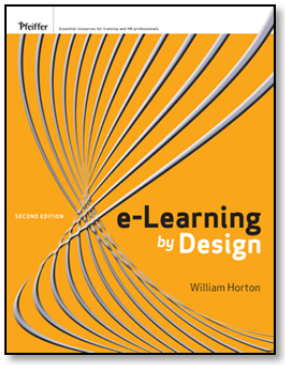
13 Strategic decisions



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Decisions that affect whole course or curriculum

As you create learning activities, tests, topics, and lessons, you may find yourself making the same design decisions over and over again. This chapter guides you through the big-picture decisions that determine the basic nature of your e-learning and apply to your entire course or curriculum as well as to each of the components it includes. These decisions include:

- **What kind of e-learning** is best for your purposes? Instructor-led or learner-led? Synchronous or asynchronous? What size class? Where will learners take e-learning? On what devices?
- **What alternative forms** of e-learning should you deploy, such as blended learning or embedded e-learning?
- **How will you reuse content?** What units of content should you reuse? What reuse standards, such as SCORM, will you follow?
- **What other standards will you follow?** Design quality standards? Accessibility standards? What technical standards will you set for your own projects?
- **How will you name your courses?**

Some of the decisions in this chapter go beyond design. For some of them, you may say, "That's not a design issue. That's management or technology or production." And right you would be. In an ideal world, we would make design decisions and then just use the right tools to carry out the design. We would just click a checkbox on the "Standards to follow" dialog box and the course would completely comply with all aspects of the standards chosen. Alas, we must compromise design for pragmatic concerns like government regulations, learners' schedules, and limitations of

authoring tools. Still, it is best for the designer to determine those compromises early in the design process rather than to have a finished design hacked away by unconcerned bureaucrats and lazy tool operators.

Design constraints apply at every level of design: curriculum through individual media components. These constraints both define and constrain the type of learning experiences you will deliver. In some cases the constraints are imposed by geography or the preferences of learners. In other cases they are design decisions you make. In either case, you must fully understand the implications of each constraint.

Some of the items in this chapter are things you observe and others are things you decide. All will constrain and guide your e-learning. Some of these decisions serve as policies governing the development of an entire curriculum or library of materials. Others may pertain throughout a course. Others may vary by lesson, topic, learning object, or learning activity. Some decisions may serve as a default that you follow throughout your work—except in special cases that warrant an exception.

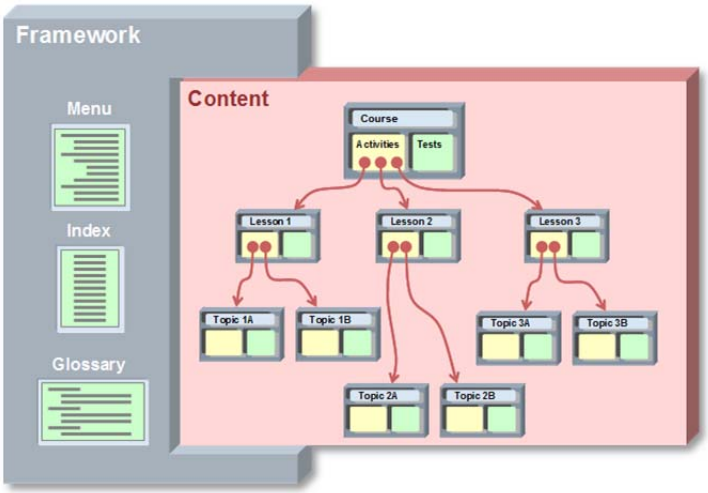
WHAT IS A COURSE?

E-learning design asks us to define our course in new terms. No longer can we think of a course as what happens in a particular room during certain hours of the week. Ultimately a course is all the experiences of all the learners who take the course. However, defining the course in terms of all the potential learning experiences is a bit hazy to guide design. So we take a step back and define in terms of the activities, topics, lessons, and media used to trigger those learning experiences.

Framework and content

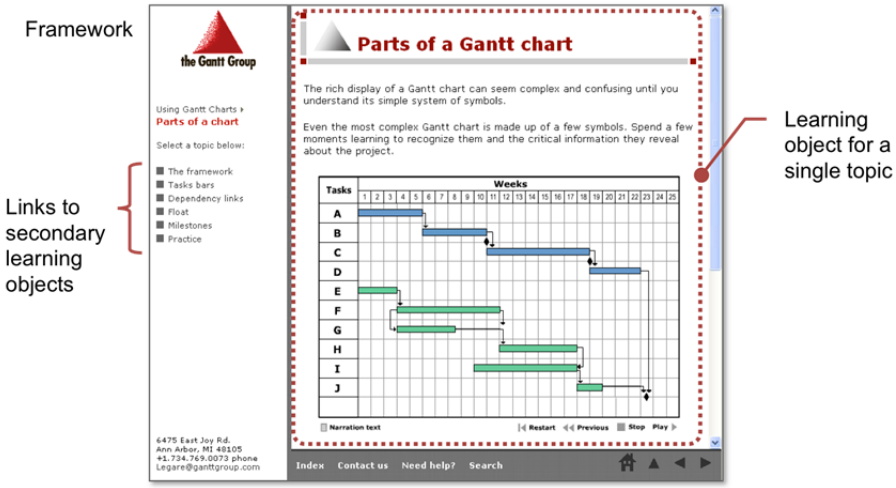
Let's look at an architecture of an e-learning course. At the top level, a course consists of a framework and content and is fleshed out with a hierarchy of learning objects. This architecture works well for mainstream e-learning courses, especially standalone, learner-led, asynchronous courses. It can be adapted to other forms of e-learning as well.

The framework of a course provides a home and a stage for the content. The framework might contain a slot for the actual content as well as mechanisms to display its menu, an index, and a glossary.



Much of the framework may be provided by a learning content management system that launches and administers the course or by the authoring tool used to create the course. Or the framework may be hand-crafted as part of constructing the content of the course.

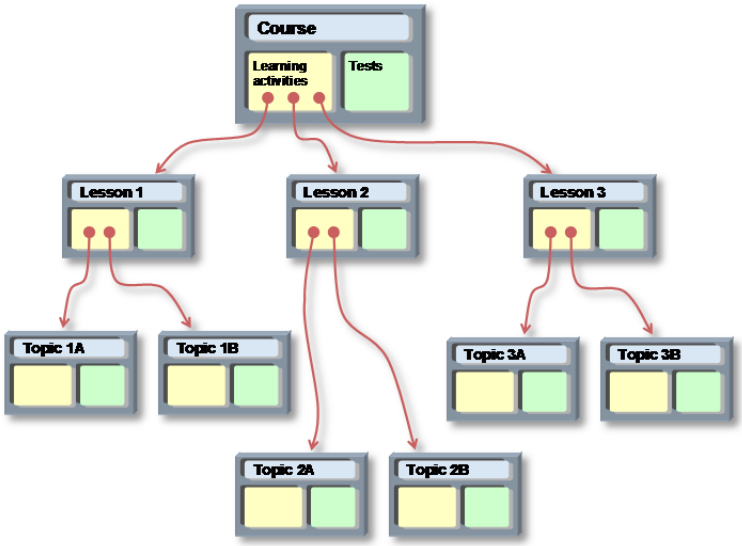
What does a course actually look like? That is, what is its outward structure? Let's take a look at one.



The framework consists of the basic window. Along the left edge are a title and a slot for displaying the table of contents. At the bottom are some generic links for getting information about the course and some buttons for displaying the index, sending e-mail, getting help, and searching. Because these actions are not associated with particular parts of the content, we think of them as part of the framework. In the larger area at the right is displayed the currently selected learning object. In the table of contents we find links to second-level learning objects.

A hierarchy of learning objects

The content is made up of learning objects. The content as a whole may be represented by a hierarchy of learning objects starting with the primary learning object.



This primary learning object may refer to other, smaller and more specific learning objects. In this example, the primary learning object for the course refers to learning objects for Lessons 1, 2, and 3, which in turn refer to even more specific learning objects.

Each topic contributes items to be displayed as part of the framework. The titles of topics may appear in the main menu indented in a way that reflects the hierarchy of relationships among the topics. Each topic may contribute terms to the index and to the glossary.

Of course, other architectures are possible. Online Chapter 12 on lessons suggests some non-hierarchical ways to structure learning objects and learning experiences. Chapter 7 on games and simulations suggests several architectures where the organization of the subject or of the game world determines the sequences of learning experiences. Online Chapter 15 on navigation suggests ways to let learners traverse the field of learning experiences possible within a course.

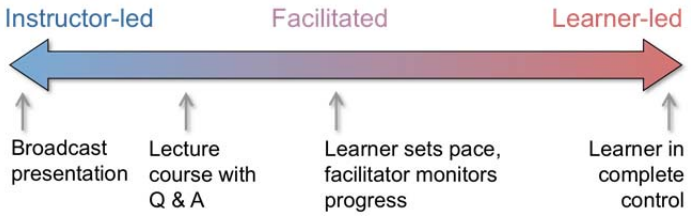
CHOOSE THE KIND OF E-LEARNING

With computer and Internet technologies, we can create many different kinds of e-learning, each providing learners with a distinctive type of learning experience and each suited to different purposes and situations. Some kinds of e-learning are led by an instructor who charts the path and sets the pace for a group of learners. In other kinds, learners find their own way, set their own pace, and interact only with the computer. Let's consider the design decisions that will determine the nature of your e-learning.

As we do, keep in mind that these decisions can apply broadly, say to the whole curriculum, or can vary for individual components of e-learning down to the level of individual activities and media elements.

Instructor-led or learner-led?

One of the first and most important decisions facing designers is the role (or lack of a role) for an instructor. For each component of e-learning, we must ask, "Who leads?" Is the e-learning paced and directed by an instructor or does the learner decide the sequence of activities and set the pace? As with many design decisions, this is not an either-or decision. Options range along a spectrum from pure instructor-led to pure learner-led.



Only broadcast presentations are truly instructor-led, with the instructor totally controlling the content and pace while the participant is completely passive. Standalone e-learning courses, at least traditional ones, are taught with no instructor. The learner decides when to take the course, which activities to perform, and when to quit.

Between these two extremes are several alternatives. A degree of learner-leadership enters when lecture courses include question-and-answer activities. Some courses or activities may have a designated instructor or facilitator who monitors the progress of learners as they proceed at their own pace.

Both instructor-led and learner-led forms offer advantages:

Advantages of instructor-led learning	Advantages of learner-led learning
▶ The instructor can answer questions and solve problems as they arise. ▶ Instructors provide authority that some learners need for motivation. ▶ An instructor can adjust the course to suit the needs of specific learners. ▶ Instructors can grade activities and tests too subtle for automated scoring. ▶ Instructors can sympathize, empathize, urge, cajole, and inspire learners. ▶ Instructor-led courses are quicker and less expensive to develop.	▶ Learners are not required to conform to the instructor's schedule. ▶ Learners are empowered by the ability to learn when, where, and as much as they wish. ▶ Learners develop self-reliance. ▶ All learners get the same quality of learning experience. ▶ Learners are not intimidated by an instructor. They do not feel they are being judged. ▶ Learner-led courses are less expensive to deploy and conduct.

Many e-learning courses deliberately shift from instructor-led to learner-led during the progress of the course. The course starts with the instructor firmly in charge, setting the pace, making assignments, presenting information, and grading results. As the course progresses, the instructor's responsibilities are taken up by teams and eventually individuals. By the end of the course learners are prepared to apply their learning alone.

For the course *Using Gantt Charts*, I decided to put the learner in control, but to include some degree of facilitation. My reasons were more pragmatic than pedagogical. First, I considered the economics. This course was free and earned no revenue to pay a facilitator or instructor. Second, the schedules of the sponsors made learner-leadership a necessity. The principals of the 2-person company were too busy and traveled too frequently to serve as instructors or even active facilitators. A third reason was the motivation of learners. Students in this course were managers who were learning for self-improvement. Highly self-motivated, these learners preferred to learn at their own pace, a desire reinforced by their hectic schedules.

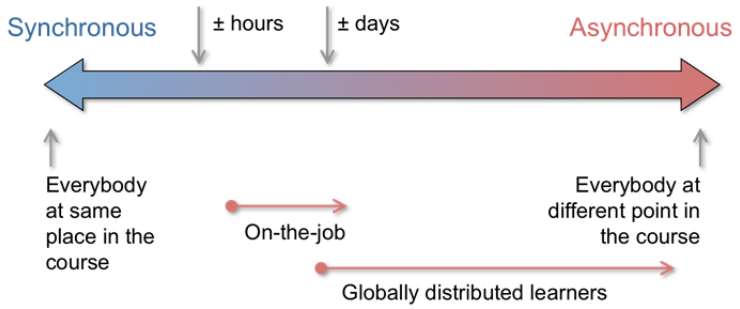
Synchronous or asynchronous?

