated throughout the room, among other equipment listed in Table 6. For a live, in-person course, it may require a high-speed processor to stream the live video and a high-speed internet connection with high bandwidth.

For ILT materials and performance aids and tools development, Microsoft Office products such as Word, PPT, and Visio can be used.

	On-the-Job Training • Microsoft Word and PPT (\$)
	Packaged Training Video • Adobe Creative Cloud (Illustrator, Photoshop, Audition, Premier Pro, After Effects, and Character Animator) (\$-\$) • 3D Studio Max (\$\$\$) • TechSmith Camtasia (\$) • VideoScribe or PowToon (for simple animations) (\$)
	Microlearning and eLearning • Articulate Storyline 360 (\$\$\$) • Trivantis Lectora (\$\$\$) • Adobe Captivate (\$) • Custom Code • Adobe Creative Cloud (Illustrator, Photoshop, Audition, and Premier Pro) (\$-\$) • TechSmith Camtasia (\$) • Microsoft Word and PPT (\$)
	Online Web Conferences and Live-Streamed Training (Synchronous Virtual Instructor-Led Training) • Adobe Connect (\$) • GoToMeeting (\$) • Zoom (\$) • Microsoft Word and PPT (\$)
	Classroom Training (ILT) Materials and Performance Aids and Tools • Microsoft Word, PPT, and Visio (\$)

Exhibit 7: Provider Computer and Other System Requirements for Each Training Delivery Format

Low Cost - \$ Moderate Cost - \$\$ High Cost - \$\$\$

Table 6: Suggested Equipment Needed for Each Training Delivery Format

Training Delivery Format	Equipment Needed
On-the-Job Training	No special equipment needed other than what is used on the job such as a computer, unless it's a technical type of job and certain equipment is needed to show someone how to use it.
Microlearning	Computer and software listed above Exhibit 7

Training Delivery Format	Equipment Needed	
Packaged Video Training	Computer and software listed above Exhibit 7 for 2D/3D animations and live action. Below lists additional equipment needed in order to produce a live action video, from basic to professional.	
	Basic	<p>Live action:</p> <ul style="list-style-type: none"> • Camera such as a high quality cell phone • LED 3 point kit (lighting cord, stand, and lighting instrument) • Cardioid condenser microphone • 2-channel field recorder (what you plug your microphone into) • 15' microphone cable • Microphone stand
	Advanced	<p>Live action:</p> <ul style="list-style-type: none"> • Mirrorless digital single-lens reflex (DSLR) camera • LED lighting instrument • 4-channel field recorder (what you plug your microphone into) • LED 3-point kit (lighting cord, stand, and lighting instrument); multiple as needed • 1 hypercardioid condenser and 1 supercardioid condenser • 1 wireless lav microphone • Microphone wind protection • Medium-grade quality microphone cables
	Professional	<p>Live action:</p> <ul style="list-style-type: none"> • Professional digital cinema camera • LED lighting instrument • 8-channel field recorder (what you plug your microphone into) • LED 3-point kit (lighting cord, stand, and lighting instrument); multiple as needed • 4 hypercardioid condenser and 4 supercardioid condenser • 6 wireless lav microphone • Microphone wind protection • Microphone blimp and cover • Microphone boom • Medium to high-grade quality microphone cables

Training Delivery Format	Equipment Needed
Online Web Conference (Webinars and Webcasts)	Computer and software listed above Exhibit 7. Additional equipment that would be needed is listed below from basic to professional.
	<p><i>Basic</i></p> <ul style="list-style-type: none"> • Webcam or video camera on facilitator/instructor's computer with an internet connection • Headset (headphones with microphone)
	<p><i>Advanced</i></p> <ul style="list-style-type: none"> • A good quality microphone • Mirrorless digital single-lens reflex (DSLR) camera • LED lighting instrument • 4-Channel Field Recorder (what you plug your microphone into) • LED 3-point kit (lighting cord, stand, and lighting instrument); multiple as needed • 1 hypercardioid condenser and 1 supercardioid condenser • 1 wireless lav microphone • Microphone wind protection • Medium-grade quality microphone cables
	<p><i>Professional</i></p> <ul style="list-style-type: none"> • High quality microphone/broadcast microphone • Microphone boom arm so facilitator(s) do not have to hold a microphone and ensure all sound is recorded • Professional digital cinema camera • LED lighting instrument • 8-channel field recorder (what you plug your microphone into) • LED 3-point kit (lighting cord, stand, and lighting instrument); multiple as needed • 4 hypercardioid condenser and 4 supercardioid condenser • 6 wireless lav microphone • Microphone wind protection • Microphone blimp and cover • Microphone boom • Medium to high-grade quality microphone cables • Optional green screen backdrop • Optional video editing software such as Adobe Premier Pro or iMovie if using video in your presentation

