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Overview

Cisco Systems, Inc. is committed to building an effective learning environment in support of its employees, partners, and customers. Cisco has published other documents that describe the infrastructure, applications, system architectures, and content structures (learning objects) that are needed to support the knowledge worker. In this paper, Cisco shares its expertise through examples of actual learning experiences.

At Cisco, every employee is quickly introduced to the advantages of business solutions enabled by Internet technologies. When a question such as “How do I…?” or “Where can I find…?” is asked, the answer is “On the web.” Improving the productivity of the person seeking information as well as that of the person from whom the information is drawn makes sense in any business environment.

Cisco encourages each individual to use Internet applications and empowers its employees to find the information, training, collaboration, and communication required to perform their jobs. The creation of content is a combination of decentralized individuals and groups using centralized tools, standards, processes, and infrastructure. In this manner, Cisco builds a culture of everyday learning.

Cisco supports a range of learning media, from informational videos that are streamed to the desktop or available on demand, to web-based and instructor-led training (ILT) materials. Ideally, learning experiences are developed according to the Reusable Learning Object (RLO) strategy (Cisco Systems, Inc., 2001), with additional sources found in white papers, presentations, and other communications. Building on this foundation, Cisco is pursuing the next generation of learning technologies. The goal of this white paper is to consider certain key questions:

- What components contribute to an ideal learner experience?
- How does Cisco support problem-based learning?
- What is it like to be a knowledge worker at Cisco, where learning, up-to-date knowledge, and skills are essential?

This white paper addresses these critical questions from the learner’s perspective, with real-world scenarios that examine current learning environments, and a discussion of the four learning approaches that support the ideal learner experience. The goal is to provide a clear picture of the learner’s experience, whether it is delivered via traditional classroom instruction, dynamic web-based simulations, virtual classrooms, or by accessing information as part of everyday work.
Cisco’s primary business drivers for this white paper include:

- Increasing employee skills and knowledge
- Demonstrating Cisco as thought leader for e-learning
- Furthering the initiative of creating reusable learning objects as defined in the RLO Strategy (2001)
- Providing examples and best practices for developing a learning experience

Cisco is committed to sharing our best practices with others in the learning community. Likewise, this white paper represents Cisco’s desire to create, support, and nurture the best possible learning experiences for employees, partners, and customers.

This white paper is divided into six sections:

- **Overview**

- **The Learner Experience:** This section describes what a knowledge worker experiences while learning Cisco subject matter. Three scenarios illustrate formal, certification-based training classes; flexible, interactive learning; and the virtual classroom.

- **The Learning Approach:** This section describes how the learner experience is created by using one of four major architectures of instruction: receptive, directive, guided discovery, and exploratory (Clark, 2000). It considers the learner’s perspective and how developers can use learning objects to support all four approaches.

- **The Future:** This section offers a look at new initiatives and future directions in learning at Cisco. In anticipation of emerging trends and research, Cisco works to provide the tools and skills that support the learning experience of the future.

- **Summary**

- **Bibliography and Additional References**

**The Learning Ecosystem**

At Cisco, the *learning ecosystem* is an environment in which tools and resources are available to support continual, everyday learning and job performance to achieve business goals, employee growth, and customer satisfaction. The process of learning and working are integrated, with no distinction between the time when formal training ends and performing on the job begins.

The development of the Cisco *learning ecosystem* has been evolutionary. It has moved beyond simple training events to supporting the learner in acquiring skills and knowledge at the time of need. Although Cisco still supports formal classroom instruction, it recognizes that the entire learning experience encompasses more than one-time events such as classes. A great deal of learning is acquired on the job, with the support of peers, communities, and mentors. Accordingly, learning is defined as a cognitive process that is supported by information, communications, collaboration, and training.
The learning ecosystem is built on a solid foundation of learning approaches and a learning architecture (See figure, The Learning Ecosystem). The learning architecture includes the system infrastructure, applications, and employee access to support the learning experience. The four primary learning approaches (information, communications, collaboration, and training) are applied when creating a learning experience that ranges from a receptive knowledge and skills transfer, with limited learner control, to an exploratory approach, wherein the learners are free to find knowledge and skills training and information to meet their needs. Directive approaches offer the learner some support and structure; guided discovery approaches allow rich problem-solving skills to develop. Each of these approaches fits a need for the learner, and each will be described in detail in this white paper.
The Learning Ecosystem

The learning ecosystem is supported by all the internal and external assets that the learner needs to acquire knowledge and skills. These assets include training materials, information, tools and resources, intellectual capital, training partners, subject matter experts (SMEs), and knowledge and learning object repositories. Assets may be acquired directly by the learner through the learning architecture, or they may be optimized for learning by applying one of the four learning approaches.

During the learners’ interactions with the learning environment, they may return contributions to the learning community as SMEs, add information to the knowledge repository, collaborate with peers, and act as mentors. Through this reciprocal interaction, the ecosystem becomes self-supporting and evolving. This white paper describes how the learning ecosystem at Cisco supports current learning, learning approaches, and the entire learning experience and offers insight into the future of the ecosystem.

Content Development Models

Many content developers, instructional designers, program managers, and others responsible for developing and delivering a learning experience follow a development process. The process includes stages for analysis, design, development, implementation, and evaluation. No matter how each stage is labeled, the desired outcome is the creation of a learning experience that meets the needs of both the business and the learner.

Gagné (1965) introduced a process that has been the basis for many development models. At Cisco, the Internet Learning Solutions Group (ILSG) has adopted a process called the Product Life Cycle (PLC) that is specifically designed to create Cisco Career Certification program content. Cisco is also aware of changes to the development process that are described in detail in the white paper Cisco’s Reusable Learning Object Strategy v4.0 (Cisco Systems, Inc., 2001).

The learning experiences discussed in this white paper are created and maintained through a repeatable, measurable development process.
Reusable Learning Objects

The RLO strategy defines a methodology for designing and delivering content as discrete, format-free chunks of information, learner interactions, practices, assessments, and instructional templates. The original RLO strategy white paper (Cisco Systems, Inc., 2001) describes the structure of information and provides examples from a directive, behaviorist form of learning. It assumes a simple structure based on five information types used in teaching: concepts, facts, principles, processes, and procedures. The RLO strategy also discusses the possibility of reusing and repurposing objects in multiple media and in a variety of learning experiences.

