



Why are San Diego Zoo Global Academy Courses Effective?

At the Association of Zoos and Aquariums Conference in September 2013 CypherWorx, Inc. and San Diego Zoo Global announced the preliminary results of our efficacy testing. You can find those results following this introduction. For that study an evaluation was conducted to assess the efficacy of the Academy training. The study involved the first four animal care courses. Professionals from four organizations across the United States served as the study participants.

A total of 155 individuals completed one or more of the Academy courses. Pre- and Post-tests, aligned with each course's designated outcomes, were administered just prior to, and immediately following, training. A follow-up assessment was also administered to a smaller group to gauge knowledge retention.

What the results told us is that knowledge gains were significant and retention of that information was also very strong. Gains in knowledge were recorded for each of the four tested courses. Average gains ranged from a low of 7 percentage points, to a high of almost 23 percentage points. In all cases, the difference between pre- and post-test means was statistically significant—indicating little to no probability that the observed mean differences were the result of random chance. While pretest scores varied by course, recorded post-test score means all clustered in the mid-90% range—between 93.8% and 96.8%. This indicates a high degree of mastery, regardless of the individual's performance level when the course began.

Retention of learned skills and knowledge over time is an equally important factor for determining the efficacy of the Academy courses. Two of the pilot testing organizations agreed to conduct a follow-up assessment. Participants completed a follow-up test for the Zoonosis course 90 days after posttest administration. Results indicate that, following an initial gain of 15.7 percentage points and achieving a posttest mean of 96.5%, students maintained 10.2 of the original percentage 15.7 point gain. This equates to 67% retention of the gained knowledge, relative to posttest performance.

We have been asked why the results of this eLearning program are so significant. A new study published in The Journal of Applied Instructional Design (www.jaidpub.org · October 2013 · ISSN: 2160-5289) outlines the reason why the instructional design approach used in the Animal Care Courses is so effective in producing results. Instructional Designers at CypherWorx, SDZGA's eLearning partner focused on the following design aspects to bring world-class content to life when building the courses:

- **Using Case Studies to Attain and Maintain the Learner's Attention and make learning relevant**
- **Using Rich Visuals to Convey Content**
- **Building Confidence through Illustration of Facts and Concepts**
- **Maintaining Attention with Variability**
- **Building Confidence and Ensuring Satisfaction with Feedback**
- **Learning Guidance through Examples and Non-examples, Advance Organizers and Mnemonics**
- **Using Elaboration Theory and Advance Organizers to Motivate**
- **Establishing Relevance with Examples and Non-examples**

Following is the efficacy test results and full published paper to give you more details on the instructional design approach utilized to produce these significant results.



CypherWorx Online Professional Development

An Efficacy Study of Knowledge Gains and Attitudinal Outcomes in San Diego Zoo Global Academy Courses

CypherWorx, Inc. helps organizations transition to online training by designing intuitive, interactive, and social learning opportunities. Through a partnership with San Diego Zoo Global, CypherWorx has developed a catalog of courses that guide the learner through many aspects of animal care. These courses, paired with a [CollaborNation Collaborative Learning Environment®](#), have created the San Diego Zoo Global Academy.

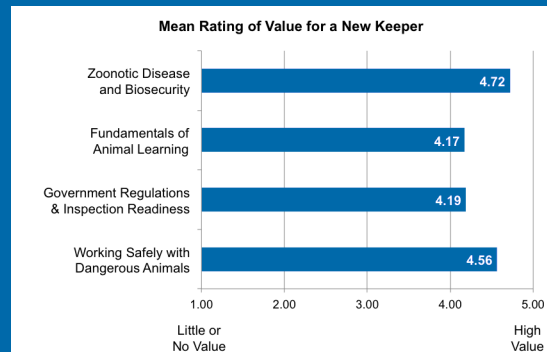
This Study

An evaluation was conducted to assess the efficacy of the Academy training. The study involved the first four animal care courses. Professionals from four organizations across the United States served as the study participants.

A total of 155 individuals completed one or more of the Academy courses. Pre- and posttests, aligned with each course's designated outcomes, were administered just prior to, and immediately following, training. A follow-up assessment was also administered to a smaller group to gauge knowledge retention.

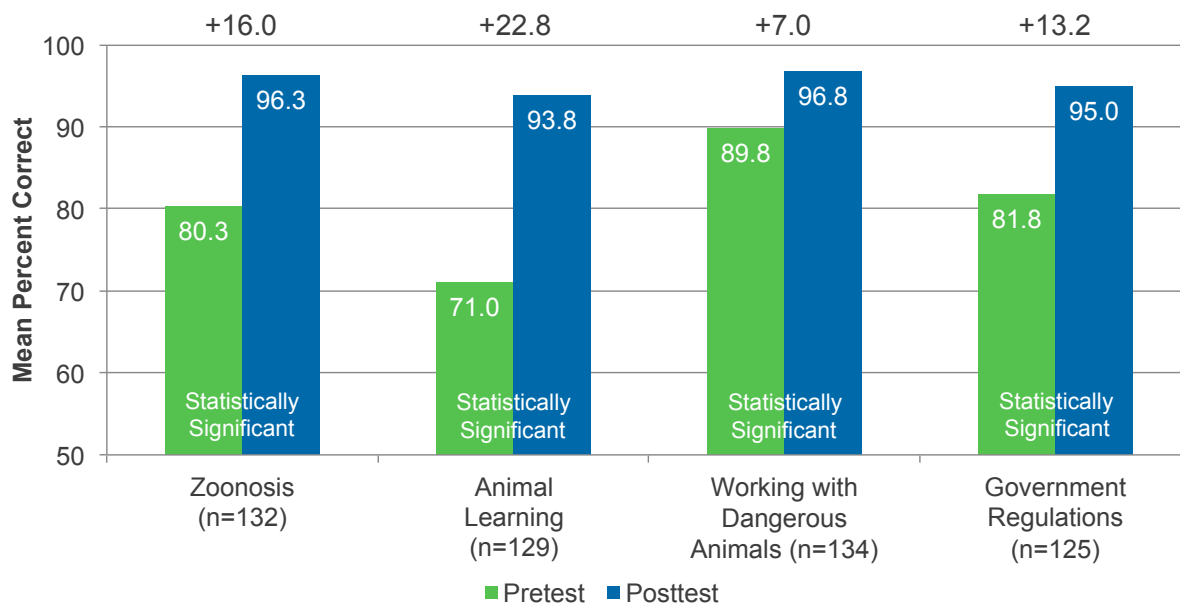
Animal Care Academy Courses: High Value to Keepers

Course topics were selected for their broad applicability to zoos, parks, and aquariums. This pilot involved the first four animal care courses. Participant responses confirmed the relevance of these topics. When asked to rate the value of each course for a new keeper, the following results were recorded.



