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INTRODUCTION

The Talent Development Community (TDC) provides opportunities for professionals to share information related to performance and development. The community also offers an avenue to leverage resources across state agencies. One of the key focus areas of the TDC is e-learning technology.

When addressing performance needs through e-learning, it is beneficial to consider industry best practices. The E-Learning Technology Subcommittee of the TDC developed this guide as a resource for designing industry standard e-learning.

This document summarizes well-known instructional approaches and design guidelines for e-learning projects. This information is intended to assist training developers in creating products that adhere to industry standards. The guide can be used as a job aid for developers and training practitioners, or as an instructional tool for those entering the training field.

This guide does not need to be read as a book. In the digital document, you can jump to the section that relates to the task you're trying to complete by using the links in the table of contents. If you're just getting started, take a look at the E-Learning Quickstart section and the glossary.

The content of this guide is organized around the following instructional design processes:

- Analysis
- Design
- Development
- Implementation
- Evaluation

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- Michael Lacy, OhioMHAS
E-LEARNING QUICKSTART

This quickstart is intended to provide a high level overview of e-learning design and development. These concepts are the critical takeaways from this guide. For more details on these concepts, see the corresponding sections in this document. In the digital version of this guide, you can jump to related sections by clicking the links provided. Headings that display the quickstart icon link back to this page.

Analysis
- Identify the training needs or problem you are trying to solve. Determine if e-learning is the best solution. Use surveys, observations, interviews, discussions, and/or focus groups to do this.

Design
- Create specific and measurable learning objectives that address the training needs.
- Chunk information into digestible modules. Make these short and relevant.
- Design activities that allow the learners to do something with the new information or skills. Have them solve a problem, make decisions in a scenario, or create something using the concepts. Make sure these activities are relevant and require critical thinking.
- Show, don’t tell. Instead of telling your learners that the content is important, show them how useful it is by letting them apply it on their own.
- Use assessments that force the learner to demonstrate mastery of the training objectives. Even multiple choice questions should require application of the concepts. You may need a pre-test to measure success accurately.

Development
- Use engaging media that supports the learning objectives. Avoid using media as filler.
- Create e-learning that you would want to take. Make the activities interesting and easy to use. Avoid simply converting an instructor-led PowerPoint to e-learning.

Implementation
- Deploy your content to a format that meets the lowest technology and connectivity specs for your target users. Run a pilot to identify any issues before mass enrollment.

Evaluation
- Evaluate the success of your training. At a minimum, answer the following questions:
  - Was the training a positive experience?
  - Can the learners do what you want them to do?
  - Are the learners using the new knowledge?
  - Did the training solve your problem or address the training needs?
E-LEARNING DEVELOPMENT OVERVIEW

E-learning development uses a number of processes to support learning. Many of these processes repeat throughout the development of a product. The models discussed in this section offer different approaches to the processes of e-learning development.

Development Models

The ADDIE Model

Analysis, Design, Development, Implementation and Evaluation (ADDIE)

ADDIE is an instructional design framework. Many organizations use ADDIE for training development, and it is a well-known standard in the field. The five phases of ADDIE include: analysis, design, development, implementation, and evaluation. A project is typically reviewed during each phase to identify areas for improvement.

The SAM Model

Successive Approximation Model (SAM)

SAM uses repetitive processes for design and development. This approach facilitates project creation through collaborative input. Development often begins with simultaneous analysis and design. The e-learning content is then formed through ongoing revision.
**Process & Deliverables**

When planning an e-learning product, it is beneficial to match the development model to the needs of the project and the capabilities of the development team. You can adjust the development model to suit your project by completing only the tasks that fit the project scope. This helps avoid unnecessary procedures and documentation.

Regardless of the model chosen, the processes of ADDIE are likely to apply. The following table outlines the common processes and deliverables for e-learning projects.

### E-Learning Development Processes

<table>
<thead>
<tr>
<th>Process</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Planning**  | **Process:**  
- Capture e-learning request (goal, scope, major learning/performance objectives, resources, desired start/end dates, dependencies, etc.)  
- Gather input on project goals and scope (face-to-face meetings, email, or online form)  
**Deliverables:**  
- E-Learning Request Form (see Appendix for additional information) |
| **Analysis**  | **Process:**  
- Identify training needs, conduct analysis if necessary  
- Determine if e-learning is the best solution  
- Create target audience profile, if not already available (technical capability, accessibility needs, learning environment, etc.)  
- Determine tasks or topics to address through training (content focus)  
- Determine feasibility and draft project timeline  
- Consider current project load and time reserved for general support activities  
**Deliverables:**  
- Needs Analysis Results  
- Audience Profile  
- Project Timeline  
- Project Charter |
<table>
<thead>
<tr>
<th>Process</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Lean Considerations** | Use a rapid approach to needs analysis  
Use online surveys or discussion boards  
Reference existing analysis data  
Create audience profiles and reuse |
| **Design** | **Process:**  
Draft learning objectives based on desired performance outcomes  
Determine a sequence of learning modules and topics  
Decide on the delivery medium  
Design learner assessments  
Storyboard or prototype the e-learning interface and interactions  
Capture formative review and make revisions |
| **Deliverables:** | Design Plan (objectives, evaluation plan, instructional strategy, etc.)  
Storyboard, Template, or Prototype (course look and feel; sometimes addressed in the Development Phase) |
| **开发** | **Process:**  
Create and assemble the content and learning resources  
Collaborate with subject matter experts to capture information and draft learning materials  
Curate, design, and/or edit associated media (images, audio, video, etc.)  
Repurpose or integrate existing content, if applicable  
Program and author courseware interface  
Develop and/or use templates where possible |
<p>| <strong>Deliverables:</strong> | |</p>
<table>
<thead>
<tr>
<th><strong>Process</strong></th>
<th><strong>Details</strong></th>
</tr>
</thead>
</table>
|             | • Storyboards  
|             | • Audio & Video Scripts  
|             | • Media  
|             | • Beta/Draft Course  

**Lean Considerations**

- Reuse and repurpose existing content  
- Create and/or use templates  
- Make strategic use of complex media

**Implementation**

**Process:**

- Roll out training to the learning management system (LMS) or other delivery platform  
- Test internally and with specific learner groups, if possible  
- Manage learner enrollment  
- Run LMS reports as needed  
- Address issues that arise  
- Identify areas for improvement through formative evaluation  
- Revise as necessary

**Deliverables:**

- Final Course (on planned delivery platform)  
- Source Files

**Lean Considerations**

- Aggregate and prioritize revisions  
- Perform formative evaluations as a group

**Evaluation**

**Process:**

- Conduct summative assessment to gauge training effectiveness  
- Consider levels of evaluation: reaction, learning, behavior, results  
- Decide on revisions to training design, content, or delivery  
- Maintain product via updates or retire when obsolete

**Deliverables:**

- Evaluation Data
Process | Details
--- | ---
• Evaluation Report and/or Suggested Revisions

**Lean Considerations**

• Evaluate only what is necessary to determine effectiveness
• Focus on updates and revisions that have the greatest impact

**Development Team Roles**

The development team may include one or more individuals in the following roles:

• Subject Matter Expert (SME)
• Instructional Designer/Instructional Systems Designer
• Graphic Artist
• E-Learning Developer/Programmer
• Audio/Video Producer
• Content Reviewer (often the sponsors or SMEs)
• Quality Assurance Expert
• Learning Management System Administrator

**General Best Practices**

<table>
<thead>
<tr>
<th>No.</th>
<th>E-Learning Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Maximize meaningful interactivity. Interactivity is the principal technique for maintaining learner engagement.</td>
</tr>
<tr>
<td>2.</td>
<td>Keep the presentation of information as simple and consistent as possible.</td>
</tr>
<tr>
<td>3.</td>
<td>Keep modules or lessons relatively short.</td>
</tr>
<tr>
<td>4.</td>
<td>Use media that is meaningful and provides a deeper explanation of the concepts. Well-designed media adds clarity and improves retention through storytelling.</td>
</tr>
<tr>
<td>5.</td>
<td>Use good visual design. Each screen should:</td>
</tr>
<tr>
<td></td>
<td>• Look crisp and inviting</td>
</tr>
<tr>
<td></td>
<td>• Be limited to one concept, procedure, or idea</td>
</tr>
<tr>
<td></td>
<td>• Have good contrast</td>
</tr>
<tr>
<td></td>
<td>• Provide adequate white space</td>
</tr>
<tr>
<td></td>
<td>• Use text that is legible</td>
</tr>
<tr>
<td>No.</td>
<td>E-Learning Best Practice</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------</td>
</tr>
<tr>
<td>6.</td>
<td>Use an intuitive user interface.</td>
</tr>
<tr>
<td>7.</td>
<td>Give the learner the ability to control the navigation and pace of the course. Provide progress information and feedback.</td>
</tr>
</tbody>
</table>

**ANALYSIS**

The goal of analysis is to identify training needs. Training needs are essentially the problem you are trying to solve through training. Needs are often based on gaps in performance, and the plausible causes of such gaps. Data gathered during analysis is used to determine if training will help to close performance gaps or solve the problem.

