Cultural Training: The Web's Newest Gaming Frontier

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ABSTRACT

The Secretary of Defense identifies "soft power" as a required capability for our Nation's forces to meet today's global challenges and it is clearly evident that cultural training is a key enabler in meeting this requirement. Such training is vitally important for all DoD personnel deploying overseas and must be available when and where required, to include "just in time" training. As pre-deployment training schedules are compressed, it is necessary to incorporate the most advanced learning methodologies available (gaming, storytelling, intelligent tutors, avatars, remediation, immersive learning, etc.). These technologies help ensure that critical knowledge and requisite skills are transferred to the learner in the most efficient and effective way possible. Currently, personal computing and learning management system-based, level I/II courseware approaches to this problem have been employed; however, it is the opinion of these authors that a web-based approach, incorporating all of the above technologies, is the only real way to satisfy the requirement completely. Accordingly, this paper describes how the technical and pedagogical challenges were identified, met and overcome in order to develop and deploy a web-based cultural training game called the Virtual Cultural Awareness Trainer (VCAT). The paper provides a description of the situated cultural methodology, a description of the VCAT technical solution, the challenges of developing and integrating a game-based, Shareable Content Object Reference Model (SCORM) conformant, web-based immersive trainer into the Joint Knowledge Online (JKO) learning management system, as well as the evaluation methodology and metrics of its instructional effectiveness.

The end result is a web-based, game-based learning environment that teaches cultural awareness and gives trainees opportunities to apply their knowledge in simulated missions. Each trainee receives an automatically tailored program of instruction, according to their country area of responsibility, mission, and mission responsibilities with a specific focus on civil affairs operations and pre-deployment site surveys.

ABOUT THE AUTHORS

Joseph Camacho is the Government Program Manager for both the Joint Knowledge Development and Distribution Capability (JKDDC) Joint Management Office (JMO) and the Regional Security Cooperation Network (RSCN) Programs. He has been instrumental in the development and advancement of Advanced Distributed Learning (ADL) within JFCOM for the last decade. He is charged with oversight of the provision of timely, relevant and globally accessible joint knowledge preparing and assisting individuals to support combatant commanders and integrated operations. Mr. Camacho is also charged with the implementation of ADL in support of Regional Security Cooperation worldwide. Mr. Camacho was recently appointed by OSD (Personnel & Readiness) as the Chair of the NATO Training Group Working Group on Individual Training and Education Developments.

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INTRODUCTION

The Secretary of Defense has identified "soft power" as a required capability for our Nation's forces to meet today's non-kinetic global challenges, and it is evident that cultural training is a key enabler in meeting this requirement. Consistent with this concept, it is clear that in order for DoD personnel deploying overseas to be more effective in their missions, they require at least a basic level of intercultural competence.

Unfortunately many deploying DoD personnel do not have enough time or even access to sufficient training in even the most basic intercultural competence. This is further exacerbated by the fact that language and culture educators, in reference to the American Council on the Teaching of Foreign Languages (ACTFL) and DoD standards, commonly advocate spending extended periods of time immersed in the foreign culture, as a way of gaining intercultural competence. This is necessary because intercultural competence requires not only knowledge of the target culture, but also extensive practice in applying cultural knowledge in intercultural interaction with foreign nationals. Yet compressed pre-deployment training schedules do not permit such immersive learning in country. Most personnel receive little or no exposure to the target culture prior to deployment, and must start carrying out their missions soon after arrival in the foreign country.

Thus, there is a great need for cultural training that focuses on the development of mission-relevant intercultural competence, that is available to personnel when and where they need it. Existing training methods are insufficient for meeting these training challenges. Classroom lecture-based cultural instruction gives learners little opportunity to practice cultural skills in realistic settings. Typical personal computing and learning management system-based courseware is primarily concerned with presenting cultural facts and information, and gives little opportunity to develop and practice cultural skills. Immersive simulation-based training experiences are well suited for cultural training, as a substitute for immersive experiences in country. However, such simulations often require special hardware and/or software installations, and so are less convenient than web-based solutions. Web-based solutions integrated with learning management systems offer learners convenience, but typically offer relatively little in the way of immersion and interactivity.

This paper describes how these technical and pedagogical challenges were met and overcome, in developing and deploying a web-based, game-based learning tool called the Virtual Cultural Awareness Trainer (VCAT). VCAT incorporates some of the most advanced learning techniques available (game-based learning, storytelling, intelligent tutoring and remediation, etc.), to help learners to quickly and efficiently develop operational cultural knowledge, and acquire cultural skills. The paper describes the instructional design methodology used in developing VCAT, called the Situated Culture Methodology, which ensures that the cultural training is efficient and relevant. It includes a description of the VCAT technical solution, and how it delivers advanced learning technologies in a manner that is conformant with the Shareable Content Object Reference Model (SCORM). It also describes the evaluation methodology and metrics that are integrated into the system to assess its instructional effectiveness.