Key Findings

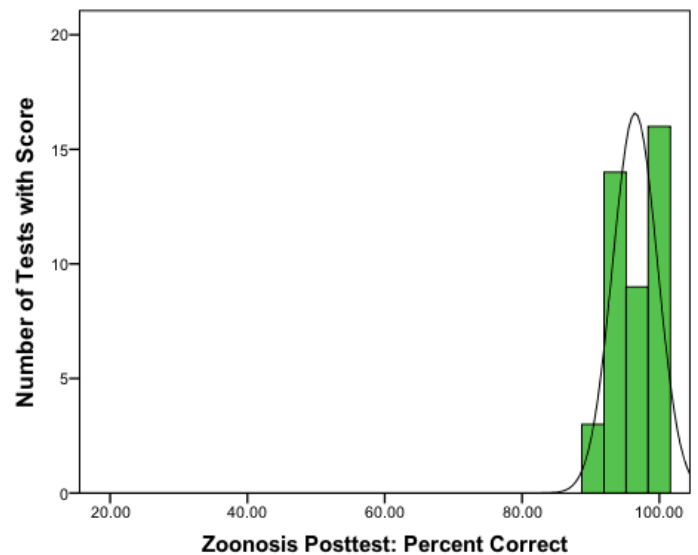
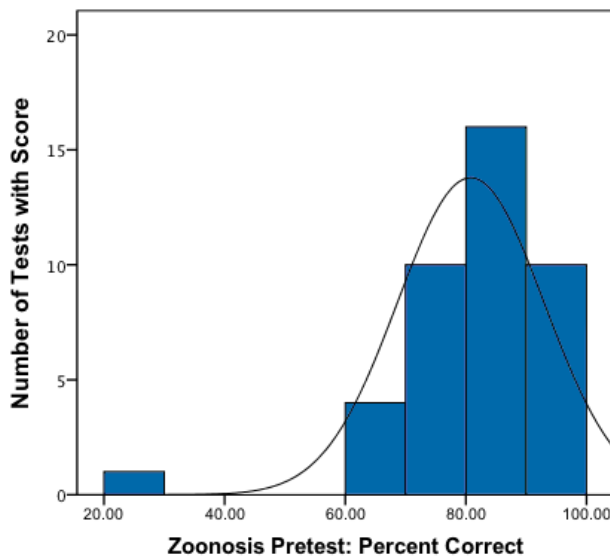
1. Animal Care Personnel Increase Knowledge and Demonstrate Consistent Mastery of Content



Gains in knowledge were recorded for each of the four tested courses. Average gains ranged from a low of 7 percentage points, to a high of almost 23 percentage points. In all cases, the difference between pre- and posttest means was statistically significant—indicating little to no probability that the observed mean differences were the result of random chance (significance varied between $p \leq .004$ — $p \leq .000$).

While pretest scores varied by course, recorded posttest score means all clustered in the mid-90% range—between 93.8% and 96.8%. This indicates a high degree of mastery, regardless of the individual's performance level when the course began.

2. Participants Achieve Consistently High Posttest Scores—Regardless of Pretest Performance



For each of the four courses, participants raised their performance from pre- to posttest. In addition, the variance across participant scores was effectively reduced. Upon posttesting, participants possessed greater knowledge of the content—and the range between the highest and lowest test score was significantly reduced.

For example, Zoonosis course pretest scores averaged 80.3% with a standard deviation of 9.5 points. The wide distribution in the first figure (Zoonosis Pretest) illustrates this range of performance. After completing the Zoonosis course, the posttest average score was 96.3% with a standard deviation of 3.4. The second figure (Zoonosis Posttest) illustrates the posttest scores which are clustered more closely, around the higher posttest mean.

Similar growth patterns, including this reduction in range of participant pre- and posttest scores, were noted for each of the four courses.

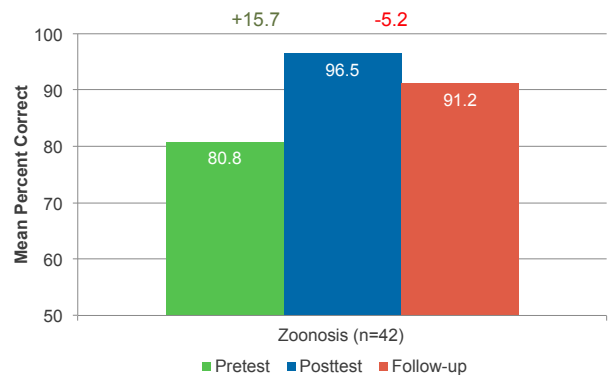
3. Participants Retain 67% of Their Gained Knowledge 90 Days Later

Retention of learned skills and knowledge over time is an equally important factor for determining the efficacy of the Academy courses. Forty-two of the original participants completed a follow-up test for the Zoonosis course 90 days after posttest administration.

Results indicate that, following an initial gain of 15.7 percentage points and achieving a posttest mean of 96.5%, students maintained 10.4 of the original gain. The differences between the pre- and posttest, and pretest and follow-up scores were statistically significant ($p < .000$).

This equates to retention of 67% the gained knowledge, relative to posttest performance.

Pre- and Posttest, and 90-day Follow-up Scores

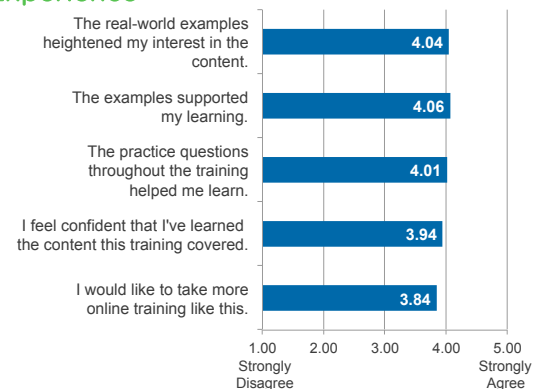


4. Participants Favor Online Learning for Professional Development

Participants gave the full range of course components high marks. In particular, these learners favored the real-world video case studies featured in each course. On average, participants believed that they had learned each course's content—suggesting confidence with the subject matter.