There are many different kinds of analyses that could be performed. Some that are common to e-learning include:

1. Training Needs Analysis
2. Target Audience Analysis
3. Task or Topic Analysis

A best practice for training development is to complete a needs assessment before starting the course design. The following questions are typically addressed during the analysis process:

1. What is the performance gap or problem to be solved?
2. Why is e-learning the right approach?
3. What are the learning objectives or outcomes? What must the learner be able to do at the end of this training?
4. How can the training be designed to achieve these objectives?
5. Are there any technical or administrative risks?
6. How will achievement of the objectives be measured? Consider measuring success at both the learner and organizational levels.
7. What follow-up support should be provided? Additional support may help learners retain the training material.
Guiding Questions for Analysis
by Ethan Edwards

1. What do you expect learners to be able to do after completing the course that they can’t do now?
2. What are the consequences to the learner if the learner fails to master the intended outcomes?
3. Can you show me an active demonstration, a detailed simulation, or provide an opportunity to directly observe the desired performance?
4. What specific performance mistakes do new learners regularly make?
5. What tools, resources, job aids, or help do successful performers (or even experts) use to do these tasks?

Training Needs Analysis

It’s important to identify training needs before starting a project. This will help determine if e-learning is the best solution. A training needs analysis (TNA) is used to identify performance gaps or organizational needs that can be addressed through training.

Lean Considerations

To help ensure a lean process for e-learning, it is best to use a rapid approach to training needs analysis. The following are some lean steps from George M. Piskurich:

1. Identify the problem
2. Analyze the tasks of the job
3. Analyze the current performance level
4. Identify the causes of the problem
5. Identify the desired performance outcome(s)
6. Identify the expectations of your training related to the outcome(s)
Target Audience Analysis
A target audience analysis describes the learners and training environment. Some factors to consider include:

- Existing knowledge of the topic or prerequisite topics
- Level of competency using technology (e.g. computer skills and technical expertise)
- Available time for training
- Location and connectivity
- Technology capabilities (computer specifications, mobile device access, etc.)
- Accessibility needs for learners with disabilities

Lean Considerations
A lean approach to audience analysis is to create audience profiles. Such profiles could be based on agency divisions or positions. These could be reused for applicable e-learning projects to save time.

Task & Topic Analysis
A task analysis defines the tasks taken to meet desired performance outcomes. These are often the tasks that an employee would do to achieve success in one aspect of his or her job. A topic analysis defines content that supports the performance outcomes. In other words, a topic analysis defines topics that are relevant to successful performance. These analyses provide data that can be used to establish learning objectives and the content that should be taught.
Capturing Input

The list below identifies common tools for capturing data to support the analysis process:

1. Surveys
2. Discussion Boards
3. Observations
4. Interviews
5. Focus Groups

Lean Considerations

1. Use online surveys or discussion boards instead of interviews
2. Reference existing analysis data
3. Observe the subject matter expert at work
4. Use video recordings for observation

Timeline

A development timeline identifies the project scope and deliverables. The timeline may include milestones and deliverables such as:

- SME content delivery
- Design document
- Storyboard
- First draft or prototype
- Final implementation/rollout date
- Estimated hours to complete

The E-Learning Development Time Estimates Table lists statistics on development time. These statistics are based on the complexity of the e-learning content. The rollout date should consider the current project load of all team members.
## E-Learning Development Time Estimates

<table>
<thead>
<tr>
<th>Training Type</th>
<th>Description</th>
<th>Development time per hour of instruction</th>
</tr>
</thead>
</table>
| Level 1: Passive | Content pages, text, graphics, simple audio or video, and basic multiple choice questions | • **49:1** - Rapid development, simple content  
• **79:1** - Average Level 1 content  
• **125:1** - Complex projects, added media production |
| Level 2: Limited | Interactive exercises, multiple choice questions, clickable graphics, and basic multimedia | • **127:1** - Rapid development through templated interactions, simple animation, efficient or low-end media production  
• **184:1** - Average Level 2 content  
• **267:1** - Advanced and custom interactions, embedded simulation activities and media |
| Level 3: Complex | Branching scenarios, software simulations, gamified activities, and other complex media | • **217:1** - Templated interactions, templated games and simulations, rapid development  
• **490:1** - Average Level 3 content |
| Level 4: Real-time | Simulated environments, serious games, complex branching scenarios, and other advanced media | • **716:1** - Complex/custom projects, advanced learning simulations and games, extensive media production |

*Time Estimates by Chapman Alliance*
DESIGN

The goal of the design process is to establish instructional specifications. These specifications address the needs identified through analysis. Learning objectives are also created during the design process to guide the rest of the project. E-learning design is typically a repetitive process of instructional design, storyboarding or prototyping, and review. Stakeholders, and the training team, provide input on the instructional activities and sequence of content. This input is used to make improvements to the design.

Adult Learning Principles

Training for the State of Ohio is designed for professional, adult learners. Keep in mind the following principles of adult learning by Malcolm Knowles.

- **Self-direction**: Adults are self-directed and expect to take responsibility for their decisions.
- **Relevancy**: Adults need to know how the material is relevant to their jobs. Why should they learn it?
- **Authenticity**: Learning should be task-oriented and relate to actual job performance. Memorization should be avoided.
- **Differentiation**: Training should accommodate a diverse range of backgrounds and experience.
- **Motivation**: Adults have an internal motivation to learn, and often seek new knowledge because they have a specific purpose for it.
- **Experience**: Instruction should allow learners to discover things for themselves. Resources provide direction, explanation, and recovery from mistakes.
- **Attention Span**: Training should be developed using short module lengths. E-learning modules are typically around 5-15 minutes.
- **Problem-centric**: Adults learn better from problem-centered activities. Instead of simply providing content, propose a problem to be solved.
Performance / Learning Objectives

Performance and learning objectives should align with organizational goals and priorities. Objectives are sometimes referred to as outcomes, and these terms are often used interchangeably. Objectives should be specific, measurable, and attainable by your learners. A common format for writing objectives is the following:

1. **Conditions** - the knowledge, information, and/or materials needed to complete the objective
2. **Person** - the learner or student
3. **Performance** - a specific task that describes exactly what the learner is expected to do
4. **Criteria** - the standard, measurement, or metric that must be met

Sometimes objectives are defined in terms of the knowledge, skills, and attitudes (KSA) required for attaining them. An example of a well written performance objective is shown below. The corresponding format components are noted in superscript:

“Given appropriate information, and a set of photographs of United States Presidents\(^1\), each student\(^2\) will select presidents Lincoln, Kennedy, and Obama\(^3\) correctly when shown the photograph of each of those presidents\(^4\).”

Verbs & Taxonomy

The most important part of an objective is the expected performance. The verb that indicates expected performance is the key to writing good objectives. Avoid verbs that do not result in observable and measurable performance. Examples of poor verbs are "learn", “understand”, and “know”.

