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Practical Applications of Technology for Learning e-Magazine

THIS WEEK: Management Strategies

When Information Technology and Instructional Design Meet

By Cheryl Johnson

It is sad to say, but there are times when information technology (IT) and instructional design (ID) meet and the result is an e-Learning solution that is not functional from either an IT or an ID perspective. Either instructional strategy loses its way in an attempt to provide content in a rapid development environment, or the technology suffers from functional issues because there was not a sound technical development process in place. In either case, it just doesn't work.

There are ways to ensure that the end product is technically functional and that it achieves its stated learning objectives. However, just when you think you have a process in place to get the job done, things change! E-Learning is constantly evolving, making it a challenge to consistently deliver effective solutions. You must clearly define your process, but you must also make it adaptable, in spite of the challenges. In this article, I outline what seem to me to be some of the major challenges, and my approach to dealing with them.

Strategic tradeoffs

To effectively design and deliver meaningful and functional online learning, designers need to address two key elements: the overall instructional design, and the functional technical issues that arise during development of Web-based learning.

It seems there are so many places in e-Learning development where learning strategy and information technology run headlong into each other that it is impossible to keep track of all the issues. In this week's article, the author has outlined the major problem areas and suggests ways to deal with them or work around them. This is another practical guide that you will want to have handy for reference by your designers!

A publication of



The instructional design process must follow sound instructional principles. That seems basic, but there are times when we focus so much on developing content with a particular authoring tool that we neglect to think strategically about choosing an effective learning method. We want to make our product “interactive,” so we create roll-overs, or drag-and-drop activities. In the end though, the result is still just content – meant to be read with a few “check your knowledge” questions inserted at various locations in the module. There is an “Objectives” page and a good “Summary” at the end, but somewhere in between we lose focus on the learner and the learning process. It is even more challenging to develop learning events that help the learner to apply the content on the job.

In addition to the strategic challenges, there is pressure to produce and deliver content quickly. In a fast-paced world where information travels at lightning speed, shouldn't learning also occur at lightning speed? Rapid development tools are one response to this pressure.

When someone asks me which tool can help provide rapid development for e-Learning, I wince. Were we ever able to put together truly effective instructor-led training in a “rapid development” environment? I compare rapid development without strategy to build-

ing modular homes. We can build modular homes fast, and many people can get into a home quickly. But is the home built on a solid foundation and in a way that will stand the test of time? Does the modular house meet the individual needs of those who live there, or does it just provide a low-cost shelter that looks good?

Having said that, there is still a need for quick solutions. There are times when a learner needs a “just in time” approach to support the acquisition of knowledge and skill. Tidbits of information, on-the-spot coaching, and immediately-relevant demonstrations that can help an employee complete the task at hand rapidly are powerful. These quick solutions can be part of a larger long term strategy. They can also provide reference information to support the overall curriculum learning design.

Dealing with design issues

If rapid development is like building modular homes, then instructional issues would have to be similar to building a conventional house. The first step is to create a custom blueprint – the actual design. Only then do you find a general contractor (a project manager for e-Learning) and you let the general contractor deal with all the subcontractors. In the case of e-Learning, these would be the instructional designer, the technical devel-

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opers and multimedia specialists, the writers and graphic artists, and so on.

Each of the specialists will use different tools in order to complete their respective tasks and to produce their assigned elements. In turn, those "assigned elements" will very much depend on that blueprint or design.

Technology is a tool, not a strategy. In fact, the quality of learning (the ultimate goal) decreases significantly when the development process focuses on technology. It is critical to outline the instructional strategy – the design – before deciding on the technology.

My suggestion, then, is to get the maximum results through the right combination of design and technology. Technology can make it easy to distribute learning throughout an organization, as long as the technology is a good fit for the learning strategy, and not just a less-expensive way to deliver training events. When you feel that an instructor-led approach would provide the best support for learning, but the budget simply does not allow travel and the other expenses associated with classroom delivery, explore the creative use of synchronous e-Learning (the virtual classroom). Rather than simply posting a narrated PowerPoint presentation, consider using Elluminate or WebEx in order to mimic, or even improve upon, the classroom experience. (*Editor's Note:* The eLearning Guild's free *Handbook on Synchronous e-Learning* provides a wealth of detail on this.)