The majority of participants indicated a willingness to complete additional online training. This proved true regardless of the learner's age. In fact, the older, more experienced participants indicated a greater desire to engage in online learning and a greater enjoyment of the online learning experience.

Mean Participant Ratings of Course Experience





About the

San Diego Zoo Global Academy

San Diego Zoo Global Academy is a powerful online learning platform that harnesses the expertise of San Diego Zoo Global and its partners to offer courses that meet the specific needs of individuals in the zoological profession. Using compelling, relevant content, the Academy immerses learners in the subject matter, presents challenging and thought-provoking material, and guides learners in a creative and engaging manner as they build professional skills.

www.sdzglobalacademy.com



About

CypherWorx, Inc.

CypherWorx helps organizations transition to online training by designing intuitive, interactive, and social learning opportunities. After years of working in the nonprofit sector, Paul Cypher founded CypherWorx to provide the training solution nonprofits needed. Since then the company has worked with organizations eager to take the next big step in member education.

www.cypherworx.com

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Motivating e-Learners: Application of the ARCS Model to e-Learning for San Diego Zoo Global's Animal Care Professionals

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Abstract: With dropout rates more than double that of classroom-based training, online learning comes with inherent challenges. Careful and deliberate instructional design can increase the effectiveness of online courses—including the motivating of learners to engage with the instruction and persist to course completion. This article describes the application of the ARCS Model of Motivation to the development of animal care e-learning at San Diego Zoo Global. It highlights five tactics represented in the developed training as best practices, and describes the alignment of each to ARCS model components.

Keywords: e-learning, ARCS, motivation, instructional design, training

Introduction

Not-for-profit zoos, aquariums, museums, and analogous non-profit institutions often face steep budgetary and other resource-related barriers. This is certainly true when it comes to providing consistent employee and volunteer training, and ongoing development of these important human resources. San Diego Zoo Global (SDZG) sought to address this challenge by implementing an online learning program for employees and volunteers. The anticipated benefits included standardized, replicable training that was cost-effective to deliver.

Beyond its own workforce, SDZG envisioned delivering the e-learning to similar institutions around the globe. Careful consideration was given to the organization of content and module topics. The initial development included a 13-module program to train individuals who care for exotic animals. SDZG anticipated that sitting behind a computer could be an unattractive way to learn for many in this audience of animal keepers. With their typical day spent outdoors, caring for, and interacting with, animals, it is not difficult to imagine some disfavor when it comes to being “sentenced” to complete e-learning modules in an office, on a computer or tablet.

The design team dedicated itself to the application of motivational strategies to address both the audience, and its acquisition of the complex content to be covered. The team leveraged the ARCS Model of Motivation (Keller, 2010; Keller, 1987) as its framework and integrated related strategies both in the overall course design, and throughout each of the developed modules.

This article describes the integration of tactics to motivate the organization's e-learners as organized by Keller's ARCS Model of Motivation (2010). In particular, the case highlights the e-learning modules produced to train animal care professionals as an applied example.

Background

Moving to an e-learning delivery model can be a challenging transition for any organization. Yet, this transition is occurring. The American Society of Training and Development's 2012 industry report found 37.3% of training hours overall are now delivered via online or computer-based technologies (ASTD, 2012). Mobile and social network-based learning are more recent contenders with which organizations must increasingly grapple.

Table 1. *Keller's ARCS Model Summary (Keller, 1987)*

Category	Definition	Basic Tactics
Attention	Capturing the learner's interest; stimulating curiosity to learn	<ul style="list-style-type: none"> • Perceptual arousal: capturing learner interest • Inquiry arousal: stimulating an attitude of inquiry • Variability: maintaining learner attention over time
Relevance	Meeting the learner's needs and goals, effecting a positive outcome	<ul style="list-style-type: none"> • Goal orientation: meeting learner's needs • Motive matching: providing learners with appropriate choices, responsibilities, and influences • Familiarity: tying instruction to learner's experiences
Confidence	Helping the learner build the belief that s/he will succeed, and giving the learner control over his/her success	<ul style="list-style-type: none"> • Learning requirements: building a positive expectation for success • Success opportunities: enhancing learners' beliefs in their competence • Personal control: illustrating that learner success is based on their efforts and abilities
Satisfaction	Reinforcing the learner's accomplishments with internal/external rewards	<ul style="list-style-type: none"> • Natural consequences: providing meaningful opportunities for learners to use their newly acquired knowledge • Positive consequences: providing reinforcement to learners' success

When compared to the corporate sector, most non-profit organizations face smaller budgets. Smaller organizations may also lack the internal know-how—both with regard to subject matter and instructional design. Plus, e-learning comes with its own challenges. Carr (2008) estimates the dropout rate for online students to be 10–20% higher relative to that of the traditional classroom. Levy (2007), in a review of the literature, notes attrition rate estimates for distance and correspondence education range from 25% to 60%. While reported attrition rates for adult, organization-based e-learning courses vary widely, most are unquestionably higher than their traditional, classroom-based training equivalents.

For organizations to optimize their investment in e-learning and combat the threat of attrition, instructional designers must carefully attend to the learner. Careful consideration and accommodation of the target audience's prior knowledge, interests, and experiences all inform the design of motivating instruction.

Motivating the e-Learner

Motivational design in the context of learning refers to “strategies, principles, processes, and tactics for stimulating and sustaining the goal-oriented behavior of learners” (Keller, 2010, p. 23). It is not separate from the process of instructional design and learning environment design, but rather a subset of those disciplines.

The ARCS model was developed by John Keller based on an extensive review of motivational literature, and then honed through application and research over

time. A clustering of motivational concepts based on their shared attributes yielded four major categories: *Attention*, *Relevance*, *Confidence*, and *Satisfaction* (Keller, 1987). Each precipitates specific strategies for stimulating motivation. Successful application requires a keen understanding of the targeted audience, the involved content, and the application of that content on the job. Table 1 (Keller, 1987) provides an overview of the ARCS Model and includes a brief summary of related tactics.

Motivating San Diego Zoo Global's e-Learners

San Diego Zoo Global is not your typical non-profit. Over 3,000 employees in more than 35 countries, and over 2,000 volunteers, support an organization that is ranked the number one zoo in the nation for attendance. Over 5 million people visit one of its campuses each year. The organization's rich history dates back to the zoo's founding in 1916 with animals left behind by the Panama-California exposition. The 97 intervening years have seen the organization grow in many ways. Its innovations in animal care, exhibit design and interpretation have garnered global recognition. But these advancements, and the resulting best practices, often remain within the organization, buried in pockets of its two campuses and countless research posts across the globe. The organization recognized that dissemination of this expertise could benefit its employees and peers in similar organizations if leveraged as the foundation for its workforce development.