Bloom’s Taxonomy offers a common vocabulary of verbs for crafting instructional objectives. The **Bloom’s Revised Taxonomy Table** describes the expected performance at each level of Bloom’s Taxonomy. Adults learn better at the higher performance levels.
### Bloom's Revised Taxonomy

<table>
<thead>
<tr>
<th>Level</th>
<th>Performance Description</th>
<th>Common Verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Remember</strong></td>
<td>Recognize and recall information</td>
<td>define, identify, describe, list, choose, name, match, select, recall, visualize</td>
</tr>
<tr>
<td>2. <strong>Understand</strong></td>
<td>Demonstrate comprehension by expressing and explaining concepts</td>
<td>explain, describe, interpret, summarize, classify, discuss, indicate, illustrate</td>
</tr>
<tr>
<td>3. <strong>Apply</strong></td>
<td>Use existing information in new ways or in new situations</td>
<td>apply, use, discover, articulate, develop, examine, demonstrate, estimate</td>
</tr>
<tr>
<td>4. <strong>Analyze</strong></td>
<td>Examine and break down information into related components</td>
<td>analyze, compare, contrast, classify, categorize, differentiate, organize, distinguish, conclude</td>
</tr>
<tr>
<td>5. <strong>Evaluate</strong></td>
<td>Judge the value of information or ideas and justify decisions</td>
<td>decide, justify, evaluate, appraise, recommend, assess, measure, critique, consider, persuade</td>
</tr>
<tr>
<td>6. <strong>Create</strong></td>
<td>Synthesize new ideas, thoughts, solutions, or products</td>
<td>create, design, compose, plan, formulate, hypothesize, write, compile, develop, integrate, prepare, modify, produce, express, propose, adapt</td>
</tr>
</tbody>
</table>

**Hierarchy**

A common approach to organizing objectives is to create terminal learning objectives (TLO) and enabling learning objectives (ELO). TLOs are the overarching performance objectives. These are higher level objectives that address each task or lesson. Enabling objectives break down terminal objectives into specific topics. The Objectives Flowchart shows a sample hierarchy of objectives.
Lean Considerations

Limit objectives to only those that are essential to support the overarching goal of the training. Avoid breaking down a task or topic into too many pieces. Unnecessary objectives may dilute the effectiveness of the learning, and burden the project with added design time.

Sequencing

The goal of sequencing is to create a meaningful training structure that supports retention, comprehension, and access to the knowledge. The Organizational Strategies for Sequencing Table describes common strategies for organizing learning content.

<table>
<thead>
<tr>
<th>Organizational Strategies for Sequencing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy</strong></td>
</tr>
<tr>
<td>Alphabetical (name association)</td>
</tr>
<tr>
<td><strong>Strategy</strong></td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Categorical (classification &amp; grouping)</td>
</tr>
<tr>
<td>Cause &amp; Effect (problems &amp; solutions)</td>
</tr>
<tr>
<td>Inherent Structure (natural organization)</td>
</tr>
<tr>
<td>Order of Importance (highest impact first)</td>
</tr>
<tr>
<td>Hierarchical (scaffolding knowledge)</td>
</tr>
<tr>
<td>Sequential (processes &amp; procedures)</td>
</tr>
</tbody>
</table>
**Strategy**

<table>
<thead>
<tr>
<th>Whole to Parts (component breakdown)</th>
</tr>
</thead>
</table>

**Description**

The whole to parts strategy establishes a high level or "big picture" view of the content, and drills down into smaller components. For example, training on electrical systems may start with a general description of the electrical grid, and move to a discussion of subsystems.

---

**Nine Events of Instruction**

The educational psychologist, Robert Gagné, developed a well-known instructional design process called the Nine Events of Instruction. Considering these events can improve the presentation and reception of your e-learning.

<table>
<thead>
<tr>
<th>No.</th>
<th>Event</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Gain attention</td>
<td>Begin with an interesting activity or story to engage your learners. Provide motivation to participate in the training.</td>
</tr>
<tr>
<td>2.</td>
<td>Inform learners of the objectives</td>
<td>Outline the learning objectives before presenting the content. Make sure the learner is aware of the desired outcomes.</td>
</tr>
<tr>
<td>3.</td>
<td>Stimulate recall of prior learning</td>
<td>Relate the training content to the learner's job, prior knowledge, and/or experience.</td>
</tr>
<tr>
<td>4.</td>
<td>Present the content</td>
<td>Deliver the content through various e-learning activities and interactions.</td>
</tr>
<tr>
<td>5.</td>
<td>Provide learning guidance</td>
<td>Provide examples and demonstrations. Include links to additional resources and support opportunities.</td>
</tr>
<tr>
<td>6.</td>
<td>Elicit performance</td>
<td>Develop activities for learners to explore and apply the concepts in meaningful and authentic ways.</td>
</tr>
</tbody>
</table>
### Best Practices

<table>
<thead>
<tr>
<th>No.</th>
<th>Event</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td><strong>Provide feedback</strong></td>
<td>Show progress and build feedback into the e-learning system.</td>
</tr>
<tr>
<td>8.</td>
<td><strong>Assess performance</strong></td>
<td>Add quizzes or real-time assessments.</td>
</tr>
<tr>
<td>9.</td>
<td><strong>Enhance retention and transfer</strong></td>
<td>Design activities for learners to apply and revisit concepts. Encourage the creation of new work and ideas. Think of ways to integrate the learning activities on the job.</td>
</tr>
</tbody>
</table>

---

**Instructional Strategy**

The Absorb-Do-Connect model is an effective strategy for designing engaging e-learning. Absorb, do, and connect activities help learners process and retain information. These activities are sometimes called expositive, application, and collaborative activities. The Absorb-Do-Connect Model Table describes these activities and offers some examples of each.

### Absorb-Do-Connect Model

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
</table>
| Absorb (Approx. 40% of learner time) | Absorb activities inform the learner about specific topics and concepts. Learners obtain information by reading, watching, and listening. | • Presentations/Slideshows  
• Demonstrations  
• Videos  
• Documents  
• Stories  
• Virtual Tours |
| Do (Approx. 50% of learner time) | Do activities help the learner use the information and skills. Learners create new knowledge through practice and discovery. | • Hands-on Practice  
• Guided-analysis  
• Case Studies  
• Games & Simulations |
| Connect (Approx. 10% of learner time) | Connect activities help learners apply knowledge to their jobs. Learners find relevance and meaning through their work. | • Asking Questions  
• Research Activities  
• Use of Job Aids  
• Original Work (Creation) |
Gamification
The difference between gamification and serious games can be confusing. Gamification is the process of applying game elements and principles to non-game activities. Serious games are actual games that are designed for educational purposes and game-based learning. Serious games are never intended as pure entertainment.

Considering instructional activities from a gamified perspective is called game thinking. This approach to learning design is focused on motivation. Self-determination theory (SDT) defines three basic factors that drive motivation.

1. **Autonomy**: Learners are motivated by choices and control over the learning outcomes.
2. **Competence**: Learners are motivated to attain proficiency and accomplishment.
3. **Relatedness**: Learners are motivated by a sense of community.

There are a wealth of game elements that support motivation. The table below outlines some of the common elements used in gamification and serious games.

<table>
<thead>
<tr>
<th>Game Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
<td>Action promotes autonomy and gives learners control over their experience. Giving learners things to do is engaging and supports retention.</td>
</tr>
<tr>
<td>Challenge</td>
<td>Challenging activities drive the motivation to achieve competence. Challenges should be attainable, but require critical thinking and problem-solving.</td>
</tr>
<tr>
<td>Risk</td>
<td>The risk of failure provides motivation for developing competence. Learning through failure is a key element in serious games and gamification where learners can fail in a safe environment without serious consequences.</td>
</tr>
<tr>
<td>Mystery / Uncertainty</td>
<td>Mystery or uncertainty engages the curiosity of learners. This, in turn, encourages them to explore the content further.</td>
</tr>
<tr>
<td>Mastery / Leveling</td>
<td>Mastery or leveling allows learners to apply knowledge to demonstrate proficiency. Levels, reports, badges, and similar game elements provide learners a means to view and share their accomplishments.</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Game Element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emotion</td>
<td>Emotion draws learners into the content and works toward the feeling of relatedness. Learners recall information more easily when it is tied to emotional memory.</td>
</tr>
</tbody>
</table>

Adapted from 8 Game Elements to Make Learning Fun by Karl M. Kapp

**Delivery Strategy**

How you deliver your training depends on the choice of learning activities, available technology, and the technical expertise of the target audience. Most e-learning will be delivered through your learning management system. You may want to consider a standalone product for external audiences, or when an LMS in unavailable. Blended learning is also a delivery strategy to consider when interaction with an instructor, mentor, or facilitator is beneficial.

**Assessment Strategy**

The goal of learner evaluation is to assess progress. Assessments are used to determine the training effectiveness and achievement of performance outcomes. Having a clear indication of progress also helps define areas for further instruction. Some strategies for assessment include:

- Use unscored practice and knowledge checks to help learners gauge progress.
- Ensure that practice opportunities support the learning outcomes.
- Align your assessment strategy with the learning objectives.