Training Delivery Format	Equipment Needed
	<ul style="list-style-type: none"> • Optional image editing tool such as Photoshop to insert high quality images and graphics into your PPT deck
Live-Streamed Training (Synchronous Virtual Instructor-Led Training)	Equipment needed would be the same as Online Web Conference. Refer to row above.
Basic eLearning (Level 1)	Computer and software listed above Exhibit 7
Enhanced eLearning (Levels 2 and 3)	Computer and software listed above Exhibit 7
Classroom Training (Instructor-Led Training)	<ul style="list-style-type: none"> • Large conference room to accommodate the number of learners with tables/chairs in a U- or V-shape arrangement for interaction with facilitator(s)/instructor(s) • Internet connection and computer • Facilitator/instructor guide, participant guide, handouts, and PPT deck • Overhead projector or computer projection system and cables for proper connection • Optional electronic remote device to advance slides in PPT presentation, if available • Projection screen (at least 6' x 6') • Optional pointer (preferably laser type), if available • Flip charts with easel and/or whiteboard with dry erase pens and eraser • Large markers (in assorted colors) • Participant tent cards (to list names and be placed on tables)
Performance Aids and Tools	Computer and software listed above Exhibit 7
Blended Learning	Depends on the components that will be part of the blended learning solution.

4.9 User System Requirements

Most of the training delivery formats, including microlearning, videos, webinars, vILT, and eLearning, would be developed to work on modern devices, including the latest browsers (Internet Explorer version 11, Edge, Apple Safari, and Google Chrome).

If computers are used in an ILT session, an internet connection would be needed. For the development of performance aids and tools, an internet connection may be needed and as would access to Microsoft Office products. For blended learning, system requirements would depend on the components used.

4.10 Timing and Recommended Length

Timing refers to how often the training needs to happen over a course of year. In addition, the timing and recommended length of each training delivery format is discussed and listed below in Table 6.

Table 7: Timing and Recommended Length of Each Training Delivery Format

Training Delivery Format	Timing	Recommended Length
On-the-Job Training	Depends on when the need to learn a new skill (or set of skills) is high; for example, directly following new employee onboarding, or over a period of time when an employee is transitioning into a new role, possibly because of promotion or succession planning.	Depends on the employer and/or human resources (HR) to align with a probationary period, transitioning to a new role, completing an apprenticeship program, completing a certification, etc.
Microlearning	Anytime, on-demand.	Typically, 1–5 minutes in length depending on the format used.
Packaged Video Training	Anytime, on-demand.	Research shows that videos should be shorter in length (on average about 2–3 minutes) to increase engagement and knowledge retention.
Online Web Conference (Webinars and Webcasts)	Depends on the subject matter, audience availability, and the time needed to cover the content.	Typically, learners lose interest after two hours, so it is recommended webinars/webcasts be less than two hours in length.
Live-Streamed Training (Synchronous Virtual Instructor-Led Training)	Depends on the subject matter, audience availability, budget, and the time needed to cover the content. Typically, a vILT course offers multiple sessions spread out over a certain period of time.	Each session should be less than two hours in length to ensure optimal engagement and knowledge retention.
Basic eLearning (Level 1)	Anytime, on-demand.	Depends on many factors including subject matter and budget but should be short in length or broken up into multiple modules to ensure optimal engagement and knowledge retention. Typically, eLearning modules can be 30 minutes to 1 hour in length.
Enhanced eLearning (Levels 2 and 3)	Anytime, on-demand.	Depends on many factors, including subject matter and budget, but should be short in length or broken up into multiple