The end result is a web-based, game-based learning environment that teaches cultural knowledge and gives trainees opportunities to apply their knowledge in simulated missions. The current VCAT system focuses on the cultures of the Horn of Africa. The system is integrated with the Joint Knowledge Online (JKO) learning management system, and is available to a wide range of military and civilian personnel. Each trainee receives an automatically tailored program of instruction, according to their country

area of responsibility, mission/scenario of interest, and level of responsibility (junior or senior).

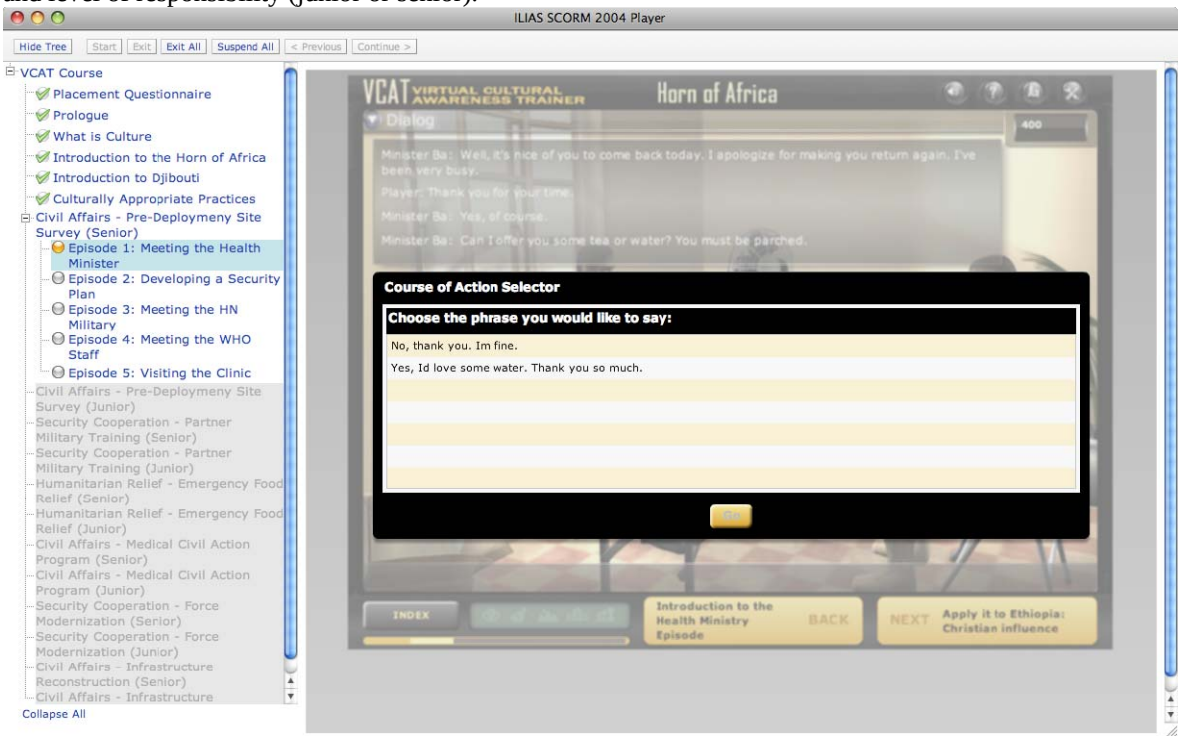

Figure 1. Example of VCAT in use.

THE SOLUTION

Figure 1 shows an example of VCAT in use. The outline on the left shows the curriculum, organized as a hierarchical sequence of SCORM modules. VCAT tailors the curriculum to fit the specific needs of each individual trainee, so that they can complete the essentials of the course in four hours or less. Each trainee selects the country in the Horn of Africa that they plan to visit, the role that they will carry out (junior leader or senior leader), and the type of mission they will carry out (civil affairs, security cooperation, or humanitarian assistance) and the kind of scenario they want to train. Based upon these choices, VCAT selects a subset of course modules most appropriate for the trainee's needs, using SCORM 2004's advanced sequencing mechanisms. For example, if the trainee indicates that he or she is a senior leader deploying to Djibouti for a humanitarian assistance mission, then the tailored curriculum will focus on the culture of Djibouti and the cultural skills that a senior leader would need for such an operation, e.g., in meetings with local health ministry officials, as in this example.