Another reason for developing the design first, before deciding on the tool, is to avoid the "square-peg-in-a-round-hole" dilemma. Too often, we invest heavily in a tool to develop e-Learning and we want to "make a good use of the investment." Another way this happens is when we convert current classroom offerings by fitting them into whatever forms our cur-

rent tool supports. The result is a course or module that falls short of expected results because we worked within the confines of the tool (or the limitations of our skill with it).

Develop the design first in order to have a solution that provides the desired outcomes. Explore where technology can support the required learning. Then pick the tool that supports the design.

Design tips to improve transfer to the job

If you are truly trying to improve performance, then you must address behavior needs in the learning. This can be challenging in any type of learning event, but even more so when delivering content online. Learners may pick up new information in the training you design, but if they don't change their behavior back on the job, then the training did not achieve its objectives. I would like to suggest some best practices that will help build behavior change into learning.

Start by providing a broad overview of the content, so that learners can see the process they are about to learn from beginning to end. Clearly outline the process. It is not necessary to state objectives at the beginning of the instruction. If a learner can articulate at the end of the course what the objectives were, chances are good they found relevant use for the information.

Clearly define the performance issues that the training addresses. Provide opportunities during the training, whether it is a single self-paced module, a virtual classroom session, or a "blended" combination, for learners to connect what they are learning with opportunities to apply it after the training is complete. Give them activities that require them to use the new skills and knowledge in a variety of settings, so they can extend their knowledge to similar scenarios.

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If the training consists of several modules or virtual classroom sessions, provide “teasers” or “Web refreshers” via e-mail on a scheduled basis. This is a good way to keep information fresh in the learners’ minds. Keep the teasers simple and short.

Teach one concept at a time. Don’t try to teach everything in one training session or module. Keep the sessions and modules short and focused on the one specific concept.

Provide the learners’ supervisors with a plan to measure milestones in the learners’ progress. Follow up (debrief) with the supervisor between modules or sessions and solicit feedback. Ask what is working, what is not working, and how you can improve the instruction. Find out if there are factors in the work environment that may be influencing the learners’ ability to perform. Find out whether training was really the issue that was keeping employees from performing.

By working with management, make the learner accountable for using the new skills and knowledge on the job. When you develop the overall learning strategy, make sure that you know how the new concepts, skills, and knowledge taught in the modules fits into the daily workflow and routine of the learner.

Build ownership into the training process. Learners can be teachers also. In synchronous e-Learning, provide learners with the opportunity to share the knowledge and experience they bring to the table. Capture that information so that it is easily sharable with others who may not be part of the session. For asynchronous e-Learning, you may be able to provide a discussion board that learners can use to accomplish the same objective. Learners feel empowered when others can hear them and value their information.

Don’t teach everything. Allow the learner to seek out information on their own and build a strategy to help them learn to use resources. Look for ways that allow them to teach what they have learned.

Just-in-time learning resources are a valuable form of learning, because they improve performance and allow the learner to have access to answers at the moment they need them. If resources are easily accessible, the learner no longer must memorize lengthy processes, or remember every step in a sequence.

Dealing with technology

Instructional strategy is only one part of the equation in building a quality learning organization. Building functional technology resources that are easily accessible, centrally organized, and free of technical issues will allow learners to use the resources. No matter how good the instructional strategy is, if learners cannot find the resources quickly, or if they aren’t functional, they won’t get used.



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Learn to match tools to various aspects of training. Training that is multi-faceted will address many learning styles and modalities. It's easier to meet the needs of many when you employ a variety of methods.

For example, NoahX (<http://www.noahx.com>) provides avatars to narrate and communicate key points. It is an inexpensive way to raise the level of interactivity in your courses.