One of the most important design decisions is whether to make e-learning synchronous or asynchronous. Can learners control when they learn? What do these terms mean?

Synchronous	Asynchronous
In a strict sense, the term *synchronous* means that everyone involved in an activity must perform their parts at the same time. Such events are sometimes called *real-time* or *live* events. Such events include online meetings and phone conferences.	*Asynchronous* activities are ones that participants can experience whenever they want. Permanently posted Web pages and automatically scored tests are clearly asynchronous—learners can complete them at any time.

Unfortunately these terms are used inconsistently even within a single university or company. One designer will call a course synchronous, while another will call the same course asynchronous. The problem is the meaning of "at the same time." Some take it to mean within minutes or seconds, while others take it to cover a span of hours or days. Are discussion-forum messages answered in two days asynchronous or synchronous?

Courses are not purely synchronous or asynchronous. Courses are made up of a mix of activities and events that can be synchronous or asynchronous. Still other events and activities take place over a different period of time for each learner. Rather than considering synchronous and asynchronous as mutually exclusive terms, perhaps we should use a scale indicating how much latitude learners have in completing activities.



Some e-learning considered synchronous may include some activities and events that learners can partake of at their own pace. And an asynchronous course can still have deadlines, timed tests, and "respond immediately" messages.

If busy people must fit e-learning around meetings and other scheduled events, such e-learning can only be synchronous within a few hours. If learners are distributed around the globe, in many different time zones, in countries with different business, government, and religious holidays, it will be difficult for participants to stay in synch with one another closer than a day or two.

Your course can be asynchronous or have a mixture of synchronous and asynchronous activities. In designing your course, consider the advantages of each approach.

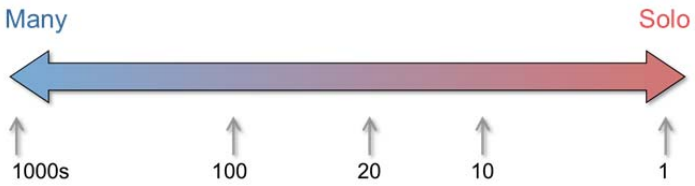
Choose synchronous activities when …	**Choose asynchronous activities when …**
▶ Learners need to discuss issues with other learners at length. ▶ Learners need the motivation of scheduled events reinforced by peer pressure. ▶ Most learners share the same needs and have the same questions.	▶ Learners are from a wide span of time zones and countries. ▶ Learners have inflexible or unpredictable work schedules. ▶ Learners cannot wait for a class to form. ▶ Learners have unique individual needs.

Let's consider the example of the course *Using Gantt Charts*. I decided to make this course purely asynchronous. Why? Learners were distributed around the globe. Getting learners from 24 time zones to all log in at the same time seemed improbable. In addition, the learners were managers with unpredictable schedules. They found it hard to commit to a particular time slot more than a few hours in advance. These same learners were ambitious and did not want to be held back by slower learners or pushed ahead by faster learners. They wanted to go at their own speed.

What size class?

In e-learning a class is a group of individuals learning the same material on the same schedule. Social learning (Chapter 8), almost by definition, requires a group or team of learners before meaningful learning can take place. Unlike classroom learning, the

size of an e-learning class is not constrained by physical architecture but by decisions of the course designer and capabilities of collaboration technology. Classes of 10,000 are technically feasible, although seldom wise.



While larger classes are more economical, they provide learners with less individual attention. The class size also affects the possibilities for collaboration. With very small classes, smaller than 10, say, work can be done by the class as a whole. Larger classes may need to divide into separate teams. Over about 20 learners, the amount of interaction with the teacher begins to drop off and teams get less attention. Classes over 100 provide little individual attention to learners and few teams get much attention.

The size of the class is an important issue, as it affects both the economics and instructional effectiveness of the course. The size determines the number of times the course must be offered, how often a class starts, the learner-teacher ratio, and the potential for team activities. Let's look at the advantages of each class size:

Large class size	Small class size	Class of one
▸ More economical as fewer sessions are required. ▸ More people taught in less time. ▸ More classmates to interact with. ▸ Enough learners for all types of activities.	▸ More individual attention from the instructor. ▸ Whole-class activities are practical. ▸ Classes start more frequently. ▸ Meets expectations of learners accustomed to small classes. ▸ Moderate instructor load.	▸ Learner gets a private tutor or mentor. ▸ No waiting for a class to form. ▸ Learning is private.

To decide on a class size, you need to consider both your organizational and learning objectives.

Let's take the example of the *Using Gantt Charts* course. I decided to design it for solo learners, without the requirement for group work. My reasons centered on the work schedule and learning styles of learners. Learners were managers with busy, unpredictable schedules that made teamwork impractical. Some wanted to take the course in very short segments, while others preferred to take it straight through. They were impatient learners.

What devices will learners use to take e-learning?

Today learners can take e-learning on a wide range of devices: desktop computers, laptop computers, tablet devices, and smart phones.

Desktop computers

The typical desktop computer consists of the main chassis with a separate monitor and keyboard. It may also include additional attachments such as printers, microphones, and video cameras. Desktop computers are the largest, most capable, and least mobile of the devices for taking e-learning.

They usually feature fast processors and can be loaded with adequate memory and large disk drives. They can have full-sized, ergonomically designed keyboards. Because they are used indoors under consistent lighting, their displays tend to be quite legible. In addition to a keyboard and mouse, they may have a range of additional input devices, such as a scanner, video camera, digitizing tablet, or trackball. And because they are large and heavy, they are less likely to be stolen than their more mobile cousins. Competition among manufacturers ensures that the cost for an almost-state-of-the-art desktop computer is moderate. And most desktop computers are deployed in environments with high-speed network connections.

The main disadvantage of the desktop computer is that it is not mobile at all. The learner has to come to it. If you are running a computer lab, the desktop computer is just fine. But if your learners want to study in stolen moments throughout the day, the desktop computer may not be the right target for your e-learning.

To design for desktop computers:

- Design the best e-learning you can. Use media wisely but freely.
- If learners must perform activities outside the vicinity of the computer, let them print them out.

Laptop computers

Laptop computers combine computer, keyboard, pointing device, and monitor in one box that closes for protection while traveling. Laptop computers are almost as capable as desktop computers today and they are mobile—or at least transportable.

Laptop computers today are nearly as capable as their desktop companions. And they can be easily moved from location to location. Learners can learn while riding on a bus or plane or while sitting on the beach. Today's models are rugged enough for all but the clumsiest users (I am living proof) and the most difficult environments.

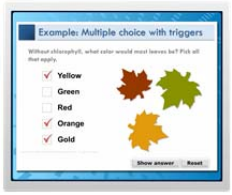
Monitors, disk drives, and memory may be a bit smaller than on desktop models. The touchpad or other pointing device may not be as convenient as a mouse. The keyboard may not be as ergonomically arranged as the best one you can buy for your desktop. However, today's laptop computer is capable of playing just about any e-learning you develop.

Problems with the laptop have to do with its portability. Like other mobile devices, it can be stolen. And its battery life is not infinite—though one extra battery pack kept me running all the way from Tokyo to San Francisco. For that portability and the miniaturization necessary to make it possible, vendors charge a premium.

Laptop computers are good for people who cannot do all their learning or work at a fixed location but who do not want to compromise the learning experience. To design e-learning for laptop computers:

- Design your e-learning to work with a moderate amount of memory and disk space and to display on a moderate-sized monitor.
- Design for the noisy environments and frequent interruptions laptop users face.
- Do not depend on continuous high-speed network connections.

Tablet devices



Tablet devices look like the screen-half of a laptop. The iPad is a prominent example. The learner interacts with the tablet by tapping, dragging, and writing on its display. Most come with built-in wireless networking.

Tablet devices range from essentially laptop computers (with the physical keyboard replaced by an on-screen keyboard) to devices primarily for consuming entertainment media and for social networking.

Tablet devices are more mobile than conventional laptops, but they have lesser capabilities for the same cost. The main advantage of a tablet computer is that the learner can use it while standing or even walking.

Some tablet devices do not run the same operating system as desktop and laptop computers. Hence, some cannot run the same programs or display the same file formats and media.

Tablet computers seem designed for people who work on their feet, or else wander corporate hallways from meeting to meeting furiously jotting notes (sound familiar?).

To design e-learning for tablet computers:

- Let learners navigate e-learning and compete activities without having to type in extensive text.
- Design e-learning to work in short segments in a noisy environment.
- Keep displays simple. Remember that tablet computers have displays that are smaller than laptop computers.

See Chapter 9 for more on designing mobile learning for such devices.

Smart phones

Smart phones are mobile devices that combine the capabilities of mobile phones, media players, and personal digital assistants. You can also think of them as miniature tablet devices. Apple's iPhone is a popular example. Smart phones are superbly portable, a bit pricey, and only so-so platforms for delivering e-learning.

E-learning delivered through a smart phone can be taken almost anywhere: office, dorm, bus, plane, train, taxi, hotel, coffee shop, checkout line, library, national park, and you name it. Many combine communications capabilities of mobile phones and computer networks, providing several options for connecting to networks.

The smart phone can, however, be a challenge for e-learners. The display is comparable in size to those of desktop computers of 20 years ago. Most either have no keyboard or only a thumb-operated keyboard. And battery life is still a concern for many models.

Use smart phone in your e-learning strategy where mobility is essential for learning or work.

To design e-learning for smart phone:

- Do not just dump e-learning designed for desktop and laptop computers on the mobile device. Design for its capabilities.
- Design true mobile learning. Do not use the smart phone just to present information. Use it to enable learning from the world. Create activities that instigate interaction with the real world.
- Make answering questions and performing activities simple. For example, do not require entering large amounts of text.
- Because of the risk of theft, do not store confidential, secret, or proprietary information on the smart phone.

See Chapter 9 for ideas on designing mobile learning for smart phones.

Where will learners take e-learning?

Imagine your learners taking your course. Where are they? Are they in their offices, at home, in a dorm room, in a coffee shop, on the road, or in a corporate training center? Where should they be?

The success of a course can depend on where people take it. I know designers who decided that learners would take e-learning on specially equipped high-performance workstations in a quiet, calm, corporate training center. After they deployed their e-learning, they found the expensive training center vacant, as most learners took the e-learning from smart phones in hotel rooms and from their children's home computers, both using relatively slow network connections. As a designer, you must design for where learners will actually take e-learning.

Where people take e-learning controls what computers they use and what kind of network connection they have. It also affects how much noise and how many distractions they must contend with. The choice of computer in turn affects the ability of the course to display information and to play media. The speed, reliability, and availability of the network connection also limit the use of media, participation in live events, and use of confidential or secret information. The environment of the learner affects how much attention learners can give the course, how long they can participate in an activity, and how often they must put a hand over the screen to hide confidential information. Almost every aspect of design is affected by where the learner takes e-learning.

People take e-learning in several main environments. Let's look at each in turn, weighing its advantages and disadvantages while noting the design requirements it imposes for the course.

In the learner's office or cubicle

Many of the cited advantages of e-learning assume learners take courses at their desks connected to an enterprise network.

Potential factor	Best practices when this factor applies
Learners must sandwich learning among other tasks, as time is available. Phone calls, visitors, and other interruptions are frequent.	Create the course with short, self-contained topics so the learner can fit learning between interruptions. Let learners bookmark topics so they can easily resume where they left off.
The environment is relatively quiet.	Use sound where appropriate. Provide or recommend a headphone if e-learning is taken in cubicles.
Computers are attached to a relatively fast network.	Use graphics, voice, and other media, where justified, to communicate clearly.
A computer tuned for accounting or software-development may not welcome the plug-ins and other software needed for e-learning.	Design for computers learners actually have and the plug-ins they can download and install. Use file formats that can be displayed by commonly available players such as the Flash Player and the Acrobat Reader.
In-house technical support is available.	Provide instructions for technical support staff to help learners prepare their computers for e-learning.
Learners have access to corporate documents, databases, and information systems.	Design activities that encourage learners to practice applying learning to their own work.

In a non-office workplace

Not everyone works at a desk. E-learning is insinuating itself onto kiosks in bookstores, onto laptops at construction sites, into corners of fast-food restaurants, and onto the factory floor. These work environments pose some challenges for computers and e-learning in particular.

