Planning Low Bandwidth Assessments That Support Curriculum Competencies

Karen E. Marcellas, Dina Kurzweil
Concurrent Technologies Corporation / Uniformed Services University of the Health Sciences
Bethesda, MD
Karen.Marcellas.ctr@usuhs.mil,
Dina.Kurzweil.ctr@usuhs.mil

Joseph Lopreiato, Justin T. Woodson
Uniformed Services University of the Health Sciences
Bethesda, MD
Joseph.Lopreiato@usuhs.mil
Justin.Woosdon@usuhs.mil

ABSTRACT

In an educational environment where increasing demands on network bandwidth and learners' time and attention prevail, blended and distributed curricula must focus on creative ways to ensure that learners are attaining the necessary competencies with optimal efficiency and return on investment (ROI). Assessment is a critical component of the learning process and, if deployed thoughtfully, can provide valuable information about proficiency in specific learning competencies as the activities are completed. While traditional strategies for student learning assessment focus on pre/post-tests, a strategy of integrating assessments throughout the course of the learning experience provides an enhanced opportunity for learners to examine their own knowledge development and tailor that experience to their individual needs. Simultaneously, these assessments, along with additional evaluation, can provide faculty, department heads, or other decision makers with data that informs curriculum decision making and extends the benefit beyond that of the individual student. By linking these assessments directly with desired competencies, curriculum developers are able to ensure that they are maximizing effectiveness while evolving the learning experience.

This paper will present a research-based approach to designing innovative high impact, low bandwidth assessments for a variety of competency types. It will introduce a methodology for aligning assessment techniques to competencies and will also identify effective low-bandwidth methods for assessment using illustrative examples from military medical student education at the Uniformed Services University of the Health Sciences (USUHS). This paper will also provide a toolkit of developmental questions, tips, and strategies to help participants analyze a variety of assessment situations for distributed learning (DL) environments. This strategic approach to implementation of assessment has applicability across a wide variety of military and governmental organizations and can enhance the effectiveness of education and training in an environment focused on ROI.

ABOUT THE AUTHORS

Karen E. Marcellas, MS, PhD has over ten years of experience in analyzing, designing, developing and evaluating educational and instructional products to ensure the highest quality of instruction. Her experience includes front-end analysis, audience analysis, content design, course evaluation, and conducting research on instructional interventions. She has an M.S. in Instructional Systems from Florida State University and a Ph.D. in English Literature from Princeton University. At *CTC* Dr. Marcellas has been involved with many instructional and educational technology initiatives at National Defense University (NDU) and the Uniformed Services University of the Health Sciences (USUHS).

Dina M. Kurzweil, MA, MS has an M.A. in Communication and an M.S. in Instructional Design, Development, Implementation and Evaluation from Syracuse University, and she is nearing completion of a Ph.D. in Education Policy and Leadership at the University of Maryland. At *CTC* Ms. Kurzweil has been involved with many instructional and educational technology initiatives at NDU and USUHS. Her responsibilities include analyzing learner needs and learning environments, designing and sequencing learning tasks, and designing and developing effective and efficient learning materials and media. Ms. Kurzweil ensures quality in executing educational

programs by evaluating and reviewing the appropriateness of course material for the target audience and recommending the appropriate program delivery options including distance-learning formats.

Joseph Lopreiato, MD, MPH is a retired Navy Medical Corps Captain. He is currently the Associate Dean for Simulation Education at USUHS and the Director of the National Capital Area Medical Simulation Center. His career emphasis has been on the education of medical students, graduate nursing students, postgraduate residents and teaching staff. He is board certified in general pediatrics and has a Masters Degree in Public Health from the University of Texas. He has developed curriculum for learners that include standardized patients and computer based virtual patients. His most recent projects focused on the delivery of content asynchronously using the Sakai learning management platform.

Justin Trevor Woodson, MD, MPH is a Lieutenant Colonel in the United States Army. He is currently a faculty member in the Department of Military and Emergency Medicine and fellow in Military Medical History at the USUHS. LTC Woodson is a Flight Surgeon and a Dive Medical Officer (DMO) and is Board Certified in Aerospace Medicine. LTC Woodson's primary career emphasis has been in applied operational medicine in unusual environments and he enjoys a diverse training background and series of personal pursuits that suits his passion for new experience and hands-on discovery. LTC Woodson has extensive experience in military medical education having held positions at the US Army School of Aviation Medicine (USASAM) as Chief of Education and as Course Director for multiple courses at both USASAM and USUHS.