Not all tools cost money. Work with your IT department to explore open-source software solutions. Wikis and Weblogs are a good way for learners to collaborate and share resources. You or your e-Learners can set up personal Weblogs and group or personal wikis with online services such as Blogger (<http://www.blogger.com>) and PBWiki (<http://www.pbwiki.com>), respectively. There is no charge for hosting with these, and they will not add to your IT department's support load.

Not all learning needs to come in the form of a formal session. Ad-hoc learning sessions and just-in-time learning are simple ways to help improve performance without formal training. Jane Hart's Weblog has a steady stream of information on low-cost, effective tools, including ad-hoc and just-in-time applications (<http://janeknight.typepad.com/pick/>). For example, Jane listed PalBee (<http://www.palbee.com/>) last week. PalBee is a free ad-hoc video conferencing service that supports multiple participants. Slideshare (<http://www.slideshare.net/>) is a useful service for just-in-time learning; upload a slide deck (including audio) and send the URL to your learners.

You can also use the wealth of information from organizations like The eLearning Guild to support research on technology. Make sure to apprise all members of the development team of the capability of such organizations, and have experience using the associated Web sites.

Many of these tools are new to learners. You will need to apply change management methods to ensure that your users are realizing the full benefit. Some new technology solutions will pose integration issues with other e-Learning content. Make sure you test, test, and test again to get the bugs out of your applications before deployment.

Technical issues and resolutions

Here are typical technical issues encountered when deploying e-Learning, and some suggested resolutions.

Multimedia issues

Media Players. The player (or the correct version of the player) that the module requires is not installed (Flash, Windows Media Player, QuickTime, etc.). Some older computers do not have a current version of typical media players and this can cause frustration for an end user who is not computer-literate as they try to

acquire, install, and run the appropriate player.

File size. Multimedia files such as video and audio are significantly larger than graphics and text. Thus, they usually require broadband access to efficiently download and play them.

Java. How can you check to see that everyone has the right version, and that the version you are using is not creating a problem?

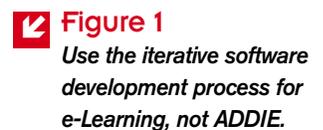
Potential solutions start with the paper-and-pencil storyboard. Design your course outside of the development environment, keeping in mind the constraints of the environment (the Web). From there follow a "software development process" or iterative process (prototype, alpha, beta, deliver) as opposed to ADDIE or other instructional methodology. (See Figure 1.)

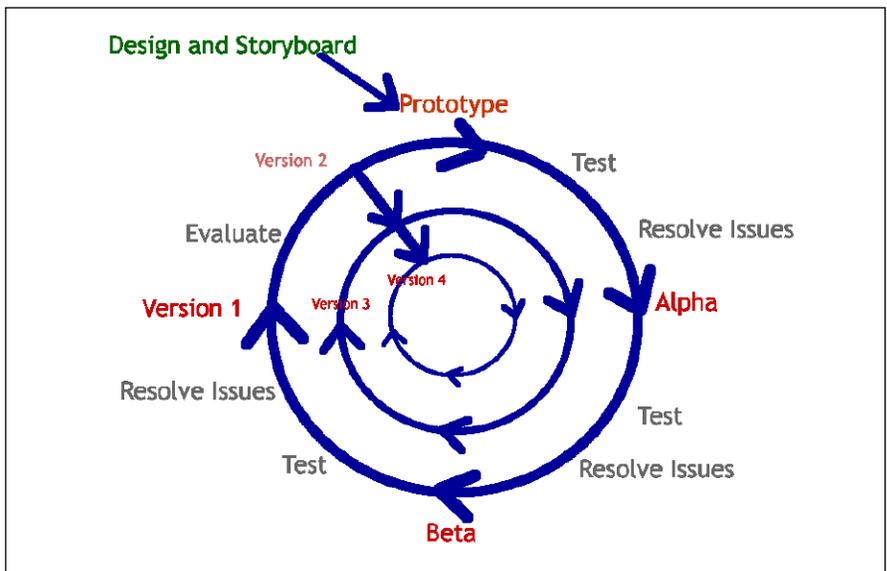
By developing modules much the same as a software developer would, you can catch functional issues early and fix them before they become burdensome. Software developers will create a "prototype" or small sampling of the overall product. They will try to include the most troublesome elements in the prototype in order to test them at the start. These issues are usually sections of the module that require the use of complex logic, video, audio, or their associated players.