Potential factor	Best practices when this factor applies
Space is limited. The computer must fit into available space with no additional desk space.	Include everything necessary online. Do not require learners to refer to separate printed materials.
The computer is shared for other purposes, which may take priority over its use for learning.	Design learning in short episodes. Enable bookmarking so learners can easily resume. Allow learners to print out lengthy activities and work on them away from the computer.
A network may be unavailable. The local network may be isolated from the Internet for security reasons. Or, it may be dedicated to specific business purposes.	Offer courses from CD-ROM or DVD.
Noise may make computer sounds hard to hear. Earphones may pose a safety hazard.	Display visual equivalents to all voice and other important sounds.
Learners may be on call for other tasks, such as answering customer questions.	Design learning in short, self-contained episodes. Make displays especially legible at a greater than normal distance.
Learners may need to wear special safety equipment, such as clean-room suits, hard hats, and protective gloves.	Do not require extensive typing or precise pointing.

Potential factor	Best practices when this factor applies
Smoke, soot, grease, dust, and other contaminants may make computers impractical in some environments.	Consider alternative devices such as media players. Or allow learners to perform activities from printed assignments.
E-learning may refer to machinery and devices in the work environment.	Design activities that do not require looking at the computer. Use voice for instructions to learners.

In a learning center

Many companies, libraries, and universities are setting up special rooms where learners can take e-learning. These rooms are called *learning centers* or *learning labs*. Most learning centers contain desks or cubicles with computers that are specially equipped to run e-learning. Some learning centers feature a facilitator or technician to greet learners, get them started, and provide help when requested.

Potential factor	Best practices when this factor applies
Learning centers provide a quiet place where people can learn without the noise or interruptions of their workplace.	Include complex activities that realistically prepare learners to apply difficult subjects in challenging environments. Use longer, more life-like activities than you might otherwise use.
Computers have all the necessary software installed and set up. They also have high-speed network connections.	Use multimedia, advanced browser capabilities, and large graphics as appropriate. For example, display detailed diagrams to explain complex processes and use voice-over narration or video to demonstrate difficult procedures.
Learning centers have on-site facilitators.	Train center staff to support your courses. Document the technical requirements and show facilitators how to get learners started.

Potential factor	Best practices when this factor applies
Learning centers require people to be away from their desks for significant periods of time.	Design self-contained activities. Do not require learners to refer to documents or other items found only in their offices or dorm rooms.
Learning centers are expensive to set up and administer. Unless all employees work on a single campus, multiple learning centers will be required.	Budget for centers. If centers must host your learners, the centers may require compensation.
Not all learners have access to the learning center.	Publish specifications and instructions so learners can set up their computers to match learning-center computers. Design activities learners can perform on their own. Tell learners how to phone the learning center to receive help.

At home

Many employees (and adult university students) take e-learning at home during evenings and on weekends. Many employees say they cannot find enough quiet time at the office to complete lessons. Some companies encourage their employees to take e-learning on their own time and may subsidize the purchase of the home computer.

Potential factor	Best practices when this factor applies
Some learners have better computers at home than at work, especially those whose work computers are old or configured for purposes other than learning. Home computers sold today are quite capable of running e-learning courses.	Research the kinds of computers learners have at home and design accordingly. Design so your e-learning will work on a variety of computers. For example, all your office computes may run Windows, but many home computers may run a Macintosh operating system.

Potential factor	Best practices when this factor applies
Many learners find they have traded office distractions for family distractions. A child needs help with homework, the dog wants to be walked, or the spouse does not like being ignored.	Design to accommodate frequent interruptions. Design short, self-contained topics. Enable bookmarking so learners can resume where they left off. Increase efforts to motivate learners. Ensure that e-learning is interesting. Provide headphones for listening to audio. This will shut out noise and signal that the learner does not welcome interruptions.
Homes lack a technical support staff other than computer-proficient children.	Minimize the technical requirements, especially the number of plug-ins the learner must download and set up.
Learners at home must typically access courses by logging into the corporate intranet, tip-toeing through the firewall, and logging into the course.	Streamline the process of accessing the course from outside the firewall. Anticipate and resolve security problems early. Test access after each security update. Do not depend on access to secret or confidential material.

While traveling

More and more professionals are mobile, spending increasing portions of their time away from the office. They check into their hotel room, plug in their laptop computer, and fire up their e-learning. Or they take e-learning on their mobile phone or tablet device.

At first glance, this might seem like the worst possible scenario for taking e-learning, namely suffering from jet lag, sleep deprivation, and indigestion. However, learning while traveling has some advantages. Many find that e-learning courses ease the loneliness of travel, especially if the course includes collaborative activities. One traveling salesman put it this way: “It’s better than hanging out at the hotel bar.” For many traveling professionals, e-learning provides the only practical way to get the education they need.

Potential factor	Best practices when this factor applies
Learners are free of the distractions of office and home.	Design for the learner's full attention. Allow richer activities and tolerate more complex displays. But keep activities short, lest fatigue prove a problem.
The learner's laptop computer is old or damaged from years of travel.	Minimize the technical requirements. Design for a three-year-old laptop. Or, design for the tablet or smart phone carried by the traveling learner.
The process of establishing an Internet connection, logging into a corporate network, navigating through the firewall, and finding the course server can be complex and unreliable.	Package the entire course on CD-ROM or DVD, or let learners download entire lessons. Let learners download e-learning when connected and burn a CD-ROM for use while traveling.
A laptop can be stolen—and its cached or downloaded materials read by malicious eyes.	Limit use of confidential or secret information. Ensure that case studies, reading assignments, and research activities do not compromise security or reveal embarrassing information. For example, make sure that computer simulations or exercises do not involve confidential customer data.
Learners feel lonely and a bit homesick.	Design opportunities for spontaneous collaboration and discussion. Set up a student lounge where learners can meet at any hour of the day. See Chapter 8 for more ideas.
The learner's schedule is erratic and subject to frequent changes.	Make live events optional. Let learners download a summary or transcript of the event. Better still, record the live event so learners can play it back at their convenience.

Potential factor	Best practices when this factor applies
Learners are tired, stressed, and jet lagged.	Design short, focused activities. Let learners postpone recorded tests till they are rested and relaxed. Minimize long reading assignments or any monotonous activities.
Learners lack access to a printer.	Minimize reading assignments or anything that requires printing out instructions.
Luggage space is limited.	Include all necessary material online. Do not require learners to lug along a fat textbook or other reference materials.

See Chapter 9 for more on designing for mobile learners.

In a dorm room

Yes, on-campus students do take e-learning to supplement their classroom studies. The dorm-room environment combines features of the home and the office.

Potential factor	Best practices when this factor applies
High-speed network connections, at least on most major campuses, are the norm.	Use graphics, voice, and other media as needed. Remember that younger learners may expect a richer media experience and resist reading large amounts of text.
Learners may have some privacy, but be afflicted with noisy and nosey roommates.	Limit display of personal information. Consider supplying headphones or reminding learners to use their own headphones.
The computer may be one prescribed by the university. It may be years out of date. It may be optimized for playing games and much of its disk space used for downloaded music.	Design for the type computers learners have. Do not require storing large amounts of material locally.

Potential factor	Best practices when this factor applies
Students may prefer to study while social networking and listening to music.	Design e-learning in short segments. Make it easy to bookmark a location and return to it later.

Outdoors

With smart phones, tablets, wireless networks, and better batteries, learners are choosing to learn outdoors. They take e-learning in a park, on safari, and at a sidewalk café. The outdoors presents some special advantages and challenges for e-learning.

Potential factor	Best practices when this factor applies
Network connections are slow, intermittent, or nonexistent.	Design e-learning so it can be downloaded and taken when not on the network. Let learners download e-learning when connected and burn a CD-ROM or DVD for use when in the field.
Bright sunlight makes reading difficult.	Design displays with high contrast. Make text and graphics highly legible.
Sounds of traffic, nature, and passersby are loud. Noise makes hearing hard.	Either forego sound or recommend noise-canceling headphones or ones with ear buds or over-the-ear muffs.
Learners can carry limited weight.	Ensure e-learning works on lightweight laptops or other mobile devices. Include all necessary material online. Do not require learners to carry textbooks or other materials.
Learners may have to contend with heat, cold, wind, dust, rain, or snow.	Recommend a ruggedized computer. Make sure learners can operate your e-learning while wearing gloves or mittens.
Battery life is finite.	Keep learning sessions short. Enable learners to print out assignments they can carry instead of the computer.

For more on designing for mobile learners, see Chapter 9.

In a moving vehicle

Learners may choose to learn in an automobile, bus, train, or airplane. For many of us, it is the only time available for professional education. More and more mobile devices are allowing learning to occur while traveling.

Potential factor	Best practices when this factor applies
The only space available may be the learner's lap, leaving no space for reference papers or peripheral devices.	Make the course self-contained. Ensure all necessary material can be displayed on the same screen as the e-learning.
The learner must attend to announcements ("Fasten your seatbelts" or "Next stop Lyon") and guard against theft or other threats.	Keep learning activities simple. Do not require the learner's full attention. Let learners bookmark topics so that they can resume where they left off.
The ride may be bumpy, subjecting the learner and the computer to vibration.	Make text especially legible. Recommend a ruggedized computer if the road is really rough.
Lighting varies from bright sunlight streaming in a window to the darkness of a tunnel.	Keep all displays legible. Ensure adequate foreground/background contrast.
If driving, the learner may be limited to audio inputs and cannot brook distractions.	Do nothing that would unduly distract the learner from driving safely. No complex activities. Nothing visual. Better still, forego e-learning while driving. Have drivers learn after they safely arrive at their destination.
Network connection is slow, intermittent, or nonexistent.	Make e-learning available on CD-ROM or DVD. Let learners download entire lessons ahead of time.

Potential factor	Best practices when this factor applies
Power may not be available.	Design to minimize disk access and network access, which consume more power.

For more on designing for mobile learners, see Chapter 9.

Other places people can take e-learning

There is almost no limit to where people are taking e-learning. I have taken e-learning in a non-reclining, middle seat on an airliner halfway across the Pacific; on a computer lashed to a tree at 3,500 meters altitude; and in numerous restaurants and, yes, bars. Others have learned in a rowboat in the middle of a lake, in a tent during a rainstorm, and while standing in line at the grocery store. How do you design for such varied environments? Although I cannot give you specific advice, I can suggest some best practices.

Environmental characteristic	Best practices
Lighting is bright, dim, or variable.	Make displays especially legible. Ensure high foreground/background contrast and use adequate font sizes.
The environment is noisy.	Provide earphones or do not rely solely on voice or sound for any critical messages.
The learner is subject to vibration.	Reading will be slow and difficult. Pace activities accordingly. Make displays extra legible. Make click targets extra large.
The network is unavailable or intermittent.	Make e-learning available from CD-ROM or DVD. Let learners download entire lessons or courses beforehand.
The environment is dirty. The computer is subject to smoke, dust, soot, or grease.	Protect the computer. Use an alternate device, such as a media player, or print out activities to be performed from paper.

Environmental characteristic	Best practices
Learner must wear gloves or mittens, say outdoors in winter.	Do not require typing or precise pointing.
Space is cramped with little room for the computer and other materials.	Make all materials available on the computer. Do not require consulting external reference materials. Make sure your e-learning works on a small display monitor.
Distractions and interruptions are frequent.	Design e-learning in short, self-contained segments. Let students bookmark their locations so they can easily resume where they left off.

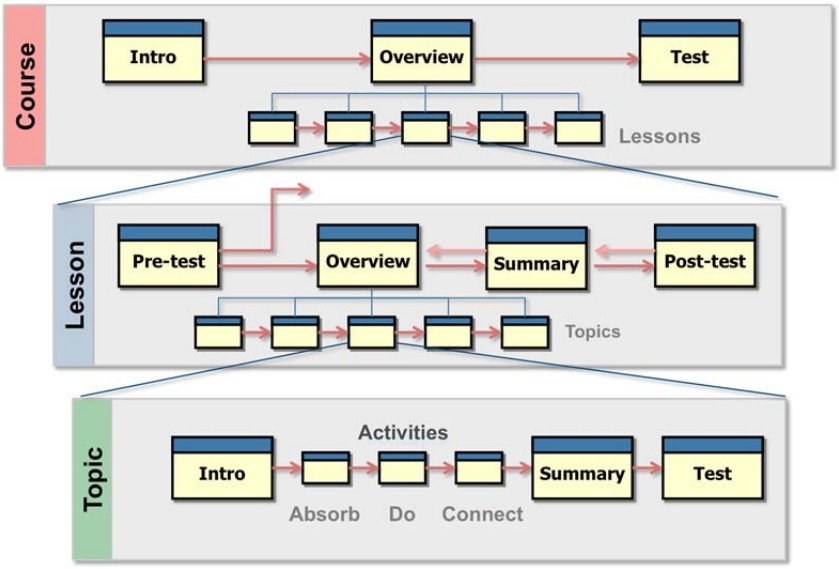
CONSIDER ALTERNATIVES TO CONVENTIONAL E-LEARNING

For many e-learning needs, the best solution may not be a single type of pure e-learning but an intelligent hybrid of different types of e-learning combined with a mix of other types of learning.