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INTRODUCTION

Assessments are critical components of the learning process and, if deployed thoughtfully, can provide valuable information about proficiency in specific learning competencies as the activities are completed. Thomas, Martin, and Pleasants, (2011) emphasize this foundational role of assessment, stating that "Assessment sets the agenda more than any syllabus or course outline" (p. 1). They continue by calling assessment one of the most significant influences on students' experiences in higher education.

The importance of the development of well-thought-out assessments is compounded when using distributed curricula and technology enhanced tools, since there is no face to face contact with learners to provide insight into their attainment of skills and knowledge. Distributed learning (DL) content and tools must focus on creative ways to ensure that learners are attaining the necessary competencies with optimal efficiency and return on investment.

Effective assessment is highly dependent on context; there is no one assessment or type of assessment that can work in all situations. Instead, it is important to develop a systematic approach to assessment, which will enable the identification of effective assessment techniques for use in each specific situation. This paper is designed to present such a systematic approach in order to provide instructors, course directors, curriculum planners, and training and course providers, especially those who are in the early stages of planning blended or DL courses or training, with research-based recommendations for the effective planning and implementation of assessments. The paper will highlight key considerations in planning assessment and provide examples of specific assessment techniques that can be effective in different situations. It will also present a toolkit that encapsulates these considerations supports the assessment planning process. Given an educational environment where increasing demands on network bandwidth and learners' time and attention prevail, the focus will be on assessments that can function effectively in a low-bandwidth environment.

CHARACTERISTICS OF EFFECTIVE ASSESSMENT

While assessments can make significant contributions to learning, they must be developed and deployed carefully in order to have the maximum effect possible. Effective assessments are:

- Learner-centered
- Competency-based
- Frequent and focused
- Rich with feedback

Learner-centered Assessments: Assessment for Learning

The concept of "assessment for learning" emphasizes the fact that assessment is a part of the learning process rather than the culmination of it. Assessment **for** learning is closely aligned with formative assessment or the use of assessment during the learning process to enable modification of the learning process. This is in contrast to assessment **of** learning, which is closely aligned with summative assessment or the use of assessment at the end of the learning process as a means of determining a grade. Beebe, Vonderwell, & Boboc (2010) make the point that "there is a distinction between assessment of learning and assessment for learning" (p. 2); they cite Elwood and Klenowski (2002) as explaining that the latter places student learning at the center of assessment. They cite Elwood and Klenowski again as they clarify the terms:

> Assessment of learning (assessment for the purposes of grading and reporting with its own established procedures) and assessment for learning (assessment whose purpose is to enable students, through effective feedback, to fully understand their own learning and the goals they are aiming for). (p. 2)

Assessment for learning emphasizes active involvement in the learning process. It can build learners' skills for peer and self assessment, help them recognize how they learn, and enable them to develop strategies for lifelong learning. When the role of assessment is viewed from this perspective, "learning and assessment are not two distinct phases in an online course, as both directly influence student learning" (Swan, Shen and Hiltz, 2006, cited in Beebe et al., p. 1). When assessment is viewed as a tool to enhance learning rather than simply to measure learning, it opens up a wide realm of possibilities in the design and development of learning environments, encouraging the frequent use of varied types of assessment.

Assessment for learning allows learners to actively build their understanding of concepts in a way that goes beyond short term memorization or use. In fact, taking an assessment can increase learning. For example, medical students using online learning modules with case based self-assessment questions and feedback outperformed those students who used the same modules but did not have access to the self-assessment questions (Cook, Pankratz, Thomas, Thomas, & Thompson, 2006). Likewise, Roediger (2006) found that students retained more information if they took an assessment after reading material than if they studied the material but were not assessed on it. Figure 1 shows a simple question embedded in an animation of a patient interview that requires the learner to reflect on the patient's responses to questions and try to rule out one possible source of the patient's symptoms. Because it focuses on a single topic, the media is very small in size but it serves to reinforce the learning before the learner moves on to the next topic.

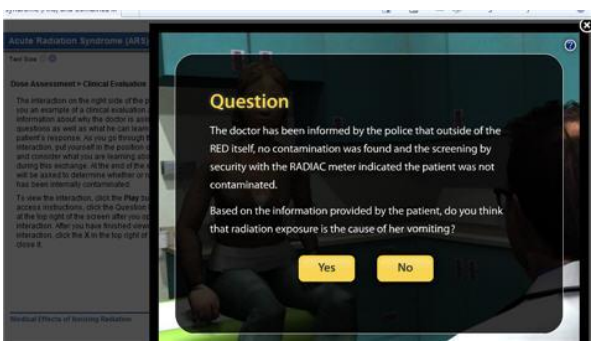

Figure 1: Assessment after Reading

Assessment for learning also takes advantage of learners' natural tendency to try to figure out what they truly need to know. As Gibbs and Simpson (2004) note, learners "work out for themselves what counts in a course and its assessment — or at least what they think counts, and orient their effort accordingly" (p. 6). Therefore, in order to ensure that learners gain the desired knowledge, instructors must be careful to align tightly the curriculum, objectives, competencies, assessment, content, feedback, and evaluation.

