This is a preprint of the paper to be presented at the 13th International Conference on Cyberworlds, Yokohama, Japan, October 21–23, 2012

Preparing for International Operations in a Cyberworld: a Norwegian Army Example

Ekaterina Prasolova-Førland and Mikhail Fominykh
Norwegian University of Science and Technology
Trondheim, Norway
{ekaterip, mikhail.fominykh}@ntnu.no

Anders I. Mørch
University of Oslo
Oslo, Norway
anders.morch@intermedia.uio.no

Ramin Darisiro
Norwegian Armed Forces
Oslo, Norway
rdarisiro@fhs.mil.no

David Hansen
Centre for International and Strategic Analysis
Oslo, Norway
david.hansen@strategiskanalyse.no

***Abstract*—Understanding culture is an integral part of international operations in developing countries and conflict zones. Cultural encounters in countries such as Afghanistan might introduce a number of challenges. This paper presents the experiences with the CAMO project (Cultural Awareness in Military Operations) seeking to address these challenges. The goal of the project has been to create a game-based simulation in the virtual world of Second Life for pre-deployment cultural awareness training among Norwegian military personnel preparing for service in Afghanistan. At the same time, due to the gradual withdrawal of troops from Afghanistan, training cultural awareness among civilian personnel becomes more important. This paper will present some experiences from the CAMO project, discussing how the proposed methodology could be extended for non-military use as well, and outlining the challenges and directions for future work.**

Keywords-cultural awareness; military training; game-based simulations

I. INTRODUCTION

In this paper, we present the results of the CAMO project (Cultural Awareness in Military Operations). The goal of the project has been to create an inexpensive and flexible game-based simulation for training cultural awareness among military personnel preparing for international operations (Afghanistan), which has the potential to be reused for civilians working in the area.

Overcoming cultural distances requires externalizations [1, 2] in the form of boundary objects [3] that have meaning across the boundaries of the individual knowledge systems [4]. In this way, boundary objects allow different knowledge systems and communities to interact by providing a shared reference that is meaningful within both parts. Another way to overcome cultural distances is by 'perspective taking' which means to see a point of view from another person's position and then to act as though one were that person. Social scientists have studied how people take on the perspective of the other when they act on shared objects e.g., boundary objects. For example, during economic exchange, both buyer and seller must take each other's perspectives towards the shared object of exchange for proper understanding. Role-playing is a technique for learning perspective taking [5].

3D cyberworlds provide interesting possibilities for creating boundary objects. Game-based simulations and role playing in 3D cyberworlds have also been used for military training and as general learning and teaching methods for a long time [6, 7]. They provide engaging learning experience and are used for demonstrating complex concepts in an intuitive way. Game-based simulations and educational role playing may have both positive and negative impacts (as discussed e.g., in [8]) that we considered in our design. We are also aware of the fact that the technology we apply may impose a number of limitations in terms of generalization, transfer, and application in real life settings [9].

An example of a complex concept that can be demonstrated and learnt in a 3D cyberworld is operational culture. Understanding culture is a basic component of operational planning, training, and execution. There are a number of commercially available game-based simulations and cyberworlds for training operational culture including systems such as Tactical Iraqi and First Person Cultural Trainer [10-12]. Such systems are typically very expensive to develop and primarily single-player, providing no or very limited support for collaborative learning and team training. In addition, there are no or very few possibilities for the user to generate own scenarios and modify existing ones, something that might be of high importance when the political situation in the region of interest suddenly changes. At the same time, there is a lack of research-based methods for using game-based simulations in military training [13], especially in the area of cultural awareness/operational

culture. The use of such systems requires aids for scenario development, training practices, and performance measurement tools that currently do not exist [13].

The CAMO project seeks to address these challenges. The project is a joint effort between the Norwegian Defense University College, the Norwegian University of Science and Technology, the University of Oslo, and the Bjørknes College. The ADL (Advanced Distributed Learning) section at the Norwegian Defense University College has been coordinating the project. Other participants include Norwegian Military Academy, Norwegian Defense Language and Intelligence School, Telemark Battalion, and Norwegian Defense Media Center. Apart from developing the simulation, the project aims at creating research-based methodology, guidelines, and tools for developing 3D educational simulations for future use in the Norwegian Armed Forces [14].