Although the RLO strategy has proved to be a valuable model for learning object applications, it does not address the learner experience and how more complex learning approaches, such as guided discovery, can be created. This white paper expands upon the original RLO strategy. It reviews the Cisco premise for developing learning objects based on a simple structure. In addition, it discusses current trends in problem-based learning which support multiple learning approaches (receptive, directive, guided discovery, and exploratory), and learning resources such as collaboration and communication that support the learning ecosystem.

To help discuss how RLOs can support the learner's experience, this white paper will use a generic definition of learning objects. For this discussion, a learning object can be either as large as an entire course, or as small as a specific piece of content, such as a definition.

Ideally, a learning object is based on a single learning or performance objective, built from a collection of static or interactive content and instructional practice activities. Any learning object can be “tested” through assessments that measure the learning or performance objective and are either positioned with the learning object or collected as an assessment group (see figure, Learning Object Structure). Within the learning object, content, practice, and assessment groupings are built from raw media assets such as text, audio, animation, video, Java code, applets, shockwave, and any other asset needed for the given delivery environment. Finally, everything found in the learning object is identified with metadata so that it can be referenced and searched both by authors and learners. Metadata, when supported by the proper tools and systems, allows for the construction of multiple delivery environments, supporting the four learning approaches described in this white paper.
Learning Object Structure

With their granular structure, learning objects can be combined to form a hierarchy such as a lesson, module, course, or curriculum that gives the objects the necessary context in which to ensure a meaningful learning experience. Likewise, the same learning objects can be leveraged in problem-based learning, exploratory environments, performance support systems, job aids, help systems, or any blended learning solution.

The most common advantages to an RLO strategy include the ability to create single-source content for any delivery medium, using a distributed model for authoring, and to increase accuracy of content.

For more information on how learning objects are classified, stored, and reused in multiple learning experiences, see the RLO strategy white paper (Cisco Systems, Inc., 2001).
Four Learning Approaches

This white paper presents four approaches to the design and delivery of learning environments, to account for different human cognitive processes, learning objectives, and outcomes as defined by Clark’s four architectures of instruction (Clark, 2000). These approaches are:

- **Receptive**: Fix-paced linear disclosure of the learning experience with limited learner control.
- **Directive**: Learner control of disclosure of the learning experience through limited branching and choices.
- **Guided Discovery**: Learners are given a specific problem or objective that is solved during their interaction in the learning environment. Completion is supported through related resources such as instructional coaching, worked examples, and peer groups.
- **Exploratory**: Little or no control over learners because they are free to find information and training resources within the learning environment to meet their specific needs.

The application of these four approaches moves developers beyond rigid forms of delivering learning objects and “training,” in which training programs are simply delivered as structured hierarchical collections of disassociated learning objects. Cisco is leveraging learning objects to create problem-based learner experiences that give learners the opportunity to explore their own needs, find solutions to complex problems, and build their own conceptual frameworks.

If the learning experience is properly designed, the problem-solving skills transfer readily to the job. When the learners encounter similar problems, they apply their skills to solve the new problems. The learning experience must give the learners enough support to build a conceptual framework, to ensure that they can make the transition from solving problems during the learning experience to solving comparable problems found on the job. If the transition is great, it is referred to as a far transfer task (for example, managing employee conflicts). A near transfer task, on the other hand, is typically found in procedural tasks, where the needs for problem-solving skills are low (for example, checking e-mail).

The skills and knowledge used on the job do not all need to be taught in classroom or learning programs. An effective learning intervention should assist the learner in building a mental model so that knowledge and skills may be discovered as needed.

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**Note**

This white paper uses the term *learning approaches* instead of the term *learning architectures*, as used by Ruth C. Clark to define the four “predominant strategies of instruction” (Clark & Mayer, 2003). This departure reflects the historic use of the term *architecture* by Cisco in a more technical, systems-level context. As it relates to the learning experience, the term *architecture* is defined in the white paper *E-Learning Content Management vs. Content Delivery* as “a system to unify the IT infrastructure and business processes to enable the implementation of an enterprise-wide web-based solution for Cisco, our ecosystem partners, and customers.”
The Learner Experience

As part of the learning ecosystem at Cisco, the learning approaches, development process, and learning objects constitute the core of the learner experience. This section describes three learning scenarios, to offer insight about what a knowledge worker experiences while learning. The scenarios illustrate formal, certification-based training for Cisco employees and customers; flexible, interactive learning for account managers; and the use of virtual classrooms to address the needs of global learners.

Scenario 1: Cisco Career Certification

Earning a Cisco Career Certification is one of many steps to a promising career in the networking industry. Cisco offers three levels of general certification, from associate to professional to expert.

- **Associate:** The first step in Cisco Career Certification begins at the associate level, comparable to an apprentice or foundation level of networking certification.

- **Professional:** This is the advanced or journeyperson level of certification.

- **Expert:** This is the highest level of Cisco Career Certification for network professionals, certifying an individual as an expert in advanced networking technologies.

In addition, a variety of Cisco Qualified Specialist (CQS) certifications, distinguished as “specializations,” are available to demonstrate knowledge in specific technologies, solutions, or job roles. New specializations are added regularly to the CQS list.

Cisco Career Certification courses are developed by authorized Cisco Learning Solutions Partner Developers in both instructor-led training (ILT) and web-based formats. Certification courses are delivered worldwide by authorized Cisco Learning Partners.

The Learner

Cisco has a number of different audiences for its certification training programs: Cisco field organizations (systems engineers and account managers), more than 40,000 Cisco channel partners, Cisco customers, or 10,000 students in the Cisco Networking Academy™ program. Certification training audiences are categorized geographically into four major theaters: the Americas; Europe, Middle East, and Africa (EMEA); Asia, Korea, Australia, New Zealand, China, and the Pacific (APAC); and Japan.