In addition to keeping learners focused on key content, well-crafted assessments can advance learning by providing scaffolding for new learning. Beebe et al., (2010) note that "assessment needs to be an ongoing and seamless process in order to address and scaffold properly the learning needs of all students" (p. 3). When learners take an assessment and receive feedback, they can begin to see their mistakes and also what a mistake-free response would look like. This process can help strengthen the learners' overall ability to critically judge the quality of their own work as well as that of their peers. When learners approach assessment in this way they are also developing skills that are invaluable for learning throughout their lives, working effectively in the workplace, and collaborating through the use of the many techniques available through assessment for learning.

It is important to note that assessment for learning does not necessarily require grading or active involvement by an instructor. Instead, it is important that the assessment be part of the required coursework and clearly tied to course objectives and competencies and not just "assessment for assessment's sake."

Gibbs & Simpson (2004) cite an example that demonstrates how effective it can be to use assessment to foster learner engagement with content.

> Forbes & Spence (1991) reported a study of assessment on an engineering course at Strathclyde University. When lecturers stopped marking weekly problem sheets because they were simply too busy, students did indeed stop tackling the problems, and their exam marks went down as a consequence. But when lecturers introduced periodic peer-assessment of the problem sheets — as a course requirement but without the marks contributing — students' exam marks increased dramatically to a level well above that achieved previously when lecturers did the marking. What achieved the learning was the quality of student engagement in learning tasks, not teachers doing lots of marking. The trick when designing assessment regimes is to generate engagement

> with learning tasks without generating piles of marking. (p. 8)

Competency-based Assessment

Competencies are descriptions of actions and behaviors that serve as the goal of learning. They are created to specifically address what the learner will obtain in terms of knowledge, skills, and abilities after working in an educational environment. Competencies also allow stakeholders such as employers and policymakers, to have a common understanding about the specific skills and knowledge that learners should master as a result of their learning experiences. Competencies can help inform and guide the basis of subsequent assessments at the course, program, and institutional levels.

Because they provide a clear description of desired end points, competencies enable the development of specific and targeted assessments. The language of the competency provides a clear guide to how attainment of the competency can be measured and thus should guide the development of the assessment for that competency. Additionally, when assessments clearly focus on measurable elements of competencies that are tied to job performance, they can provide learners with practice in realistic situations. For example, if a learner is seeking to attain the competency "Generate an age appropriate differential diagnosis and initial diagnostic and therapeutic plan for each patient presenting with otalgia [ear pain]," an assessment could provide learners with realistic details about cases and give learners the opportunity to actually make a diagnosis and develop a therapeutic plan.

In addition to providing more realistic assessment, the use of competencies makes assessment more meaningful to the adult learner by making it clear how the assessment and thus the learning tie in to the goals they may have that are external to the learning situation.

Competencies are also significant because, as Boud and Falchikov (1989) explain, assessments that require learners to exercise judgment about meeting criteria can help learners develop metacognitive skills as well as content knowledge. Metacognitive skills refer to the learner's ability to reflect upon, understand and control his or her own learning; the term is sometimes oversimplified as "thinking about one's thinking." Initially, learners may use the results of self-assessments to identify areas of weakness so that they can go back and study those areas in more depth. These assessments and feedback can serve as scaffolding that can help the learners develop their own internal standards, and get them into the habit of self-assessment. As Boud & Falchikov (1989) note, "one of the implicit goals of most higher education courses is that students should be able to appreciate the appropriate standards and criteria for their subjects and apply them to their own work" (p. 544).

Frequent and Focused Assessment: Integration of Assessment throughout the Course

While the principles of assessment for learning and the significance of competencies emphasize the importance of the content and structure of assessments, the placement of assessments in the learning environment can also have a significant impact on learning and performance. Implementing assessment throughout the online course can help uncover the learner's understanding and progress towards objectives and competencies. However, it is important to provide such assessments at appropriate times. As Brown (2004) explains, "the responses given to assessed work need to allow opportunities for amendment and remediation of errors" (, p. 83). Assessment should also appear soon after the learners encounter content so that they can begin to actively engage with it (Brophy, 1981).