Begun in 2010 through a partnership with San Diego State University's Department of Learning Design and Performance, SDZG and its development

partner have now produced more than 20 training modules that cover animal care, animal natural history, human resources, customer service and interpretation content. The initiative commenced with the development of animal care-focused e-learning. ARCS-supported tactics were employed throughout the coursework to build and sustain the learner's motivation for engaging with the instruction and achieving the outcomes it involved. Table 2 provides an overview of these tactics that have been applied to the full complement of e-learning modules—whether targeting animal care, customer service or interpretive training. Descriptions and examples of each of the five tactics follow Table 2.

Tactic 1—Case Studies using Zoo-related History and Experience

Many consider storytelling to be the oldest instructional strategy. Societies have conveyed key pieces of information in this way throughout history (Andrew, Hull & Donohue, 2009). Yet, in 2009 a study e-learning practice, Marshall & Rossett (2010) found that just 25.8% of responding practitioners regularly based their e-learning programs on realistic scenarios that press employees to make choices and learn from

the results of those choices. Only 14.3% indicated aspirations to do so in the future.

SDZG wanted its workforce professionals, as well as those in similar organizations around the world, to benefit from the considerable institutional knowledge generated by a century's worth of experience. The e-learning design benefits from the organization's vast experience through integrated case studies that provide a vivid context for the content each module delivers. The case studies align with the ARCS model categories of *Attention* and *Relevance* in particular.

Case Studies to Attain and Maintain the Learner's Attention

Inquiry arousal involves raising a question in the learners mind. That question serves to press the learner to find an answer, which is accomplished through engagement with the instruction. The animal care e-learning modules are designed with "bookends" that provide an introduction and conclusion in the form of a video-delivered case study. The introductory video introduces the case by presenting a real-life problem or case that the San Diego Zoo faced at a given point in its history. The learner is then challenged to consider how

Table 2. Overview of Strategies and ARCS Component Examples

Strategy	Examples ARCS Components Addressed
1. Case Studies	<ul style="list-style-type: none"> • Uses inquiry arousal to gain attention by stimulating curiosity. • Connects the learner's interest in, and familiarity with, animal care with relevant problems from SDZG's history.
2. Rich Visuals	<ul style="list-style-type: none"> • Stimulates perceptual arousal, captivating the learner's attention through visual interest. • Visually demonstrates techniques to aid in their demystification, creating a positive expectation for success, and thus building the learner's confidence.
3. Module Organization	<ul style="list-style-type: none"> • Standardized interface and module sequencing reduces extraneous cognitive load and makes learning more efficient, resulting in increased confidence for learning, and satisfaction with the learning experience.
4. Interaction	<ul style="list-style-type: none"> • Interaction provides variability in the learning experience to support maintaining the learner's attention. • Interactive assessments that closely follow the presentation of new material allow learners to test their mastery in a safe environment, building confidence and positive expectations for success. • Feedback provides learners with reinforcement and positive outcomes from their efforts, which can boost satisfaction.
5. Learning Guidance	<ul style="list-style-type: none"> • Advance organizers, coupled with case studies that pose questions and stimulate inquiry, help to gain and maintain learner attention by providing clues as to how topics will build on and connect to one another. Supporting the learner in making such connections increases confidence. • Provides an overview of how information will progress, indicating how the mastery of one topic can lead to the mastery of the next. Examples vs. non-examples present a view of what success looks like, building confidence by providing a concrete path to success and guiding against potential pitfalls. • Elaboration theory provides a roadmap that gives learners cues as to what successful assimilation of information looks like. When learners successfully traverse that roadmap, the schema that the advance organizers presented support satisfaction.

Table 3. *e-Learning Module Organization and Strategy*

Menu Category	Strategic Purpose
Introduction	<p>The introduction section profiles module creators and presents the introductory video-based case study.</p> <p>Introduction to the module creator(s). The introduction provides a brief biography of each Subject Matter Expert (SME) and a brief statement of why he or she believes the material presented in the module is of vital importance. This serves to promote the accuracy and credibility of the module content in a field where such authentication is regularly questioned. In addition, it serves to establish the topic's relevance in the animal care field.</p> <p>Video case study. A 2-3 minute video case study depicts a real-world case relevant to the module material. Each concludes by prompting the learner with a question that should be considered as he or she accumulates new knowledge throughout the module.</p>
Objectives	The objectives section alerts the learner to the model's outcomes which he or she is expected to master. The objectives provide the learner with an advance organizer or basic scaffolding for the content with which the learner will engage. Understanding what is expected serves as a building block toward increasing learner confidence.
Content	The core content in each module. It contains text for the learner to read, multimedia such as video and visual diagrams, and opportunities for interactive practice and feedback. Strategies employed here, and described throughout this article, attend to all ARCS model categories.
Practice	The practice section provides a final opportunity for practice and feedback before the learner proceeds to a mastery quiz. Practice topics are comprehensive and provide a variety of questions that involve content across the entire module. Practice and feedback are a critical means for building confidence. In addition, and when well designed, such opportunities support the satisfaction component of ARCS.
Conclusion	Here, the resolution to the video case study is presented. It explains how the module material applies to the challenge posed in the case study and examines the best practices as they relate to addressing that challenge. Again, because case study content is drawn from real-life, critical episodes in SDZG history, these e-learning elements serve to gain and maintain attention and establish relevance for the instruction. In addition, learners may build their confidence as they reach the case study conclusion and observe their solutions and underlying thinking match that of the experts.

that challenge might best be resolved. As the module concludes, the e-learner is reminded of this framing case study. He or she is challenged to offer a solution, after which the historical solution is presented in a concluding video.

Inquiry, or curiosity, arousal has been shown to increase recall and performance. Keller (2010) cites an interesting example of how this can work. He explains how Berlyne (1954) conducted a study in which one group of students was given a set of "fore" questions prior to instruction, while another group was given only instruction. This researcher found that the fore questions resulted in greater curiosity towards the instruction and better recall when presented with a set of post-questions following instruction.

Keller notes that attention is heightened when case study details are concrete, rather than abstract. Keller suggests, "Generally speaking, people are more interested in specific people and events than in abstractions" (Keller, 2010, p. 93). The e-learning benefits from "real," animal care-related episodes from SDZG's rich history. For example, Newcastle's Disease, which could have affected the organization's entire avian population, is used to bookend the Zoonosis and Biosecurity module. The learner is presented with

the problem of a potential spread of the disease throughout the collection and challenged to pursue the instruction for a solution. Each module's conclusion provides the historical resolution to the presented case.