The right side of Figure 1 shows one of the VCAT gaming modules in use. In this example the learner's character, John Pearson, is engaged in a meeting with the local health minister. This is an example of how immersive game-based learning is incorporated into the training. In this example, the health minister has offered Pearson water to drink, and the learner has the option to accept or decline the offer. The trainee receives a cumulative score (top right corner) based upon the number of culturally appropriate actions taken, as well as a detailed debrief on how well the trainee applied his or her cultural skills.

The cultural skills that trainees must use are applications of specific cultural concepts taught in the course. Figure 2 shows an example of how these cultural topics are taught. Here a service member is explaining the importance of building relationships when working in the Horn of Africa. If the trainee refuses the health minister's offer of drink in Figure 1, the debrief after the episode will point this out, and encourage the trainee to go back and review building rapport as in Figure 2. This example illustrates how VCAT integrates instruction in cultural concepts and application of these cultural concepts in concrete settings, and in particular the use of first-person storytelling techniques in the presentation of cultural concepts. In fact, storytelling techniques are employed throughout the course to maximize the salience of the learning experience.

Figure 2. Building relationships in the Horn of Africa

Figure 3. The VCAT Virtual Coach

Another way in which learning in VCAT is made engaging and salient is through the use of the Virtual Coach, an animated pedagogical agent (Johnson et al., 2000) that guides the learner through the learning process. The Virtual Coach personalizes the learning material, which Mayer et al. (2004) have shown increases interest and retention. It interacts with the learner both at a cognitive level (presenting concepts and giving feedback on learner performance) and at an affective level (conveying enthusiasm, reassurance, confidence, etc.). The virtual coach complements the avatar-based practice exercises of VCAT as in Figure 1, and the personal stories as in Figure 2, so that the learning material takes a personalized perspective throughout.

THE CHALLENGES

In developing VCAT, a number of technical and pedagogical challenges were identified, met, and overcome. These challenges were identified and systematically addressed as research questions:

- How can a training system enable trainees to develop useful cultural skills in a very short amount of time? Trainees may start with very little understanding of what culture even is, and need to end up with enhanced cultural awareness, specific knowledge about the target culture, and the ability to apply this knowledge in intercultural settings. They need to come away with an understanding of the dos and don'ts that apply to the culture, as well as the underlying cultural beliefs that explain those practices.
- How should advanced learning technologies be employed in support of the VCAT design? Specifically, what types of games, multimedia and interactive activities should be used, and how should they be combined into a compelling, engaging course?
- How do we realize these technologies within the context of a web-based, SCORM-conformant framework? While VCAT aims at reaching Interactive Multimedia Instruction levels 3 or 4, the current deployment requirements limit applications to standard plug-ins such as Flash and Java. Further, the need to deploy the system in SCORM limits radically what can be done both in terms of structuring the application and assessing the learner performance. A major challenge, therefore, is to stretch the technological boundaries of what is normally done with SCORM and these standard plug-ins.

Each of these research questions posed significant challenges, and led to the development of unique solutions for VCAT, which are described below.

INSTRUCTIONAL METHODOLOGY

The VCAT approach to cultural awareness training bears a strong operational objective, focusing on those aspects of culture that influence the outcome of joint operations. Military approaches to training operational culture, such as the US Marine Corps Center for Advanced Operational Culture Learning (CAOCL)'s Operational Culture for the Warfighter model (Salmoni & Holmes-Eber, 2008) or the US Army Training and Development Command (TRADOC)'s CARVERSHP model (TRADOC, 2007) share some relevance such as the VCAT focus on addressing the human terrain in which the joint warfighter will operate. Other models, however, such as Hofstede's (2003), deal with broad national cultural trends and do not get to the level of individualization that VCAT intends to achieve. The VCAT approach also contrasts with cultural literacy

approaches (e.g., Arvizu & Saravia-Shore [2004]) and compendia of cultural facts such as the World Factbook of the Central Intelligence Agency and the Human Relations Area Files (HRAF, 2009), which address a wide range of facts and information about a culture, without regard to how trainees might apply this information to operations. Further, joint operations are not always strictly military operations and can include non-military elements and involve non-military as well as military objectives. Therefore, available military operational culture methodologies, addressing strictly military concerns, do not meet the needs of cultural training for joint operations.