One way to provide assessment throughout the course is to ask questions or request reflection from the learners about implementation of concepts. An icon such as the one shown in Figure 2 can be an effective but low-bandwidth way to call learners' attention to these moments for self-assessment.

Figure 2: Self-assessment Icon

A low-bandwidth way to implement these consideration points is to insert them in text throughout a DL course or training and follow them up with discussion via email or discussion boards. These reflection or question points, when followed up with feedback, can provide learners with a wealth of information on content gaps and knowledge. Instructors should review the responses and analyze them for trends or issues and then reply to the group with this analysis rather than replying to each individual message. Replying to the group provides feedback to all participants while maximizing the impact of the instructor's time.

Reviewing the responses to questions for consideration allows the instructor to gain valuable information on the group's strengths and weaknesses with respect the content covered and to modify the course accordingly. This method and others like it represent an iterative

approach to assessment that enables adaptation of content based on learner needs. It calls upon the instructor's knowledge of the content, but also requires creativity and flexibility. If all an instructor does is look at assessment as "tests", more structure than flexibility is created; this approach will do little to advance learner towards the objectives and competencies or even higher levels of metacognition.

Rich Feedback

While integrating assessments into content on a regular basis provides learners with opportunities for practice, that practice alone cannot improve skills, knowledge, or performance. Feedback is a key ingredient in effective assessment because it provides learners with information about their progress in learning. Feedback should also be timely and specific (Brophy, 1981) so that the learners can correct any mistakes as early as possible. Information provided in feedback can motivate learners to extend and expand the learning experience. Gibbs & Simpson's (2004) research underscores the significance of feedback:

> In a comprehensive review of 87 meta-analyses of studies of what makes a difference to student achievement, Hattie (1987) reports that the most powerful single influence is feedback. Similarly, Black & Wiliam's (1998) comprehensive review of formative assessment emphasizes the extraordinarily large and consistent positive effects that feedback has on learning compared with other aspects of teaching." (p. 9)

Providing feedback enables learners to gain knowledge through the assessment process, but it can also help to guide learners toward the development of their metacognitive skills. Gibbs & Simpson (2004) stress the importance of feedback in this respect:

> Teaching students to monitor their own performance is, in Sadler's theoretical analysis of the role of feedback, the ultimate goal of feedback (Sadler, 1989). Research on the impact of the use of 'classroom assessment' in college in the USA again and again stresses the impact not on the learning of specific content but on the development in students of 'meta-cognition' and the ability to gain control over their own learning (see Steadman, 1998, for a summary). (p. 25)

In order to support metacognition, the feedback must contain information about why the work is right or wrong.

The feedback learners receive does not need to be presented to them directly by the instructor. As Forbes & Spence found, learning increased when learners experienced peer reviews in which faculty had a very limited role, due primarily to their deep engagement with the content (Forbes & Spence, 1991, cited in Gibbs & Simpson, 2004).

Figure 3 presents an example of an assessment that takes advantage of technology to provide timely, relevant feedback in supporting students who are learning the systematic examination of the inner ear.

Figure 3: Providing Automated Feedback

In the example in Figure 3, feedback is provided directly through a low bandwidth interface. This assessment supports the learners in attaining competencies by providing them with an opportunity to start exploring what is "normal" and "abnormal" in the inner ear. Though the questions are simple yes and no questions the correct or incorrect answer chosen provides feedback that helps the learner consider a diagnosis. The feedback here also supports the learners' metacognition, reminding the learners of what the standards (describing the landmarks and also the light reflex) are and helping them incorporate those standards into their own practice. While the assessment shown here was developed using Adobe® Flash, it could also be provided with a smaller footprint in an HTML interface or even by posting images in a discussion forum or sending them via email with accompanying questions. This could also be done through various low bandwidth learning management system (LMS) tools such as discussion boards, polling features, and quizzes.

PLANNING EFFECTIVE ASSESSMENT

Planning effective assessment involves a comprehensive approach. As Brown (2004) notes,

> We need to consider not just *what* we are assessing and *how* we are doing it (particularly which methods and approaches), but also *why* — our

> rationale for assessing on any particular occasion and in any context. Our different reasons (to motivate students, to encourage activity, to provide guidance and feedback for remediation, grading and selection) will impact on our choice of assessment instruments." (p. 81)

Instructors or curriculum planners should select assessments that provide meaningful and useful information to inform key audiences, which includes the instructors or curriculum planners themselves as well as the learners, about the learning that has taken place.