Organizations with large investments in classroom training may prefer to reuse their well-tested training materials during a transitional period while they redesign their courses as pure e-learning. They may want to blend multiple types of learning or embed e-learning into other knowledge products.

What do we mean conventional e-learning

Conventional e-learning courses have a hierarchical structure and a didactic purpose. Learners proceed linearly through the courses, progressing from fundamentals to advanced topics. Typically, conventional courses have a structure something like this:



The course is made up of lessons, which contain topics. This basic structure is quite robust. It works for all kinds of objectives. It work for games standalone e-learning, virtual-classroom learning, social learning, and mobile learning.

Games and simulations (Chapter 7) provide an alternative to the conventional structure, as do blended learning and embedded learning, which are explained in the following sections.

Blended learning

To accomplish any difficult educational goal, we often must blend different media, instructional strategies, and design approaches. This process of crafting custom mixes of learning goes under the name *blending*.

Blending is not a type of e-learning but a strategic decision on how best to accomplish each learning objective. Blending can be defined simply as the mixture of different forms of education or training for a single purpose. The only thing remarkable about this definition is that it does not limit itself to mixtures of e-learning and classroom learning. A blend can be any mixture of any form of learning possible: classroom, virtual-classroom, social learning, or standalone e-learning. It may mix informational, behavioral, cognitive, and constructive strategies. It may mix CD-ROMs, Web sites, books, online help files, video broadcasts, e-mail exchanges, and dozens of other media. It may be delivered on desktop computers, laptop computers, tablet computers, personal digital assistants, and even mobile phones. The proper blend may be custom tailored to an individual learning objective or even the individual learner.

Is blending really a breakthrough?

All effective learning is a blend. And always has been. The only question is what that blend consists of.

To prove my point, how did you learn to drive? What blend of learning experiences taught you to pilot an automobile safely? Did you take classroom instruction? Did you read about driving on your own? Were you assigned reading by an instructor? Did you demonstrate your driving skill to your parents, instructor, or licensing official? Did you practice driving under the supervision of a licensed driver? Did you practice driving on your own? Were there other learning experiences that helped you learn to drive? For most people, learning to drive was a blend of activities, like most everything we learn in life.

Levels of blending

Blending is a complex issue. It involves so many possible ways of mixing learning activities and requires so many design decisions that we may be tempted to just try combinations at random or else stick with what worked in the past.

One way to simplify the task of selecting the correct blend is to consider different levels of blending, that is, different degrees of sophistication and potential success. For each level, let's describe what goes on at that level.

Level		Description
4	Personal	Custom tailoring detailed learning experiences to the needs of individual learners.
3	Tactical	Mixing methodologies, design approaches, and media for each individual topic.
2	Strategic	Mixing classroom and e-learning events based on subject matter and goals.
1	Mechanical	Sandwiching slabs of existing e-learning and classroom content.

Level 1 is **mechanical** blending. This level creates blends by mechanically sandwiching slabs of existing e-learning and classroom content. Neither classroom nor e-learning experiences are in any way tailored to the task at hand or the needs of learners.

Level 2 is called **strategic** blending. At this level we mix classroom and e-learning events based on the subject matter and our goals for learning.

Level 3 is **tactical** blending. This level takes a jump in sophistication. At this level we mix methodologies, design approaches, and media for each individual topic or

activity in the overall course. One objective might be taught by a traditional classroom session while the next might be taught by a learning game. Level 3 requires thorough analysis of the subject and a hand-crafted instructional design.

Level 4 is called **personal** blending. As its name suggests, this level custom tailors detailed learning experiences to the needs of individual learners. This level is the most ambitious ideal. It requires extensive instructional design because each topic may require multiple versions. For example, for each objective, different versions might be required for factory supervisors, business managers, technical professionals, and office clerical staff. This level also requires a sophisticated learning content management system (LCMS) to identify which module to dispense to which learners.

For now, we will look at strategic blending as it is both practical and worthwhile.

Level 2: Strategic blending

Level 2 or strategic blending mixes classroom and e-learning events based on subject matter and goals. Let's look at how we might perform strategic blending.

Decompose the skill

The first step in strategic blending is to decompose the learning objective into its components. Ask yourself these questions: What must learners be able to create, decide, and do? And what must they know, believe, and feel?

Let's say we are designing a course on how to resolve disputes among subordinates. The course will be offered to new supervisors.

In order to apply this skill: **Resolve disputes between subordinates.**

This group of learners: **New supervisors** must:

Create	Decide	Do
		1. Listen objectively 2. Apply a procedure to resolve disputes
Know	**Believe**	**Feel**
3. Calming words	4. Disputes are destructive	5. Openness 6. Calmness

Our analysis reveals that resolving disputes does not require creating nothing or making any difficult decisions. It does, however, require listening objectively to

subordinates and applying a procedure to resolve disputes. Resolving disputes may also require recalling calming words to use instead of inflammatory words when mediating disputes. It also requires supervisors to actually believe that disputes are destructive. On the emotional side, success may require attitudes of openness to the opinions and ideas of others and of calmness in the middle of heated conversations.

We could define additional objectives, but these six will suffice for our example.

Select learning experiences

Now that we have identified what we must accomplish, we can ask what experiences best teach each ability, bit of knowledge, belief, and feeling. At this stage we are not asking what medium best teaches, just what human experience best accomplishes the required item. We will later decide what medium best produces that human experience.

Listening skills may be honed by practice through a role-playing activity. Perhaps we decide that the procedure for resolving disputes should be memorized securely so that it can be recalled reliably in the presence of stress. This will require an activity of memorizing and practice. As will the calming words to use in such conversations. To convince the supervisor that disputes should be resolved and not ignored, we may choose to have the supervisor experience a series of case studies showing how in situations like those the supervisor will experience, failing to resolve disputes cost the supervisor and the supervisor's organization dearly. Openness is tougher. It may take observation and critique of a group of the supervisor's peers. And it may require repeated practice. Calmness may require desensitizing the supervisor to the angry words and insults of others. We decide, for the purpose of this example, that the best way to desensitize the supervisor is through simulated confrontations.

For each of these learning activities, we can then ask what it requires. Specifically, does it require a person to interact with the learner or monitor the learner's efforts? If it does require a person, must the collaboration be face-to-face (F2F)?

Role playing to teach listening objectively will require another person to talk and to listen, but the contact can be virtual and not face-to-face. Memorizing the procedure to resolve disputes does not require another person and hence does not require face-to-face contact. Likewise, learning calming words does not require a person or face-to-face contact. The case studies for teaching that disputes are destructive require neither a person nor face-to-face contact. The group critique involved in teaching openness, on the other hand, definitely requires at least one other person. Because

openness is manifest in gestures, body language, facial expressions, and tone of voice, this activity will require face-to-face contact. For the same reasons, the simulated confrontations needed to teach calmness will require a person and face-to-face contact.

Our next decisions concern how best to deliver these learning experiences.

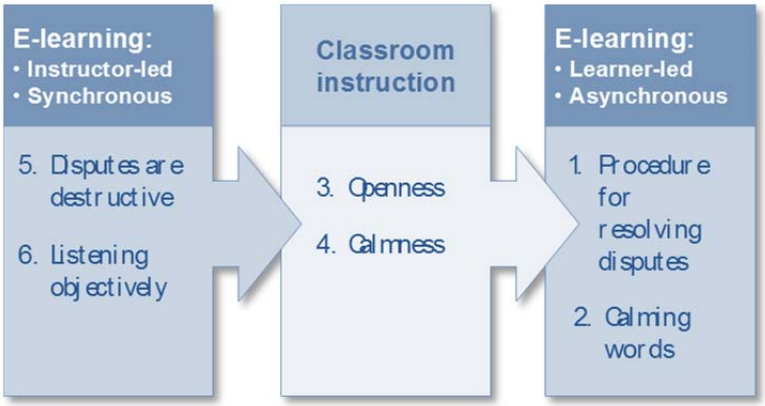
The task of teaching the skill of listening objectively requires a person, but not face-to face-contact. That means we could teach it over the Web or in a classroom. The memorization and practice activities needed to teach how to resolve disputes can be delivered by Web or even in a book. The same reasoning applies to teaching calming words. Presenting case studies of the type needed to teach that disputes are destructive can best be delivered over the Web. In fact, we may find case studies well suited for that purpose readily available on the Web. To teach openness, we said we needed face-to-face contact, and that may best take place in a classroom. The same goes for teaching calmness.

For more ways to accomplish learning objectives, see Chapter 1, page 36.

This type of analysis is a lot of work, but it guides in selecting the type of learning we need, the proper delivery mechanism, and the media we need.

Sequence the experiences

Our final set of decisions puts the experiences into a chronological sequence and more precisely specifies the form of delivery. To make these decisions, we fall back on economic concerns. In the long run, we want to make training as inexpensive as we can and we want to get as much revenue as possible from our expensive development efforts. For that reason, we want to do the items that do not require face-to-face contact in e-learning and minimize the necessary classroom time. Toward this end, an e-learning/classroom/e-learning sandwich seems the best approach.



In the first e-learning segment, learners need to acquire motivation and basic skills necessary to complete the other activities. We will make it instructor-led to better support learners new to e-learning. And we will offer it in a synchronous meeting, to save money by reducing the effort required of the instructor and to motivate learners through peer support.

What do we teach in this first segment? As mentioned earlier, we start with topics that are basic and motivational, namely the knowledge that disputes are destructive and a technique for listening objectively. Don't let the numbers fool you. Those are just the order in which we identified the objectives to teach. And, yes, some designers do absentmindedly teach objectives in the order in which they were identified.

The middle segment will be taught in the classroom. There we teach the segments that require face-to-face contact, specifically openness and calmness. In the classroom, learners can also apply their abilities to listen objectively as they demonstrate and hone their attitudes of openness and calmness.

Finally, after returning to the workplace, learners continue studying. For continued study, learners engage in more e-learning. The e-learning is learner-led and asynchronous so learners can continue at their own pace. In this third segment, they learn the well-defined procedure for resolving disputes and add to their vocabulary of calming words.

Embedded e-learning

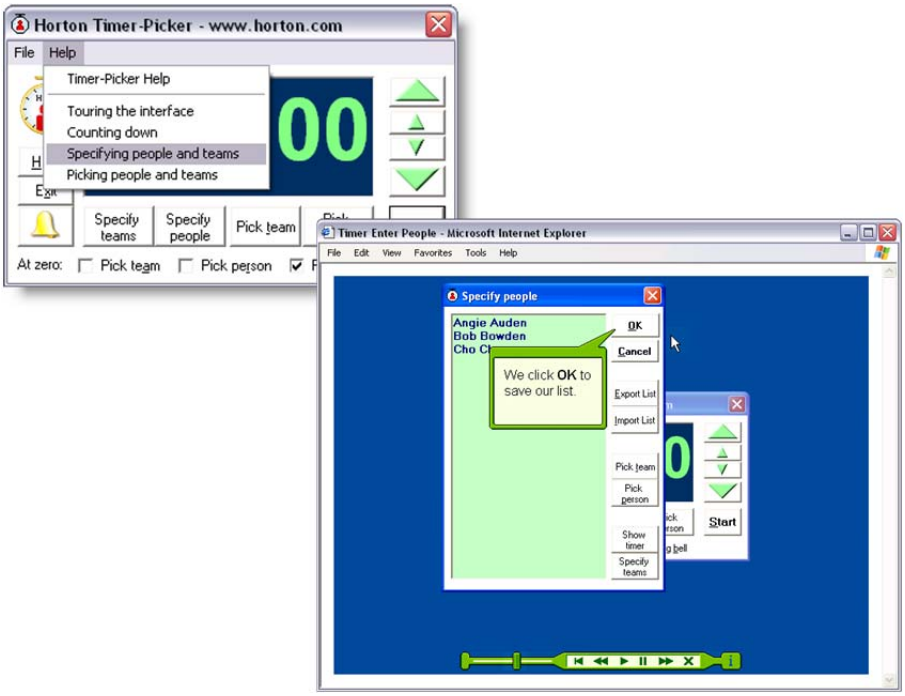
E-learning can stand alone or it can be embedded within a computer program, online Help, diagnostic procedures, or some other knowledge product.