It is not possible to cover the entire range of cultural concerns relevant to joint operations in the Horn of Africa within the confines of a four-hour course. Therefore VCAT prioritizes on cultural material of greatest relevance to each individual joint trainee. It addresses the operations that each trainee is likely to be engaged in as opposed to presenting cultural material that is generally relevant to joint operations in the Horn of Africa. First, it focuses primarily on the specific type of mission that the trainee expects to be engaged in—civil affairs, security cooperation, and humanitarian assistance. For example, if the trainee is engaged in a humanitarian assistance mission, VCAT will present example humanitarian assistance scenarios to the trainee, and highlight the cultural issues that arise in such contexts (e.g., meetings with host nation health ministry officials). Secondly, VCAT addresses the culture of the specific country in the Horn of Africa to which the trainee is deploying. And lastly, the curriculum is tailored to the particular type of role that the trainee is likely to perform in the target country. If the trainee is a senior leader, then the trainee is presented with cultural dilemmas that arise in the context of planning joint operations, in collaboration with host nation officials. If the trainee is a junior leader, the trainee is presented with cultural dilemmas that arise in connection with executing joint operations. Thus, depending upon the characteristics of the individual trainee, VCAT can generate any of a total of 6 (# missions/scenarios) × 13 (# HoA countries) × 2 (leadership roles) = 156 tailored programs of instruction.

Another way in which the VCAT curriculum focuses the cultural material is by concentrating on the cultural skills that relate to the trainees' day-to-day activities. VCAT encompasses not only cultural aspects that generally influence the outcome of joint operations, but more specifically the cultural aspects that impact on the trainees' individual encounters with host nationals in the course of carrying out their missions. It addresses not just the macro-social features of the human terrain (characteristics of the nation, state, region, tribe, etc.), but also the micro-social features (characteristics of face-to-face interactions). This includes training in culturally appropriate behavior, such as the dos and don'ts that apply in mission contexts. Trainees thus come away with cultural knowledge and skills that they can put to immediate use when they deploy.

Situated Culture Methodology

To meet the challenges of developing cultural training that is tailored and focused on the needs of the individual warfighter, the program adopted an approach to developing and authoring cultural training content that focuses on the development of task-oriented cultural proficiency. Figure 4 shows a schematic overview of the SCM methodology (SCM) (Valente et al., 2009; Johnson, 2009a) which was used to develop the course. The methodology is broken down into three major sections: Context, Cultural Factors, and Curriculum. The Context section investigates the tasks that trainees are likely to encounter in the course of conducting their missions, and helps to determine which cultural factors are important to train. The Cultural Factors section determines how the cultural material is categorized and organized. The Curriculum section determines the learning objectives and performance objectives for the cultural training, and determines how to accomplish these objectives using a combination of learning activities.

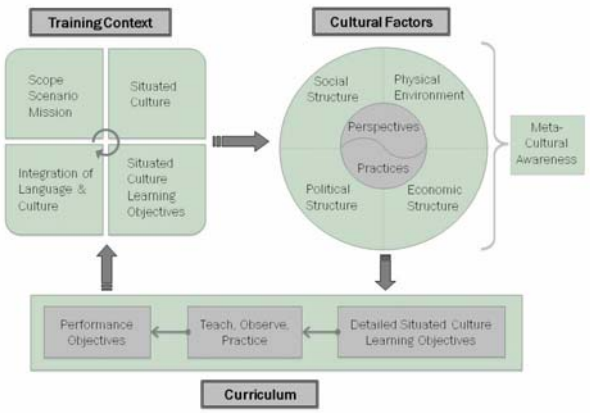

Figure 4. The Situated Culture Methodology

The Context analysis for VCAT started with the target mission types (e.g., humanitarian assistance), and proceeded with the development of example scenarios illustrating the conduct of these missions. From this the course authors identified the particular situations that trainees are likely to encounter in the conduct of the

mission (e.g., meetings with local health ministry officials), and cultural skills that they would need to acquire to succeed in these situations (e.g., building rapport with the host nation officials prior to getting down to business). This in turn made it possible to identify the specific situated cultural training objectives for the VCAT course.

The Cultural Factors analysis determined and documented the cultural factors relevant to the VCAT curriculum, and organized them in a manner suitable for integration into the curriculum. The cultural factors center on Perspectives (ways in which culture affects the ways people perceive actions and the world generally) and Practices (cultural norms and constraints on behavior), as these govern face-to-face intercultural interactions. For example, it is common practice in many Horn of Africa countries to require visitors to wait prior to meetings, and impatience over a delayed meeting may be perceived as rude.