Assessment needs to highlight to the learners what they have learned and provide situations where they can practice what they have learned. When deciding to assess learners on part of their learning, creators of learning and training experiences must think about:

- Who is being assessed (i.e., characteristics of learners)
- What is being assessing (i.e., competency and type of skill)
- When assessment should occur
- Where assessment should occur
- Why assessing is being undertaken
- How assessment is being undertaken

Assessment also needs to provide the instructors or curriculum planners with a sense of what areas are causing problems for learners. It is also important to consider what information the assessments will provide that can be used to improve the educational quality being provided to the learners. Deciding in advance on how results will be used can help keep the assessment plan focused. Some of the primary questions relating to instructors and curriculum planning include:

- Who are learners and stakeholders?
- What analysis approach are we taking and why?
  - What changes in the content will we make as a result of the assessment?
- When and how often will we look at data?
- How will we analyze data?
- How will we disseminate results?

Answering all of these questions can lead to the development of assessments that measure gains in skills and knowledge but also serve as learning experiences in and of themselves. It also allows for data to be collected to inform updates and adaptations to the content. The Toolkit appended to this paper provides a list of "9 Steps for Successful Assessments" that summarizes these questions and highlights their place in the Assessment planning process.

Once these kinds of preliminary questions have been answered, a key element in planning the integration of assessment is the development of a detailed map of competencies covered by the course or training and an analysis of the types of learning associated with those competencies. As Dick, Carey and Carey (2001) note, assessments should be "linked to instructional goals and an explicit set of performance objectives derived from the goals" so that the results can indicate both how well the learners learned material and also how the material might need to be changed to enhance learning (p. 145). Developing a competency-based assessment map incorporates many of the characteristics of effective assessment: it keeps assessments focused on learning and competencies while encouraging attention to the integration and placement of assessments. Finally, the use of an assessment map supports the integration of the assessment in a systematic fashion, so that it enhances learning by focusing on the appropriate content and also giving learners adequate time to respond and instructors adequate time to adapt. The Toolkit appended to this paper provides a template for an assessment map that focuses on these elements, which will be described in more detail in the next section of the paper. This template also incorporates a focus on feedback to ensure that this key element of assessment receives attention during the planning process.

When planning for blended or distributed courses, it is also important to pay attention to the "size" of the assessment, both from a bandwidth perspective and from a resource perspective.

Yet low bandwidth does not have to mean low in value or low in interactivity. A variety of methods are available to facilitate the active engagement of learners in learning and assessment. Many of the well known options, such as testing and quiz software, are embedded in most LMSs. Other types of assessments can be created using Microsoft® Word documents; simple media development tools; or text-based tools such as discussion boards, wikis, and blogs that are built into LMSs. Taking short self-assessments and viewing and working through about scenarios or case studies, either via text-based tools or more complex media-based tools can also provide an active engagement in the learning process. Assessments such as this require feedback to support learning, but using online tools enables feedback to be built into the assessment tool. Using technology for assessment can reduce the burden on the faculty member without necessarily having a negative impact on student learning. As Gibbs & Simpson (2004) note,

> There has been very widespread adoption of computer-based testing to provide at least some feedback on progress, and in some assessment software it is possible to provide 'remedial feedback' when incorrect answers are selected. Cook (2001) has reported that students' final exam marks were closely related to the number (and therefore frequency) of computer marked assignments students had tackled. The frequency and speed of response of such feedback, which is possible to provide reasonably economically, may compensate for its relatively poor quality and lack of individualization. (p. 17)

Assessment techniques

Just as there are a number of tools for delivering assessment in the distributed or blended learning environment there are also a number of techniques that can be used with those tools. Careful consideration and alignment of assessments with goals and competencies enables the selection of effective tools. As Beebe et al. (2010) note, "there should not be a mechanistic transfer from one environment to the other without due consideration of their intended purpose and outcome" (p. 10). Aligning assessments with competencies requires analyzing the competency to determine what type of learning is needed and then identifying assessment techniques that support that type of learning. With competencies, the verb often provides a good indication of the type of learning that occurs and the type of assessment that is needed; for example, the competency "Observe the tympanic membrane using an otoscope and an insufflator" would require demonstration of a physical skill while "Generate an age appropriate differential diagnosis" would require more critical thinking and analysis.

A number of assessment techniques have been compiled by Angelo & Cross (1993). The Toolkit that appears at the end of this paper lists some of these techniques and identifies situations in which they can be used effectively.

A version of one of Angelo and Cross's (1984) techniques, the confidence survey has been used at Uniformed Services University of the Health Sciences (USUHS) in a number of courses to help learners and instructors identify areas of growth and areas where they need to continue to seek additional instruction. For example, the following questions appear on a survey given to second-year medical students after they complete an in-class role-play exercise dealing with negotiation in the context of civil-military operations.