Forms of embedding

E-learning can be embedded in a computer program, within the online help for a program, in a diagnostic procedure, or among other sources of electronic information.

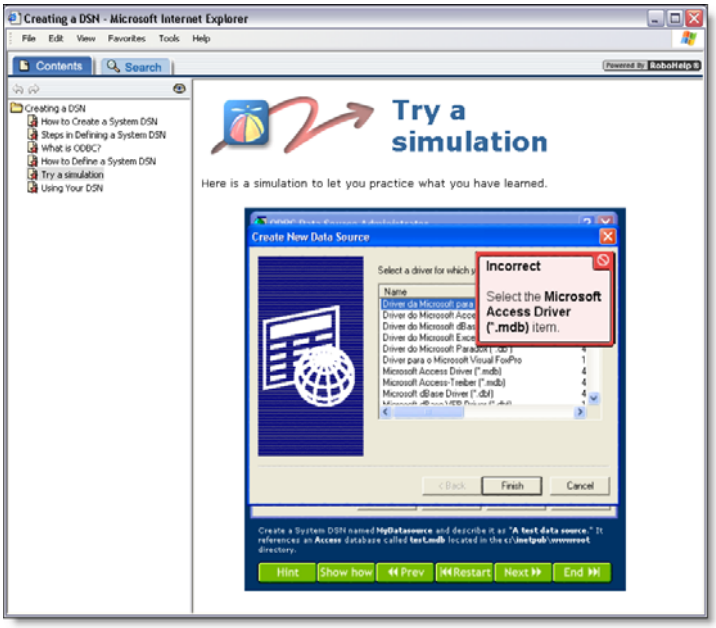
Embedded in an application

You might choose to embed your e-learning in the user-interface of a computer program. For instance, here is a classroom timer application. On the Help menu are links to tutorials that explain the interface and some of the most common tasks users perform.



Demonstration built using Adobe Captivate.

Embedded in online Help: E-learning can also be embedded into online Help for a product or process.

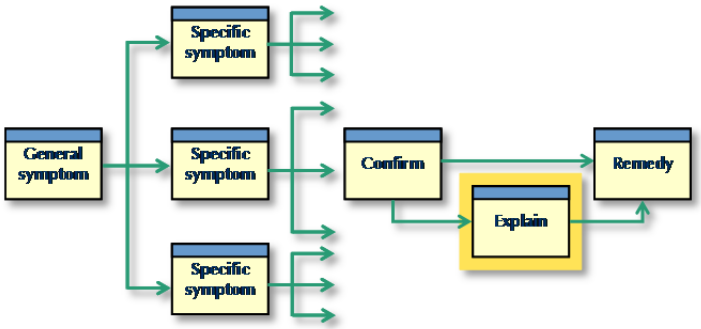


This example looks like a conventional Help topic, which it is. However, if we select the **How to** item from the menu, the Help window displays a demonstration showing how to perform the procedure. Clicking the **Try a simulation** link brings up a simulation in which we can practice performing the procedure (as shown here)

Simulation built with Adobe Captivate. View example at horton.com/eld/.

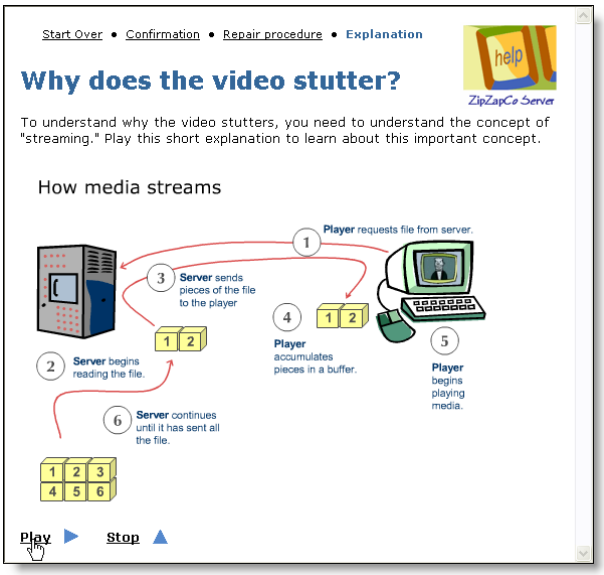
Embedded in diagnostics

E-learning can also be embedded in a business procedure, such as a diagnosis of a problem. The procedure might start with a general symptom that the troubleshooter has noticed. The procedure might then ask questions or suggest tests that help identify a more specific symptom. This procedure of refinement would continue until the cause of the problem is confirmed. The next step would be to remedy the problem.



At this point, between confirming and fixing the problem, we might want to embed an optional explanation of the problem. Chances are troubleshooters would not choose the explanation the first couple of times they encounter this problem. But if the problem proves common or expensive to fix, they would become eager to learn why

the problem occurs and what could be done to prevent it in the first place. That point at which the troubleshooter becomes eager to learn is a "teachable moment," and the explanation becomes embedded e-learning.

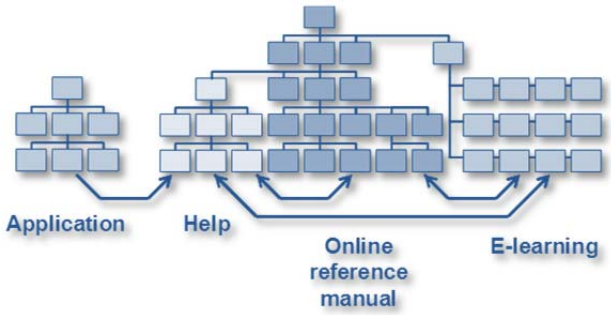


Here is an example of such e-learning that is embedded near the end of a diagnostic procedure. At the start of this diagnostic procedure for a media server, we see a list of symptoms and select one. Then, through a series of screens, we are asked questions to zero in on the cause of the problem. At the end of the diagnosis we find a repair procedure. At the bottom of this procedure is a link that displays this explanation of the cause of the problem.

Built using Adobe Dreamweaver, Microsoft PowerPoint, and TechSmith Camtasia.

Linked knowledge products

We can use hyperlinks to connect separate knowledge products, including e-learning. Such links provide pathways to related knowledge. One common use of such links is to connect a computer application, its Help file, online documentation, and e-learning.



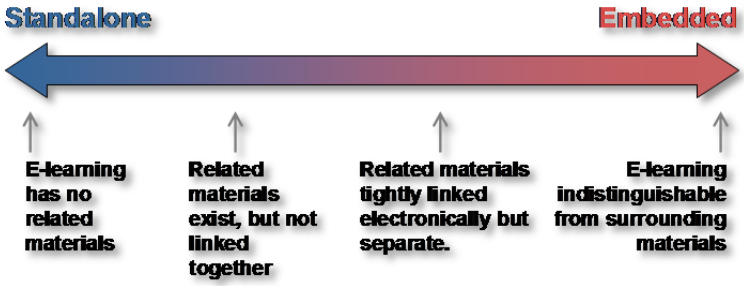
The user of the application presses a button and jumps directly to a relevant topic in the Help file. Increasingly, designers are linking these context-sensitive Help topics to other information in the online reference manual. A user who jumps into Help can jump further into the reference manual. Likewise a user who starts at the table of contents of the reference manual can navigate down to the Help topics.

More advanced designs link Help and the online reference manual to e-learning. This way the user can jump from a detailed reference topic to the training module that explains the concepts behind that topic. Also, users in Help can jump directly to an e-learning module on the subject of the Help topic. Likewise, users can look up details in the reference manual or Help while taking a module of e-learning.

Systems that integrate reference materials and training are sometimes called *electronic performance support systems*.

Standalone or embedded e-learning?

Should you produce standalone or embedded e-learning? Is e-learning the whole product or just a component of a larger knowledge product?



Varying degrees of embedding are possible from pure standalone e-learning to completely embedded e-learning. Let's consider some reference points along this scale. At the extreme standalone end of the scale, e-learning is completely self-contained and has no related materials. It is not a part of anything else and it depends on nothing else. Next along the scale might be e-learning with related materials, say a textbook or an online reference document, but these materials are not linked together. Further toward the embedded end of the scale would be e-learning and related materials that are tightly linked electronically but still physically separate. On the extreme embedded end of the scale we find e-learning that is indistinguishable from surrounding materials in which it is embedded.

When to embed

How do we decide where we want to be along this scale? Standalone e-learning tends to be easier to revise. Embedded e-learning appears right where learners need it. Standalone e-learning is simpler to manage. But embedded e-learning can be integrated with job aids, user interfaces, help files, and other familiar and valued tools. The visual display of standalone e-learning may be less constrained as to its size and interface design. However, embedded e-learning may be indistinguishable from

other aspects of the application and, hence, create a seamless experience for the learner.

First, when should we use embedded e-learning? Embedded e-learning is appropriate when teaching and guiding people through making complex decisions. We can embed e-learning so it is available at the moment the decision must be made. We can use embedded e-learning when diagnosing and troubleshooting complex systems to enable problem-solvers to gain knowledge needed to spot patterns of problems and to prevent the causes of problems. We may want to embed e-learning into processes where people must pick from many alternatives or make other decisions that require conceptual knowledge.

Example: Standalone vs. Embedded

Let's look at an example. For the course *Using Gantt Charts*, I chose a middle position a bit more toward the standalone end of the scale.

I listed three ways to connect to other materials. I allowed learners to access the course from the Web site of the Gantt Group, the sponsor of the course. In this way, the course was embedded among other reference and promotional material from the Gantt Group. The course referred to reference material on the Web site. This further embedded the course and promoted use of the reference materials. Special versions of the course, such as one just for managers, were also posted on the Web site.

Best practices for embedded e-learning

What are some best practices for embedding e-learning? First and foremost, keep embedded learning nuggets small so as not to distract from the task at hand. If the subject is complex, embed a summary and link to a longer version.

Locate embedded bits of e-learning at the teachable moment, that is, the place where people naturally want to learn, typically because they realize that a little knowledge will help them make a tough decision, solve a difficult problem, or prevent a recurring problem.

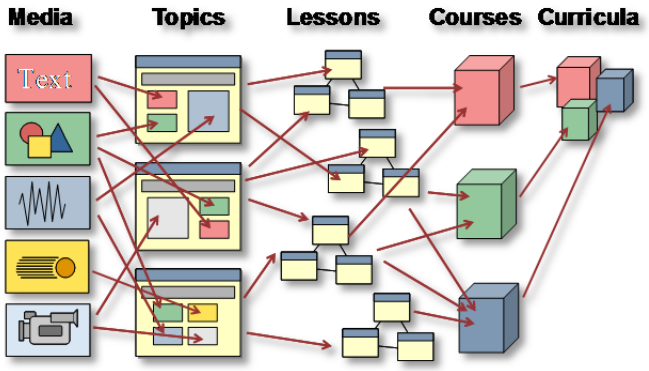
And make embedded e-learning modules optional. Remember that these modules are guests and are likely to be perceived as an interruption or distraction. Let people skip the e-learning until they recognize their need to learn.

PLAN FOR REUSE

Executives, managers, and instructional designers alike recognize that they can save money, deploy quicker, and increase quality by reusing perfected units of e-learning rather than constantly recreating them. Increasingly, designers are trying to design reusable learning objects.

Build from reusable parts

Reusable learning objects let us build from existing parts. That means we will not need to develop all the content we need for a particular project. Parts, once perfected, can be reused on several projects.

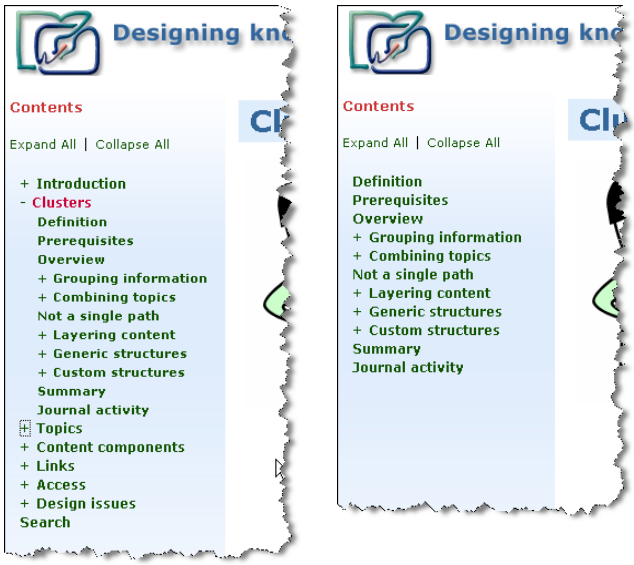


At the top level we can assemble a collection of courses from reusable courses. We can select from existing courses to construct a curriculum or library. To create courses, we can shop for existing lessons. Proven lessons may find their way into multiple courses. To create the lessons, we may combine existing topics. Relevant, well-crafted topics may appear in multiple lessons. Topics, likewise, may be composed by including existing lower-level media components. These media components may consist of reusable boilerplate text, standard graphics, narration segments, animations, and video clips.