Cisco certification learners hold a variety of job titles, such as webmaster, Internet/network administrator, network engineer, systems administrator, systems engineer, support engineer, and technical sales specialist.
Process

The process by which learners select, access, and complete certification courses includes these steps:

**Step 1** Enroll in certification training by using one of these methods:

1. Access the Cisco Learning Partner course schedule by using the Learning Locator on the Cisco.com website.

2. Contact one of more than 140 authorized Cisco Learning Partners worldwide.

3. Take Cisco Career Certification training through the Networking Academy program offered at secondary schools and community colleges. The Networking Academy and ILSG work together to expand and improve the curriculum and related development and delivery techniques.

4. Use one of a variety of internal and external learning portals.

**Step 2** Complete learning from an authorized Cisco Learning Partner, the Networking Academy, or via a learning portal, employing either ILT, online training, or a blend of delivery modalities.

**Step 3** Pass the certification exam.

![Learning Locator](image)

<table>
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<tr>
<th>Course Name</th>
<th>ICND v2.0</th>
<th>ALL AVAILABLE LEARNING PARTNERS</th>
<th>INSTRUCTION METHODS</th>
<th>ALL AVAILABLE REGIONS</th>
<th>20 20 02 03</th>
<th>Narrow</th>
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<tr>
<td>TRN ICND: Interconnecting Cisco Network Devices (ICND) v2.0</td>
<td>Delivery: Instructor-led</td>
<td>Duration: 25-DEC-2002 to 26-DEC-2002 (6 days)</td>
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The Cisco Career Certification courses are available in both web-based and ILT formats. Certification courses include extensive hands-on activities that are designed to promote an efficient, effective, and engaging learning experience, as well as the acquisition of experience in representative networking environments. Cisco uses realistic networking simulations in both its learning and exam experiences, thus requiring certification candidates to perform tasks on simulated Cisco networking devices. Exams that include simulations model real-world networking scenarios by requiring test-takers to apply troubleshooting and problem-solving skills. The use of simulations in exams ensures that a comprehensive measurement of the skill and knowledge levels of certified individuals is achieved. The acquisition of generalized skills, such as network design and troubleshooting, is facilitated by a combination of worked examples and guided discovery scenarios.

Cisco employees may access the courses through the internal Field E-Learning Connection (FELC) learning portal. The courses are accessible to Cisco’s external partners on the Partner E-Learning Connection (PEC).

Learners have a number of online tools available to help them. For example, Certifications Online Support is a continually updated knowledge base that offers answers to certification and training questions. This service provides 24/7 self-service support with easily accessed answers, automatic answer update notification, and follow-up e-mail question service, including online question status management. Also, many of the Cisco Learning Partners provide access to Cisco equipment via their remote lab programs.

Environment

Although certification courses are often delivered in a traditional linear fashion, such as ILT, they are built from carefully constructed learning objects. In this way, certification courses can be reassembled into web-based versions without having to recreate the course content found within the learning objects. The learning objects are also reassembled into specific “training solutions” that are part of programs for newly hired employees or technology boot camps.

The learning approach used for ILT is a combination of directive and guided discovery. Instructors deliver the information to the learners during the course. They provide opportunities for learners to practice lab skills and other knowledge exercises, and to share questions, concerns, and comments. Repeated laboratory exercises, simulations, games, worked examples, and other activities are then employed, to encourage the learner to discover the knowledge that is required to solve realistic networking problems. Instructors can use online versions of slides or other materials to take advantage of animations and simulations.

Results

As of early 2003, more than 450,000 certifications have been issued. Because Cisco certifications are based on the demonstration of actual job skills, the percentage of skills and knowledge that is transferred back to the job is quite high. Survey data indicates greatly increased satisfaction with the Cisco Career Certification program, concomitant with the use of problem-based learning experiences, realistic simulations, guided discovery, and learning objects.
Scenario 2: Account Manager Learning Environment

The Account Manager Learning Environment (AMLE) provides account managers with online learning resources that allow learners to find information, build their skills, and improve their service levels to customers. The AMLE was developed and designed by a dedicated instructional design team at Cisco, based on a thorough assessment of the learners’ needs, work environments, and preferences. The team discovered that account managers work in highly mobile, time-sensitive positions, and need to be able to obtain and learn information relevant to their jobs quickly and at any time, in any setting. Account managers are motivated by competition and need training, not merely content, that is mapped to job skills or tasks.

The Learner

The learners who access AMLE courses include approximately 5000 Cisco internal account managers and 2000 external channel partners located in 60 countries worldwide. The account managers need to communicate complex information to customers in the most efficient and directed manner possible. They need easy access to consistent, up-to-date information on the latest Cisco solutions, products, and technologies.

Process

The process by which learners select, access, and complete AMLE courses includes these steps, in which the learner:

Step 1  Receives a prompt to access content
Step 2  Accesses courses through the learning portal
Step 3  Selects the learning options (online, offline, e-lesson, scenario, audio, print)
Step 4  Completes a mastery assessment

A variety of situations may prompt the learner to access AMLE content:

- A request from management to complete specific courses
- Preparation in advance of a sales call
- Questions from customers on a specific topic
- Results of a preassessment indicating certain lessons the learner should complete

Learners who are Cisco employees can access AMLE courses through the FELC learning portal. The courses are accessible to Cisco’s external channel sales partners through the PEC. AMLE courses are developed according to the Reusable Learning Object (RLO) strategy. The strategy’s modular approach allows learners to customize their learning experiences. Account managers can choose to learn the course content in these environments:

- Online or offline with a web-based e-lesson
- On-the-go, away from their computers, with a downloadable, paper-based magazine
- Online or offline with interactive sales scenarios
All formats convey the same relevant information, yet give learners the choice of delivery method, depending upon their learning preferences or environments.

To earn “completion” status in their training, learners must successfully complete a mastery assessment. Learners can complete a course assessment either before they access a course, in order to receive prescriptive information about what topics they need to review, or after they finish a course, to validate their mastery of the content.

Environment

Using AMLE, account managers can develop, practice, and test their abilities to explain Cisco technology in ways that are most appropriate for the interests and needs of specific customers. The learning approach of AMLE courses, combined with an array of media and delivery options, provides account managers with a rich learner experience.