Training Delivery Format	Timing	Recommended Length
		modules to ensure optimal engagement and knowledge retention. Typically, eLearning modules can be 30 minutes to 1 hour in length.
Classroom Training (Instructor-Led Training)	Can vary greatly and depend on the subject matter, audience availability, and the time needed to cover the content. Typically, ILT is broken up over a series of days or even weeks/months.	Can vary greatly and depend on the subject matter, audience availability, and the time needed to cover the content.
Performance Aids and Tools	Anytime, on-demand.	Depends on many factors including subject matter, complexity, and budget.
Blended Learning	Depends on the components that will be part of the blended learning solution.	Depends on the components that will be part of the blended learning solution.

4.11 Learning Management System Platform Requirements

The Learning Management System (LMS) requirements are dependent on what training delivery format is used and its capabilities. All products can be developed to work on an LMS, given its requirements and the LMS ability to accept the product.

Videos, online web conferences, and vILTs can also be standalone (i.e., provided via a website) but can be developed/packaged to work on an LMS. For ILT, courses can be listed in an LMS depending on the type of LMS and its capabilities. The LMS could be used for ILT coordination and enrollment/tracking. For blended learning, platform requirements depend on the components used and the LMS ability to accept its capabilities.

4.12 Effectiveness of an Adult Learning Tool

In this section, the effectiveness of information retention and learner engagement is discussed for each training delivery format, as is whether it assists with active or passive learning, or both. In addition, each training delivery format is also discussed in terms of where it falls within each of the learning domains as referenced in the [Determining the Optimal Training Delivery Format/Method](#) section of this report, as shown in Table 7.

Table 8: Learning Domain Alignment and Active/Passive Learning

Training Delivery Format	Active, Passive, or Both?	Cognitive	Affective	Psychomotor
On-the-Job Training	Active	X	X	X
Microlearning	Both	X	X	

Training Delivery Format	Active, Passive, or Both?	Cognitive	Affective	Psychomotor
Packaged Video Training	Passive	X	X	
Online Web Conference (Webinars and Webcasts)	Passive	X	X	
Live-Streamed Training (Synchronous Virtual Instructor-Led Training)	Both	X	X	
Basic eLearning (Level 1)	Passive	X	X	
Enhanced eLearning (Levels 2 and 3)	Both	X	X	X (Level 3)
Classroom Training (Instructor-Led Training)	Active	X	X	X
Performance Aids and Tools	Passive	X		
Blended Learning	Depends upon components used	Depends upon components used		

4.12.1.1 On-the-Job Training

OJT can be immediately applied on the job. It can target cognitive, affective, and psychomotor development, so it provides one of the highest forms of learner knowledge retention and engagement. OJT is considered active learning because it provides a comprehensive hands-on experience. OJT should be selected for certain types of learning, such as those that: (1) require a high level of case-by-case and individual judgment; (2) involve processes that are unpredictable and inconsistent; and/or (3) necessitate the development of detailed technical skills.

4.12.1.2 Microlearning

Because microlearning can utilize a variety of formats that connect to a wider variety of learning styles, learner engagement is high. Content is shorter, and knowledge retention is higher, especially if spaced repetition (practicing new topics repeatedly over time) and retrieval practice (using questions to recall information and strengthen memory) is incorporated. In addition, with growing evidence of increasingly reduced attention spans, microlearning can meet the needs of learners in the workplace. Microlearning can target cognitive and affective development. Microlearning is mostly passive learning, but active learning elements can be included.

4.12.1.3 Packaged Training Videos

Videos are ideal for showing learners how to perform a task or demonstrate a soft-skill training action that cannot be adequately represented in writing. They can also be used to model correct/incorrect behaviors or performance. Videos can target cognitive and affective development and are considered passive learning.

4.12.1.4 Online Web Conferences

Webinars and webcasts can target cognitive and affective development. Webinars are mostly passive learning, but active learning elements can be included (e.g., exercises, discussions), whereas webcasts are considered passive learning.

4.12.1.5 Live-Streamed Training (Synchronous Virtual Instructor-Led Training)

vILT retention can be higher than that of WBT alone because it can include ILT discussions and exercises/activities to help reinforce material. vILT can target cognitive and affective development and is mostly passive learning, but active learning elements can be included.