Video, with rich images and sounds, was employed for the case studies with purpose. As Bishop and Sonnenschein observe, "sounds are particularly good at gaining attention because, unlike eyes, ears can never be averted or shut with 'earlids'" (p. 6). Here, the dual emphasis on visuals and sounds reflects the animal care audience. These are professionals who rely heavily on both senses when caring for animals, not to mention assuring their safety, in the field.

Case Studies to make Learning Relevant

A carefully selected case can also motivate learners by making the e-learning relevant. Careful analysis that explores the work, worker and workplace (Rossett, 1999), is prerequisite to identifying a relevant case topic, and designing a case study that aligns with the target audience. Zoo personnel are passionate about animals and dedicated to providing their charges with the best, and most proper care. The fact that case studies are pulled from historical challenges faced by SDZG animal care professionals like themselves provides authenticity and relevance. The audience is

challenged to solve problems similar to those they will face in the course of their daily work and career.

Tactic 2—Rich Visuals to Convey Content

Integrating rich visuals into the e-learning was largely a foregone conclusion, given the audience and content. Caring for animals is a visually-intensive pursuit. Will Rogers said, “The best doctor in the world is the veterinarian. He can’t ask his patients what is the matter—he’s got to just know.” The same is true for animal keepers. Their daily observations of animals must detect the subtlest of changes in appearance or behavior.

Given the considerable visual component of their work, it is not difficult to imagine how a largely text-based e-learning experience would threaten the e-learners motivation to persist. Rich visuals were carefully integrated into the e-learning to motivate the learner, most directly in the *Confidence* and *Attention* categories.

Building Confidence through Illustration of Facts and Concepts

The act of animal husbandry and care is comprised of many active, physical tasks. At first glance, such outcomes may seem a less-than-optimal match for e-learning delivery. The fact that these types

of outcomes may not be best presented verbally or via text was carefully considered and directly addressed. A significant part of the solution was deliberate use of visuals to facilitate learning, and support the e-learner’s burgeoning confidence toward mastering the subject matter.

Creating a positive expectation for success is one strategy for building learner confidence. The ability to depict important tasks visually, especially complex procedures, demystifies those tasks. That demystification enables the learner to visualize his or her own successful completion of those tasks, thus increasing learner confidence.

The *Zoonotic Disease and Biosecurity* module provides an example. It includes significant amounts of content addressing the proper use of Personal Protective Equipment (PPE) to reduce the probability of contact with infectious material. This includes specific steps for donning and doffing PPE properly. Physical motor skills for a task such as removing gloves without coming in contact with potentially contaminated areas can be difficult to describe verbally. As a result, the use of video was vital for communicating these particular concepts. The step-by-step process for proper donning and doffing PPE was shot in high definition video and enhanced to highlight crucial details by attending to

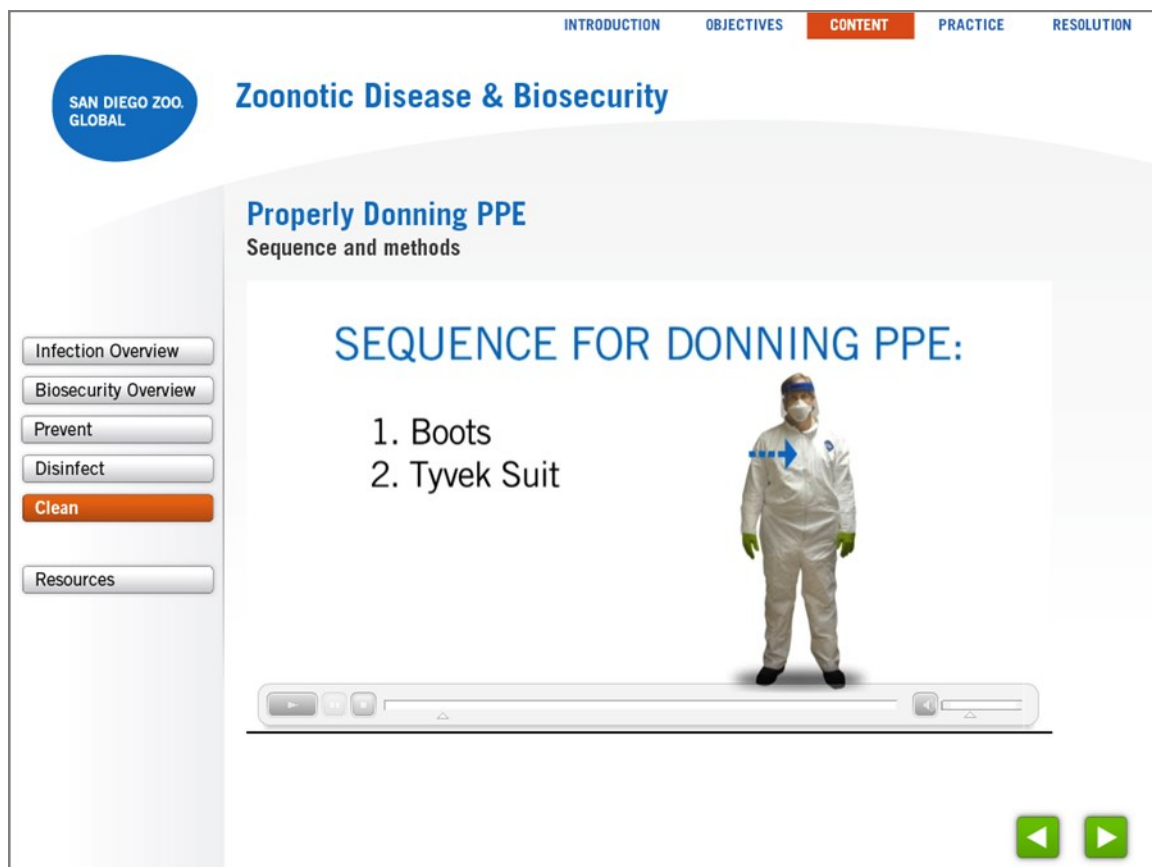


Figure 1. Rich Visuals and Video to Support Confidence in Procedural Tasks Gaining Attention with Visuals.

optimal performance and common mistakes identified through task analysis (Figure 1).

