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Training Cultural Awareness in Military Operations in a Virtual Afghan Village: A Methodology for Scenario Development

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Abstract

3D virtual worlds and game-based simulations are to an increasing degree used for military training. However, there is a lack of research-based methods for using game-based simulations and developing scenarios for educational role-plays in a military context, especially in the area of cultural awareness. The CAMO project (Cultural Awareness in Military Operations) seeks to address these challenges. The goal of the project has been to create a game-based simulation in Second Life for training cultural awareness among military personnel preparing for international operations and to explore the advantages and limitations of 3D virtual worlds in this context. This paper will focus on the methodology for scenario development, outlining the challenges and directions for future work.

1. Introduction

The use of three-dimensional Virtual Worlds (3D VWs) has been growing rapidly in the first decade of the 21 century. Although entertainment remains one of the most successful application domains, many VWs are created for 'serious' purposes [5, 20, 26]. Application domains include education, training, research, commerce, and socialization [6].

The VW technology provides a unique set of features that can be used for educational purposes, such as low cost and high safety (compared to real-life training), three-dimensional representation of learners and objects, and interaction in simulated contexts with high immersion [4] and a sense of presence [7, 19]. Possibilities for synchronous communication and interaction allow using 3D VWs for collaborative learning [17]. In addition, possibilities for simulating environments on demand and for active collaborative work on the content allow applying situated learning [10] and project-based learning [13] approaches. Constructivist approaches, such as problem-based learning, are also popular among the adopters of 3D VWs [1].

The use of game-based learning and serious games in 3D VWs is increasing [11], related to the popularity of online games in general. A serious game can be defined as "a game in which education (in its various forms) is the primary goal, rather than entertainment" [5, 21]. Such games are generally highly motivating and emotionally engaging, causing high and long knowledge retention.

3D VWs and game-based simulations have been used for military training for a long time, demonstrating concepts and situations that are difficult, expensive or unsafe to represent efficiently enough in a classroom setting [3]. An example of such a concept is operational culture. Operational culture is defined as "those aspects of culture that influence the outcome of a military operation; conversely, the military actions that influence the culture of an area of operations" [23]. Understanding culture is a basic component of operational planning, training, and execution [23]. In order to scope our contribution, we focused our research on this very narrow segment of the vast cultural awareness field.

Examples of existing serious games and virtual worlds for training operational culture include systems such as Tactical Iraqi and First Person Cultural Trainer [14, 25, 27]. 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 [24], 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 [24]. Few of the existing methods are published and systematized due to security concerns or/and commercial interests.

Typically, the existing reports in the area are often fully or partly classified.

The CAMO project (Cultural Awareness in Military Operations) seeks to address these challenges. The project is a joint effort between the Norwegian Defense University College, Norwegian University of Science and Technology (NTNU), and the University of Oslo (UiO). The ADL (Advanced Distributed Learning) office 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.

The goal of the project has been to create an inexpensive and flexible game-based simulation in Second Life for training cultural awareness among military personnel preparing for international operations (Afghanistan) and to explore the advantages and limitations of 3D VWs in this context. In addition, the project aims at creating research-based methodology, guidelines, and tools for developing 3D educational simulations for future use in the Norwegian Armed Forces.

The methodology aiding scenario development for the CAMO project is based on the Naturalistic Decision Making approach [2, 9, 16, 28] and Situation Awareness theory [8, 9]. This theoretical background is broadly used for training in a military context (see e.g. [2]) since it provides the best description for decision making by military commanders in an unstable, dynamic environment [2, 9, 16, 28]. In a nutshell, this approach focuses on making rapid decisions under critical conditions based on previous experience as a repertoire of patterns. When diagnosing the situation, the decision-maker needs to recognize the pattern and then choose the appropriate course of action, 'typical' for the situation [9].

When developing scenarios and simulations for the CAMO project, it was a deliberate choice to focus on methodologies for military applications as opposed to the ones for developing serious games and educational simulations in general due to the very specific requirements imposed by the field. As a starting point, we studied publicly available literature and guidelines for operational culture training, such as "Operational Culture for the Warfighter: Principles and Applications" [23] and recommendations for developing cross-cultural competencies at the US Department of Defense [18]. We have also studied scenario methodologies developed at the UK Human Factors Integration Defence Technology Centre [2] and the Royal Netherlands Army/TNO Defense, Security & Safety/Delft University of Technology [9], 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. Since the existing literature on Afghani operational culture (especially the Pashtun ethnic group who, together with so-called foreign fighters, pose the greatest threat to the Norwegian armed forces operating in the area) is rather fragmented and/or classified, it was decided to use subject experts within the Norwegian Armed Forces as the major source of information for the scenarios.