During prototype phase you will identify and resolve the majority of functional issues. During the Alpha phase the primary focus is on content and usability, although you will also address additional functional issues. The typical focus in the Beta phase is fleshing out content issues with SME's and preparing for delivery. Once delivered, long-term evaluation of the course can begin to solicit suggestions for future revisions.

Browser check tools are small software programs that identify missing components on an end user's machine. They help to ensure the end user's comput-

Provide the learners' supervisors with a plan to measure milestones in the learners' progress. Follow up (debrief) with the supervisor between modules or sessions and solicit feedback. Ask what is working, what is not working, and how you can improve the instruction.

 **Figure 1**
Use the iterative software development process for e-Learning, not ADDIE.



er has the necessary and appropriate players, Java version, display settings, etc. Figure 2 shows a typical browser check tool as the end user's system will display it. This particular tool is from TCC Publishing (<http://www.tcc-pub.com/bct/bct1.htm>). The screen shot shows a modified version that I use. However, most browser check tools are homemade solutions built by internal IT departments.

The browser check tool typically runs before the end user's machine tests or launches modules. This tool also helps testers or Help Desk personnel diagnose the most common functional problems associated with e-Learning. It is helpful to put together a checklist of "recommended requirements" before developing a tool like the one you see in Figure 2.

Finally, charts like the one in Table 1 on page 7 can help you when developing your audio and video. The chart gives you standard recommendations for settings to use when recording. It will also help you anticipate file size based on your recording settings.

WYSIWYG authoring tools issue

The advance of authoring tools has taken novice developers into the 21st century. No longer are high-level programming skills required to create Web-based learning. WYSIWYG ("What You See Is What You Get") authoring tools are great for novice developers. They are not that great when they export the HTML or SCORM code associated with the module, because they do not compile code in an efficient format. The exported code may not be optimized for efficient delivery, and pre-loaders and graphics can be randomly coded using ineffective methods, thus taking valuable time to load and run for the impatient learner.

The potential solution is to work closely with the vendor for your authoring tool. Make sure that you have a comprehensive service level agreement in place to help you resolve issues as they arise.

SCORM issue

SCORM should make content "portable," but getting it to run on the first LMS can be a challenge. When you switch to another LMS, the fun begins all over again. SCORM is a significant step forward in standardizing the development of e-Learning, but it is not yet a seamless process.

Tools such as the ADL Test Suite (from <http://www.adlnet.gov/>) or the SCORM Visualizer (Figure 3 on page 8) provided by Platte Canyon can help you test modules and identify the specific SCORM issues with the course. From there you can locate the appropriate resources (your own developer, your LMS provider, or your vendor) to resolve the issue. Tools like this generate a report detailing the specific areas

where the SCORM calls failed. Some LMS providers also use these types of SCORM diagnostic tools. Check with your provider to find out if they use one.

Developing e-Learning on a local machine for export to the Web

Most authoring tools require you to develop your e-Learning application on a local machine (your desktop) and then export it to the Web for launch. Previews are available, but you also launch most of those previews from your desktop and not in the Web environment where your learning will occur. The Web set up and design is different than your local machine. It displays things differently and requires different elements to ensure that all your assets are functional and displayed properly. The bottom line is that when you author on a desktop, your work can display differently on the Web. This complicates troubleshooting and other corrections.