Gaining Attention with Visuals

The use of rich visuals is an equally effective tactic for gaining and maintaining learner attention. One of the ARCS basic tactics for gaining attention is perceptual arousal; in this case, using dynamic visuals to captivate the learner. With thousands of visual assets to choose from, San Diego Zoo Global e-Learning extensively leverages perceptual arousal to capture attention.

Here too, the need for concreteness is accommodated. Using rich media provides both specificity and concreteness. In addition, variability in the types of media employed helps maintain the learner's attention over the course of an instructional session.

Tactic 3—Standardized Module Organization and Flow

Managing the learner's cognitive load is an important aspect of any product's instructional design (Sweller, 2005). This is especially true for e-learning products that must facilitate the learner's focus on content, and minimize extraneous cognitive load (i.e., time spent understanding the module's organization, or determining how to operate the interface). Successful management of cognitive load not only promotes learning, but can also positively affect learner persistence in a given learning experience.

The e-learning design carefully attended to cognitive load through both the user interface (UI) and flow of information. Major module sections were standardized. Modules were outfitted with a standardized top menu (Figure 2). The module organization, represented in the highest-level, five-section, top-right menu, is consistent across all modules (see Table 3). As the learner traverses the module, the menu automatically highlights his or her position. As a result, this menu serves two primary functions:

- Advanced organizer: The menu serves as the module roadmap, laying out the path for the flow of content in a standardized way across all modules.
- Position Tracking: Tracks the learner's current location.

As a result, learners become familiar with the structure, and dedicate less processing time to interpreting the module's organization and operation (AITaboli & Abou-Zeid, 2007). Table 3 describes each module element and highlights its strategic role in motivating the e-learner.

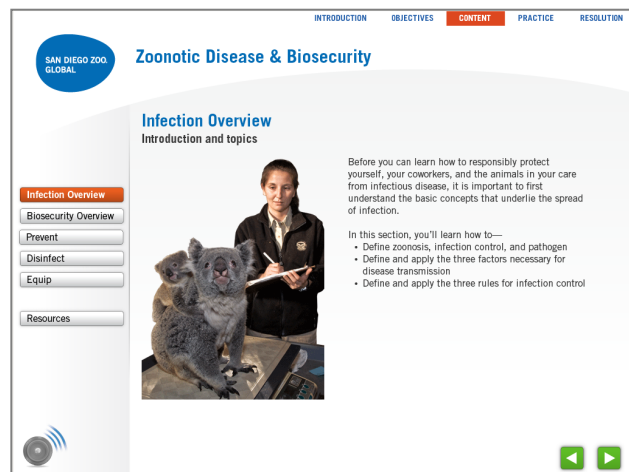


Figure 2. Standardized Interface to Reduce Extraneous Cognitive Load

Tactic 4—Interactive Practice and Feedback

Embedded opportunities for the learners to interact with the module content provide another tactic that supports motivation. Interaction stands in stark contrast to e-learning products that are little more than document text repurposed for online delivery. Interactivity can impact each of the ARCS categories, but is perhaps most directly aligned with *Attention* and *Confidence*.

Maintaining Attention with Variability

Variation in module's content delivery helps to maintain learner attention over time. Interactivity is a helpful tool to vary module content in an intuitive way. Presentation of new information can be followed by interactive, informal checks for knowledge. Regular e-learning segments that require the learner to take action and control of the content delivery and progression provide this variability.

Building Confidence and Ensuring Satisfaction with Feedback

Motivating instruction also supports the learner in building confidence with the module's content. Providing opportunities for the learner to "prove" newly acquired knowledge supports incremental increases in confidence as the subject matter is mastered. The SDZG animal care modules incorporate interstitial checks for understanding and provide opportunities for application of learned content. Each interaction allows the learner personal control over the experience. As a result, the learner's success is within his or her own grasp. Interactivity, in the form of a variety of interactive exercises and queries, cue the learner to exert his or her mastery over newly acquired material. Basic examples include multiple choice, matching, and fill in the blank questions. More complex, scenario-based activities that challenge the learner with multiple dimensions are also offered (Figures 3-7).

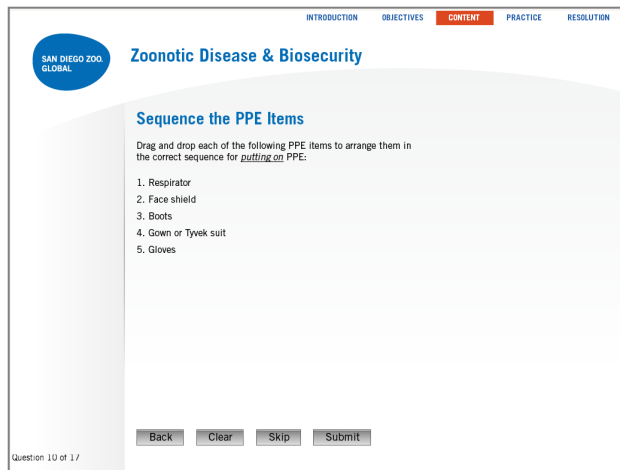


Figure 3. Example Interactive—Sequencing Question.

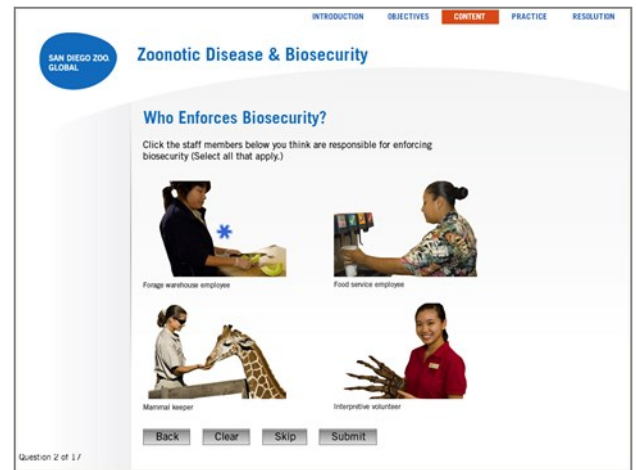


Figure 6: Example Interactive—Visual Identification Question

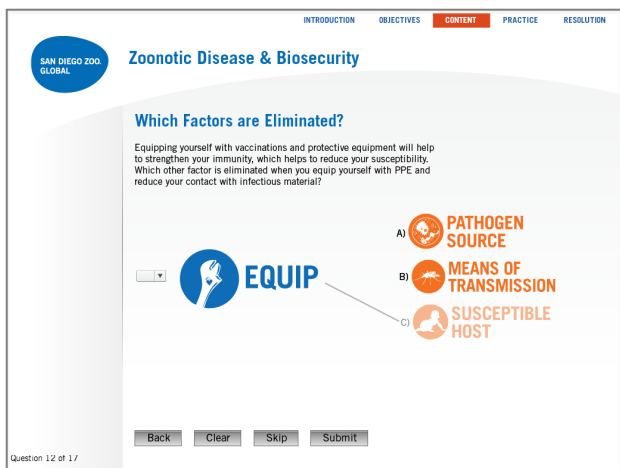


Figure 4: Example Interactive—Visual Multiple Choice Question.