As a starting point for developing such a methodology, we studied publicly available literature and guidelines for operational culture training, such as "Operational Culture for the Warfighter: Principles and Applications" [15] and recommendations for developing cross-cultural competencies at the US Department of Defense [16]. We have also studied scenario methodologies developed at the UK Human Factors Integration Defence Technology Centre [17] and the Royal Netherlands Army/TNO Defense, Security & Safety/Delft University of Technology [18], which are well developed and rather systematized, but are primarily focused on tactical/operational tasks and not on operational culture. Therefore, these methodologies have been developed further during the project to be adjusted to the goals of the CAMO project [14]. Since the existing literature on Afghani operational culture is rather fragmented and/or classified, it was decided to use subject matter experts within the Norwegian Armed Forces and Norwegian academia as the major source of information for the scenarios.

In the following, we present the results of the project, discussing how the resulting methodology and design principles could be further developed and extended for civilian use in Afghanistan and generally developing countries in the region.

II. Background

A Norwegian military force operating in foreign countries would, regardless of the composition and organizational affiliation, have a need for culture-related knowledge – in order to carry out their missions in a best possible way (either missions taking place in Afghanistan, Sudan, Syria, the Balkans or other areas of operation). In brief, there are major cultural differences between what a Norwegian soldier is used to from Norway, and even other international operations, and what one is met with on the ground in Afghanistan – whether it is in Kabul or in a district such as Maymanah, Northern Afghanistan.

In this paper, the concept of culture is specified to encompass cross-cultural issues covering general operational culture, including aspects related to gender and language, limited to tactical scenarios in Afghanistan. This is considered to be of primary relevance for the forces of Provincial Reconstruction Teams (PRT), Military Observation Teams (MOT), tactical mentors that operate in cooperation with local Afghan forces (Afghan National Army-ANA and Afghan National Police ANP), and Special Operations Forces (SOF). It would also be relevant to the staff officers serving in the International Security and Assistance Force (ISAF) headquarters, as well as other contributions, such as field hospital personnel, mine-clearing personnel, Norwegian police elements in Afghanistan, and other smaller units and individual officers serving in other NATO / UN positions in Afghanistan. In a wider context, some other actors, such as embassy personnel, non-governmental organizations and media personnel, could also benefit from the learning insights and knowledge derived from the project presented in this paper.

Since Afghanistan is very complex and ethnically diverse, it was necessary to prioritize, focusing in particular on the cultural aspects typical of the Pashtun ethnic group. However, the learning goals of this project caught up the cultural aspects of a more general character – with validity beyond Pashtuns – to the extent that was appropriate and necessary to describe the cultural aspects. Furthermore, the project also focuses on the generic aspects of culture.

Operational culture in this context means practical, specific, and applicable knowledge about cultural issues related to, among other things, rhetorical and linguistic factors: religion (Islam), myths, folklore and superstition, crime and local conflicts, interpersonal relationships and psyche, power, position, and social conditions.

Practically applicable knowledge means knowledge that a single man, a patrol, a team, or others should be able to use in their everyday work in interaction with and in the analysis of friendly as well as hostile local citizens and social structures in general – with the intent to implement their operations in the best possible way. Another perspective on cultural awareness/operational culture can be found in [19], which states that cultural awareness (in general) is about, "Norwegian forces' understanding of the local [cultural] context in the operational area and their approach to local moral, ethical, cultural and legal borders, in cooperation with both the civilian population, allied military and the enemy."

Both definitions emphasize the importance of identifying the relevant aspects of culture that affect military operations and that helps us to understand the effects of our actions in the light of the socio-cultural composition of the operational environment. Focus on culture allows (theoretically) military units and partners to use knowledge of foreign culture for the following purposes:

- Understanding the specific socio-cultural action (or non-action)
- Understanding enemy mindset
- Exerting influence on the population
- Improving interaction with other actors in the area of operation
- Justifying own actions

The above points also constitute the overall learning goals for this project. The practically applicable knowledge

was conveyed through practical learning objectives that had been embedded into the simulated training including a virtual Afghan village and local 'Afghans' in a cyberworld based on Second Life (SL) platform.