Even though we may have to develop some original content, the costs will be less because that original content can be reused in subsequent projects. Or such is the dream.

Combine objects freely

Reusable components of content make it easy to publish various subsets of the content. This is useful when the material is used for many different purposes or is needed by different groups of people—in other words: whenever it is hard to anticipate your needs ahead of time.



These two course menus show how two courses share certain learning objects. The course on the right only contains modules about designing clusters—a subset of the larger course on the left.

At what level will you reuse content?

As a designer, you must decide at what levels you will reuse content. This decision will affect the economics of your project. Here is an example of the decisions made for one project about what would be reused at each level of content.

	What will you reuse?	Why?
Curriculum	*Popular courses in certificate programs.*	*To cover broad subject areas.*
Course	*Generic courses on popular subjects.*	*Courses are available and inexpensive.*
Lesson	*(Nothing at this level.)*	*Lessons not modular enough at this level.*
Topic	*"Boilerplate" pages.*	*To save time and ensure consistency.*
Media	*Clip art.*	*To save money and ensure consistency.*

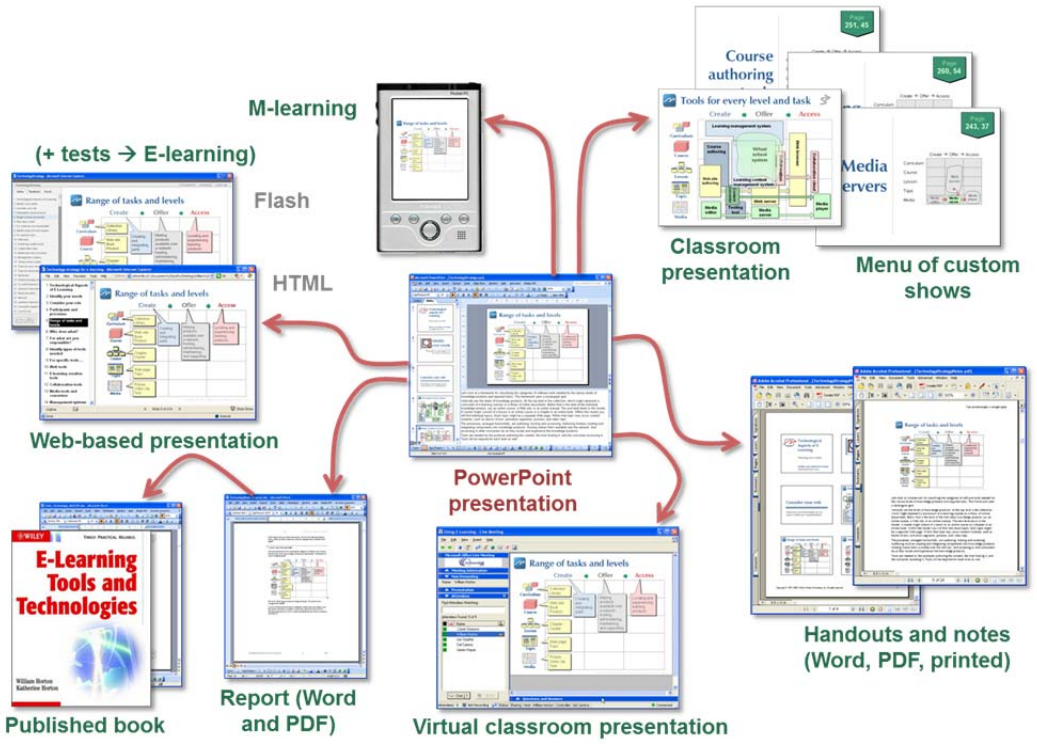
In making such decisions it is important to weigh the tradeoffs between money and time saved by reuse versus the extra effort required to make units of content reusable.

Reuse in different ways

The more ways you can reuse an object, the more value it offers. Our plan for reuse must consider different opportunities to reuse units of content.

Suppose we have an individual object. It may be a course, a lesson, a topic, or just a media component. We want to publish it on the Web. Immediately we run into a problem. We need two versions: one designed for learners with fast Internet connections and another for those with slower connections. Not everybody has a Web connection. Even those with connections in their offices and homes may be offline while traveling. For these learners we may want to offer our learning objects on CD-ROM or DVD. Well-developed materials may be quite useful in the classroom—the physical classroom as well as the virtual classroom. Each of these venues may require a slightly different form of the object. And let's not forget those who prefer to curl up with a good book. The need to publish material on paper is not going away. Even students in virtual classrooms clamor for paper handouts.

Here is a practical example of reuse. If shows how a PowerPoint presentation evolved to serve as the single source for most of the forms we just discussed.



Being able to publish content in multiple forms is valuable if you need to distribute to the widest possible audience; incorporate new distribution channels as soon as they

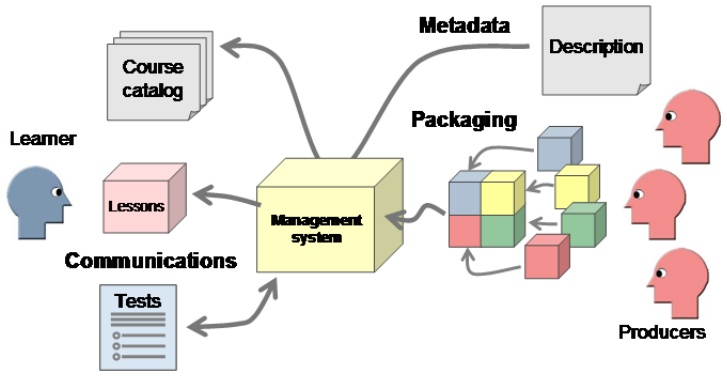
become available (e.g., mobile phones); or respond to new platforms, file formats, browsers, and so forth.

Follow standards for reuse

Standards for reuse simplify the process of reusing content created by various teams in different tools and running them in different management systems. Ideally, a school should be able to build a course by combining modules created in ToolBook by Jane's Multimedia with modules created in Flash by Peters Petagogee and be sure they can be launched and tracked by the SymunLegree LMS.

Types of reuse standards

Technical standards for e-learning help us mix and match units of content, authoring tools, and management systems. They help both producers and consumers combine components freely.



Producers design, develop, and distribute e-learning content. They may produce whole, monolithic courses, or they may produce individual learning objects such as lessons and topics that could be combined to build courses. These producers may use different authoring tools.

By following standards, these producers can integrate objects created by different teams using different authoring tools into a single course and import that course into a management system, such as an LMS or LCMS. The standards that say how separate objects must be produced so they can be integrated are called *packaging* standards.

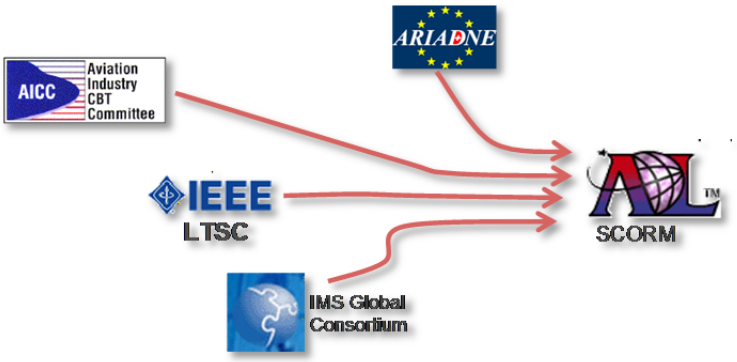
Once the course is safely lodged on the management system, learners need to take the course. That means the management system must dispense individual objects and keep track of which learners have completed which courses, lessons, and objects. It may also need to conduct tests and record who passed and who failed—or even how each learner answered a particular question in a specific test. For tests and learning

objects to communicate back completion and test scores, they must follow *communications* standards that define a language that both the module and management system understand.

Learners need to know what e-learning is available for them to take. Producers need to know what learning objects are available for them to reuse. For this to happen, the management system needs to publish a searchable catalog of all the available components and courses. That in turn requires a way for producers to describe their individual contributions. *Metadata* standards make this possible.

Standards bodies

Standards are often known by the name of the organization that specifies them. For e-learning technology standards, there are several main groups whose names you will encounter.



The oldest organization active in e-learning standards is the Aviation Industry CBT Committee or AICC for short. AICC was originally formed to help airframe manufacturers integrate training from various subcontractors into systems that could remain accessible over the decades an airplane was in service. Over the years, other industries realized they had similar needs and joined AICC so that today its membership is quite diverse.

Other standards organizations sprang up to serve different industries, to solve specific problems, and to give us more abbreviations to learn. The most important of these were the Institute of Electrical and Electronics Engineers (IEEE, pronounced "eye-triple-E") Learning Technology Standards Committee (LTSC), the IMS Global Consortium. And the European ARIADNE project and foundation.

For years these groups merrily issued specifications, which most people called standards. Unfortunately the "standards" were not always consistent and seldom easy to understand or implement. The joke in the e-learning field was, "The only good thing about standards is that there are so many to pick from."

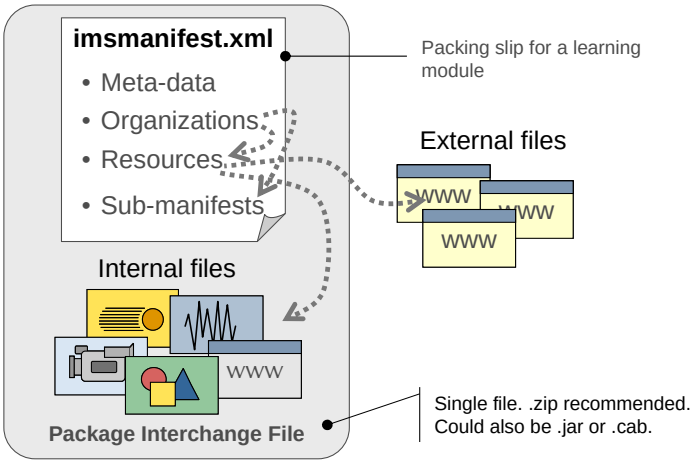
The world's largest education institution, the United States Department of Defense (DoD, in case you have not had enough abbreviations) was not amused. So it chartered the Advanced Distance Learning (ADL) initiative, whose first combat mission was to "harmonize" the differing standards so they could be used. The name of that project was the Sharable Content Object Reference Model (SCORM) project.

SCORM fostered a lot of communication and real cooperation among the rival standards groups to the point that SCORM began gaining acceptance globally.

When I refer to SCORM as a standard, I am talking about a *de facto* standard. It is only a standard because vendors of tools and creators of content have begun following it. ADL has no legal enforcement powers. If you fail to follow SCORM standards, Military Police will not erase your hard disk. Of course, your customer may refuse to buy your course.

Packaging standards

Packaging standards refer to how you bundle up all the separate components of a course, lesson, or topic so that a management system can dispense the pieces properly. A complex course may consist of hundreds of separate files, each of which must be in a specific subdirectory for the course to work.



The core of the packaging specification within SCORM is a manifest. The manifest is a packing slip for the package, which could be anything from a whole course down to an individual sound clip. SCORM refers to these units as SCOs (rhymes with snows). This manifest must be named imsmanifest.xml, which might seem to be a bit weird. The "ims" on the beginning refers back to IMS Global Consortium, which wrote the original specifications for a manifest. The ".xml" at the end means that the file must follow the rules of XML (eXtensible Markup Language, a do-it-yourself version of HTML).