AMLE courses use an exploratory approach. The modular structure and web-based nature of the content, combined with the rich set of learning delivery options (e-learning, magazine, interactive scenario), allow learners to complete each learning object in any order they choose, wherever and whenever they want.

Learners can build their skills with interactive lessons and sales scenarios and by other AMLE elements, including:

- A glossary
- “Cheat sheets,” or learning objects that provide additional focused content, which users can call upon for help during a sales presentation
- Pre- and post-assessments for each lesson, which help learners to identify topics that need more work, thereby personalizing the learner experience
- Reports for tracking progress and credit

Results

The vice president of the Cisco U.S. Enterprise Sales Organization deemed learning and development so critical to the company’s ability to meet its FY2002 sales goals that he mandated completion of the first six AMLE courses for more than a thousand U.S.-based account managers and their management. On the basis of a self-rated, web-based survey taken by account managers before and after the first AMLE Voice and Video course, the AMLE course was determined to contribute to business results by helping learners to increase their confidence, knowledge, and ability to sell Cisco products and solutions. For example, respondents reported:

- Increasing by 30 percent their ability to solve customer business needs and overcome objections with Cisco voice and video products and solutions
- Increasing by 25 percent their ability to sell Cisco voice and video products and solutions
- Reducing by 23 percent their dependence on others to accompany them on sales calls
In terms of increasing sales productivity, respondents reported spending an average of two hours per week gathering knowledge before the AMLE courses were available. Respondents estimated that the AMLE course reduced their research time by an average of 40 percent. This savings in time is valued at approximately $511,000 a week across the entire enterprise team. When cost reductions of 40 to 60 percent in typical field training and training-related travel are added to savings in research time, the return on investment is significant for a company the size of Cisco.

Approximately 64 percent of the respondents felt that the AMLE online format saved them time in acquiring knowledge about Cisco voice and video products and solutions, thereby meeting the business objective of reducing time to technical competency. Of those who reported time savings in acquiring knowledge, most reported that they had acquired knowledge 41 to 80 percent faster than by other methods (for example, ILT, asking a systems engineer, or searching the World Wide Web).

Although it is too soon to determine whether AMLE courses will reduce time to revenue, survey respondents reported an overall increase of 45.3 percent in their understanding of how Cisco voice and video products and solutions compare with the competition. Knowledge of the competition was the most important gain in the study, and a key measure of the increased selling confidence of account managers in a short amount of time and without leaving the field. Another 54 percent of respondents believed that more than half of the knowledge they gained through the AMLE Voice and Video course translates directly into selling skills. At a total cost of $1,000 per account manager for six courses, the return on investment (ROI) on this program is dramatic.
Scenario 3: The Virtual Classroom

Virtual classrooms provide live ILT that is delivered via the Internet at scheduled class times. At Cisco, an important application for virtual classrooms is Transfer-of-Information (TOI) and other similar events where the expert and the audience can take advantage of being in direct communication with each other. Virtual classrooms are also used to deliver formal distance learning for both internal and external live audiences, for example:

- Cisco’s Worldwide Sales Force Development organization offers the 160-hour IP Accelerate Program’s advanced technical training to systems engineers worldwide in the virtual classroom format.
- Cisco Learning Solutions Partners offer a suite of Cisco Career Certification courses to Cisco employees, partners, and customers via virtual classrooms.

The Learner

The learners are offered a virtual “space” in which to receive live, interactive training at their desktops. Typically, virtual classrooms use specialized online conferencing applications to deliver the learner experience in conjunction with voice teleconferencing to provide the audio portion of the presentation.

A primary advantage of virtual classrooms is that the learning experience can mirror that of an ILT experience, without the time, inconvenience, and expense associated with traveling to traditional classroom-based training. Learners can participate in virtual classrooms from their offices or homes at any hour. Virtual classrooms can be accessed by learners worldwide, thereby bringing together learners who would not ordinarily have the opportunity to interact.

Process

Registration for a virtual classroom can take place in many different ways. Internal Cisco learners may register for virtual classrooms via the Education Management System (EMS) or, in the case of TOI events, they may receive an e-mail invitation. Cisco Learning Partners manage their own registration systems, so that Cisco employees, partners, and customers can contact an authorized Cisco Learning Partner directly to register for a virtual classroom.

To participate in a virtual classroom, the learner uses a software application accessed through a web browser to log in at the beginning of each class. At the same time, the learner dials into the teleconferencing bridge to access the voice portion of the instruction. Alternatively, the virtual classroom software may provide Internet-based voice service. In this case, the learner wears a headset and microphone attached to the computer.

Environment

In virtual classrooms, learners have different ways in which to view the presentation and interact with the instructor and other participants. At a minimum, the learner can view slides that are presented via the virtual classroom software while listening to the instructor’s lecture. The virtual classroom typically offers built-in polling and interactivity features that allow learners to ask questions, or to signal the instructor to speed up or slow down. The virtual classroom may also have a second person, serving as a mentor, to help with the course presentation and answer learner questions via a text-based chat system while the instructor continues with the lecture portion of the class. Virtual classrooms provide opportunities to
practice technical skills via lab exercises interspersed at appropriate places within the course. It is also possible to display shared whiteboard space, share applications, conduct small breakout sessions among participants, and present materials that can be viewed on a web browser.

![Image]

**Service Provider IP SE Accelerate Program**

Jan 20, 2003

**Slide Presentation in Virtual Classroom**

Training materials can be developed according to the same process as those developed for any traditional ILT course. Ideally, learning objects are used to build the content, practices, and learning approaches that are used in the virtual classroom.