1. As a health care professional, I will be placed in situations that present human rights challenges and/or competing political agendas in the operational context of international civil military operations. I feel I would be able to meet my mission and mission objectives by…
   a. Successfully analyzing an operations situation
      Strongly disagree to strongly agree
      12 11 10 … 3 2 1

   b. Successfully developing an effective negotiation strategy
      Strongly disagree to strongly agree
      12 11 10 … 3 2 1

This simple, text-based assessment requires them to reflect on their own capabilities as they consider what they have learned. The assessment is completed on paper but it could easily be completed online.

The authors of this paper (Marcellas, Kurzweil and Woodson) have found an interesting trend when reviewing the research on results from this assessment. Students sometimes feel **less** confident after the activity than they did beforehand. We have hypothesized that this could be because learners have gained an awareness of the content and complexities of the content that they did not know before they engaged in the course. The hope is that this reduction in confidence will spur the learners to seek additional knowledge and experience in these areas.

While the techniques Angelo & Cross (1989) describe are mostly simple, non-graded, anonymous, in-class activities, many can be easily adapted for online use in ways that give both instructors and learners useful feedback on the teaching-learning process. Online versions of these activities would tend to be text-based, and thus not require a great deal of bandwidth for implementation. Activities based on these techniques can take place via email or chat, or on discussion boards so that small groups or the whole class can participate. Discussion boards can also be used to support a wide variety of other activities, such as debates, peer reviews, "guest expert" discussions, and discussions of key concepts and controversial points. Instructors can use this questioning and learning environment to foster discussion as an opportunity to increase their learners' knowledge and improve understanding. However is important to note that instructors need to make sure to ask thoughtful, reflective questions rather than simple, factual ones and to encourage thoughtful, in-depth participation. Requiring references in discussion board posts and using grading rubrics to identify elements of good discussion board responses can encourage more robust,

vibrant discussion boards that contain both opportunities for and evidence of learning.

Discussion boards can be used to enable learners to share and reflect on real-world experience and also receive feedback from the instructor or other experts in the field. Consider the following discussion board activity, which was used in a third-year clerkship in family medicine at USUHS, when students were posted in a number of clinical sites around the United States:

1. Describe one patient with whom you discussed behavior change and used motivational enhancement strategies. In your description include responses to the following questions.
    a. What was the presenting problem?
    b. What behavior did you target?
    c. How would you describe the patient's stage of change?
    d. How did you initiate the conversation about behavior change?
    e. How did you demonstrate the "spirit" of motivational interviewing (i.e., collaboration, evocative, respecting autonomy)?
    f. Describe the skills of motivational enhancement that you used?
    g. What behaviors do you think the patient will change?
    h. Do you think that the patient's thoughts about the behavior changed?
2. Post a reaction to another student's response. In your response suggest possible alternative approaches that could have been used that may have also enhanced the patient's motivation.

This low-bandwidth assessment activity required the learners to practice a newly-developed skill in a real-world environment without requiring the faculty member to travel to observe them. It also enabled the learners to compare a variety of approaches to the application of this skill. Finally, it enabled them to receive individualized feedback and also learn from the feedback provided to others.

A discussion board activity can provide a low-bandwidth way for learners to explore complex concepts in depth and obtain nuanced feedback. However, some elements of learning do not require this level of feedback. Factual content can be handled by self-assessments that do not count towards the grade, but contain short, fact-based questions and have feedback programmed into them in advance. Figure 4 provides an example of a format used at USUHS.

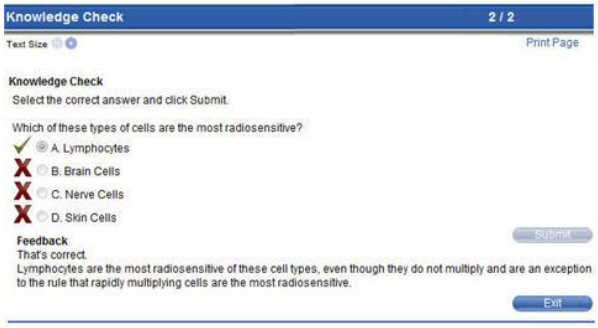

Figure 4: Multiple Choice Self-Assessment with Feedback

This basic interaction is text-based and requires little in the way graphics work or programming, so it is small in size and level of effort. The feedback, while automated, is clear and focused, which helps the learners make sense of the content and expands their understanding of the content even as it reduces the faculty member's workload. At USUHS, such self-assessments are created in a template that can easily be updated to reduce the workload on the development team. Using a consistent look and feel within and between courses for elements like this can also reduce cognitive workload for learners by ensuring that they do not have to re-learn the interface each time they encounter it. For course developers who do not have access to programmers, LMSs also usually enable the development of short self-assessments (that are not linked to the learner's grade) with interactive feedback. However, one caveat in using test or quiz tools built into LMSs is that it can be difficult to link directly to them in the middle of a learning experience – it is frequently necessary to go to a specific area of the course site in order to access them.