Within the manifest are four main sections:

- The **Meta-data section** describes the module. Entries within this section must follow metadata standards.
- The **Organizations section** tells what the module contains and how it is structured. The Organizations section lists two types of content: resource descriptions and sub-manifests, each of which is further detailed in subsequent sections. Think of the Organizations section as a table of contents for the module. The Organizations section may also specify how lessons and topics are sequenced, that is, what prerequisites learners must complete before starting a lesson or topic.
- The **Resources section** contains resource descriptions that identify specific files that make up the package. There are two types of files: local files that are actually scooped up and uploaded with the module to the management system and external files that are just URLs to resources available elsewhere on the Web.
- **Sub-manifests** contain the same Meta-data, Organizations, and Resources sections as the main module, but for included units of content. A sub-manifest may include other sub-manifests. For example, the manifest for a course may include sub-manifests for included lessons. The sub-manifests for lessons may include sub-manifests for topics.

The SCORM packaging standard also says how the dozens or hundreds of separate files can be bundled up with the manifest into a single file. The most common file format for such packages is the common .zip format, specifically PKZIP Version 2.04.g. Other formats acceptable are a Java archive (.jar) or Windows cabinet (.cab) file.

Design issues for packaging

Packaging standards present you with decisions you must make and limitations you must design around. For instance:

- What level do you package: curriculum, course, lesson, topic, test, or media component? The most reusable units seem to be whole courses and media components (individual graphics, animations, and sound sequences.) However, creating many packages adds to the work and recordkeeping necessary.
- How do you restrict the sequence in which learners can take lessons and topics? Do you enforce a strict linear path from beginning to end? Or do you let learners navigate freely within the course? Or do you selectively enforce prerequisites between topics and lessons?

- Do you need to define packages within packages, i.e., sub-manifests? Will your LMS support that capability? Can you make packages truly independent enough that they can be included within other packages?
- What prerequisite relationships exist among your packages? This will affect the version of the SCORM standard you follow. Standards can restrict the complexity of relationships you can build into your course.

And you must ensure that your LMS and LCMS can handle the level of detail you desire.

Communications standards

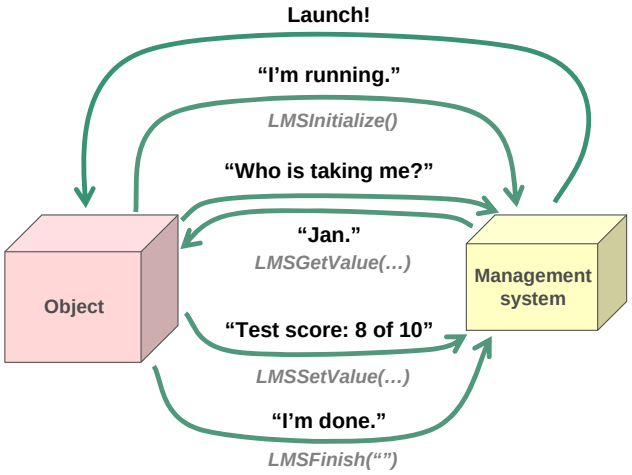
Communications standards define a language whereby the learning management system can start up modules and communicate with them. In this segment, we will consider what the learning management system and modules need to communicate, what communications standards have been proposed, how they work, and what we must do to comply with them.

What objects communicate

Communications standards prescribe how (but not what) objects and management systems can communicate. All communication is initiated by the object. It can:

- Signal that it has started or is about to end.
- Send data to the management system.
- Request data from the management system.

What do the learning management system and learning module need to communicate? What could they possibly have to say to one another?



The LMS might want to start the module and have the module acknowledge that it is running. The module might ask the name of the learner so it can personalize responses, or the module might report back how much of the module the learner has completed. For tests, the LMS needs to record the scores. And the LMS needs to know when the learner has completed and closed a module.

Keep in mind that none of these communications needs is new. We never noticed them in traditional CBT modules because the communication was within a single integrated piece of software running on a single machine, rather than among distributed components running across the World Wide Web.

Design issues for communications

- What level do you track: course, lesson, or topic? Management systems may limit the levels you can track. Pure LMSs track only courses.
- What will you do with the data you record? One good use is to analyze navigation and pacing to improve the organization and user interface of your course.
- What events do you track at each level: just start and finish, one test result per object, multiple test results, or answers to individual test questions?
- What data items will you want to exchange about the course, about the module, and about the learner?
- Privacy laws and policies may restrict what data you collect and record.
- More data is not more information. You must filter, analyze, and organize the data to turn it into useful information. Do you really have time to do that?
- Knowing their every action is recorded can intimidate learners.
- Implementing the tracking adds time to the schedule for building the course.

Metadata standards

Metadata is a fancy name for descriptive labeling. It is like the spines of books or posters for movies. Metadata is literally data about data. For e-learning, metadata standards provide a consistent way to describe courses, lessons, topics, and media components. These descriptions can be compiled into a catalog and electronically searched. Learners can consult the catalog to find modules to take. Producers can consult the catalog to find units to reuse.

Example of metadata items

Metadata standards specify dozens of items, some optional and some required, some essential and others pedantically obscure. Here are some commonly specified items of metadata:

Name	Example	What it records
Title	Introduction to Gantt Charts	Official name of the course, lesson, topic, or media component.
Language	en-US	Code for the language used in the unit, American English, in this case.
Description	Overview of using Gantt Charts in business.	What the unit teaches.
Keyword	Gantt chart, project management	Terms under which this module might appear in an index or be searched for.
Structure	hierarchical	How the unit is organized internally.
Aggregation level	3	The size of the unit, a course, in this example.
Version	1.1	Number indicating sequence among revisions.
Format	text/html, image/gif, application/x-shockwave	File formats used in the unit.
Size	1200000	Size of the files comprising the unit (in bytes).
Duration	PT3H30M	Time required to complete the unit, 3.5 hours, in this case.
Cost	no	Does the unit charge a fee?

Other metadata items may record specific items of interest to you.

Specific metadata schemes

Metadata standards are very open-ended. There are individual metadata schemes that specify what items are mandatory and how to consistently describe items. That

level of detail is best left to entire organizations and professions. If you are developing a scheme for your department, say, you may want to base your scheme on one of these:

- ARIADNE (www.ariadne-eu.org).
- CanCore (www.cancore.org).
- HEAL (www.healcentral.org).
- MERLOT (merlot.org).
- Dublin Core (www.dublincore.org).

Design issues for metadata

- Which metadata items do you record for your own use? And for reuse by others?
- For what levels do you include metadata: course, lesson, topic, and media component?
- How do you ensure consistency? Do you adopt a taxonomy, which is a specific vocabulary and classification scheme? Do you define keyword dictionaries? What quality checking procedures will you put in place?
- Who writes subjective metadata, such as descriptions and keywords? How do you ensure that such entries are accurate and objective?
- How will you handle items for which the standard does not define metadata items, such as the instructor's contribution to a course, collaborative events, and blended learning?
- How will you represent quality and effectiveness?

Related standards

There are many other standards that affect e-learning. Most of them pertain only to tools used to create and manage e-learning and do not directly affect design. However, there are a couple more you should know about.

AICC

Think of AICC as SCORM for dinosaurs. AICC standards for reuse date back to the 1980s. They inspired many of the features of SCORM standards. AICC standards are still found in some authoring tools and management systems—as well as content produced with and for those systems.

If you have content that meets AICC standards, you may want to continue to support those standards. If you are starting fresh, do not adopt these obsolete standards. Follow the more up-to-date standards, such as SCORM.

IMS Question and Test Interoperability

The IMS Question and Test Interoperability (QTI) specification spells out how test questions authored in one tool can be combined with questions authored in another tool and how they all can be delivered by a third tool. Since much of the work of authoring a course goes to writing test questions, developers are understandably reluctant to have to re-create their questions for each management system they might encounter. As more and more management systems and test-authoring tools follow this standard, test questions will become more portable.

Avoid a naïve view of reuse

Reuse is a beautiful goal and has great benefits in practice, but designers must honestly admit the challenges it poses.

- **Real-world knowledge is highly interrelated, and skills are interdependent**. Concepts that make good blocks in a schematic diagram sprawl and slither all over the place when you try to corral them into learning objects.
- **Technical incompatibilities have not been eliminated**. A module created with WebWonker cannot always be dropped into a course managed with PathGrinder and displayed in the NoChoice browser on the Zebra operating system. Not everything is as standardized as some of the plugfests suggest.
- **Learners experience whiplash learning**. On one page, buttons are at the top, on the next they squat on the bottom. Tranquil earth tones abruptly shift to pulsing neon. Text-only pages alternate with multimedia extravaganzas. The experience is bumpy at best. Unless developers follow common standards for the user interface, visual appearance, and media usage, learners suffer.

FOLLOW QUALITY STANDARDS

Following SCORM or other technical standards does not guarantee that anyone will find your course usable. Design standards can help ensure that human beings can use and learn from your e-learning. Two main types of quality standards are emerging.

- **Design quality.** A checklist to ensure that your e-learning follows generally recognized principles of instructional design and user-interface design.
- **Accessibility.** Requirements to ensure that those with common disabilities can take your e-learning.

Standards for quality of design

Design-quality standards set minimum requirements for the design and production of e-learning. The primary design-quality standard for e-learning ***was*** the E-learning Courseware Certification Standards from the ASTD Certification Institute. The Certification Institute used to certify that e-learning courses comply with composite standards covering user-interface design, compatibility with standard operating systems and tools, production quality, and instructional design. This standard, however, worked only for conventionally structured cognitive courses. (Your humble author was on the team that drafted the standards.). The standards covered 18 different aspects of design in 4 main groups. Even though the ASTD eCC standards are no longer supported, they are still a good idea. So, I list them here:

- **Interface Standards** concerning the ease of use of the e-learning, specifically:
  - Orientation.
  - Tracking features.
  - Required navigational functions.
  - Optional navigational devices.
  - Operational support.
- **Compatibility Standards** to ensure that the e-learning works with the computer's operating system and other programs running on the computer, specifically:
  - Installation and initial launching.
  - Set-up.
  - Subsequent launching.
  - Uninstalling.
- **Production Quality Standards** to ensure that the course's text and graphics are clear and consistent, specifically:
  - Legibility of text and graphics.
  - Formatting and internal consistency.
- **Instructional Design Standards** to ensure the instructional effectiveness of the course. They concern its goals, objectives, content, and methods. These standards include:
  - Expression of course purpose.
  - Presence of instructional objectives.
  - Consistency of objectives with course content.
  - Presentation, demonstration, facilitation of learning.

- Practice with feedback.
- Engagement techniques.
- Assessment of learning.

Also, check out Quality Matters (www.qmprogram.org) for quality standards being developed for online and hybrid learning in higher education.

Standards for accessibility

Accessibility standards aim to make information technology usable by those with common disabilities, such as less-than-perfect hearing or vision, lack of ideal eye-hand coordination, or reading difficulties. There are no accessibility standards just for e-learning. E-learning falls under the standards and regulations covering information technology, most often the Web Content Accessibility Guidelines of the World Wide Web Consortium or the regulations of Section 508 in the United States.

For information on the prevalence of specific disabilities, go to http://www.census.gov/hhes/www/disability/sipp/disable05.html. If this link goes dead, go to census.gov and search for *Americans with Disabilities*.

In addition to permanent disabilities, we all face limitations in our abilities to take e-learning at some time or other. Here are some examples of limitations that can handicap any learner:

- Needing to look away from the screen while performing a task.
- An injured hand or finger.
- No sound card.
- Sound turned off.
- Graphics turned off in the Web browser.
- Migraine headache.

Web accessibility standards

The World Wide Web Consortium (W3C) has taken the lead in making Web content, such as e-learning, accessible to everyone. As part of its Web Accessibility Initiative, the W3C has published Web Content Accessibility Guidelines whose goal is to "make all Web content accessible to people with disabilities."

The Guidelines specify three levels of actions at different priorities, Priority 1 being most urgent. These Guidelines have found their way, almost verbatim, into various government regulations, for example:

U.S. Section 508

The term *Section 508* refers to the 1998 Revision of Section 508 of the Rehabilitation Act of 1973 (29 USC794d) and applies to U.S. Federal agencies and subcontractors.

Its stated goal is to ensure that employees and the public "with disabilities have access to and use of information and data that is comparable" to that of those without disabilities.

Section 508 consists of several separate sections. E-learning may fall under either of the first two sections, depending on the technology used to construct the e-learning: §1194.21 for content that runs in a plug-in or media player, and §1194.22 for content that appears in Web pages.

Requirements for accessibility

Here are some of the requirements imposed in §1194.22 of Section 508:

(a) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).

(b) Equivalent alternatives for any multimedia presentations shall be synchronized with the presentation.

(c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.

(d) Documents shall be organized so they are readable without requiring an associated style sheet.

(e) Redundant text links shall be provided for each active region of a server-side image map.