The Learner Assessment Methods Table lists common assessment methods and their uses.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Method</th>
<th>Record Score?</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measure progress (Lesson quizzes)</td>
<td>Test each learning objective</td>
<td>Yes</td>
<td>Score, possible remediation suggestions</td>
</tr>
<tr>
<td></td>
<td>after instruction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicate progress (Knowledge checks)</td>
<td>Frequent short tests</td>
<td>No</td>
<td>Score, with explanation</td>
</tr>
<tr>
<td>Measure skills and knowledge</td>
<td>Comprehensive test</td>
<td>Yes</td>
<td>Profile of what has been learned and what still needs to be learned</td>
</tr>
<tr>
<td>(Summative/final exam or project)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Purpose</td>
<td>Method</td>
<td>Record Score?</td>
<td>Feedback</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>-------------------------------</td>
<td>---------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td>Learn through assessment (Exercises)</td>
<td>Periodic critical thinking exercises or graded activities</td>
<td>Optional</td>
<td>Peer evaluation and/or instructor comments</td>
</tr>
<tr>
<td>Motivate learning (Test your knowledge)</td>
<td>Informal pre-tests</td>
<td>No</td>
<td>Recommended focus areas for learning</td>
</tr>
<tr>
<td>Measure training effectiveness (Test comparison)</td>
<td>Comparison of pre and post tests</td>
<td>Yes</td>
<td>None to learner</td>
</tr>
</tbody>
</table>

Based on research by William Horton

**Multiple Choice Questions**

The following best practices offer strategies for creating and framing multiple choice assessments. The questions should be intuitive for the learner and effective for assessing progress towards the learning outcomes.

<table>
<thead>
<tr>
<th>No.</th>
<th>Best Practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Consider the Learning Objectives</strong></td>
</tr>
<tr>
<td></td>
<td>Align each question with one or more learning objectives. This will ensure that the desired learning outcomes are being assessed.</td>
</tr>
<tr>
<td>2.</td>
<td><strong>Encourage Critical Thinking</strong></td>
</tr>
<tr>
<td></td>
<td>Extend the use of multiple choice questions beyond an assessment of comprehension and memory recall. Explore questions that require learners to apply knowledge and use higher level or critical thinking skills.</td>
</tr>
<tr>
<td>No.</td>
<td><strong>Best Practice</strong></td>
</tr>
<tr>
<td>-----</td>
<td>------------------</td>
</tr>
</tbody>
</table>
| 3.  | **Use Clear and Concise Language**  
Questions and answers should be stated as simply and clearly as possible. It is a good practice to avoid using vague or subjective words. Also avoid language that relies on subtle differences in interpretation. Using statements with absolutes such as “all”, “none”, “always”, and “never” should only be used when they cannot be refuted.  
It’s a good idea to refrain from using double negatives as well. This includes two or more negative words or prefixes in the same sentence. For example, the following question uses a double negative, and could confuse test takers.

> “Which of the following would not be the least unprofessional approach to customer service?”

Words that might be overlooked should use special formatting such as bold, underline, and/or capitalization. For example, consider highlighting words such as “not” or “best.” |
| 4.  | **Use a Consistent Format**  
Place most of the text in the question. Keep the wording, formatting, answer length, and number of answers consistent. This helps avoid confusion, and prevents learners from guessing answers based on the formatting.  
Answers such as "All of the Above" and "None of the Above" should also be used consistently. This will prevent them from becoming the obvious choice. Consider that “None of the Above” is generally a poor correct answer, since this does not indicate if the learner knows the actual answer. |
| 5.  | **Use Plausible Distractors**  
A distractor is an incorrect answer. Distractors should be believable so it’s not obvious which answers are incorrect. |
| 6.  | **Randomize the Order of Correct Answers**  
Consider the position of the correct answers among the answer choices. Try to randomize which choice is correct. This will minimize the possibility of guessing the pattern of correct answer placement. For example, avoid the tendency to place the correct answer as choice C or D more often than A and B. |
Feedback Best Practices

Exercises should give the learner practice along with instructional feedback. Correct feedback often paraphrases the answer and explains why it's correct. This reinforces the rationale for the correct choice. Incorrect feedback usually provides a brief explanation of why the answer is wrong. This offers a path for remediation without giving away the correct answer.

Storyboard, Prototype & Review

As the design of the instruction comes together, it is a good practice to create either a storyboard or a prototype. Storyboards and prototypes show the visual design and structure of the e-learning. A storyboard is a non-interactive, visual map of the training product. This often includes images of the user interface and core content elements. A prototype also provides a rough draft of the visuals, but includes some basic functionality such as navigation and buttons.

These tools demonstrate the direction of the design, and can be used to solicit input from the sponsor, stakeholders, and training team. The process of storyboarding, prototyping, and review is iterative. The goal of repeating this process is to identify areas for design improvement before the development occurs.

Lean Considerations

Minimize formal documentation and use feedback from reviews to guide the project. Doing so reserves project time for implementing improvements. Instead of justifying the original concept through documentation, consider a flexible approach and make strategic improvements as you go along.
DEVELOPMENT

The goal of the development process is to create and assemble the e-learning content. Related resources are integrated during this process as well.

Content Development

Content development is completed in collaboration with the subject matter experts. SMEs often provide the initial written content and access to supporting materials. The development team creates media to support the activities in the design plan. If existing media is available, this may be repurposed during content development.

Writing Guidelines

Text content that is easy to understand and consistently worded helps make your e-learning a success. The following are some best practices for writing good text content:

- Keep language and instructions clear, concise, and consistent.
- Use a friendly, conversational tone.
- Focus on active voice. This keeps the content succinct and understandable. For example, use "staff members know the policy" instead of "the policy is known to staff members."
- If writing for a general audience, try to write for an eighth grade reading level.
- Avoid using sentence fragments unless these are part of a bulleted list.
- Provide introductory statements, clear transitions, and summary statements.
- Avoid the misuse of the word "they" as a singular pronoun. Instead use "he" or "she."
- Avoid jargon, slang, and phrases that may not be easily understood.
- Avoid language that may reduce the shelf life of the course. For example, dates, buzz words, and references to current events can date your content.
- Use the abbreviation "e.g." to denote the phrase "for example." Use the abbreviation "i.e." to denote the phrase "in other words."
Use the word “affect” as a verb meaning “to influence,” and “effect” as a noun meaning the “result” or “impact.” The word “effect” can also be used as a verb meaning “to produce.” Some examples of proper usage include:

“Good writing affects how well the content is understood. The effect of good writing is a better understanding of the content. Through good writing, the developer was able to effect a better understanding of the content.”

Check the spelling and grammar of your work. Proofread for words that are used incorrectly, such as “their” used in place of “they’re.”

**Determining Reading Level**

The online Hemingway Editor can be used to check the readability and grade level of written content. This can also be accomplished through Microsoft Word’s spelling and grammar checker. To enable this option in Microsoft Word, go to: File > Options > Proofing. Under “When correcting spelling and grammar in Word,” check the following options: “Check grammar with spelling” and “Show readability statistics.”

**Formatting**

Consider the following guidelines when formatting text for e-learning:

<table>
<thead>
<tr>
<th>Formatting Type</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bullets</strong></td>
<td>• Maintain consistent formatting and writing conventions</td>
</tr>
<tr>
<td></td>
<td>• Only use a bulleted list when there is more than one item</td>
</tr>
<tr>
<td></td>
<td>• Try to limit your lists to two levels</td>
</tr>
<tr>
<td></td>
<td>• Use numbered bullets when the order of items is important</td>
</tr>
<tr>
<td></td>
<td>• Bulleted items that are incomplete sentences should start with a capital letter and end without punctuation</td>
</tr>
<tr>
<td></td>
<td>• Avoid using commas or conjunctions like “and” or “or” after each bulleted item</td>
</tr>
<tr>
<td>Formatting Type</td>
<td>Best Practices</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Acronyms &amp; Abbreviations</td>
<td>• To introduce an acronym for the first time, write out the full name followed by its acronym in parentheses</td>
</tr>
<tr>
<td></td>
<td>• Acronyms should not include spaces or periods</td>
</tr>
<tr>
<td></td>
<td>• Abbreviations should be used for titles before and after names (e.g., Mr., Mrs., PhD)</td>
</tr>
<tr>
<td></td>
<td>• A name should be abbreviated when the abbreviation is more familiar than the full name (e.g., USA, IBM, FBI)</td>
</tr>
<tr>
<td></td>
<td>• Abbreviations should be used for mathematical measurements (e.g., lbs., kg.)</td>
</tr>
<tr>
<td>Capitalization</td>
<td>• Capitalize all words in headings, except for definite/indefinite articles (e.g. a, an, the), prepositions (e.g. in, at), and conjunctions (e.g. and, but) that are shorter than four letters</td>
</tr>
<tr>
<td></td>
<td>• Only capitalize the word “state” when referencing the formal name of a state (e.g., State of Ohio)</td>
</tr>
<tr>
<td>Numbers</td>
<td>• Use figures to express the numbers 10 and above, all numbers representing mathematical functions or quantities, dates, ages, time, money, and numbers as a part of a series</td>
</tr>
<tr>
<td></td>
<td>• Use a consistent formatting for numbers within the same sentence</td>
</tr>
<tr>
<td></td>
<td>• Spell out any number that begins a sentence, title, or heading</td>
</tr>
</tbody>
</table>
Media Guidelines

This section focuses on guidelines and best practices for creating and presenting various types of media including: text, graphics, animations, audio, and video. Leading principles of multimedia and visual design are also summarized. Following these principles helps ensure that your training content is well crafted for delivery as e-learning.