Just as it is possible to design a presentation structured with learning objects, it is possible to design training materials for virtual classrooms on the basis of learning objects. For example, a virtual classroom can be built from a collection of learning objects along the lines of Cisco Career Certification courses. To augment the learning experience and to provide take-home items for the learner, the courses may provide learners with a hard copy of the learner guide. Learners who participate in this experience may also be provided with access to an online version of the course materials. The blending of virtual classroom time with self-paced and referential elements helps to enhance the overall experience for the learner.
Results

As with any aspect of the *learning ecosystem*, a virtual classroom is reviewed for its impact on both the learner and the business. An example is the Accelerate Technical Training Program for systems engineers that was evaluated by a learner satisfaction survey, attendance records, and assessment reports. The data collection methodology was not designed to measure the business impact, and there was no control group established to measure the overall effectiveness of the learning objects. There was, however, a survey conducted among a limited number of students comparing their instructor-led training with their virtual classroom experience. On a five-point scale, the instructor-led classroom rated an average of 4.68 and the virtual classes rated an average of 4.46. This indicates a slight preference for the instructor-led experience; however, 0.22 is a relatively small margin of difference.

One Cisco training partner has conducted satisfaction surveys of its virtual classrooms. The results for more than 300,000 hours of Cisco courses delivered through virtual classrooms indicated that 75 percent of the learners reported satisfaction with the learning experience, and the learners who completed the courses via virtual classroom demonstrated a 94 percent certification pass rate.
The Learning Approach

In the previous section, The Learner Experience, three scenarios are presented to illustrate different approaches to learning and how each approach meets the learner’s needs and the business impact goals. The learning experiences use a variety of content sources, including learning objects, and encompass multiple delivery environments and learning approaches.

In this section, the four learning approaches (receptive, directive, guided discovery, and exploratory) (Clark, 2000) serve as a framework for explaining how learning experiences fulfill learning and business objectives. Even though they are presented separately, there may not always be a clear demarcation between each approach. Instead, the approaches may blend together to form a continuum of approaches, from receptive to exploratory.

Although each approach has a place in the learning ecosystem, Cisco recognizes that problem-based learning, part of the guided discovery approach, is an effective way to teach far transfer skills and knowledge. Knowledge workers are required to apply problem-solving skills on the job, and the guided discovery approach is an ideal match for learning experiences with problem-solving objectives.

Throughout this section, each of the four approaches is defined. Examples of each approach and how it is used across the entire learning ecosystem are presented.

Receptive

The receptive approach is characterized by a fixed presentation of the instruction, in a linear path from beginning to end. There is little or no learner control over the learning experience. In effect, the learner proceeds through the experience in a predetermined path and at a predetermined pace. The receptive approach is best suited for near transfer tasks, novice performers, or people new to a job function; it does not require high metacognition skills (or, the ability to apply effective learning). Examples of this type of delivery include video training, lectures, or any environment where the learner cannot navigate flexibly and independently around the course.

How Is It Used with Learning Objects?

In a receptive approach, a developer can search the database of existing information and learning objects to assemble a number of learning objects on a fixed path or structure. Together, they form a single receptive learning object that the learner follows, based on a fixed path or hierarchy from start to finish. The scope of the final learning experience is limited by the number of learning objects that fit together without the need for branching, while still meeting the learner’s needs.

For example, a developer can assemble a series of learning objects about installing memory into a computer and have the delivery system present all of the learning objects without navigation controls, other than the most elementary. In this way, the developer prevents the learner from taking control of the speed and pace of the learning experience.
Receptive Example 1: *Mr. Router’s Neighborhood* Broadcast

**Mr. Router’s Neighborhood**

**Audience**

Cisco employees

**Access Method**

Learners access the live interactive television broadcast of *Mr. Router’s Neighborhood* from the online CiscoTV Guide. The program is broadcast every other week, on regularly scheduled days.

Learners who miss the live broadcast can view a rebroadcast, or they can locate an archive of the broadcast by using the Cisco Media Locator, a search tool that enables learners to search for content objects using a variety of search criteria or metadata, such as title, product, technology, solution name, language, delivery type, learning objective, and release date.
Learner Experience Description

Mr. Router’s Neighborhood gives learners an entertaining look at Cisco routers and technology. The show is broadcast using Cisco IP/TV multicast technology and standards-based unicast technology (Webcast) that delivers the broadcast internally to learner desktops on the Cisco LAN and WAN and externally over the World Wide Web. Learners see live streaming video of the program, with accompanying audio and slide presentations. They have the ability to ask questions of the speakers by using the tool’s online “question manager.”

Receptive Elements

Mr. Router’s Neighborhood includes a stream of information that the learner receives. There is no opportunity for the learner to practice applying the information. The intent of the program is to provide learners with a regularly scheduled, entertaining delivery of information.
Receptive Example 2: Voice Over IP Network Issues Training

VoD Objectives

**Objectives**

Upon completion of this lesson, you will be able to:

- Identify and configure settings to provide the optimal voice quality for a call on a Cisco voice over data network.

Audience

Cisco employees

Access Method

Media Locator

Learner Experience Description

Learners view a series of videos on demand (VoDs) that includes video and audio of the presenter, along with slides that display in sequence with the presenter’s dialogue. Learners can pause, stop, or replay the VoDs by using VCR-style control buttons. They can also select a specific topic by using a “table of contents” navigation menu within a VoD. This feature gives learners a more exploratory-style experience, providing them with the ability to move around within the receptive-style content.

Learners have the option of downloading a VoD as an audio on demand (AoD), with only audio and no video. This is useful for learners with limited bandwidth. Alternately, learners can selectively download either the slide presentation file or the audio as an MP3 file.

Receptive Elements

The Voice over IP Network Issues VoDs provide learners with a stream of information, with no opportunities to practice applying the information. This receptive learning approach is frequently used at Cisco by SMEs who need to produce information rapidly, often at the same time that a new product or solution is being launched.
Creating a VoD is a low-cost, do-it-yourself project for SMEs at Cisco. They create a simple slide presentation, record themselves giving the presentation by using one of many self-service production studios available to Cisco employees, and apply metadata to their presentation with the easy-to-use Content Upload Tool (CUT). The CUT is used to upload and deploy VoD content on distributed Cisco VoD servers. It takes properly produced multimedia assets, using standard technologies, and assembles them into web pages in a consistent format, using the Cisco Media Template.

Creating a VoD, from the Studio to Audience

The SME then sends the presentation to a publishing server, converting it to the Cisco VoD format, and it is made available for learners in the Media Locator.