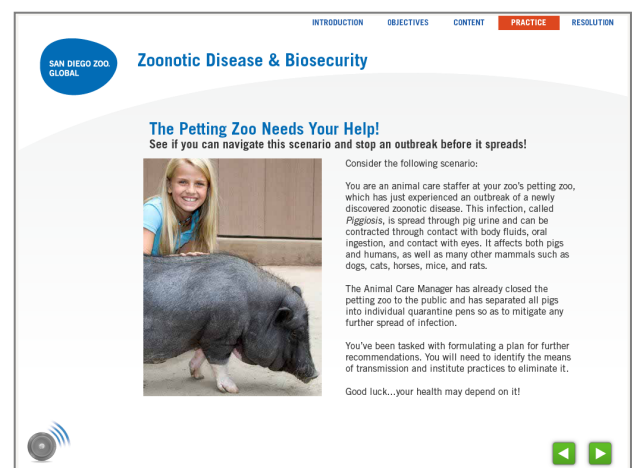


Figure 7: Interactive Example—Scenario-based

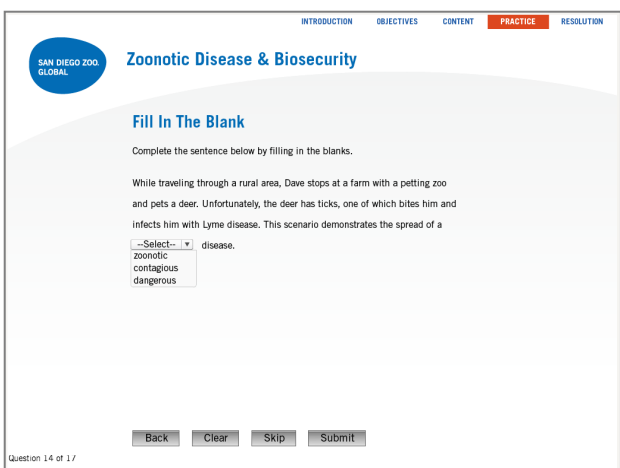


Figure 5: Example Interactive—Fill-in-the-Blank Question

Successful instruction also attends to learner satisfaction. Feedback is a helpful tactic for accomplishing this important ARCS category. In particular, Keller (2010) suggests that designers “provide feedback and other information that reinforces positive feelings for personal effort and accomplishment” (p. 189). Regular opportunities for both interaction and feedback promote learner satisfaction. Such interactions must be perfectly aligned with presented content. A difference between the content that is presented and assessed causes a significant threat to learner satisfaction.

Tactic 5—Learning Guidance through Examples and Non-examples, Advance Organizers and Mnemonics

Learning guidance provides the learner with instructions and support as he or she works to internalize the module content. Here, the modules employ specific strategies to direct the acquisition of knowledge. Successful design helps manage the learner’s cognitive load over the course of a multi-hour, content-rich e-learning module. As a result, learning guidance can support the e-learner’s motivation across each of the four ARCS categories.

Using Elaboration Theory and Advance Organizers to Motivate

Elaboration Theory (Reigeluth, 1992) suggests that instruction should be structured and presented in an order of increasing complexity. Fundamental ideas are presented first, with increasingly complex, related ideas added throughout the course of instruction. The complexity of the animal care module topics provided regular opportunities to sequence instruction in this manner.

The Zoonotic Disease and Biosecurity module provides a helpful example. The initial content section defines a zoonotic disease, proceeding to describe its characteristics and how it is spread from host to host. This introductory segment is followed by multiple sub-sections identifying various, increasingly complex, strategies for preventing disease transmission. The instruction moves from simple strategies like proper hand washing, to more complex procedures such as proper sequencing of donning and doffing personal protective equipment.

The use of advance organizers further supports this elaboration of content. Advance organizers present the learner with a high-level roadmap of how the instruction will unfold. This prompts awareness of the relevant knowledge ahead, before that knowledge is actually presented. As a result, the learner can construct a preliminary schema onto which increasing levels of elaborated content can be placed.

The Zoonotic Disease and Biosecurity module employs advance organizers, as depicted in Figure 8. This screen is from the introductory segment that defines zoonotic disease and modes of transmission. After these fundamental ideas are presented, this screen closes the segment. It primes the learner by highlighting the topics to come, and representing each topic graphically and with text. These key words and corresponding images are then used throughout the

module to activate the learner's schema as established by this advance organizer.

The use of elaboration theory, coupled with advance organizers, serves to motivate the learner in each of the following ways.

- Attention is gained through inquiry arousal. For example, in the Zoonotic Disease and Biosecurity module: Following presentation of the means by which disease is transmitted, the learner is presented with an overview of topics to come that serve to prevent transmission. This stimulates a natural inquiry process during which the learner envisions how those topics might be connected.
- Relevance is established by linking constructed schema to upcoming content; learners observe how the information just learned connects to content ahead. Advance organizers provide a “bigger-picture” view—in this case a full view of the basics of disease prevention.
- Confidence with the subject matter is realized as the learner actively makes connections among diverse pieces of content, and realizes his or her evolution from a basic, to an increasingly more complex understanding of the involved content.

Establishing Relevance with Examples and Non-examples

Examples of best practice contrasted with examples of poor performance can be powerful tools for building learner confidence. Such examples can provide a definitive picture of what success looks like for the learner to model. Non-examples are equally important. Understanding sub-optimal performance and common mistakes can help insure against such challenges resulting from incomplete training.

The Zoonotic Disease and Biosecurity module utilizes video to define optimal practice for a seemingly simple, yet often incorrectly performed, hand-washing procedure. The learner is initially presented with a video that shows hands washed for only 10-12 seconds and is then prompted to input whether he or she believes video depicts adequate washing (Figure 9). This serves as the non-example; the learner is instructed that the hands in the video were not washed for a proper duration and proper technique was not used.