The emergence of Web-based authoring tools reduces these issues. QMIND (relaunched last year as Splashcast, at which time it exited the enterprise e-Learning business) was a leader in providing this type of solution, but many other Web-based authoring tools are entering the marketplace. Wildform (<http://www.wildform.com>) is one of these Web-based development tools, and you can locate others by using The eLearning Guild's Buyers Guide.

Connectivity or bandwidth issues

Some learners still depend on dial-up Internet access. In addition, as we continue to be more and more mobile, we want access to learning while disconnected from the Web.

A few vendors have developed "players" designed to run e-Learning on your local machine, but then connect to your LMS at a later time. For example, Meridian KSI (an LMS provider, at <http://www.meridianksi.com>) has an offline player along with "Web-ROM" from LIQVID eLearning Services Pvt. Ltd.

Instructional strategy is only one part of the equation in building a quality learning organization. Building functional technology resources that are easily accessible, centrally organized, and free of technical issues will allow learners to use the resources. No matter how good the instructional strategy is, if learners cannot find the resources quickly, or if they aren't functional, they won't get used.

 **Figure 2**
The browser check tool verifies that the learner's computer can run the e-Learning application, and helps the learner obtain any missing resources.

Browser Requirements: <i>The browser characteristics required for use with</i>	Current Browser Settings: <i>The following table is an indication of compatibility -- green cells indicate OK - red indicates a problem, yellow a possible problem.</i>
Target platform must be Win32, (Windows 95,98,NT, 2000 or XP)	Yes
Browser must be Internet Explorer 5.5 or 6.0	Yes
Java must be enabled	Yes
Pop ups must be allowed	Yes
Javascript must be enabled	Yes
Cookies must be enabled	Yes
Screen resolution must be set to 1024x768 or greater	1024 x 768
Java VM should be Sun's 1.5.0_06 and Javascriptable! Other versions of Sun's Java VM may work but are unverified. (downloadable from here .)	Sun Microsystems Inc. Version: 1.6.0_01
Adobe's Flash Plugin, version 6 or newer must be installed.	Adobe Flash Player is installed. Version 9.0.28.0 Installed Successfully

(<http://www.liquid.com>). There are several players available that allow end users to run e-Learning modules "offline" (while not connected to the Internet). These provide a great alternative for those with low bandwidth considerations or people who want to take their courses offline while they travel. The player acts as a local LMS on the end users' machine and tracks SCORM information in the application. Once reconnected to the Internet, the information can then be transferred to a LMS. You can develop modules without much consideration for bandwidth or Internet connection because the course runs on the local machine.

Test and review issues

Test and review issues affect geographically dispersed review teams. Suppose that you have just finished developing your prototype. You exported it to the Web and it worked just great! Testing and review should now begin. How do you get your module from

your computer to all your reviewers? How do you capture their comments and compile them in one simple repository? How do you keep reviewers from having to review whole sections of a course time and time again, when all they really needed was to review one small segment?

Testing is a critical component in creating functional e-Learning. It is best to test with numerous computer configurations (if your staff takes their courses outside the company Intranet). Feedback from SME's and usability experts is vital. There are great tools, such as Morae (<http://www.morae.com>), for conducting usability tests. The two most challenging aspects of testing are developing a comprehensive test plan that includes methods for getting test modules out to geographically dispersed populations, and then gathering, categorizing, and compiling the results. There are other new tools that help with that. CleanCourse

Table 1: Guidelines and suggestion for producing video content for the Web

	Target	Video Codec & bitrate	Audio Codec & bitrate	Details	Comments	End Result
Low bandwidth	Dial-up user or better (56K+)	Windows Media 9 @ 15Kbps ¹	Windows Media 9 @ 10Kbps	Video 320x240, 15fps, 8 seconds per key frame. Audio 16Khz, Mono	WMS is the preferred encoding method. Very efficient, good selection of tools and cross platform playback.	File should end up ~330KB per minute of video.
Medium bandwidth	ISDN or better (128K+)	Windows Media 9 @ 25Kbps ²	Windows Media 9 @ 20Kbps	Video 320x240, 15fps, 8 seconds per key frame. Audio 16Khz, Mono	Good compromise.	File should end up ~650KB per minute of video.
High bandwidth	DSL or better (256K+)	Windows Media 9 @ 73Kbps ³	Windows Media 9 @ 20Kbps	Video 320x240, 24fps, 8 seconds per key frame. Audio 32Khz, Mono	More fluid motion due to the increased frame-rate.	File should end up ~950KB per minute of video.