III. Cultural Challenges and Scenario Development

The methodology for scenario development used for the CAMO project is based on a systematized set of learning goals and associated 'mini-scenarios', to obtain the maximum reusability of the content. Each 'mini-scenario' comes with a set of 'cues' [18], associated reactions from the gaming environment or feedbacks from the 'game master'. Cues can be defined as "the perceptual elements of the environment that influence the challenging decisions" [18, 20].

These 'mini-scenarios' provide a basis for requirements for the virtual environment for every 'scene'/gaming sequence and the associated scripts for the role players, especially the 'Afghans'. Based on the consultations with the subject experts, the following major categories of learning goals were identified:

- T. Tactics: general tactics (in a concrete cultural context) e.g., identifying threats based on the relevant cues from the environment
- G. Gender: interacting with women in tribal/clan communities e.g., how to act towards Afghan women
- R. Religion: dealing with religious customs and practices
- S. Socializing: observing local customs, e.g. dealing with children, visiting a house
- L. Language: basic language skills for simple tasks like polite greeting, asking for directions, identifying security threats; interactions between the interpreter, the locals, and the squad.

Though being initially identified for the project setting (focusing on international operations in Afghanistan), these categories are generally applicable for operational culture training and, as discussed later, for cultural awareness training of civilian personnel. Each of the learning goals categories are split into sub-categories, providing a basis for the corresponding 'mini-scenarios', for example:

- Tactics sub-goal T1. Identifying possible threats
- Religion sub-goal R1. Correct behavior during a prayer
- Religion sub-goal R2. Food during Ramadan
- Gender sub-goal G1. Close contact with local women
- Social interaction sub-goal S3. Dealing with children
- Language sub-goal L1. Basic polite phrases in local language.

Each of the learning sub-goals is further detailed with corresponding cues, appropriate reactions, typical mistakes, and typical responses in case of mistake. Below is an example of such a detailing for a gender-related learning sub-goal:

Learning sub-goal G1: Close contact with local women

- Cues: a local woman asks for/needs (medical) assistance
- Appropriate reaction: a female soldier approaches the woman, talks to her and provides necessary assistance
- Typical/possible mistake: a male soldier approaches the woman, talks to her and in the worst case touches her while attempting to provide assistance
- Typical response in case of mistake: the woman (other locals) gets upset/hostile, further efforts are needed to resolve the situation.

The scenario consists of eight 'scenes' with associated places in the virtual environment called 'zones' (Fig. 1). Before the start of the role-play, a 'mission order' was provided in the form of a short video. It contained the following information: threat level is medium, it is Ramadan, it is Friday, it is about 12.45 pm when the squad enters the village, and the squad does not know where the village chieftain and his house is, but they have an appointment to meet him in the village. The purpose of the meeting is to obtain information about possible Taliban activities in the area.

Figure 1. Looking for the mosque in the virtual Afghan village

When the squad enters the village, they see three children playing along the road. While the squad passes by/possibly greets the children, the children come closer, attempt to touch the weapons, and beg for chewing gum and candy. A local woman appears from a house on the other side, shouts angrily at the children, and waves them away. The squad approaches the local woman to inquire about the whereabouts of the village chieftain (Fig. 2). After talking to her, the soldiers continue on the road, looking for the village mosque. Few characteristic features distinguish the mosque from ordinary houses (Fig. 1). The squad needs to wait outside and greet the chieftain and his two men appearing from the mosque. If the squad greets the chieftain properly, he might invite them to his house. While passing by a house, the squad observes a crying woman, visibly injured. After helping the woman, the squad arrives at the chieftain's compound. They enter his reception room where the squad and the chieftain are to discuss the security situation in the area.

Figure 2. Talking to a local woman (Example 1)

There are several possible paths to the village chieftain, depending on the players' preferences but also on their abilities to choose an optimal course of action for each situation. For example, if the soldiers give chewing gum to the children in the beginning of the role-play, it might upset the local woman. Furthermore, if they talk to the local woman in the next scene (Example 1) in a way she perceives as disrespectful, she would be less inclined to share information about the whereabouts of the village chieftain and the position of the mosque where he is most likely to be since it is Friday prayer time. Consequently, the squad must spend more time locating the mosque, probably contacting the home base/ 'game master' for the assistance. If the soldiers fail to observe the cultural codes treating the locals in an impolite and inappropriate manner, the chieftain might get upset and unwilling to provide information about Taliban activities (Example 2).