After the new product or solution is launched and the information in the VoD becomes more stable, the business reasons for investing resources in a more structured learning approach become stronger. At this point, the SME might work as part of a content development team to build a more robust learning object, or a series of smaller learning objects, by using a directive, guided discovery, or exploratory approach.

Directive

Directive is one of the most common approaches found in web-based learning because it is perhaps the simplest to develop and it is rooted in sound instructional design principles. A typical flow of information starts with an overview, presents content and practice activities, has a summary, and assesses the learner’s newly acquired skills and knowledge. The directive approach offers the learners control over their learning environments, while still providing them with a structure that suggests both a beginning and an end to the experience.

Directive approaches are often represented as hierarchies or through suggested learning paths. During the experience, the learner is encouraged to use the course as designed, from start to finish, by responding to a number of visual or audio cues. Examples of directive approaches include books and web-based training where there is a “page turning” approach to the delivery. This approach may also be found in simple role plays or simulations where the number of branches or choices for the learner is limited and little deviation from the learning path is allowed.

Although the directive and receptive approaches may seem similar, the directive approach gives the learner more choices. There is not a hard line between approaches, so similarities may often exist.
How Is It Used with Learning Objects?

When Cisco first introduced the RLO strategy (Cisco Systems, Inc., 2001), it based the model on a directive approach. Each learning object started with an overview, followed by content and practice activities, and ended with a summary and assessment.

To build a directive learning environment that is delivered via the World Wide Web or another computer-based system, a series of related learning objects is connected through a hierarchical menu, allowing navigation with forward and backward buttons. Groups of learning objects are combined to form larger groupings, such as a lesson, module, or course. Although learners can use branches and explore, the developer assumes a logical progression through the training materials. This progression may move from simple to more complex skills or from a beginning to an end point for a process or procedure. The structure, visual cues, and other devices all suggest how the learner should progress through the series of learning objects.

The challenge in designing learning objects to support the directive approach is to ensure that each learning object can stand alone and be removed from its current hierarchy. This allows both the developer and the learner to reuse the learning object in other approaches.

Directive Example 1: Enterprise Security SE Accelerate Program

Audience

The primary audience for this training is Cisco systems engineers who are responsible for explaining and selling Cisco technology to customers. The secondary audience includes partner personnel who will be providing technical assistance and support to Cisco customers.

Access Method

Systems engineers are nominated for participation in the program by their managers and access the four weeks of course materials from FELC.

Learner Experience Description

Learners attend a series of four units, or courses, taught in a traditional classroom instructor-led format. They listen to instructors who present the content and then participate in a variety of role-plays, case studies, and lab activities in which the instructors provide guidance and feedback.

Although this experience is classroom-based, it is still designed from learning objects, which facilitates delivery of the experience in virtual classroom or web-based versions, as needed. When reconfigured, the learning experience can still be directive, or the learning objects may be redesigned or reassembled into another form of learning approach.

Directive Elements

Learners experience a chunked, predetermined instructional sequence. Although learners have little control over the sequence in which the content is presented, they are provided with frequent opportunities for practice and feedback. The practice activities assist learners in applying the skills that they are learning to the job.
Directive Example 2: Cisco Voice Over IP

Audience

Candidates for the Cisco IP Telephony Support Specialist qualification exam

Access Method

Learners register for a course offered by an authorized Cisco Learning Partner using the Learning Locator.

Learner Experience Description

Learners attend the five-day, instructor-led class in person at an authorized Cisco Learning Partner training facility. The instructor presents each lesson using slides, while learners follow with a printed learner guide that includes notes to accompany each slide. At the end of each lesson, learners are given the opportunity to practice applying the information that they have just learned. Practice activities are in either multiple-choice, question-and-answer, or hands-on lab format, depending on the nature of the content for a particular lesson.

Directive Elements

Because the directive approach is built from learning objects formatted to the RLO strategy, the learning experience provides learners with frequent practice opportunities. Learners can also receive immediate feedback from instructors. The drill-and-practice, show-and-do format used in this course typifies the directive learning approach. This approach is appropriate for learners, who are typically novices to the topics being presented.

Guided Discovery

During a guided discovery approach, learners are encouraged to explore a learning environment. There is often a job scenario or problem presented to the learner to frame the discovery of new skills and knowledge. Examples of guided discovery applications include rich multimedia simulations, case studies, and scenarios in which the learners solve problems or complete tasks as they would on the job.

The guided discovery approach is somewhat more complex to design and deliver than the other approaches. The overall learning experience is designed to encourage learners to find the skills and knowledge that they need to successfully complete their job tasks or learning goals.
How Is It Used with Learning Objects?

A common application of this approach is a job-based simulation, in which a performer may find a simulated desk, computer system, filing cabinet, customers, job-related tasks, and real-world distractions. Learning objects are used as resources to support each component in the simulation. For example, if the learner is given a task during the simulation, the task could be a very specific, granular learning object. Likewise, the resources accessed by the learner while completing the task, such as computer system, telephone, customer, peer, or manager, would each be a learning object stored in the database.

Common Database for All Approaches

Guided discovery environments are traditionally constructed with authoring tools or programming languages. The tools connect the referenced learning objects that are stored in a common database to build the guided discovery experience. The higher fidelity of these simulations correlates with the higher cost of both design and programming. The savings, however, are realized in accessing existing learning objects and adding new learning objects as needed to support other approaches.

Ideally, all the learning objects that are needed for the guided discovery approach already exist in the database and are already in use in either the receptive, directive, or exploratory approaches. The developer can search or mine the database and reuse learning objects to build a learning experience based on the guided discovery approach. The benefit of this approach is that a learning object inside the guided discovery experience can be updated once, and the changes will appear in that experience as well as other learning experiences that use that learning object.
Guided Discovery Example 1: Sales Situation Simulator

Audience

Field account managers

Learner Experience Description

The Sales Situation Simulator (S3) provides account managers with a 3-D practice tool that is built around real-world Cisco customer case studies and features actual Cisco account teams. During each simulation, learners try different approaches in reaction to planned and unplanned situations that range from customer presentations to casual meetings in a hallway or elevator.