The Cultural Factors analysis also takes into account the following broader macro-social dimensions of culture: Social Structure, Physical Environment, Political Structure, and Economic Structure. Cultural information along these dimensions was included if it was relevant to the situations identified in the Context analysis, and/or if it helped to explain the Perspectives and Practices. For example, the strength of tribal social structures in the Horn of Africa can explain why host nation officials may try to get American joint personnel to give preference to particular tribes when distributing humanitarian assistance. The focus on situated culture, as well as on relevance to perspectives and practices, help to determine which cultural facts to focus on in VCAT, and help trainees understand how to put them to use.

An additional factor that cuts across all dimensions of Cultural Factors is Meta-cultural awareness. Meta-cultural awareness is the ability to recognize cultural factors in one's own culture as well as in the target culture, and to evaluate them in a non-judgmental fashion. Meta-cultural awareness is an important contributor to intercultural competence (Bennett, 1986), and facilitates cross-cultural learning.

The Curriculum analysis phase organized the VCAT cultural materials into a coherent curriculum, intended to accomplish particular learning objectives and performance objectives. The curriculum uses a Teach, Observe, and Practice approach—teach cultural concepts, let trainees observe how the concepts apply in particular situations, and have trainees practice applying the concepts.

Two types of subject matter experts (SMEs) participated in the development of VCAT, in accordance with the SCM methodology. Task SMEs were experts in the types of missions VCAT is designed for, as applied to the Horn of Africa where possible. Culture SMEs were people familiar with the cultures of the Horn of Africa, particularly people native to that region. The involvement of these SMEs helped ensure the accuracy of the instructional materials in VCAT, and their relevance to joint pre-deployment training.

Further Details of the Instructional Design

The cultural learning objectives of VCAT fall into three distinct categories. First, we want trainees to develop better general intercultural sensitivity and meta-cultural awareness. This will better prepare them for overseas deployments regardless of what country or countries they will be working in. Secondly, trainees need to acquire knowledge of the culture they will be working in, relevant to their particular mission. Some of this knowledge applies generally to the cultures of the Horn of Africa, and some is specific to the countries and even the local region where the trainee will be working. Lastly, trainees must develop the specific intercultural skills necessary to handle the situations they are likely to face when carrying out their mission. Thus, the VCAT curriculum includes learning modules addressing each of these topics, starting with a general introduction to culture, a general discussion of culture in the Horn of Africa, an introduction of the culture of the country of interest, followed by interactive modules intended to develop cultural skills. Each module builds upon the concepts learned in the previous modules, and gives trainees opportunity to apply the knowledge gained in the previous modules, reinforcing that knowledge.

One of the most basic hurdles that the VCAT curriculum must address is that trainees may start out with a very poor understanding of what culture is, why it is relevant to joint operations, and how to go about developing competence in a particular culture. They may have had relatively little exposure to culture, and little meta-cultural awareness. For this reason the VCAT curriculum starts with a learning module that provides an introduction to culture itself: what it is, and why it is important, both to facilitate positive mission outcomes and to avoid negative consequences of contact with unfamiliar cultures such as culture shock. It introduces key cultural terms such as cultural awareness and cultural competence, so that trainees can

better understand the cultural learning objectives of the course.

Because the VCAT curriculum is designed to be completed in four hours or less, it can only cover the basic essentials as part of the tailored curriculum. However, it is hoped that trainees will be motivated to revisit the VCAT on-line learning materials, and explore them in further depth later. Therefore VCAT provides trainees with an initial exposure to additional cultural concepts that go beyond the immediate training objectives of the course, which trainees may explore in further depth later as time permits. For example, VCAT introduces some key phrases in the language(s) spoken in each country, but does not require trainees to develop foreign language proficiency to complete the course. Also, trainees are free to explore the full range of game-based learning scenarios in the course, including ones that involve other missions and situations.

Games play key roles in the VCAT curriculum. Games serve multiple functions in the curriculum design. They motivate learners to keep practicing and training, in order to raise their game scores. They provide trainees a change of pace during the training, which previous studies have shown is helpful when trainees are engaged in lengthy training sessions (Johnson & Wu, 2008). Finally, the scenario-based games give trainees opportunity to practice their cultural skills in concrete contexts similar to what they will encounter when they are deployed overseas.