A. Example 1: Conversation with a Local Woman

In this example, the squad approaches a local woman (who appears from her house to wave away the children) to inquire about the whereabouts of the village chieftain. The learning goals for this scene are composed of the following sub-goals: G3. Verbal contact with local women + S1. Polite greeting + L1. Basic polite phrases in local language + L2. Interaction between the interpreter, the locals and the squad.

In this scene, the soldiers need to react to and reflect on the following cues:

1. A local woman who has potentially useful information, her age and social status
2. Whether the woman is alone in the house
3. Whether the woman is neutral or unfriendly minded towards the Norwegians (after their interactions with local children).

Based on the cues, there are different possible responses the soldiers could choose, with corresponding outcomes, from 'optimal' course of action to typical mistakes, as summarized below:

1. One of the male soldiers approaches the woman (in the worst case, with a direct contact between the avatars) and greets her => the woman, especially if she is young, hides in the house, expresses fear, provides no information => another round with a female soldier attempting to resolve the situation/contacting the game master/'home base' for help ('worst case')
2. Male soldiers follow the woman into the house to talk with her without any of her family present => the woman might feel dishonored, protests => another round with a female soldier attempting to resolve the situation/contacting the game master/'home base' for help ('worst case')
3. One of the male soldiers greets the woman without approaching => the woman (especially if she is older) answers that the village chieftain is in the mosque but does not show where the mosque is, goes back to the house => proceed to the next scene
4. A female soldier/interpreter approaches the woman, possibly enters the house, starts asking questions => the woman perceives the greeting as not polite enough/is angry after what happened in the previous scene/misunderstands what is said by the interpreter, answers that the village chieftain is in the mosque but does not show where the mosque is, goes back to the house => proceed to the next scene
5. A female soldier/interpreter approaches the woman, possibly enters the house, greets her politely, starts asking questions => the woman answers that the village chieftain is in the mosque and shows the way there => proceed to the next scenes ('best case').

B. Example 2: in the village chieftain's reception room

In this example, the squad/squad leader and the village chieftain are having a conversation about the security situation in the village in the chieftain's reception room. During the conversation, the soldiers are offered food and water, and they need to decide whether to accept it or not, considering that it is Ramadan (Fig. 3).

Figure 3. Conversation with the village chieftain

The learning goals in this scene can be summarized as follows: S1. Polite greeting + S4. House visit + T2. Interaction within the squad/home base + T3. Securing an area + G2. Female soldiers on a house visit + R2. Food during Ramadan + L1. Basic polite phrases in local language

+ L2. Interaction between the interpreter, the locals, and the squad.

Correspondingly, the soldiers need to react to and reflect on the following cues:

1. Being served tea and cookies during Ramadan and in the middle of the day (mission order) => the locals do not eat or drink, eating is rude unless the host repeatedly insists
2. 'Hierarchy' of both the Afghans and Norwegians present, in terms of external features (large turban worn by the village chief), the Norwegian soldiers' uniform, gender and mutual position of avatars => determining who sits where in the room
3. Shoes, helmet, and sunglasses are not suitable inside the house => should be removed when entering.

Based on the cues, the responses and possible outcomes can be summarized as follows:

1. The soldiers do not take off shoes / helmet / weapons => perceived as rude by the Afghans, the conversation is slow, the squad does not get the necessary information => another round trying to improve the situation ('worst case'/mistake)
2. The female soldier / interpreter sits too close to the village chieftain's place, the Norwegian squad leader occupies the chieftain's place in the room => perceived as rude by the Afghans, the conversation is slow, the squad does not get the necessary information => another round trying to improve the situation ('worst case'/mistake)
3. The soldiers accept the refreshments they are offered right away even though it's Ramadan => perceived as rude by the Afghans, the conversation is slow, the squad does not get the necessary information => another round trying to improve the situation ('worst case'/mistake)
4. The interpreter fails to make the soldiers aware of their mistakes, does nothing actively to rectify the situation => there are misunderstandings and confusions, the conversation is slow, the squad does not get the necessary information => another round trying to improve the situation
5. The squad leader goes straight to the point and starts asking questions about security situation in the village => the atmosphere might get tense, the conversation is slow, there is a need for more specific clarifying questions => another round to get necessary information
6. The interpreter speaks too little/unbalanced with one of the parts, does not convey nuances correctly => there are misunderstandings and confusions between the parts, in the worst case somebody gets insulted, the conversation is slow, there is a need for additional clarifying questions => another round to get the necessary information
7. The squad/squad leader makes no serious mistakes, beginning with some polite 'small talk' and moving on to specific questions about the security situation, when offered refreshments first politely declines but finally takes some tea after the host repeatedly insists => the conversation goes as expected, the squad gets important information => the game master ends the game => to Debrief ('best case').