S3 places learners in a sales situation that requires them to use their business skills to sell a Cisco-converged IP solution. They participate in a series of meetings with representatives of the customer organization and respond to questions posed by various individuals. Each response is scored, resulting in movement along a dynamic simulated path. Depending on their performance, the learners can continue to meet with the customer company or be removed from the simulation.

The simulation moves through several areas of emphasis. First, learners must address general issues and concerns about IP telephony. Next, they are asked to provide detailed answers to a customer’s technical questions while still maintaining a focus on the customer’s business needs. Finally, they must justify IP telephony as a viable financial decision for the customer.

Outside of meetings, learners may have the opportunity to hold conversations with various members of the customer organization. Information gained during these encounters may or may not be of value to them in future meetings.
Upon successful completion of all the scheduled meetings, the learners must present a solution to the customer. To design the solution, the learner asks a systems engineer several questions related to customer network requirements and performance objectives.

Learners then present the design to the customer decision-makers. Depending on their performance during the simulation, the resulting transaction can be of very high or very low value.

A variety of job-authentic features are available to the learner, including:

- A briefcase icon to research the customer company.
- A PDA icon to go to a list of links to external websites for more information on a technical topic.
- A cell phone icon to request help from a systems engineer.
- A “check your messages” icon that displays dynamically populated e-mail messages to provide feedback to learners about their answers to customers’ questions.
- A customer monitor arrow to scroll through icons of the customer characters. A green background indicates that the characters are reacting favorably to the learner’s responses. A yellow background indicates a neutral reaction. A red background indicates that the customers are reacting negatively to the learner’s responses. The learner’s goal is to ensure that all customer characters have a green background.

**Guided Discovery Elements**

S3 provides learners with a guided discovery approach through a learning experience that is based on solving job-related problems. Because the experience is designed and built from learning objects, information that is needed to solve the problems is presented only if the learners decide that they need it. Learners discover the solutions to the problems through the job-relevant tools and guidance available in S3 and construct their own mental model of the knowledge. This approach is appropriate for experienced learners, in this case account managers at Cisco, who need to apply their business skills and knowledge of new solutions, products, and technologies to their jobs.
Guided Discovery Example 2: Global Virtual Teams

Global Virtual Teams, Identify the People Problem

A. Team members have incompatible personalities.
B. People have different working styles.
C. Trust and a common bond are not yet established.
D. Not everyone is contributing.

Use the Resource buttons on the bottom of the screen to research the answer on the IT Virtual Teams Globalisation site.

Click Below To Continue.

Audience

All Cisco employees

Access Method

HR Learning and Development Catalog

Learner Experience Description

Learners explore content located on Cisco’s IT Globalization website. They do this as members of a fictitious ad hoc task force, following a new global virtual team through three meetings. Learners observe problems related to people, processes, and technology, and complete exercises that help them learn how to prevent or solve such issues as they arise. To complete the exercises, learners may choose to do some research, using the resource links provided at the bottom of each exercise screen. The resource links guide the learner to specific pages that are located on the IT Globalization website. Otherwise, the content required to answer the questions is not presented to the learner within the course itself. Learners can use a table of contents navigation feature to select the sequence in which they complete each section.
Guided Discovery Elements

This course makes excellent use of the guided discovery approach. Learners try to solve the highly relevant, job-based problems presented to them, with guidance available if needed. Tips and other resources found in the guidebook are formatted as learning objects so that they can be referenced in the guided discovery experience. Likewise, job-based problems and related guidance are built as learning objects. Learners construct their own mental models of the content. In a guided discovery learning experience, the learners take responsibility for researching the available content to complete each exercise. This approach is appropriate when the learners already have some experience in participating on work teams.

Exploratory

The exploratory approach allows the learners to search and browse freely throughout the content to find knowledge and information that meets their needs. Successful exploratory learning is based largely on the learners’ motivation to find what they need to perform a skill or acquire new knowledge. Examples include the World Wide Web, corporate information databases, and libraries. Although it is difficult to avoid putting in some structure (for example, a table of contents), the learners are free to explore and investigate anything that they feel is necessary to meet their needs.

Exploratory approaches meet learning requirements such as information, communication, and collaboration that are not necessarily met by traditional training programs. During the normal work process, each of these learning requirements may be accessed as the learner solves on-the-job problems and completes job tasks. To make this possible, the resources must be granular, properly tagged with metadata, and connected independently.

How Is It Used with Learning Objects?

The use of learning objects offers important advantages when developing learning experiences in an exploratory approach. Because learning objects are stored in a database and are created with rich search data (metadata), tools can be built to enable the learner to access any learning object found in the database. The search engine allows exploration based on any number of criteria, including content type, job task, interests, media, language, or related learning objects. The flexible, easy search and access capabilities inherent in the exploratory approach are key to the learner’s satisfaction during the learning experience.

Occasionally, available learning objects may fit into other approaches but not into the exploratory framework. In that case, the developer may build a needed learning object, tag it with search data, and deposit it in the database.

In all four of the approaches, a learning object, when updated, can be dynamically changed in all other learning experiences that reference the learning object. This gives the learners the up-to-date learning object regardless of which approach they are accessing.
Exploratory Example 1: FELC SE Enterprise Specialty Curriculums

SE Enterprise Specialty Curriculums

**Audience**

Systems engineers who want to qualify for membership on a specialty virtual team

**Access Method**

Online via FELC

**Learner Experience Description**

Learners determine which learning path to follow, based on the virtual team they wish to join. The learning path specifies a variety of assessment options which learners must complete to qualify for the team and recommends a variety of resources which learners can access to prepare for the assessments.

**Exploratory Elements**

Learners have complete control over which resources they choose to access. Links are provided to resources within the company, including white papers, VoDs, and ILT. Although each of these resources represents a large container, close examination reveals that each is constructed either from a series of granular learning objects or as a large single learning object (for example, a VoD). In the exploratory environment, learners are expected to construct their own knowledge bases from whatever information they choose to access. The exploratory approach is appropriate for systems engineers, who are generally experienced learners with good self-regulating skills.
Exploratory Example 2: AMLE

**Audience**

Field and channel account managers who need to build their knowledge of Cisco products, solutions, and technologies

**Access Method**

Online via FELC

**Learner Experience Description**

Learners can customize their learning experience, by choosing to work either online or offline, with a web-based e-lesson, interactive sales scenario, printable magazine, or audio talk show. Learners may also access “cheat sheets” to assist with completing the sales scenarios, an online discussion area, links to the FELC Resource Center, and a glossary.