VCAT contains two types of games: casual games and scenario-based games. Casual games give trainees opportunities to develop their cultural knowledge and apply their cultural skills, particularly for short periods. VCAT includes two casual games: Mad Match and Suspect Search. Mad Match is a *Concentration*-like game in which trainees must recognize and associate related cultural concepts. Suspect Search is a game similar to *Where in the World is Carmen Sandiego*, where trainees must use cultural facts as cues to locate a suspect hiding in a Horn of Africa country. These games are designed to facilitate the development of cultural knowledge. Scenario-based games, such as the one shown in Figure 1, are designed to facilitate the development of cultural skills. Each scenario includes a series of choice points, where the trainee must select an action for his avatar to perform. Each choice point requires the application of particular cultural skills. As trainees learn to master the scenarios, they develop the ability to apply the requisite cultural skills.

Throughout the VCAT learning materials there are a range of interactive activities that give trainees opportunities to explore the culture and develop a deeper understanding of it. For example, there are multimedia activities that include a mixture of cultural materials using different media, including images and videos. The variety of media is intended to accommodate learners with different learning styles, and to give them more of a sense of control over their learning. Learner control has been shown to improve learner motivation (Lepper & Malone, 1987) and is also one of the factors that contribute to the effectiveness of game-based learning.

The instructional design used in VCAT has similarities with some other language and culture training systems, such as the Tactical Language Training System (TLTS) (Johnson 2009b). TLTS teaches culture as well as language, and so is designed for trainees who have somewhat longer amounts of time to train. In TLTS trainees must speak in the foreign language in order to play the scenario-based games. On the other hand, TLTS does not place as much of an emphasis on meta-cultural awareness. In other respects the courses are similar, as a result of the fact that they are developed using the same Situated Culture Methodology.

VCAT also has some similarities to game-based culture training systems such as VECTOR (Deaton et al., 2005) and ELECT (Hill et al. 2006). These games give trainees opportunities to practice cultural skills, but do not teach the cultural knowledge underlying those skills. The Integrated System for Language Education and Training (ISLET) project has developed a web-based cultural training component, and shares certain training objectives with VCAT. However the ISLET cultural trainer is designed as an introduction to culture within a larger language and culture training course, not a self-standing course.

TECHNICAL APPROACH

The following is a description of how VCAT realizes this highly immersive and adaptive design within the constraints of a standardized web-based training delivery mechanism. The research underlying the development of VCAT led to a number of technical innovations and departures from conventional methods for delivering multimedia instruction.

The VCAT curriculum is organized as a collection of learning modules, or Shareable Content Objects (SCOs), in conformance with the SCORM 2004 standard (JCA Solutions, 2009) and delivered by

AtlasPro, the learning management system employed by Joint Knowledge Online.

Each module in VCAT is delivered using a web-based content delivery system, supporting the delivery of a variety of types of interactive learning materials in VCAT, including interactive multimedia presentations and game activities. The delivery system is implemented using the Adobe Flex technology for rich web applications, which in turn works on the Flash browser plug-in. The requirement to use only Flash (and Java) and no other additional plug-ins presented a key technical challenge that required a considerable amount of development.

Curriculum Sequencing

As noted above, VCAT uses advanced sequencing features in SCORM 2004 to tailor the content by dynamically building a program of instruction specific to the needs of each learner. Specifically, the tailoring process works as follows:

1. The learner answers an initial questionnaire where the learner specifies (among other answers) three parameters: the main country the learner is deploying to in the Horn of Africa, the role the learner will play while deployed (junior or senior), and the type of mission the learner is likely to perform (one of: civil affairs, security cooperation, or humanitarian assistance).
2. Using advanced sequencing mechanisms in SCORM, VCAT offers a program of instruction that (a) omits lessons that are not relevant to the learner (e.g., in-depth cultural knowledge about countries other than the deployment country); and (b) selects the simulation game scenarios for the mission selected by the learner. Each scenario is provided in two versions depending on the level of the user (junior or senior); the system selects the appropriate scenario based on the answer given in the initial questionnaire.
3. VCAT also filters the lesson content in some lessons based on the country selected. Specifically, it selects the appropriate instructional content to explain differences between the way a scenario unfolds (which is based on Djibouti as a "base" country) and the way the scenario would unfold in the country where the learner is deploying.
4. The program of instruction also offers all instructional materials that are not part of the main program of instruction in an "Optional" group, making them available to learners who have more interest or more time to spend than the baseline four hours of instruction.

Immersive Game-Based Learning

The immersive game scenarios in VCAT are intended to provide trainees with the experience of engaging in complex intercultural interactions, in which trainees can practice their intercultural communication skills and see the consequences of their actions. Trainees can engage in extended conversations with non-player characters, in the context of meetings at host national offices or encounters on the street. Non-player character behavior needs to be appropriate for the target culture, as well as serve useful instructional functions. Such complex interactions are not typical of interactive games generally, and certainly not of typical military training scenarios that emphasize kinetic interactions.