Principles of Multimedia

In his book, Multimedia Learning, Richard E. Mayer established several principles for the development of multimedia learning. These have become widely used by the e-learning industry, and are intended to support good design. The tables below outline these principles and offer best practices for using them.

### Principles to Support Understanding

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multimedia Principle</strong></td>
<td>People learn better from words and pictures than from words alone.</td>
<td>Support the concepts with visuals.</td>
</tr>
<tr>
<td><strong>Personalization Principle</strong></td>
<td>People learn better from multimedia lessons when words are in conversational style rather than formal style.</td>
<td>Use a conversational tone for instruction.</td>
</tr>
<tr>
<td><strong>Voice Principle</strong></td>
<td>People learn better when the narration in multimedia lessons is spoken in a friendly human voice rather than a machine voice.</td>
<td>Have an actual person record the narration.</td>
</tr>
<tr>
<td><strong>Image Principle</strong></td>
<td>People do not necessarily learn better from a multimedia lesson when the speaker’s image is added to the screen.</td>
<td>Use images that relate specifically to the content instead of headshots, talking heads videos, or characters.</td>
</tr>
</tbody>
</table>

Principles of Multimedia by Richard E. Mayer
### Principles to Support Retention

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Segmenting Principle</strong></td>
<td>People learn better from a multimedia lesson when presented in user-paced segments rather than as a continuous unit.</td>
<td>Chunk the content into digestible modules or lessons and allow self-paced navigation.</td>
</tr>
<tr>
<td><strong>Pre-training Principle</strong></td>
<td>People learn better from a multimedia lesson when they know the names and characteristics of the main concepts.</td>
<td>Provide an overview of the training in advance.</td>
</tr>
<tr>
<td><strong>Modality Principle</strong></td>
<td>People learn better from graphics and narration than from animation and on-screen text.</td>
<td>Use narration to explain concepts rather than on-screen text.</td>
</tr>
</tbody>
</table>

*Principles of Multimedia by Richard E. Mayer*

### Principles to Minimize Confusion

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
<th>Best Practices</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coherence Principle</strong></td>
<td>People learn better when extraneous words, pictures, and sounds are excluded rather than included.</td>
<td>Only use media that supports the learning objectives and avoid using media as filler.</td>
</tr>
<tr>
<td><strong>Signaling Principle</strong></td>
<td>People learn better when cues that highlight the organization of the essential material are added.</td>
<td>Visually highlight key information and emphasize related concepts in the narration.</td>
</tr>
<tr>
<td><strong>Redundancy Principle</strong></td>
<td>People learn better from graphics and narration than from graphics, narration, and on-screen text.</td>
<td>Choose between text and narration and avoid narrating text that is on-screen.</td>
</tr>
</tbody>
</table>
### Spatial Contiguity Principle

People learn better when corresponding words and pictures are presented near to, rather than far from, each other on the page or screen.

**Best Practices**
Place related content in close visual proximity.

### Temporal Contiguity Principle

People learn better when corresponding words and pictures are presented simultaneously rather than successively.

**Best Practices**
Present related text and imagery together.

---

### Principles of Visual Design

Visual design is a complex subject that encompasses a wide range of practices. This section outlines four basic principles of visual design: contrast, repetition, alignment, and proximity. Using these principles helps you avoid common design mistakes that might detract from the e-learning experience.

<table>
<thead>
<tr>
<th>Design Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contrast</strong></td>
<td>Contrast allows people to visually distinguish one graphical element from the next. Use contrast to visually highlight important elements on a slide, page, or layout. This can be done through the use of size, color, position, or even your choice of fonts.</td>
</tr>
<tr>
<td><strong>Repetition</strong></td>
<td>Repetition brings continuity and cohesion to visual design. Simply stated, repetition is reusing design elements to provide a sense of visual unity. This could be as simple as using an icon to denote a particular concept every time the concept is referenced. Consistent backgrounds and heading styles are examples of repetition.</td>
</tr>
<tr>
<td><strong>Alignment</strong></td>
<td>Alignment is used to provide balance and connect visual elements. To achieve alignment, it is necessary to position each graphical element so that it lines up with at least one other element. You can test for alignment by drawing an imaginary vertical or horizontal line between two or more graphical elements. Elements that line up at an edge, or the center, are considered to be in alignment. Sometimes alignment can be more of an art than a science, but the goal is for the alignment of visual elements to look intentional.</td>
</tr>
</tbody>
</table>
**Design Principle** | **Description**
--- | ---
**Proximity** | Proximity is the distance between graphical elements. You can use proximity to show visual relationships and add organization to the content. Related text and graphics should be visually positioned or grouped together so learners will know these are related. Likewise, unrelated elements should be separated to provide visual distinction.

---

**Best Practices for Media Development**

This section provides a list of best practices for developing different types of media including: text, graphics, animation, video, and audio. Implementing these practices helps ensure that your e-learning products are highly usable. These suggestions support good design and communication of your content.

**Text**

- Present instructional information in a top-down, and left to right format
- Establish a specific location for the display of instructions and prompts
- Provide recurring information in consistent locations
- Provide generous white space to separate blocks of text
- Limit the amount of text on each page
- Break up blocks of text to make it easier for the learner to scan the content
- Use bullets, numbered lists, tables, and charts to break up lengthy sentences
- Use consistent color for text and graphics
- Use a legible font and text size, and keep this consistent throughout the course

**Graphics**

- Use quality images that add meaning to the course, further illustrate a concept, and support the learning
- Avoid using clipart and other generic imagery, if possible
- Ensure that all text within a graphic is readable
- Use consistent borders, effects, and graphic quality
- Use colors that accommodate learners who are colorblind or have low vision
- Avoid graphics that may become quickly outdated
Animation

- Use animation when motion is needed to help convey concepts that would otherwise be difficult to describe in words alone
- Allow learners to trigger and control the playback of animations
- Use special effects only when required for emphasis or transition
- Avoid timed effects and events

Video

- Use quality video that reinforces, clarifies, or emphasizes concepts
- Minimize the use of video clips more than five minutes in length to help maintain streaming media performance
- Use the MP4 format, if possible, as it optimizes file size and video quality
- Provide playback controls for the learner to pause and replay the video content
- Add closed captioning for any audio that provides meaningful information

Audio

- Use audio to help explain concepts in more detail and further support the learning
- Avoid reading to the learners
- Use a conversational tone for audio narration
- Have an actual person record the narration
- Ensure that audio volume levels are consistent throughout the course
- Add closed captioning for any audio that provides meaningful information
- Give the learner the option of turning the audio off
- Provide playback controls for the learner to pause and replay the audio
- Use MP3 format, if possible, as this optimizes file size and audio quality
Courseware Development
Programming and authoring of the e-learning deliverables occurs during the development process. An interface for the course is created or developed from a template. Media is integrated into the interface, and learning interactions are developed. If the use of third-party content is planned, this is integrated during the development process as well.

Lean Considerations
Reuse of existing content is a key factor in both rapid and lean development. Repurposing relevant materials for training often saves time. Likewise, using templated learning activities and interactions can decrease development efforts. Making judicious and strategic use of complex media will help minimize development time. Complex media should focus on content areas where the technology will be most beneficial.

Interactivity
The level of interactivity in a course is usually decided upon during project planning. This is typically documented in the work plan or design/scoping document. The table below describes these levels in more detail.