Norwegian Army Weapon School and Norwegian Military Academy have earlier experimented with VBS2 and Steelbeasts, and will most probably use these and similar platforms to a significant extent for operational training. However, for other educational purposes, other platforms might be more suitable, less expensive, and easier to use for development. It is a common practice to adapt regions of large social VWs for serious purposes [12]. Therefore, Second Life (SL) has been chosen for the project, especially for economical, time-related, and practical concerns. The advantages of such a platform appear to be numerous, including availability, the possibility for modeling of avatars and artifacts, low entry level, some degree of security (the possibility for restricted access to virtual spaces), and low development and usage costs.

2. Study settings, research design and data collection

In terms of research, the major motivation behind the CAMO project has been the following:

- To obtain first-hand experiences with pedagogical use of the technology (possibilities, usage areas and limitations) within the context of the activities of the Norwegian Armed Forces
- To develop necessary competencies internally in the Norwegian Armed Forces to facilitate further efforts in this direction in the future

At the moment, the experiment did not aim at measuring relative effects, such as comparing our findings with traditional classroom education or e-Learning. Rather, its goal has been to study whether 3D VWs and simulations contribute to learning, based on the participants' experience as revealed by their role enactment and interaction with other players in the simulations.. Another goal, which is the focus of this paper, has been to investigate how such simulations can be developed in a fast, flexible and

resource-efficient fashion, including both scenario development and implementation of the virtual environment.

The major focus has been on incorporating cultural awareness, with language training and gender-perspective as sub-topics within the 3D VW. Afghanistan was chosen as the role-play setting to make the experiment as realistic and concrete as possible and considering involvement of the Norwegian Armed Forces in this country.

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. 1). 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.

Norwegian Defense Media Center produced a video serving as an introduction to the experiment. The video contains a mission order for the Norwegian squad.

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 (about 15 minutes each), were integrated in the role-plays, following the milestones in the mission plus one between the two role-play rounds. The debrief sessions were conducted by an expert in Afghan culture with military background.

The evaluation consisted of the following major data collection techniques:

- **Observation**: The role-plays were recorded by using commercially available software (BSR screen recorder) while the researchers were doing manual note taking to provide a preliminary index of the material.
- **Questionnaires**: the cadets answered a web-based questionnaire before and after the role-play. The goal of these pre- and post-tests has been to access the cadets' knowledge of cross-cultural communication and motivation for further training within the topic. After the role-play, the cadets got another questionnaire with questions related to the suitability of SL as a platform for cultural awareness training, including usability issues and usage patterns.
- **Interview**: Following the completion of the role-play, three of the soldiers participating in the project (one of the squad leaders, a female soldier, and one of the interpreters) have been interviewed.

Figure 1. Cadets at the Norwegian Military Academy exploring the virtual Afghan village

3. Scenario development

3.1. Overview of methodology

The methodology for scenario development used for the CAMO project is based on a systematized set of learning goals and associated 'mini-scenarios'. Each 'mini-scenario' comes with a set of 'cues' [9], 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" [9, 22].

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. when 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 concrete project setting (focusing on international operations in Afghanistan), these categories are generally applicable (possibly with minor modifications) for operational culture training. Each of these learning goals categories are split into sub-categories, providing a basis for the corresponding 'mini-scenarios', for example:

- **Tactics sub-goal T3**. Securing an area (village/house)
- **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

Apart from the cues from the virtual environment and feedbacks from the 'game master', 'mission order' is an important part of the role-play. It contains a description of the situation making it possible for the players to contextualize their choices during the simulation. For example, when being informed that it is Ramadan at the moment, the players need to decide whether or not to accept food. When informed that Taliban are active in the area, the players would need to evaluate the treat situation differently when encountering a man with a gun.