The VCAT game-based training solution is further constrained by authoring and training delivery considerations. The gaming solution needs to be authorable by cultural specialists, who may be non-specialists in artificial intelligence or agent technologies. Otherwise, it would be difficult to create large numbers of training scenarios for VCAT, and get the cultural details right in each scenario. This limits the complexity of the specification languages and notations that can be used. TLTS language and culture courses face similar authoring considerations, and so the authoring tools and approach used in TLTS (Johnson & Valente, 2008) was adapted for use in VCAT.

The resulting game scenarios need to be delivered via Joint Knowledge Online. This places specific requirements on system architecture, program size, and interface technology. To give the sense of engagement in face-to-face conversations, the simulation engine for the game scenarios and non-player characters needs to run on the trainee's client computer, to minimize latency in interaction. Since JKO permits only Flash and Java as plug-ins this rules out sophisticated 3D game engine plug-ins. Likewise, client-side speech recognition plug-ins are excluded, precluding spoken dialog as in TLTS.

To meet these constraints, VCAT uses a 2 ½ dimensional simulation system to replace the 3D game engines that are normally used in this type of simulation. In our initial concept, the user was going to navigate in a first person world in first person by switching between a fixed set of "blockings", in a way similar to the classic game *Myst.* However, user testing in earlier versions of the system indicated that users found this type of exploration unnecessary (especially

considering VCAT is a short course). We therefore replaced it with a mechanism in which scenarios are divided on episodes, and in each episode the user starts just outside the place where the dialog is supposed to occur. At that point, the system offers the possibility to optionally explore the place by clicking on culturally appropriate objects for the AOR (e.g., a camel) and receiving information about them.

Once the user reaches the place where the dialog is to occur, the system switches to a third person "conversation mode"; the third person view is used so that the learner is able to see the physical behavior (including gestures) of his/her own character in the game. The user interface in conversation mode allows the user to select appropriate actions and/or gestures to perform at each turn. The dialog is run in part by the system, so to expose the learner to specific examples of culturally appropriate behavior as well as to place the learner in situations where critical cultural choices need to be made.

Non-player character (NPC) behavior is controlled via finite state machines, which define the response to each possible action of the trainee or of other non-player characters. In scenarios where it is important for the trainee to get to know the non-player character and develop rapport with him, the degree of rapport is maintained as a dynamic variable which can increase or decrease in response to the trainee's actions. Subsequent non-player character actions may be conditioned upon the level of rapport attained.

Scenario authors use a graphical editing tool named TIDE (Johnson & Valente, 2008) to define the sequencing of scenario events and non-player character actions. TIDE also allows authors to specify when trainee actions have a positive or negative effect on rapport, whether or not a trainee action was appropriate, and author feedback to give to the trainee in the debrief at the end of the scenario.

Trainees receive feedback both during the scenario and in the post-scenario debrief. During the scenario, the reactions of the non-player characters provides the feedback—trainees can infer from the NPC's responses that they must have done something culturally inappropriate.

Scenario-Based Assessment and Remediation

VCAT shares technology used in the existing Tactical Language systems for specifying an interactive mission scenario based on interpersonal communication encounters. This makes use of XML-based representations that are compiled and interpreted at run time. The specification covers the whole scenario, from the set of places where each conversation occurs, existing non-player characters, behaviors of the non-player characters, possible conversation paths and branches, briefings, and debriefings for each possible outcome. The targeted debriefings make it possible to implement a remediation strategy where we can point out to the learner what was done correctly or incorrectly, and where to go in the course to improve performance.

While the simulation technology used from the Tactical Language systems covers assessment based on outcomes and specific paths taken by the learner, we have also integrated a third-party suite of tools and middleware providing the ability to track and assess student performance and communicating results to a SCORM-conformant LMS.

Intelligent Coaching

The VCAT Virtual Coach (Figure 3) is an animated pedagogical agent (Johnson et al., 2000) that supports training, making it more salient and effective. Like other pedagogical agents, the Virtual Coach supports learning through user interactions that combine a cognitive component (e.g., presenting cultural information and evaluating the quality of trainee culture actions) and an affective component (e.g., expressing encouragement and approval when the trainee is performing well, or empathy when the trainee is encountering difficulties). However unlike most other pedagogical agent applications, e.g., AutoTutor (Graesser et al., 2004) the Virtual Coach is designed specifically to support immersive game-based learning. It places emphasis on coaching the trainees, to help them maximize their performance.