¹ Frequently referred to as 25Kbps in software applications. This is a peak value.

² Frequently referred to as 45Kbps in software applications. This is a peak value.

³ Frequently referred to as 93Kbps or 100Kbps in software applications. This is a peak value.

The Web is a less-than-ideal delivery method for video and quality is always compromised in order to achieve acceptable playback time.

These are guidelines only. The most important number is the file size guideline in the "End Result" column. **Resolution, bitrates, framerates, etc. can dramatically affect end file size.** It is likely that one or more can be increased and still be within the suggested file size limit depending on the project. If one can be reduced while maintaining acceptable quality, do so.

WMB video requires an audio track. If audio is not desired, configure the audio codec to use 0Kbps, thus giving WMB the audio track it desires, while taking no bandwidth or file size.

Macromedia's (Adobe's) Flash and Quicktime are acceptable alternate container formats. The suggested file size still applies.

from Rapid Intake (<http://www.rapidintake.com>) is one example and some LCMS's (Outstart and Geo-Learning, at <http://www.outstart.com> and <http://www.geolearning.com>) provide that functionality, contingent upon the authoring tool of choice.

Media use considerations

These media use issues will interact with your learning design. There are no pat solutions to these, apart from experience.

1. Visual layout. Is your e-Learning easy to navigate? Are colors and fonts appropriate to enable readability? Does the information organization allow the content to flow logically? Do your learners have to struggle to figure out how to use the technology and thus lose focus on the content?
2. Use of audio. Does the use of audio enhance or detract from the learning? Too much of a good thing will encourage students to tune out information.
3. Too much text on the screen acts the same as too much audio. People tune it out. Students rarely read more than one paragraph of information at a time. Frequent activities that require the student to utilize the information read will increase the likelihood they will read and use the information. You can use the text-based resources as feedback to situations posed in the learning, and the learner can access them to resolve problems.
4. Is the e-Learning itself challenging and engaging? It does not have to be complex to engage the learner. Relevant information that forces thinking can be very powerful.
5. Does the e-Learning application enhance the learning process, or is it "the" learning process? If technology is the sole source of learning, consider whether the instructional strategy employed is sound. Consider changing to a "blended" approach.

Conclusion

The emergence of new tools and technology are minimizing the issues that plague e-Learning development. Developing a plan for development, and using these tools, can minimize frustration. As with any good project, the development of a systematic plan for designing, developing, and evaluating learning will facilitate more effective learning and ensure it is functional and effective.

Many users are not used to accessing and using information in the new age. They are not technically literate, so making technology resources effective, functional, and easily accessible is critical. But even

with these issues resolved, old learning habits need to change and people need to learn how to learn in the technology age. Changing management or marketing plans to introduce new technologies will increase the chances that people will use the new learning tools. Don't assume, because they didn't use it the first time you introduced it or they say they aren't "ready" for it, that they won't accept it. With an effective plan to help incorporate technology with learning resources, over the course of time people's habits will change, and they will benefit from the wealth of information at their fingertips.

And, just to spice things up a bit, the landscape of learning is evolving more. Keep your eye on Podcasts, handheld devices, virtual world simulations, and intelligent tutoring. These forms of technology are quickly proving to be viable learning solutions, and will once again change the whole face of learning on the Web! 