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level 1: Passive</strong></td>
<td>The learner acts solely as a receiver of information. Content is presented linearly through text, video, or audio. This level of e-learning is not generally as effective as those with more interactivity. Level 1 e-learning is best used to communicate procedural knowledge, or to raise awareness of simple topics. If the project requires a low budget or quick turnaround time, a Level 1 approach may be necessary.</td>
</tr>
<tr>
<td><strong>Level 2: Limited</strong></td>
<td>The learner controls the presentation of the content and can progress in a nonlinear sequence through the course. Interactions are relatively simple, and may include practice scenarios, interactive exercises, multiple choice questions, and clickable graphics. Feedback on these interactions is used to reinforce the learning. Level 2 e-learning is best used for training that requires low level problem solving, knowledge acquisition and comprehension, rote practice, or topic refreshers.</td>
</tr>
<tr>
<td>Level</td>
<td>Description</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Level 3:</strong> Complex</td>
<td>The learner interacts with the content through flexible, nonlinear controls. Multiple responses to instructional cues are made using a variety of techniques that focus on applying knowledge and making decisions. Examples include branching scenarios, software simulations, gamified activities, and other complex media. This is the preferred level of interactivity because it optimizes the trade-off between active learning and development time.</td>
</tr>
<tr>
<td><strong>Level 4:</strong> Real-time</td>
<td>The learner is directly involved in real-time, discovery-based learning. The e-learning experience provides an authentic simulation of job performance. Level 4 activities provide opportunities for real-time problem solving, assessment, feedback, and remediation. Examples include simulated environments, serious games, complex branching scenarios, and other advanced media. Activities in this level are sometimes considered part of Level 3.</td>
</tr>
</tbody>
</table>

**Navigation**

Interactive and navigational components in Level 3 and 4 e-learning are typically customized, and vary in complexity. However, these components are more standardized in Level 1 and 2 e-learning. Menus, or the table of contents, are usually placed on the top or left side of the screen. Menus guide the learner to modules, lessons, and topics. Navigational controls allow for maneuvering through the course itself. The order of the menu items should align with the sequence of modules and topics. It is generally a good practice to limit the number of menu levels to three or fewer (e.g., module, lesson, and topic).

Consider providing instructions on how to use the menu. Create the shortest module and lesson titles needed to convey meaning. Titles should use descriptive headings such as "Module 1: Introduction and Overview."

Navigational controls are usually placed on the right side or bottom of the screen. Consistent navigation features should be used throughout the course. Inactive or disabled buttons usually adopt an altered visual appearance, such as being hidden or grayed out. The navigational controls listed below are commonly found in Level 1 and 2 e-learning products:

- Forward (or Next)
- Back (or Previous)
- Home (or Go to Start)
- Menu (or Table of Contents)
- Glossary (when applicable)
- Tools (when applicable)
• Help (when applicable)
• Exit (when applicable)

Other navigational buttons may include:

• Example
• Show Me
• Explain
• Resources (such as policies, bibliography, and websites)

Assessments
In Level 1 and 2 e-learning, it is a good practice to include knowledge checks with feedback after each topic. Consider how many times the learner should be allowed to answer before receiving feedback or remediation. To reinforce the learning, it may be beneficial to include a review. Showing assessment results communicates progress and achievement.

Technical Guidelines
The minimum software and hardware requirements for courseware are usually based on the technology used by the target learners. An example of such specifications may be:

• Operating System: Windows 7
• Minimum Processor Speed: 1.0 GHz
• Screen Resolution & Color Depth: 1024x768, 32 bit
• Browser: Internet Explorer 10

Hardware
E-learning products should be designed to perform on the least capable hardware configuration in use by the target learners at the time of development. Hardware configurations change with updated operating systems and applications, so it is a good idea to check with information technology support staff for the latest specifications.

Screen Resolution
Depending on the target delivery platform, it may be necessary to develop content for multiple screen resolutions. The goal is to keep all elements of the interface within the viewable area of the screen, unless scrolling is an intended feature. If learners will be accessing the course using mobile devices, a responsive design approach can be incorporated. Responsive interfaces adjust the content to match the screen size of the device.

Authoring Tools
A wide variety of authoring tools are used to develop e-learning content. See the Appendix section for a list of recommended tools.
**E-Learning Standards**

The standards outlined below govern how e-learning data is communicated to a learning management system. E-learning authoring tools are typically capable of publishing standards compliant content. In most cases, e-learning content that is deployed to the learning management system should use one of the following standards.

**SCORM**

SCORM stands for “Sharable Content Object Reference Model.” It is a standard developed through the Advanced Distributed Learning (ADL) initiative from the Office of the United States Secretary of Defense. SCORM is a set of technical communication standards for e-learning products. SCORM tells programmers how to write their code so that it can integrate with other e-learning modules and the learning management system. SCORM governs how online learning content and learning management systems communicate.

SCORM does not address instructional design or any other development concerns. It is purely a technical standard. There are multiple versions of SCORM that are still in use, so it’s a good idea to test content in the deployment environment to insure proper functionality.

**AICC**

The Aviation Industry Computer-Based Training Committee (AICC) was an international association of technology-based training professionals. Prior to the organization’s dissolution in 2014, the AICC developed an e-learning standard to facilitate communication between course content and learning management systems. The AICC standard shares a similar purpose with SCORM, but uses a different technical approach.

**XAPI (Tin Can API)**

The Experience API (also known as xAPI or Tin Can API) was finalized to version 1.0 in April 2013. An API is an application program interface that tells software how to communicate. The Experience API offers a more flexible approach to e-learning data communication, storage, and tracking than the existing SCORM and AICC standards.

The Experience API allows e-learning products to read and write experiential data. This data records what a learner does in the course or module. Experience API data is stored in what is called a learning record store (LRS). The LRS can exist on its own, or within a learning management system. An e-learning product can store information about learner interactions with the content, either online or off. This might include progress information, answers to questions, or time spent on various activities. Offline data can later be sent and stored online.
IMPLEMENTATION

The goal of the implementation process is to install and test the training product in the actual learning environment. Instructions and supporting materials are distributed, and the learners are given access to the product.

Installation & Distribution

The training is deployed to the learning environment during the installation and distribution process. The learning environment is often a learning management system. In some cases, the content may be distributed as a standalone website or courseware package. Connectivity should be considered when determining a rollout strategy. For example, will learners view the training from a learning management system, public website, local network, or standalone computer system? A pilot group of learners tests the training to ensure the implementation was successful. If any issues arise during the pilot, these are addressed prior to final implementation or "go live." Following installation and testing, learners enroll, and their progress is monitored and managed by the training team.

Learning Management System (LMS)

At the time of publishing this guide, the current learning management system for the State of Ohio is the Enterprise Learning Management (ELM) system. ELM is located on Ohio.gov and managed by the Department of Administrative Services, Human Resources Division (DAS/HRD). ELM is built on the Oracle PeopleSoft platform and accepts SCORM 1.2 compliant content.

Formative Evaluation

E-learning development is guided by formative evaluation. Key stakeholders, users, and team members review the project at various stages and provide feedback. Formative evaluation helps to identify areas for improvement before the training is released. It is often beneficial to run a pilot test to gather formative input prior to the final implementation. The most common methods of formative evaluation are shown in the table below.
### Methods of Evaluation

<table>
<thead>
<tr>
<th>Method</th>
<th>Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subject Matter Expert Review</strong></td>
<td>• Generate feedback on the clarity, impact, and feasibility of the instructional design plan, storyboard, and/or prototype</td>
</tr>
</tbody>
</table>
| **One-to-One Trial**    | • Identify obvious errors in the planned learning  
• Generate initial feedback and reactions to the course content                                      |
| **Small Group Trial**   | • Identify outstanding issues with the course materials and delivery  
• Generate feedback on the final course content and activities                                                                 |
| **Field/Pilot Test**    | • Observe the learners in the actual learning environment  
• Identify minor implementation issues                                                                 |

#### Lean Considerations

It is often beneficial to aggregate and prioritize revisions to better manage changes to your e-learning. Performing group evaluations also helps streamline the revision process.

### EVALUATION

The goal of evaluation is to determine how successful the training was at achieving the learning objectives and outcomes. An industry standard for training evaluation is Donald Kirkpatrick’s Four Levels. These levels are described in the table below.