IV. Implementation

The scenario exemplified above provided requirements for the design and implementation of the virtual environment. As with the former, the focus during implementation was on low cost, short development time, and reusability.

The project scenario describes the main location for the educational simulation – the virtual environment of Afghan village. At the same time, each mini-scenario required some additional specific content. The design and development of the environment went through several stages following the description of the scenarios. The idea was to split the design of the environment into parts, which can be combined and reused. The environment consists of general content for creating the generally required context and atmosphere (such as landscape elements, animals, vehicles, parts of buildings, furniture, authentic clothing for avatars, and relevant textures) and specific content, designed for specific mini-scenarios (such as a mosque, a school building, a ball, a medical kit, a photo camera, a specific gun, and tableware).

First, the required objects had to be created or collected. Practically, some of the objects and avatar clothing have been acquired from the SL marketplace (a portal for trading virtual content) as well as searching free objects everywhere in SL. Many other VW platforms allow importing 3D models, which can be found in free online libraries. However, most of the specific artifacts required in the mini-scenarios were designed from scratch. They also usually need to be highly authentic.

Second, when the basic objects (or elements) were collected and platform is set up, building and co-locating the typical elements could be started. The basic elements could usually be reused in multiple places of the environment or joined in different combinations. These elements were later copied (sometimes slightly modified) and used in multiple places in the environment. After receiving feedback from the subject experts, some of them were modified or replaced.

V. Evaluation: Understanding Culture through Perspective Taking

The study was organized as a one-day experiment conducted at the Norwegian Military Academy on November 25, 2011. It was preceded by a 'rehearsal' session the week before. In addition, the participants received two-hour introduction training in SL technology.

Totally 14 cadets from the Norwegian Military Academy participated in the experiment, playing roles of the Norwegian soldiers in the simulation (Fig. 4). In addition, six students and two teachers from the Norwegian Defense Language and Intelligence School participated in the experiment. The former played the roles of the Afghan civilians and interpreters for the Norwegian squad while the latter played the role of the Afghan civilians and provided input to the scenario development.

Figure 4. Cadets at the Norwegian Military Academy exploring the virtual Afghan village

The role play was organized in two rounds. In each of them, a group of the cadets / squad executed the mission, proceeding through the different scenes of the scenario. In the first round, the squad leader had a previous field experience from Afghanistan. Totally three debrief sessions conducted by an expert in Afghan culture were integrated in the role-plays, following the milestones in the mission plus one between the two role-play rounds.

The data have been collected through observation of the role play and screen-capture recording, pre- and post-questionnaires (with 14 respondents), and three in-depth interviews of selected participants following the completion of the role-play. The complete overview of the evaluation results is outside the scope of this paper. The evaluation results have been also presented in more detail in [14].

Therefore, in this paper we rather choose to focus on some examples illustrating how the Norwegian soldiers acquire better understanding of Afghan culture by perspective taking. Proper perspective taking of key stakeholders is a prerequisite for the team to achieve its goals. It happens in stages, and more or less consciously. For example, to achieve the goal of the mission the soldiers had to take into account the cultural and religious point of view of the Afghans. They also needed to use the knowledge they already had of this area to solve various situations they encountered. Communication was essential to both the Afghans and the Norwegian soldiers in order to understand the others' perspectives. This is illustrated in the following excerpt from the role-play (Table I).