While the assessment in the Family Medicine Clerkship requires students to work with patients to practice a skill and requires the faculty to work with them in real-time, an activity used in the pediatrics clerkship takes advantage of technology to give learners the chance to work on attainment of a competency. The following competency is part of the Third Year Clerkship in Pediatrics: Generate an age appropriate differential diagnosis and initial diagnostic and therapeutic plan for each patient presenting with one of the following symptoms, physical examination findings, or laboratory findings.

Otalgia or ear pain is one of the symptoms on the list, and one of the faculty members, a co-author of this article, has developed a systematic approach to differential diagnosis of ear pain. A media-based assessment developed gives learners the chance to practice using that approach.

Figure 5 shows the screen that learners use for practice.

Figure 5: Assessing the Ear Exam Competency: Assessment Problem

After reviewing a case (details of which can be reviewed by clicking the "Case History" tab shown in Figure 5), the learners can view an actual image of an inner ear, taken through an otoscope (with video to show movement), go through the findings, and make a diagnosis using the approach learned during the lesson. Once they click **Submit**, they see the results and feedback, as shown in Figure 6. Note that it is possible for them to get the diagnosis incorrect and the findings correct, or vice versa, and view feedback about why each of their findings is correct or incorrect.

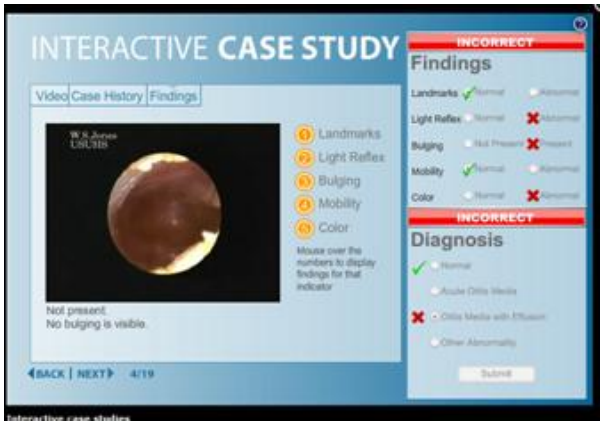

Figure 6: Assessing the Ear Exam Competency: Assessment Solution

There are 13 cases provided in this assessment, giving learners a great deal of opportunity for practice with a wide variety of cases. Such an assessment is particularly effective for a competency that requires use of a systematic approach to evaluating a situation. The use of a template for the main elements of the systematic approach and the incorporation of media only when appropriate enable it to have a relatively small footprint (under 200K). The structure also enables new cases to be added fairly easily, simply requiring the updating of a spreadsheet with key information to enable it to be added to the assessment. The "heavy processing" occurs on the learner's end, not in the assessment.

The Toolkit appended to this document provides a list of assessment strategies and tools that can be used for a variety of types of learning. It also provides a template for an assessment plan that includes areas to document competencies, types of learning, use of media, assessment questions and feedback.

CONCLUSION

If assessments are clear, meaningful, well planned and evaluated, and fully understood by relevant stakeholders, there is a greater likelihood that linkages across all educational systems can be built. Assessments must accurately or meaningfully measure whether learners have achieved the education objectives and competencies specific to the program or institution. In addition the instructor must develop guidance about where and how to improve learning when holistically reviewing results from the assessments. Finally educating instructors about how to plan, design, develop, analyze, and modify assessment (and content) will bring about a holistic approach to the educational product. Simultaneously, these assessments, along with additional evaluation, can provide faculty, department heads, or other decision makers with data that informs curriculum decision making and extends the benefit beyond that of the individual student. The Toolkit appended to this document is designed to support the planning and documentation of effectiveness while evolving the learning experience. It identifies considerations during each step of the assessment planning process that can help ensure that assessments are being used effectively throughout the curriculum and includes a tool that can be used to create an assessment map for a single course or training to support planning and placement of assessments. This strategic approach to implementation of assessment and evaluation has applicability across a wide variety of military and governmental organizations and can enhance the effectiveness of education and training in an environment focused on ROI.