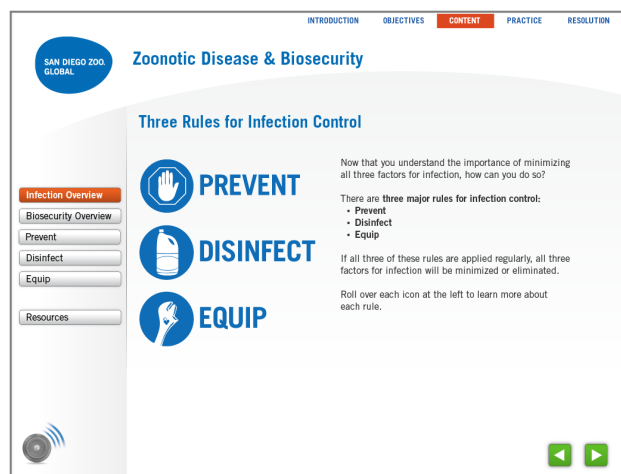


Figure 8. Advance Organizer Example

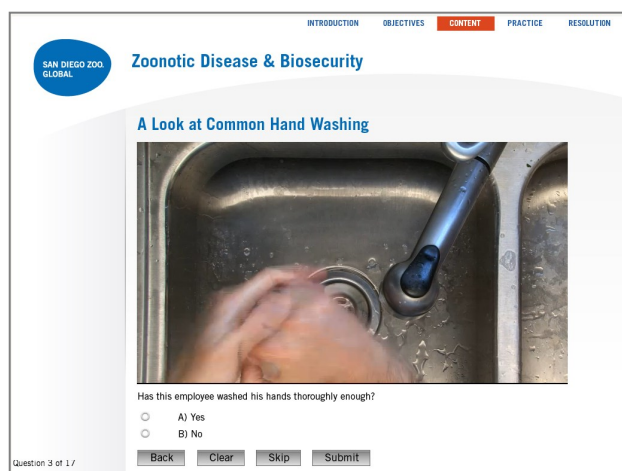


Figure 9. Non-Example—Handwashing Challenge

The following screen presents a video with the optimal duration and method for hand washing, followed by text that describes key performance points for hand washing technique (Figure 10). The contrasting non-example/example sequence serves to build the learner's confidence by modeling proper technique and guarding against typical shortcomings identified through task analysis.

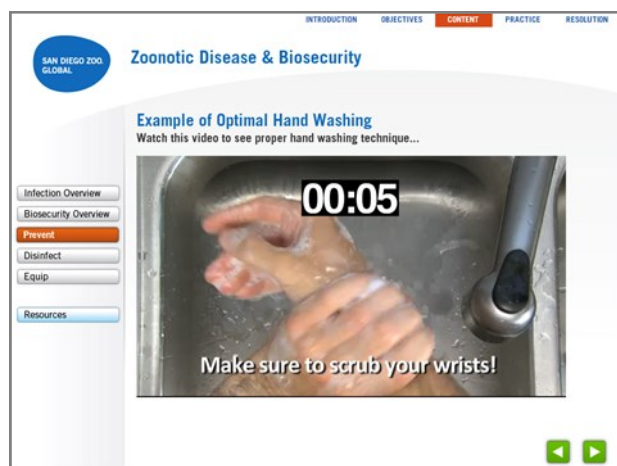


Figure 10: Handwashing Worked Example

Conclusion

Learner motivation is an important element of any instructional endeavor. When designing e-learning, careful attention must be paid to the e-learner—including attaining and maintaining attention, demonstrating content relevance, building confidence, and ensuring satisfaction. Research has demonstrated that each of these elements promote learner persistence and ultimately, mastery of e-learning content.

e-Learning designers must be especially vigilant when it comes to motivating their e-learners. Keller's ARCS Model provides helpful guidance that frames motivational design. This case study has demonstrated

one organization's application of ARCS to e-learning module design.

As Keller (2010) suggests, motivational design is not separate from instructional design. This article has provided an example of how careful instructional design and relevant strategies can serve to motivate learners. The range of tactics employed in the SDZG e-learning carefully attend to each ARCS model category in an effort to motivate the learner throughout his or her online learning experience—and beyond, as he or she applies trained skills in the workplace.

References

- Altoboli, A. & Abou-Zeid, M. R. (2007). Effect of Physical Consistency of Web Interface Design on Users' Performance and Satisfaction. In J. A. Jacko (Ed.), *Human-Computer Interaction: HCI Applications and Services* (pp. 849-858). Berlin: Springer.
- ASTD (2012). *The 2012 ASTD State of the Industry Report*. Alexandria, VA: American Society for Training & Development.
- Andrews, D. H. , Hull, T. D. , & Donahue, J. A. (2009). Storytelling as an instructional method: Descriptions and research question. *The Interdisciplinary Journal of Problem-Based Learning*, 2(3), 6–23.
- Berlyne, D. E. (1954). A theory of human curiosity. *British Journal of Psychology*, 45(3), 180–191.
- Bishop, M., and Sonnenschein, D. (2012). Designing with sound to enhance learning: Four recommendations from the film industry. *Journal of Applied Instructional Design*, 2(1), 5-15.
- Carr, S. (2008). As distance education comes of age, the challenge is keeping the students. *The Chronicle of Higher Education*, 46(23), 39–41.
- Keller, J. M. (1987). Development and use of the ARCS model of motivational design. *Journal of Instructional Development*, 10(3), 2–10.
- Keller, J. M. (1999). Motivation in cyber learning environments. *Educational Technology International*, 1(1), 7–30.
- Keller, J. M. (2010). *Motivational design for learning and performance: The ARCS model approach*. New York, NY: Springer.
- Levy, Y. (2007). Comparing dropouts and persistence in e-learning courses. *Computers & Education*, 48 (2), 185–204.
- Marshall, J. & Rossett, A. (2011). Mapping the e-learning terrain. *International Journal of E-Learning*, 10(2), 169-198.
- Reigeluth, C. (1992). Elaborating the elaboration theory. *Educational Technology Research & Development*, 40(3), 80–86.
- Rossett, A. (1999). *First Things Fast A Handbook for Performance Analysis*. SF: Jossey Bass/Pfeiffer.

Sweller, J. (2005). Implications of Cognitive Load Theory for Multimedia Learning. In R. Mayer (Ed.), *Cambridge Handbook of Multimedia Learning* (pp. 19-30). New York: Cambridge University Press.

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