#### Kirkpatrick’s Four Levels of Evaluation

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 1: Reaction</td>
<td>The first level of evaluation captures the immediate learner reaction to the training, basically whether they liked it or not. This often takes the form of a course evaluation. <a href="https://www.surveymonkey.com">SurveyMonkey</a> is a good online tool for such evaluations. This feedback doesn’t indicate if learning has occurred, but it does help determine if the learning experience was a positive one.</td>
</tr>
</tbody>
</table>
**Level**

| Level 2: Learning (Was the desired knowledge transferred to the learners?) | The second level of evaluation measures if the audience has successfully learned the new knowledge or skills. This is typically captured as a specific assessment of the learning objectives. This can be a traditional multiple choice test, an interactive activity, or a project-based assignment. A Level 2 evaluation is recommended for all technical training. All learning objectives should be tested. The threshold for mastery is typically set at 80%. Learners may take the test as many times as they wish. |
| Level 3: Behavior (Did learner behavior or performance change following completion of the training?) | The third level of evaluation identifies whether or not the learner uses the acquired knowledge or skills. To effectively evaluate at this level, there must be a prior measure of performance for comparison. A Level 3 evaluation should be conducted after learners have time to demonstrate new or improved performance. |
| Level 4: Results (Was the performance gap successfully bridged?) | The fourth level of evaluation measures the training impact on performance. As with Level 3, there must be a prior measure of performance. This serves as a baseline for comparison. A Level 4 evaluation also gauges progress towards meeting the organizational goal for the training. This will help you identify if the problem you set out to solve was indeed solved through e-learning. |

**Lifecycle Maintenance**

Evaluation results can be analyzed to determine further improvements to the training design, content, or delivery. A decision must be made whether to make revisions or to close the project. It may be beneficial to revise an e-learning product to better address the goals of the organization, or to integrate new or updated content. The lifecycle of a product may end when the training becomes obsolete. In this case, the project can be retired and removed from the delivery platform.

**Lean Considerations**

The goal of evaluation is to determine training effectiveness. This can be demonstrated in different ways. To save time, it is best to evaluate only what is necessary to determine if the training met the desired outcomes. Focus on revisions that have the greatest benefit to the learners, instead of wish list items and one-off requests.
ACCESSIBILITY GUIDELINES

The State of Ohio is committed to providing equal access to its e-learning curriculum for people with disabilities. Courses must be accessible to people with disabilities in accordance with Section 508 of The Rehabilitation Act. The overarching goal of e-learning accessibility is for all learners to receive the same information from a course, and an equivalent learning experience.

Principles of Accessibility

The World Wide Web Consortium (W3C) created four principles of accessibility for their Web Content Accessibility Guidelines (WCAG) 2.0 specifications. W3C is the primary international web standards organization, and these principles offer a high level view of accessibility goals.

- **Perceivable** - Users must be able to perceive all information presented
- **Operable** - The interface and components must be operable to everyone
- **Understandable** - Users must be able to understand the information and how to access and navigate it
- **Robust** - Content must be robust enough to be compatible with standard technologies including browsers, operating systems, and assistive technologies (e.g. screen readers and magnification devices)

Section 508

The Section 508 Overview Table provides general guidance for developing accessible content. For more specific information, visit the [Section 508 Best Practice Library](#). For additional accessibility guidelines, visit the [quick reference to WCAG 2.0 requirements](#).

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyboard Navigation</td>
<td>Keyboard access and control must be available for all interactive interface components. This includes any content that can be accessed or controlled with a mouse. Users should be notified of the existence and use of alternate keyboard commands. This notification can occur through the interface, application help, and/or associated documentation.</td>
</tr>
<tr>
<td>Requirement</td>
<td>Description</td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Content Organization</td>
<td>The reading or tab order of content is the logical sequence in which that content should be read. Content organization should allow a screen reader to navigate and narrate the information in the order intended. Headings should be identified through code or styles, so that a screen reader will recognize these. Heading accessibility should match the visual outline of the content. It is best to use clear and concise language when creating headings.</td>
</tr>
<tr>
<td>Navigation</td>
<td>A method must be provided to skip repeated content or links, such as instructions, navigation bars, and interface components. This allows a user to move directly to specific content without navigating through the same items over and over again.</td>
</tr>
<tr>
<td>Links</td>
<td>Links and user controls must have meaningful names. Such names should describe the unique destination, function, and/or purpose of the link or control. For example, instead of a link that reads, “Click Here”, provide a link title that is representative of the destination, such as, “State of Ohio website”.</td>
</tr>
<tr>
<td>Images</td>
<td>All images must have associated alternative text describing the purpose and/or function of the image. Decorative images do not require a description, but it may be beneficial to note that an image is decorative so learners will know to ignore it.</td>
</tr>
<tr>
<td>Audio &amp; Video</td>
<td>Content that contains only audio must be accompanied by a textual transcript of what is being said or communicated through sound.</td>
</tr>
<tr>
<td>Video &amp; Animation</td>
<td>Video and other synchronized media that contains no audio, must be accompanied by an alternative description. The alternative description can be text, or an audio file, describing what is being shown. Synchronized media must have captions that are time-synchronized with the dialog and relevant sounds. Synchronized media must also have audio descriptions that are time-synchronized with the video.</td>
</tr>
<tr>
<td>Color</td>
<td>Color must not be the only means of conveying information, indicating an action, prompting a response, or presenting a status. Information conveyed through color must also be provided in text displayed on the screen, or by visual differentiation. There must also</td>
</tr>
</tbody>
</table>
### Requirement |
### Description
---
be contrasting colors or shades at a ratio of 4.5:1 for discerning between background and foreground content.

**Data Tables**
The row and column headers of a table that contains data must be programmed for use with screen reading software. This allows individuals who use screen readers to interpret the content of a table in the way it is intended.

**Forms**
Labels, instructions, directions, and cues that are necessary to complete a form must be programmatically associated with their respective fields or input controls.

---

**Testing Accessibility**
The best practice for testing accessibility is to use assistive technology to access and navigate e-learning content. There are a number of software tools that can be used to test accessibility, including commercial, freeware, and open source options. A selection of these tools is listed below:

- **NVDA (NonVisual Desktop Access)** - Free and open source screen reader
- **JAWS (Job Access With Speech)** - Commercial screen reader
- **Window-Eyes** - Commercial screen reader that is free with a licensed copy of Microsoft Office 2010 or later by visiting the Window-Eyes for Office website
- **Colour Contrast Analyser (CCA)** - Free software tool to check color contrast on screen
- **Contrast-A** - Free online tool to check color contrast
APPENDIX

Project Planning Guide

Requests for e-learning development can range from a simple activity to a complete course or simulation. Regardless of the project type, it is a good practice to capture the e-learning request and gather initial input on the project goals and scope. The initial project information is often recorded on an e-learning request form. Missing information is filled in following discussions with the project sponsor. If a needs analysis has been conducted, and indicates a training gap, the learning objectives and project scope can be based on this data. If a preexisting needs analysis is not available, the learning objectives and project scope are based on input from the sponsor and key stakeholders. A retroactive needs analysis can be performed if necessary. The Types of Input Table lists information that may be captured during project planning. Additional details are provided in the Project Summary Table and the Project Details Table.

<table>
<thead>
<tr>
<th>Types of Input</th>
<th>Sponsor Information</th>
<th>Project Summary</th>
<th>Project Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Name</td>
<td>Request Type</td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td>Department</td>
<td>Working Title</td>
<td>Roles</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>Description</td>
<td>Delivery</td>
</tr>
<tr>
<td></td>
<td>Phone Number</td>
<td>Organizational Goals</td>
<td>Training Type</td>
</tr>
<tr>
<td></td>
<td>Email</td>
<td>Target Audience</td>
<td>Learning Type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Needs Analysis</td>
<td>System (LMS)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Learning Objectives</td>
<td>Administration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance Outcomes</td>
<td>Resources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Evaluation</td>
<td>Maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Availability</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Roles</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Project Summary</th>
<th>Input</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Request Type</td>
<td>New project</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enhancements to existing project</td>
</tr>
<tr>
<td></td>
<td>Title</td>
<td>The working title for this project. If this project is an update to existing training, indicate both the existing title and the new title.</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Provide a brief overview of the project.</td>
</tr>
<tr>
<td>Input</td>
<td>Details</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Organizational Goals</td>
<td>Describe how this training will impact and benefit the organization. Are there other alternatives besides training that could be used to accomplish this goal?</td>
<td></td>
</tr>
</tbody>
</table>
| Target Audience               | • Define the learner group and position(s) this training will focus on  
• Describe any limitations the learners may have (e.g. time, technology, connectivity)  
• List accessibility needs                                                                                                                                 |
| Needs Analysis                | Have you conducted a needs analysis?  
• Yes  
• No                                                                                                                                                        |
| Learning Objectives           | What do the learners need to learn? Describe the specific knowledge or skills the learners should acquire or improve through this training. These objectives should support the organizational goal(s).            |
| Performance Outcomes          | What performance improvements do you expect to see from this course? Describe what the learners will be able to do that they were not able to do prior to this training.                                        |
| Evaluation                    | How will the effectiveness of this training be measured? What evaluation instruments will be used (e.g. surveys, observations, performance reviews, and/or performance metrics)? Who will manage the evaluation of this training? |
## Project Details