VCAT learning activities are organized in a Prepare, Perform, and Review cycle. The Virtual Coach has a crucial role to play in reinforcing this structure, particularly during the Prepare and Review phases, and particularly for game-based practice activities. During the Prepare phase, the Virtual Coach reviews the objectives of the next activity, to help the trainee to get mentally prepared for the upcoming activity. This mental preparation may be of a cognitive nature, reminding the trainee of cultural points that may be relevant to the upcoming activity. It may also have an affective aspect, e.g., offering encouragement, bolstering confidence, and promoting a sense of excitement about the upcoming activity. After the trainee performs the activity, the Virtual Coach reviews the results of the activity with the trainee, and

summarizes both the positive aspects of the trainee's performance and the areas where the trainee needs to develop and improve. The Virtual Coach offers suggestions of lesson material that the learner should review in order to improve the cultural skills that the trainee appears not to have fully mastered.

The role of the Virtual Coach during the Perform phase of the activity cycle depends upon the type of activity, and that, differs from a typical intelligent tutoring or pedagogical agent application. If the activity that the learner is performing is a game or a quiz, then the Virtual Coach interacts with the trainee very infrequently or not at all, and postpones feedback until the debriefing phase. This contrasts with typical step-based tutors (VanLehn, 2006) or AutoTutor, which continually engage in tutorial dialog with the trainee. There are multiple reasons for this difference in approach. First, as described above the game activities are designed so that they provide frequent and continual feedback, especially from the non-player characters. If trainees are able to see for themselves that they have made a cultural mistake, the experience is likely to be memorable and more salient than a critique from an intelligent tutor. Secondly, good game-play maintains a flow of activity, and commentary from a virtual tutor can disrupt that flow.

For learning activities that consist of presentations of cultural concepts or sets of short practice exercises, the Virtual Coach interacts more frequently with the trainee. But even here we make an effort to keep the Virtual Coach from distracting the trainee's learning activities. For cultural presentations in particular, the Virtual Coach's voice is used to narrate the cultural points, but the Coach's persona does not appear except to emphasize a particular point. Otherwise the Coach's animated persona might draw the trainee's attention from the visual or textual material on the screen, and interfere with learning.

EVALUATION AND ASSESSMENT

Evaluation and assessment are integrated into the VCAT program, both to assess the learning gains of individual trainees and to assess the effectiveness of the training program as a whole. Each major content module includes learning assessments appropriate to the learning objectives covered in that module.

Each module that covers factual and conceptual knowledge includes a self-assessment quiz at the end. Trainees are free to study and attempt these self-assessments multiple times, until they feel that they have mastered the concepts. Moreover, the self-assessments are designed to cover the concepts that the subsequent game scenarios practice and test. If the trainee has difficulty applying a cultural skill in a practice scenario, the scenario debrief gives specific guidance regarding which cultural modules to review.

The VCAT system has undergone a series of iterative evaluations, and these evaluations are ongoing. Two alpha versions have been developed so far, and each one has been reviewed by a combination of Government and civilian personnel. Each review has yielded comments that have resulted in further improvements to the overall design.

The next phases of evaluation will examine how effective VCAT is at promoting intercultural competence. Pre-training and post-training assessments have been integrated into the VCAT system for the purpose of this evaluation. The evaluation plan was developed in collaboration with Dr. Eric Surface and Dr. Marinus, who have conducted independent evaluations of a range of military language and culture courses, including Tactical Iraqi in 2007 (Surface & Dierdorff, 2007). It is designed to be analogous to earlier evaluations of TLTS, so that we can compare the effects of training with the two systems.

The pre-training questionnaire includes measures of constructs such as individual trainee characteristics that might affect their acceptance and use of VCAT's game-based learning technologies (e.g., gender, age, educational background, and experience with computer games), motivation, self efficacy and self-reported cultural proficiency.

The post-training questionnaire includes measures of constructs such as intention to apply the cultural skills learned in VCAT, self-efficacy in the area of intercultural competence, self-reported cultural proficiency, reactions to the training, and suggestions for further improvement.

We hypothesize that after completing the short VCAT course that the trainees will show measurable increases in cultural competence and self-efficacy, and will indicate an intention to continue to develop their cultural skills.

CURRENT AND FUTURE WORK

The VCAT course entered acceptance test by USJFCOM in July 2009. Test feedback will be incorporated in the final version of VCAT, scheduled to be released on Joint Knowledge Online in late 2009. At that time a summative evaluation of the training system will commence. There will be a formal report of preliminary results from the summative evaluation, as

well as early data regarding the use of VCAT, at I/ITSEC 2009.

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