TABLE I. DISCUSSION WITHIN THE SQUAD AFTER TALKING TO THE AFGHAN WOMAN (EXAMPLE 1)

Squad leader:	Interpreter, I need to talk with you.
Interpreter	Yes
Squad leader:	What impression did you have of the lady? […] Would she talk? Is this a Pashtun city?
Interpreter	She seems to be like that... She spoke Dari. She was shy and when we came in she asked the children to pull away and that this was dangerous. So I think it is useful to talk a little bit longer with those we meet […] To show that we are not a threat
Squad leader:	Yes, but it sounds fine. What do you recommend about the mosque now? I suggest that we stand here and wait until they come out.
Interpreter	Agree
Squad leader:	Now we just wait here until they come out

An important element in this excerpt, and generally in the CAMO project, is the Gender Perspective. Gender perspective is a special form of perspective taking. In the scenario, the soldiers were confronted with gender-related challenges in several situations: in communication with men, women, and children. The special focus was on the problems that could arise if these challenges were not addressed properly. The Afghan women in the scenario react differently depending on whether a woman or a man tries to talk to her. The following excerpt illustrates how the soldiers can learn more about considering this element when communicating with the Afghans. The soldiers in the squad talk to an injured Afghan woman. She damaged her head when she fell from the house roof and needs medical assistance. The female soldier in the squad talks to the woman, using a female interpreter (Table II).

TABLE II. GENDER PERSPECTIVE

Female soldier:	Do you want us to bandage your wound? We can do that for you.
Interpreter (Afghan woman):	Thanks a lot, but it must be a woman who bandages me
Female soldier:	It is OK. I will help her with your head.
Female soldier:	Squad leader, I am going to use my medical kit to bandage her head. She wants a woman to help her.
Squad leader:	Received. When you are finished, tell her there is nothing more we can do, we don't have a doctor with us. Thank her politely and withdraw from the building, so that we can proceed to our primary meeting, over.

During the reflection rounds after the role play, the soldiers reflected on the perspective taking process and the importance of a dual process when bridging Norwegian and Afghan cultures. This excerpt from the reflection round shows how the soldiers based on the knowledge they already have on cross-cultural communication reflect on how to deal with the Afghans in the village. The soldiers emphasize the importance of a dual process, i.e. as they show understanding and respect for Afghan culture, they expect the same in return form the Afghans (Table III).

TABLE III. INTERVIEW CITATIONS: PERSPECTIVE TAKING AS A DUAL PROCESS

Solder 1:	So we talk a lot about us respecting the Afghans, respecting the culture and being humble. But one must not forget that we represent a culture, too […] And the Afghans are also aware of that. If you are humbled by the people you talk to, it can give them a bad opinion of you. It is important that you dare to stand up for what you represent as well […] it is about pushing the Afghans a little bit and because […] they have a slightly different agenda than we have. We do not have the time they have […] so you have to push a bit […].
Solder 2:	It's a very big difference between being humble and being weak

The interview data provided further indications that the soldier' understanding of cross-cultural issues has improved over the course of the experiment. For example, one of the female participants noted: "I got very much out of it during a very short time", "plenty of aha-experiences". She also reported a high level of immersion in her role. Another, male participant believed that: "This (system) can provide several possibilities in a deployment environment to increase understanding among troops preparing for international operations".

The questionnaire data give tentative evidence of an increased understanding of the cultural and religious aspects. At the same time, some of the soldiers disagreed that the experience in SL was suitable for correct evaluation of the threat situation due to the lack of 'crowd', which could possibly indicate an ambush. The cadets have been generally positive to the use of 3D cyberworlds for training cultural awareness. Overall, they reported that the simulation in SL has been a user-friendly, motivating, and fun experience. At the same time, the participants identified a number of limitations, especially, a limited selection of avatar gestures and body language that complicated expression and perception of certain cultural and social aspects.

VI. DISCUSSION

We believe that in this project we have demonstrated the potentials of 3D cyberworlds, providing recommendations for creating flexible low-cost simulations, both in the military and civilian context, with a focus on resource reuse.

Our experience shows that this approach has advantages:

- Virtual simulation provides a safe environment for exploration and experimentation, where the participants playing the roles of e.g., 'Norwegians' and 'Afghans' could improve their understanding of each other's cultural representations before critical encounters in real life, something which is especially important in a military context and generally in conflict areas.
- Virtual simulations provide possibilities for creating representations of cultural artifacts that may serve as boundary objects through virtual settings, objects, avatars, and scenario modules. These boundary objects created opportunities for perspective taking as the 'Norwegians' learned some aspects of 'Afghan' culture through the role play, such as identifying a mosque and procedures for waiting for people to come out.