AMLE courses are structured to maximize learner control. Each course is organized into several short lessons that use the RLO strategy, and learners have the freedom to move in and out of lessons, even from topic to topic, in any order they choose.

**Exploratory Elements**

AMLE courses use an exploratory learning approach that gives learners a high degree of control in choosing content sequence and delivery. The AMLE is constructed from learning objects and combined with an extensive set of learning delivery options and resources that enable learners to access learning objects in any order they choose, wherever and whenever they want. The exploratory approach is appropriate for Cisco account managers, who are experienced learners with the self-regulating skills required to construct their own knowledge bases.
The Future

As Cisco moves toward an increasingly learner-centric approach to learning, it advances the Internet-enabled technologies and systems necessary to support learning in myriad environments. To this end, Cisco is pursuing a variety of initiatives designed to enhance the learner experience through improvements in job task analysis techniques, training program evaluation, virtual classroom design, and learning object design.

Streamlined Learning Objects for Easier Maintenance

When the RLO strategy started, the focus was on conversion of legacy content in parallel development efforts. As a result, the number of similar or redundant learning objects was great. Now, as courses are updated, the number of redundant learning objects can be reduced and streamlined.

The structure of each learning object will be streamlined to reduce the amount of time that learners need to complete a course. Each course will have a reduced number of lessons, and within each lesson there will be a reduced number of topics. Content that changes frequently will be separated from core, more stable content to streamline the maintenance process. Likewise, content that is redundant with other learning offerings will be removed, so that only “core learning” is included in each course.

Improved Virtual Classrooms

Virtual classrooms offer clear advantages to distributed learners. From a business perspective, reduced travel costs and leveraging a small instructor pool are major benefits. Cisco will continue to improve the virtual classroom learner experience in three key areas:

- **Course design**: Materials that are used in the virtual classrooms should be based on learning objects, stimulating interactions and opportunities to collaborate with fellow learners in the virtual classroom experience.

- **Blended learning**: Practices and activities in a virtual classroom can be designed to leverage the capabilities of both ILT and self-paced web learning. For example, a team of remote learners can each configure its local networking device and then have the instructor test the connectivity of the network that they created.

- **Classroom management**: Although the design team can build learning objects with supporting interactions, simulations, and virtual classrooms, the instructor’s comfort with the materials and media can make the learning experience either more or less successful. Most virtual classrooms still use instructors who may be very knowledgeable about teaching traditional classes, or who may be SMEs in their respective areas, but who may not yet have learned the skills required to manage a remote, virtual classroom.
**Guided Discovery**

Cisco will move increasingly toward the guided discovery approach. The job-task, problem-based experiences used in the guided discovery approach should result in more effective performance of far transfer tasks for the company’s experienced learners. Although the design and development costs for guided discovery can be higher than for other approaches, Cisco plans to control costs by leveraging existing learning objects.

**Other**

Additional initiatives that may be part of the future learning experience at Cisco include:

- Notifying learners of content changes automatically
- Developing new methods to engage learners and ensure that they have achieved their learning objectives
- Advancing the use of system prescriptions and learner preferences to deliver learning objects in any learning approach and delivery medium
- Improving the capabilities of dynamically generated learning experiences to provide up-to-date skills and knowledge
- Integrating tools and processes that bridge the gap between information, communication, and training
- Continuing efforts toward increasing functionality of authoring; content management, and work flow; metadata application and management; delivery; and learning management applications to support improved learner-centric capabilities
- Increasing functionality of the applications to develop, manage, and deliver learning objects, including authoring systems for simulations
- Enabling learners to apply new knowledge and skills on the job by leveraging communities of practice to create new content
- Blending learning approaches and delivery media to provide the most effective methods for teaching the problem-solving skills and knowledge required for knowledge workers
- Tracking learner activity within simulations and problems to provide coaching feedback at a level of support that the learner selects
- Creating databases of problems, cases, and scenarios to leverage existing documentation, VoDs, and websites as research sources (for example, a course for employees on the competition could be a series of challenging questions related to one competitor, with answers to be found on the website)
- Creating a series of real-world problems that learners would receive in 15-minute segments every day (“problem of the day”), with a tracking tool to show what the learner has accomplished
- Enhancing use of audio and video as objects in learning materials
Summary

Cisco Systems is committed to building an effective learning environment in support of its employees, partners, and customers. In the Cisco learning ecosystem, knowledge workers can find information, exchange communications, collaborate, and obtain training. With the learner’s needs and preferences in mind, Cisco advances the development and design of infrastructures, applications, system architectures, and content structures that support the knowledge worker.

In Enhancing the Learner Experience, Cisco reviews the Reusable Learning Object (RLO) strategy that it presented in 2001. Three scenarios selected to illustrate formal training, interactive learning, and the virtual classroom describe the processes, environments, and results that learners may currently experience. While building on this foundation, Cisco is pursuing the next generation of learning technologies.

By leveraging learning objects in newly expanded learning approaches, such as guided discovery and exploratory, Cisco offers examples of ways in which learners may access more flexible and sophisticated resources to meet their learning needs and business goals. The guided discovery approach, in particular, provides real-world, problem-based learning experiences that can be delivered to busy, results-oriented knowledge workers, wherever and whenever they choose.

Future pursuits in learner-centric approaches include Internet-enabled job task analysis, object-enabled learner satisfaction, streamlined learning objects for easier maintenance, and improved virtual classrooms. Increased functionality in applications, tools, and content management will expedite the transfer of information, communications, and skills to the job and encourage collaboration throughout the learning community. With these goals in mind, Cisco plans to engage learners and ensure their success throughout the future learning experience for employees, customers, and partners.
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