As you can see, they are quite detailed and prescribe techniques for *building* the e-learning, not specific *design* issues.

Approaches to compliance

Complying with accessibility regulations can be quite difficult and expensive, depending on your approach. Your organization should have a consistent, well-thought-out approach. Here are some possible approaches.

Claim an exemption (to 508)

Most regulations spell out where the regulation applies and where not. For example, Section 508 explicitly exempts projects where:

- "undue burden would be imposed."
- National security, where military and intelligence activities are involved.
- Compliance would require "fundamental alteration in the nature of a product or its components."
- Technology is "incidental to a contract."

Alternative content

One approach approved in most regulations is to provide alternative content. Usually this is phrased as "substantially equivalent or better access." Some forms of alternative content include:

- Alternative formats: "voice, fax, relay service, TTY, Internet posting, captioning, text-to-speech synthesis, and audio description."
- Alternative knowledge product, e.g., accessible e-book, Web site, or text file.
- Human assistance, e.g., e-mail link to ask for help or explanation.

Universal accessibility

Another approach is to make every page accessible to everyone. Every component must follow every particular of the standard. This is called *universal accessibility*. It avoids the difficulty of maintaining multiple versions, but can prove extremely difficult and expensive.

Dynamic customization

The most sophisticated approach stores content in a neutral format and then electronically generates custom versions suited to the abilities of individual learners. This technique is called *dynamic customization*. There are two main approaches, both highly technical.

- **Database publishing**. Units of content are stored in a database or in XML. Versions suited for different abilities are generated automatically by formatting the content to match the abilities of the learner.
- **On-the-fly formatting**. Like database publishing, but individual pages are generated as requested.

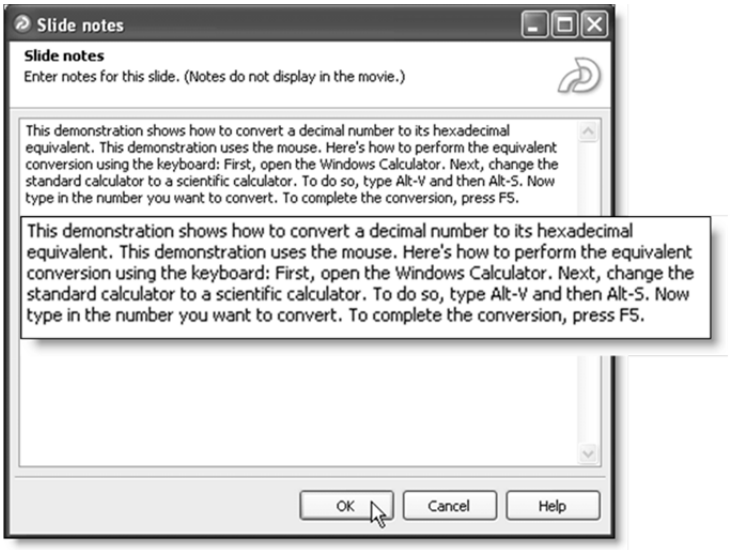
Design issues for accessibility

Having worked on several projects that had to meet Section 508 requirements, I can say that the effect on design is important, but not disruptive. The most common modifications to project requirements were:

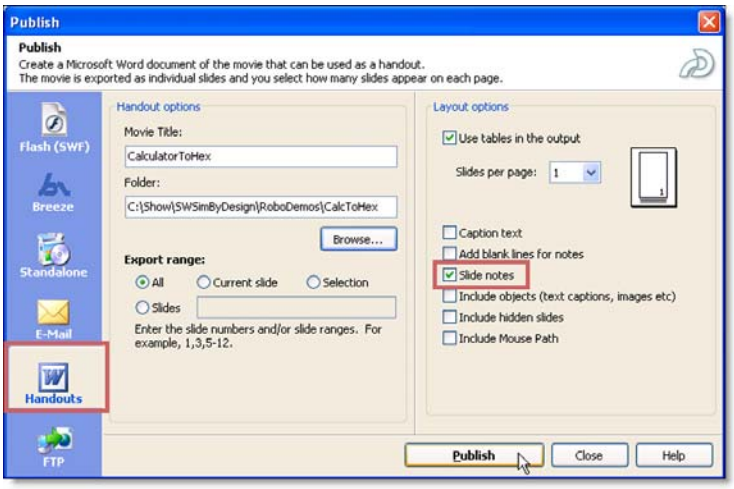
- Transcripts for all spoken words.
- Buttons large enough.
- More legible text.
- Text descriptions or summaries for all graphics.
- Descriptions for all links.
- Alternate navigation links.
- Link triggers large with good contrast.
- HTML layers organized in a logical sequence (in the HTML code) so they made sense when read by screen readers.

Example of "or better" access

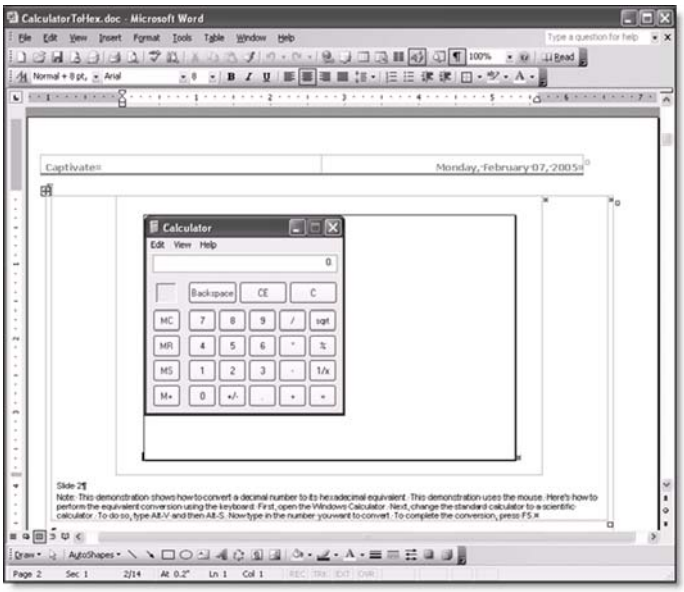
Consider those who cannot see. If your authoring tools do not make it easy to build simulations accessible by blind users who rely on screen readers, take a few extra steps to provide an alternative form of the information contained in the simulation.



Let's look at how you might do this with Adobe Captivate. For each slide in the simulation, you can enter text in the **Slide notes** dialog box. Notice that here we include the keyboard shortcuts which, for blind users, are easier than mouse actions.



Once we have entered the notes, we can export the simulation to a Microsoft Word document. We make sure the document includes the slide notes.



Once we have the Microsoft Word document, we can make it available to those who use screen readers. Or we could convert it to a Web page or Adobe Acrobat PDF, which can also be read by screen readers.

SET YOUR OWN TECHNOLOGY STANDARDS

E-learning depends on technology. As such, e-learning designers must take into account their goals and limitations as they lay down some basic rules about what technologies they will rely on. These rules are especially important if the e-learning will be created by separate teams or outside vendors.

Designate target browsers

First decide what browser learners can use to take your course. Limit this list to one or two specific browsers. Be sure to specify the version of your target browsers. For example you might specify your e-learning will run on Internet Explorer 8 and Firefox 3.

If HTML features are supported by all of your target browsers, use them freely. If features are supported by some of your targeted browsers and ignored cleanly (that is, without causing any error) by the others, use the features for non-essential information, for decorations, and for experiments. If features are not cleanly ignored by some of the target browsers, either do not use the feature or prepare two versions of the page.

Consider requiring a late model browser rather than an earlier one that requires multiple plug-ins. For example, the HTML 5 supported in later browsers may be adequate for media that would require a plug-in with earlier 3 browsers.

Specify file formats for materials

The choice of allowable file formats has several critical implications for designers. Some file formats will require proprietary plug-ins that learners must download and install. Information in one format may download quicker and display more smoothly than in another. Not all formats can be displayed in all versions of all browsers. The choice of file formats may limit the choice of tools for creating course materials. Pick formats that everyone can display safely.

Favor widely used file formats

So that as many people as possible can take your e-learning with the minimum amount of time spent downloading and installing plug-ins, pick file formats that play in the browsers most people already have.

Start with browser-native formats

Start with formats displayed directly by the browser itself without assistance from other software, such as plug-ins. These formats displayed by the browser are called *browser-native* formats. They depend on the brand and version of browser you have selected. For example, here are browser-native formats for Internet Explorer 6.0:

- HTML and Cascading Style Sheets (CSS)
- Text (ASCII and Unicode)
- JavaScript
- GIF, JPEG, and PNG graphics
- XML
- Java

Next consider platform-independent formats

Platform-independent formats are ones that can be reliably displayed, albeit with plug-ins, in multiple browser versions on multiple operating systems. Although plug-ins are required, they exist for most browsers and are either inexpensive or free. Platform-independent formats are usually industry standards rather than proprietary formats. Some industry-standard formats include:

- **Audio**: MP3
- **Music**: MIDI
- **Video**: MPEG

Then think about popular Web formats

Next consider some proprietary formats that are already widely used and for which technical support is readily available. Many learners will already have the required plug-in installed, and, if they need to install one, help is available. Here are some formats in this category:

- **Sound**: WMA, MP3, OGG
- **Video**: Shockwave Flash (SWF), Flash Video (FLV) WMV, MPEG-4
- **Documents**: Adobe Acrobat PDF, Rich Text Format (RTF)

At this point, consider licensing requirements. Some formats can be distributed freely over the Web from a server but require a license to distribute on CD-ROM.

Finally, consider popular desktop formats

Consider formats common in specific work environments. These might include desktop applications and other tools used by target learners. For example, some businesses have standardized computer set-ups that include a suite of applications such as Microsoft Office. Such a company could include Microsoft PowerPoint, Word, and Excel documents in their courses. Remember to check for licensing restrictions.

Avoid obscure and unsupported formats

I do not recommend using formats that require a rare plug-in or one for which technical support is not readily available—unless you are prepared to provide that support.

Favor virus-proof formats

Favor virus-proof formats. For example, a Java applet is more virus-proof than a Java application. A word-processing document without embedded macros is more virus-proof than one with macros.

Limit file sizes

Unless all learners have high-speed network connections **all the time**, consider suggesting limits for the total file size for each topic, for example the HTML file **and all the files it automatically loads**.

Here are some guidelines that should get most topics to learners in less than 10 seconds:

If learner's connection speed is:	Limit each topic to a total size of:
56 Kbps	40K
128 Kbps	80K
1 Mbps	640K
Faster	1 Megabyte per Mbps

And remember, we are talking about real speed over a busy, shared network—not theoretical speed.

TITLE COURSES CAREFULLY

Titling your course may seem like a trivial decision. Yet, in e-learning, the name of a course can affect who takes the course.

Often the title is all users see to entice them to click on a link for more information. Name a course so that learners can predict the goals, approach, and subject of the course just by reading the title.

Project management—advanced level simulator
Selling suburban real estate – Self-paced tutorial
Developing your financial plan: Webinar for individual investors

Think about how a course will be retrieved and sorted in an online catalog. Here are some guidelines in naming your course:

- **Put the most important parts first**. That way, the title is predictably situated in an index or alphabetical listing, and learners' rapidly scanning eyes will notice these important words.
- **Promise benefits**. Make clear what learners gain by taking the course. Too many titles tell what the teacher wants to talk about rather than how the learner benefits.
- **Use terms learners understand**. Use terms meaningful to learners—before taking the course. Avoid esoteric terminology and product names.
- **Imply who should take the e-learning**. Use terms like "advanced" or "basic" or name the job categories that benefit from the course.

IN CLOSING ...

Summary

- Many types of e-learning courses are possible, depending on a few fundamental choices. Consider where your course should fall along each of these scales:

Pure instructor-led	to	Pure learner-led
Pure synchronous	to	Pure asynchronous
Large class	to	Class of one

- Specify where learners should take the course and the devices they will use. Then design it for where and how learners will really take it.
- Pure e-learning may not be the best approach to training. Consider mixing different forms of e-learning with different forms of classroom learning.
- Specify what technologies can be used in your course. Favor technologies that are reliable, available to many, and fully supported by their vendors.

For more ...

The front line for creating learning objects lies in the design of topics (Chapter 6). You can also learn a lot by searching the Web for the phrase *reusable learning object*.

Complying with standards can be complex. Here are some sources for more information on standards:

- **SCORM**: www.adlnet.org
- **Web Content Accessibility Guidelines**: www.w3c.org
- **Section 508**: www.section508.gov
- **IMSCC**: www.imsglobal.org/cc/index.html