4.12.1.6 Basic and Enhanced eLearning

Basic eLearning (Level 1) can target cognitive and affective development and is considered passive learning. Basic eLearning (Level 1) should not be used to teach psychomotor skills; rather, it is ideal for subjects that are short in duration (e.g., compliance training) and easy to assimilate.

Enhanced eLearning can increase retention more than Level 1 basic eLearning because it can provide more complex scenario-based learning and real-world application. It is considered passive learning, but active learning elements can be included. Enhanced eLearning can target cognitive and affective development, and sometimes psychomotor in complex scenarios and simulations (Levels 3 and 4).

4.12.1.7 Classroom Training (Instructor-Led Training)

ILT encourages collaborative learning techniques and opportunities and is considered active learning. It also works well for learners adverse to technology and change. In addition, it exposes learners to multiple learning modalities that can target cognitive, affective, and psychomotor development. ILT can be very effective when focused on problem-solving and exchanging and sharing new ideas and solutions.

Similar to OJT and blended learning, ILT provides one of the most engaging forms of learning, with a higher rate of knowledge retention than asynchronous formats, eLearning, videos, webinars, and microlearning. It provides the maximum opportunity for learning, engagement, and retention.

4.12.1.8 Performance Aids and Tools

Performance aids and tools can target cognitive development and should not be used for psychomotor skills or if the learner does not have prerequisite skills. They are considered passive learning.

4.12.1.9 Blended Learning

Blended learning can target cognitive, affective, and psychomotor development, depending on the mix of formats. Because of the use of multiple learning modalities and formats, it provides one of the highest forms of learner knowledge retention and engagement. It can provide a mix of active and passive learning. The key to success with blended learning is choosing the right tool for each portion of the content. Blended learning can be the most powerful tool in the arsenal because it can be customized based on the learner and content. Learners and trainers alike benefit from the flexibility this format offers. It works very well with a large curriculum that is broken into pieces/sections and provided in a given order.

5 REFERENCES

Anderson, L.W., & Krathwohl, D.R. (eds.). (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's Taxonomy of educational objectives*. New York: Longman.

Why microlearning is huge. (2014, July). Retrieved from <https://elearningindustry.com/why-microlearning-is-huge>

Sink, L. Darryl (2014). Design models and theories for adults. American Society for Training & Development (ASTD). *ASTD Handbook*. Retrieved from <https://dsink.com/downloads/10SinkASTDhandbook.pdf>

Training budget benchmarks and optimizations for 2017. (2016, December). Published by Brandon Hall Group. Retrieved from <https://www.litmos.com/lp/training-budget-benchmarks-optimizations-2017>

Chapman, B. (2010). *How long does it take to create learning?* [Research Study]. Published by Chapman Alliance LLC. Retrieved from <http://www.chapmanalliance.com/howlong/>

Rossett, A. & Gautier-Downes, J. H. (1991). *A handbook of job aids*. San Diego: Pfeiffer & Company.

Virtual instructor-led training. (2013, February). Retrieved from <https://trainingindustry.com/wiki/content-development/virtual-instructor-led-training-vilt/>

L. Medsker, K & M. Holdsworth, K & Brethower, Dale. (2002). *Models and strategies for training design*. International Society for Performance Improvement.

What learners want: strategies for training delivery report. (2018, September). Published by Training Industry. Retrieved from <https://www2.trainingindustry.com/what-learners-want-strategies-for-training-delivery>

Piskurich, George M. *Rapid Instructional Design*. (2006). San Francisco: Pfeiffer, An Imprint of Wiley

What really is the cone of experience? (2017, August). Retrieved from <https://elearningindustry.com/cone-of-experience-what-really-is>

Laird D. (1985). *Approaches to Training and Development*. Reading, Massachusetts: Addison-Wesley.

Hrastinski, Stefan. (2008). Asynchronous and synchronous e-learning. *Educause Quarterly*. 4.

DeSimone, R. L., Werner, J. M. (2012). *Human Resource Development*. Mason, OH.: South-Western College Pub.

Hofmann, Jennifer (2018). *What Works in Talent Development: Blended Learning*. Alexandria, VA: Association for Talent Development (ATD) Press.