Author Contact



Cheryl Johnson is a Performance Solutions Specialist with ten years of experience in learning, development, and performance. With a pioneering attitude, she has made strong contributions in the areas of learning with emphasis on behavioral change. She is recognized for innovating and building programs from scratch and pioneering the use of technology in education. She is currently engaged in the design and development of virtual-world training solutions using an artificial intelligence engine to provide individualized custom training solutions. She was also recognized for her dedication to developing learning solutions that drive performance at work and in one's personal life. Working with an associate, she developed a powerful interactive patented online training solution for voice recogni-

The two most challenging aspects of testing are developing a comprehensive test plan that includes methods for getting test modules out to geographically dispersed populations, and then gathering, categorizing, and compiling the results.

 **Figure 3**
The SCORM Visualizer helps you test modules and identify any SCORM issues that your course has.

SCO URL:

If you would like to change the value of one of the data items below, click on it and then modify it in this window.

E	Data	Value
<input type="checkbox"/>	cmi.comments	
<input type="checkbox"/>	cmi.comments.from.lms	
<input type="checkbox"/>	cmi.core.children	credit,entry,exit,lesson_location,lesson_mode,lesson_status,score,session_time,student_id,student_name,total_time
<input type="checkbox"/>	cmi.core.credit	credit
<input type="checkbox"/>	cmi.core.entry	ab-initio
<input type="checkbox"/>	cmi.core.exit	
<input type="checkbox"/>	cmi.core.lesson_location	
<input type="checkbox"/>	cmi.core.lesson_mode	normal
<input type="checkbox"/>	cmi.core.lesson_status	not attempted
<input type="checkbox"/>	cmi.core.score.children	max,min,raw
<input type="checkbox"/>	cmi.core.score.max	
<input type="checkbox"/>	cmi.core.score.min	
<input type="checkbox"/>	cmi.core.score.raw	
<input type="checkbox"/>	cmi.core.session_time	
<input type="checkbox"/>	cmi.core.student_id	Joe_Student1
<input type="checkbox"/>	cmi.core.student_name	Student, Joe

Could not find an LMS, running in standalone mode.
The sequence of SCORM API calls made from the SCO will be shown below.

tion technology before online learning was considered effective. Her unique value is the ability to identify needs, address gaps, and develop long-term strategies to influence positive change. The keys to her effectiveness are a true passion for learning, strategic thinking patterns, and a desire to facilitate self-discovery. Whether it is through staff development, training, teaching, learning, or evaluating, she firmly believes that setting goals, learning, and creativity are the essential ingredients to personal empowerment, growth, and ultimately, success.

Contact Cheryl Johnson by telephone at 703.380.1094, or by e-mail to cherstinane@readwritetechnology.com

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Even if you have not been published before, we encourage you to submit a query if you have a great idea, technique, case study, or practice to share with your peers in the e-Learning community. If your topic idea for an article is selected by the editors, you will be asked to submit a complete article on that topic. Don't worry if you have limited experience writing for publication. Our team of editors will work with you to polish your article and get it ready for publication in **Learning Solutions**.

By sharing your expertise with the readers of **Learning Solutions**, you not only add to the collective knowledge of the e-Learning community, you also gain the recognition of your peers in the industry and your organization.

How to Submit a Query

If you have an idea for an article, send a plain-text e-mail to our editor, Bill Brandon, at bbrandon@eLearningGuild.com, with the following information in the body of the e-mail:

- **A draft of the first paragraph**, written to grab the reader's attention and identify the problem or issue that will be addressed.
- **A short outline of your main points** addressing the problem or resolving the issue. This could be another paragraph or it could be a bulleted list.
- **One paragraph on your background or current position** that makes you the one to tell this story.
- **A working title** for the article.
- **Your contact information:** name, job title, company, phone, e-mail. This information is to be for the writer of the article. We are unable to accept queries from agents, public relations firms, or other third parties.

All of this information should fit on one page. If the topic fits our editorial plan, Bill will contact you to schedule the manuscript deadline and the publication date, and to work out any other details.

Refer to www.eLearningGuild.com for Author Guidelines.