ASSESSMENT TOOLKIT
9 Steps for Successful Assessments

Step 1: ***Create Program Mission Statement*** - Establish or find a description of the purpose of the overall program (or larger program curriculum) the course/training supports. Consider the following questions: Whom does the program serve? What are the goals and how does the courses/training, fit into the larger mission of the program?

Step 2: ***Identify Course/Training Learning Competencies*** - Develop statements of what the learners will be able to do in the areas of knowledge, skills, and dispositions upon successfully completing the course/training. Make sure those statements support Step 1.

Step 3: ***Check Alignment of Content with Competencies*** - Review your content with the competencies in mind. Consider the following questions: How well does your content address the competencies? Do learners have time to study and practice the learning competencies repeatedly within the course or training?

Step 4: ***Develop Assessment Plan*** - Determine the assessment plan that will be used to understand how the course/training is working for the learners and as a part of the curriculum. Consider the following questions: How will you collect evidence? What do you need to do (approvals, etc.) in order to make changes? Who are the learners and stakeholders? What analysis approach are we taking and why? What changes in the content will we make as a result of the assessment? When and how often will we look at data? How will we analyze data? How will we disseminate results?

Determine how you will measure whether assessment strategies are contributing to learner growth and development. Establish the level of expected performance and decide on a schedule for collection of evidence. Make a plan for sharing what you learn.

Step 5: Create Assessments - Consider the following questions: Who is being assessed? What is being assessed? When should assessment occur? Where should assessment occur? Why is assessment being undertaken? How is assessment is being undertaken the program or institution?

In addition the instructor must develop guidance about where and how to improve learning. An Assessment Map can help instructors organize assessments. Figure 7, below, shows an entry for a single assessment, which contains areas to remind instructors to incorporate elements of effective assessments such as feedback and competencies. It also contains areas to keep track of file size to help instructors focus on keeping the bandwidth as low as possible. Putting together a series of these entries builds the Assessment Map for an entire course or training.

Step 6: ***Implement Assessments*** - Implement the assessment plan. Pay careful attention to placement and seek to integrate assessments at points where learners have learned content that they need to explore or apply but have time to review before the course or training ends and/or they are tested on the material. The list below identifies a few of the techniques most suited for use in a distributed or blended learning environment for a variety of types of learning, adapted from Angelo & Cross (1984). (See also Haugen, 1999; National Teaching & Learning Forum, undated, for more details on selecting assessment techniques to align with learning goals).

Assessment 1

Competency:			**Location of Content in Course:**
Type of Learning:	**Assessment type:**	**Provider of feedback:** ☐Self ☐ Instructor ☐Peer ☐ Automated	**Location of Assessment in Course:**
Format(s) of Assessment (select all that apply): ☐Text ☐Static graphic Number____ / File size_____	☐Animated graphic Number____ / File size_____ ☐Interaction Number____ / File size_____	☐Audio Number____ / File size_____ ☐Video Number____ / File size_____	
Assessment Item(s) and Feedback (or file location):			**Rubric:** ☐No ☐Yes **Location of File:**

Figure 7: Item in an Assessment Map

- Minute paper, muddiest point, and background knowledge probe can be effective when assessing prior knowledge, recall and understanding.
- The defined features matrix, pro- and con- grid support can be used when assessing skills in analysis and critical thinking.
- The one sentence summary or providing approximate analogies can provide insight into learners' ability to synthesize and think creatively, helping the instructor or peer reviewers look at higher level skills.
- A problem recognition task asks learners identify a problem and provide diagnosis.
- Providing documented problem can help learners keep track of steps and is a good method for peer review or sharing in low bandwidth environments.
- Application and performance assessments include directed paraphrasing and application cards.
    - Paraphrasing asks the learners to translate information into their own words
    - Application cards provide an idea of the real life application of what was just learned.
- One of the harder areas to address is the learner attitudes, values and self awareness. Angelo and Cross (1984) recommend the use of opinion polls and confidence surveys.
    - Both of these methods allow the instructor to understand where the learners are in their knowledge and take steps to remediate if necessary.

Step 7: *Collect Evidence* - Collect evidence about the effectiveness of the assessment and evaluation plan. Consider the following questions: Do you have evidence that learning was taking place? Are there content areas and competencies where you can tell that more or less learning was taking place?

Step 8: *Modify* - After you have collected results decide if modifications are necessary to the course/training or the assessments.

Step 9: *Share Results* - Share results with other instructors, administrators, and/or curriculum planners. Provide them with an interpretation of the results and a recommended path forward.

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