<table>
<thead>
<tr>
<th>Input</th>
<th>Details</th>
</tr>
</thead>
</table>
| **Availability** | • Target Release Date  
                   • Target End Date (if applicable)                                       |
| **Roles**      | • Key Stakeholders (individuals who have a vested interest in the project)  
                   • Subject Matter Expert(s)  
                   • Training Developer(s)                                           |
| **Delivery**   | • Web-Based  
                   • Blended                                                               |
| **Training Type** | • Mandatory  
                   • Elective  
                   • Compliancey  
                   • Prerequisite                                                          |
| **LMS Administration** | • Perform mass enrollment  
                          • Allow self-enrollment  
                          • Require approval for enrollment  
                          • Generate learner reports                                           |
| **Resources**  | • Is there any existing documentation or other information that could be used for the design of this training (e.g. needs analysis, task analysis, topic analysis, or performance analysis)?  
                   • Is there any existing content that could be used to support development of this training (e.g. process documentation, job aids, user manuals, functional specifications, design specifications, visual media, audio, or third-party content)?  
                   • Will completion of this project require the use of any specialized tools or services (e.g. software, hardware, network access, or connectivity)? |
| **Maintenance** | Will the content for this training need to be updated or maintained?  
                          Describe the expected lifecycle of this project and frequency of updates, if applicable. |
## Recommended Development Tools

<table>
<thead>
<tr>
<th>Vendor</th>
<th>Application</th>
<th>Features</th>
<th>Price Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Articulate</td>
<td>Storyline</td>
<td>Used to create e-learning products. Includes components for interactive content, quizzes, assessments, and animations. Publishes for LMS, web, and mobile devices.</td>
<td>$1,846.00</td>
</tr>
<tr>
<td>Adobe</td>
<td>Captivate</td>
<td>Used to create e-learning products. Includes components for interactive content, quizzes, assessments, and animations. Publishes for LMS, web, and mobile devices.</td>
<td>$1,099.00 or $29.99/Month</td>
</tr>
<tr>
<td>Trivantis</td>
<td>Lectora</td>
<td>Used to create e-learning products. Includes components for interactive content, quizzes, assessments, and animations. Publishes for LMS, web, and mobile devices.</td>
<td>$2,174.00</td>
</tr>
<tr>
<td>Dominic Mazzoni</td>
<td>Audacity</td>
<td>Used to record and edit audio.</td>
<td>Free, Open Source</td>
</tr>
<tr>
<td>TechSmith</td>
<td>Camtasia Studio</td>
<td>Used to record screen captures and to edit video and interactive elements.</td>
<td>$299.00</td>
</tr>
</tbody>
</table>

1 Prices as of 7/1/2016
Glossary

**Accessibility**
The ability of a product to be used by people with disabilities.

**Active Learning**
Instructional activities where learners actively participate.

**ADDIE**
An industry standard model or framework for instructional design that includes the following phases: analysis, design, development, implementation, and evaluation.

**Assessment**
A test or quiz that is used to gauge learner progress and success.

**Assistive Technology (AT)**
Technologies, such as screen readers and magnification devices, that are used to aid people with disabilities.

**Author/Authoring**
The process of creating and publishing e-learning.

**Autonomy**
Allowing a learner to independently control and interact with e-learning content.

**Beta**
A draft version of an e-learning product.

**Comprehension**
A learner's ability to understand the instructional content.

**Connectivity**
If and how a learner connects to the internet.

**Courseware**
Standalone e-learning that typically runs offline as a separate software application.

**Critical Thinking**
A learner's ability to analyze and evaluate various concepts, knowledge, and ideas.

**Deliverable**
Something that is provided during the process of e-learning development (e.g. documents, storyboards, drafts, and the final product).

**Delivery Platform**
The technology used to distribute the e-learning (e.g. a learning management system, content management system, website, video streaming service, or standalone application).

**Discovery-Based Learning**
Learning activities in which the learner uses experience, prior knowledge, critical thinking and problem solving skills to interact with the instructional content.

**Distractor**
A wrong answer choice in a multiple choice question.
Enabling Learning Objective (ELO)
A specific learning objective that supports the overarching, or terminal, learning objective for an e-learning module.

Formative Review & Evaluation
Capturing feedback that is used to determine or "form" revisions to the e-learning.

Functional Specification
A description of how a piece of hardware or software is supposed to operate or function.

Gamification/Gamified
The process of applying game elements and principles to non-game activities.

Higher Level/Higher-Order Thinking
A learner's ability to analyze and evaluate various concepts, knowledge, and ideas at a higher or deeper level. This relates to the levels of Bloom's Taxonomy.

Instructional Design Framework
A model or process that helps guide the design of e-learning instruction.

Iterative Process
A process that repeats or is conducted multiple times.

Job Aid
A short summary of instructions for completing a process or performing a task.

Knowledge, Skills, and Attitudes (KSA)
The knowledge, skills, and/or attitudes required for successfully performing a task or completing a learning objective.

Lean Considerations
Ideas for streamlining the e-learning design and development process and minimizing project time.

Learner
The person or student taking the e-learning training.

Learner Group
The group of people or students taking the e-learning training.

Learning Environment
The location and/or context in which the e-learning takes place. This could be an office, training room, computer lab, field location, etc. Each environment has its own set of learning circumstances and situations.

Learning Management System (LMS)
A web-based software application that manages e-learning deployment, enrollment, progress tracking, and reporting.

Learning Objective
The intended goal of an e-learning activity. Sometimes called an outcome.

Lifecycle
The process of creating, using, and retiring e-learning products.

Linear
The requirement that a learner progress through the e-learning sequentially, from start to finish, without jumping around.

Navigation
How the learner accesses and moves through the e-learning product.
Nonlinear
The possibility for a learner to jump to different parts of the e-learning content.

Outcome
The intended goal of an e-learning activity. Sometimes called an objective.

Performance Objective
The intended goal of an e-learning activity. Sometimes called an outcome.

Practitioner
Someone who works in the field of training and development.

Project Charter
A document which states the objectives or goals of a project.

Prototype
A rough draft of the visual elements in an e-learning product. This includes some basic functionality such as navigation and buttons.

Rapid Development
Streamlining the e-learning design and development process to minimize project time and redundant documentation and processes.

Relatedness
A sense of being connected to something or someone. This is used to engage learners in the content.

Remediation
A path for learners to obtain additional information and support in correcting mistakes and improving learning outcomes.

Responsive Design
An authoring technique that allows the e-learning interface and content to resize for different screen sizes and devices.

Retention
A learner's ability to recall the instructional content over longer periods of time.

Rote Memorization/Practice
Repetition or regurgitation of information for the sole purpose of committing it to memory. Rote memorization often results in poor retention over time.

Scope/Scoping Document
The definition or documentation of the design approach, processes, and elements involved in creating an e-learning product. The scope defines the extent and breadth of a project.

Self-Determination Theory (SDT)
A theory of motivation that indicates that adult learners tend to have intrinsic or internal motivation towards success and achievement.

Sequencing
The process of organizing learning modules and topics in a particular order.

Source Files
The digital files used to produce an e-learning product including project files, media, and documents.

Storyboard
A non-interactive, visual map of the e-learning product. This often includes images of the user interface and core content elements.
Subject Matter Expert (SME)
An individual who has expert level knowledge of the instructional topics and content.

Summative Assessment
A quiz or test that is usually taken at the end of an e-learning module or course. A summative assessment tests all of the learning objectives for the module or course.

Target Audience Analysis
A target audience analysis describes the learners and their training environment.

Target Audience Profile
A description of the target audience including: existing knowledge of the topic, level of competency using technology, available time for training, location and connectivity, computer specifications, and accessibility needs.

Task Analysis
A task analysis defines the tasks taken to meet desired performance outcomes. These are often the tasks that an employee would do to achieve success in one aspect of his or her job.

Technical Capabilities
The computer specifications, connectivity, device access, and other technical information relating to how the target audience will use the e-learning.

Template
A pre-built user interface or interactive component that can be populated with custom e-learning content.

Terminal Learning Objectives (TLO)
The overarching performance or learning objectives. These are higher level objectives that address each task or lesson.

Topic Analysis
A topic analysis defines content that supports the performance outcomes. In other words, a topic analysis defines topics that are relevant to successful performance.

Training Needs
Performance gaps or organizational needs that can be addressed through training.

Training Needs Analysis (TNA)
The process of determining training needs through surveys, discussion boards, observations, interviews, focus groups, and other techniques.

User Interface
The visual layout of the e-learning product and the components that the learners uses to interact with the content.
References