However, the majority of currently available 3D cyberworlds have a number of limitations in this context, something that was also identified during the evaluation of the CAMO project:

- The limited graphical possibilities of SL, especially in terms of body language, might lead to misinterpretations and oversimplified models of real cultural interactions.
- 3D cyberworlds such as SL require high bandwidth, making it complicated to use in developing countries. However, if used as a part of training program prior to deployment, this problem is less critical.
- We identified two limitations of role plays. First, by abstracting away significant features of the real situation, learning opportunities will be missed (threat authenticity, contextual information, etc.). Second, for optimal application of perspective taking, both parties should learn the other's position. Our scenarios focused on Norwegians learning from Afghans (Afghan culture) rather than Afghans learning Norwegian culture.

At the same time, we believe that the methodology could be easily extended and adjusted for non-military use in conflict areas as also mentioned in Introduction, for example, for embassy workers, non-governmental organizations workers (e.g., Red Cross), medical workers and journalists. Extending and adjusting from military to civilian use might have the following implications for scenario methodology:

- Exchanging existing tactical learning goals with safety learning goals, with similar triggers and responses. For example, in the learning goal "Identifying possible threats", encountering an empty village would indicate a possible ambush to civilians as well (such as Red Cross employees), the difference would be in a more passive appropriate response (e.g., hiding, not entering the village) as opposed to reconnoitering by the military.
- Gender, socializing, religion, and language learning goals could be used without any (or major) alterations.
- The mini-scenarios can be re-arranged and used as building blocks for different types of general scenarios, more relevant for civilians, for example Red Cross working in a refugee camp or journalists working in conflict areas.
- While a number of elements could be reused across areas and situations (such as learning goals related to Islam), for better credibility and realism it is important to take local nuances into account, such as Shia/Sunni Islam and different local customs, with corresponding variations in learning goals. In order to systematize these differences, it is necessary to create a repository with appropriate metadata and annotations possibilities.

In addition, we identified the following implications for technology and design elements:

- Most of the 3D environment elements are reusable, so for example the same village can be used for simulating both military and purely civilian situations that can happen there.
- Most of the elements used for military simulations, such as the ones found in the village (such as houses, avatars, and furniture) could be recombined to simulate other situations such as a refugee camp. At the same time, the library of objects should be further extended to encompass a greater variety of possible civilian situations.

- Similarly as for scenarios, a library of objects should be structured and systemized, including both generic and area-specific objects. These should be linked with the corresponding mini-scenarios and used when the mini-scenario is used.

For flexible and effective development and extension of scenario and design elements base, a wiki-based approach could be most suitable. This will require establishing an open community for exchanging resources, something that was not quite feasible in a purely military context.

VII. Conclusions And Future Work

In this paper, we have reported the results of the CAMO project using 3D simulations for cultural awareness training in a military context, focusing specifically on scenario and design methodology for producing low-cost easy-to-use and reusable solutions. We consider the study presented in this paper a pilot one that will be followed up with a full scale study to verify our tentative assumptions.

The resultant methodology is an important outcome of the project and could be used further in connection with similar projects at the Norwegian Armed Forces. The authors are aware that the scripts developed using this methodology might provide an oversimplified representation of the reality. However, in accordance with the Naturalistic Decision Making approach [18, 21], these scripts provide 'patterns' necessary for making decisions under critical conditions and a basis/skeleton for further improvisation. This methodology could be developed further and reused for deployment in other countries than Afghanistan experiencing conflicts where peacekeeping troops are involved. Due to its modular structure, the methodology can be extended, reused, and adjusted in a flexible manner to be applicable for civilian use as well, especially in neighboring countries with a complex security situation. This will constitute an important direction for the future work.

Acknowledgment

The authors would like to express their gratitude to all participants from the Norwegian Armed Forces, to Øystein Ramseng from Ytre Venstre who helped to organize the design experiment, and to Ingvill Thomassen from Department of Education, University of Oslo, who helped to collect and organize the empirical data.

References

[1] J. S. Bruner, *The Culture of Education*. Cambridge, MA: Harvard University Press, 1996.

[2] S. Papert and I. Harel, "Constructionism: research reports and essays 1985 - 1990 by the Epistemology and Learning Research Group," Norwood, NJ: Ablex Publishing Corporation, 1991.

[3] S. L. Star, "The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving," in *Distributed Artificial Intelligence*. vol. II, L. Gasser and M. N. Huhns, Eds. San Mateo, CA, USA: Morgan Kaufmann Publishers Inc, 1989, pp. 37–54.

[4] G. Fischer, "External and shareable artifacts as opportunities for social creativity in communities of interest," in *5th International Conference on Computational and Cognitive Models of Creative Design*, Heron Island, Australia, 2001, pp. 67–89.

[5] A. Gillespie, "Games and the Development of Perspective Taking," *Human Development,* vol. 49(2), 2006, pp. 87–92.

[6] J. A. Cannon-Bowers and C. A. Bowers, "Synthetic learning environments: On developing a science of simulation, games and virtual worlds for training," in *Learning, training, and development in organizations* S. W. J. Kozlowski and E. Salas, Eds. New York, NY, USA: Taylor & Francis, 2010, pp. 229–261.

[7] T. Sant, "Performance in Second Life: some possibilities for learning and teaching," in *Learning and Teaching in the Virtual World of Second Life*, J. Molka-Danielsen and M. Deutschmann, Eds. Trondheim, Norway: Tapir Academic Press, 2009, pp. 145–166.

[8] T. M. Connolly, E. A. Boyle, E. MacArthur, T. Hainey, and J. M. Boyle, "A systematic literature review of empirical evidence on computer games and serious games," *Computers & Education,* vol. 59(2), 2012, pp. 661–686.

[9] S. Warburton, "Second Life in higher education: Assessing the potential for and the barriers to deploying virtual worlds in learning and teaching," *British Journal of Educational Technology,* vol. 40(3), 2009, pp. 414–426.

[10] W. L. Johnson, "A Simulation-Based Approach to training Operational Cultural Competence," in *International Congress on Modelling and Simulation (MODSIM)*, 2009.

[11] M. A. Zielke, "The First Person Cultural Trainer Whitepaper," 2011, http://www.utdallas.edu/~maz031000/res/FPCT_White_Paper.pdf.

[12] E. A. Surface, E. C. Dierdorff, and A. M. Watson, "Special Operations Language Training Software Measurement of Effectiveness Study: Tactical Iraqi Study Final Report," Special Operations Forces Language Office, Tampa, FL, USA, 2007.

[13] M. J. Singer and B. W. Knerr, "Evaluation of a Game-Based Simulation During Distributed Exercises," U.S. Army Research Institute for the Behavioral and Social Sciences, Research Report 1931, 2010.

[14] E. Prasolova-Førland, M. Fominykh, R. Darisiro, and A. I. Mørch, "Training Cultural Awareness in Military Operations in a Virtual Afghan Village: A Methodology for Scenario Development," in *46th Hawaii International Conference on System Sciences (HICSS)*, Wailea, HI, USA, 2013, pp. 903–912.

[15] B. A. Salmoni and P. Holmes-Eber, *Operational Culture for the Warfighter: Principles and Applications*. Quantico, VA, USA: Marine Corps University Press, 2008.

[16] D. P. McDonald, G. McGuire, J. Johnston, B. Selmeski, and A. Abbe, "Developing and managing cross-cultural competence within the Department of Defense: Recommendations for learning and assessment.," Department of Equal Opportunity Management Institute, 2008.

[17] A. Caird-Daley, B. Dawson, R. Ciereszko, B. Osborne, and I. Parker, "Training decision making using serious games: Requirements analysis for decision making training," Human Factors Integration Defence Technology Centre, UK, HFIDTC/2/WP4.6.2/1, 2009.

[18] C. Hartog, "Scenario design for serious gaming: guiding principles for the design of scenarios and curricula in military Job Oriented Training," TNO Defense, Security & Safety, 2009.

[19] T. Holo and M. D. Andreassen, "Culture astray: A review of Norwegian military's focus on cultural understanding," Norsk Utenrikspolitisk Institutt (NUPI), Oslo, Norway, 2010.

[20] J. Phillips, "Decision-centered MOUT training for small unit leaders," U.S. Army Research Institute for the Behavioral and Social Sciences, Fort Benning, GA, USA, 2001.

[21] G. Klein, *Sources of Power, How People Make Decisions*. Cambridge: The MIT Press, 1999.