'Mission order' typically contains the following components [9]:

- Description of the current situation (e.g. the village, its position, the local clan structure, recent activities, conflicts, whether it is Ramadan or other religious/local celebrations at the time
- 'Rules of Engagement', i.e. the rules for the application and use of military force
- Mission objectives: description of the tasks/mission for the squad/unit in question
- 'Intel': e.g. whether Taliban are active in the area, possible security threats

The 'mini-scenarios' are combined in a logical and coherent manner to provide an outline/skeleton for each scene/module. The overall storyline can be (somewhat simplified) summarized as mission order + role definitions + 'scenes' + alternative courses. The story provides a basis for the requirements for the virtual environment, including the design of the virtual places, the avatars, and the virtual artifacts.

This modular approach will make it possible to develop scenarios in a flexible and efficient way and reuse the 'mini-scenarios' on a later occasion. This 'database' of 'mini-scenarios' can be further extended with additional learning goals and corresponding cues/reactions/responses depending on the current educational needs. In this way, this 'database' can provide a basis for further scenario development in connection with game-based learning at the Norwegian Armed Forces.

3.2 Realization of the methodology: creating a scenario

In this section, we outline the scenario developed on the basis of the methodology from the previous section as well as inputs from the project participants and the subject experts.

The mission order was provided before the start of the role-play 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 chief ('Malik') 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.

The scenario consists of eight 'scenes' with associated places in the virtual environment called 'zones' and several possible paths through them depending on the players' preferences but also their performance and the ability to choose an optimal course of action for each situation. For example, if the soldiers give chewing gum to the children in

Scene 1, it might upset the local woman. Furthermore, if they talk to the local woman in Scene 2 in a way she perceives as disrespectful, she would be less inclined to share information about the whereabouts of the Malik and the position of the mosque where he is most likely to be since it is Friday prayer time. As a consequence, 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 and treat the locals in a polite and appropriate manner, the Malik might get upset and unwilling to provide the necessary information about Taliban activities.

Scene 1: Three children play along the road. While the squad passes by/possibly greets the children, the children come closer, attempt to touch the weapons, 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.

Scene 2: The squad approaches the local woman to inquire about the whereabouts of the Malik.

Scene 3: The soldiers follow the way, looking for the village mosque. There are few characteristic features that distinguish the mosque from ordinary houses (Fig. 2).

Scene 4. Outside the mosque. The squad is to wait outside the mosque and greet the Malik and his two men appearing from the mosque.

Scene 5. If the squad continues walking along the road, they will pass by a house with an open door. Through the door, they can see a praying man with a gun (AK47) on the floor beside him. This scene was omitted during the actual role-play.

Scene 6. While passing by a house, the squad observes a crying woman, visibly injured (Fig. 3).

Scene 7. The squad has arrived at the Malik's compound and is standing outside the door to the reception room.

Scene 8. In the Malik's reception room (where the squad and the Malik are to discuss the security situation in the area).

Figure 2. Looking for the mosque

For each of the scenes, a detailed overview of learning goals, corresponding cues, typical mistakes, recommended actions, and possible responses has been developed. This overview is based on general tactical aspects as described in e.g. [2, 9] and consultations with the subject experts, especially concerning various aspects of Afghan/Pashtun culture. Below is such an overview for Scene 6.

Learning goals: G3. Close contact with local women + S5. Providing medical assistance to local population + T1. Identifying possible threats + T2. Interaction within the squad + L1. Basic polite phrases in local language + L2. Interaction between the interpreter, the locals, and the squad.

Cues to focus and reflect over:

- A local woman is visibly injured (bloody clothes/is crying/in need for help, her age and the social status.
- General threat situation (needs to be evaluated anew), e.g. why is the woman injured? Is it domestic violence? Presence of other family members, such as husband.

Figure 3. Close contact with local women

The different courses of action with possible responses and outcomes for scene 6 are summarized below, with point 1 representing the 'worst case'/typical mistake, 2 and 3 are neutral and the last one representing the 'best case' or 'optimal' solution:

Responses and possible outcomes:

1. ('Worst case'): One of the male soldiers approaches the woman (in the worst case involving a direct contact) with the intention to help. The woman, especially if young, shouts and protests, the Malik/husband get involved and expresses displeasure with the situation => another round in Zone 6 by involving a female soldier/interpreter to resolve the situation/ contacting the 'game master' or the 'home base' for assistance.

2. One of the male soldiers starts talking to the woman without approaching her, probably asking for permission to come closer. The woman (especially if young) denies and protests, the Malik/husband dissatisfied that the woman does not receive any help => another round in Zone 6 by involving a female soldier/interpreter to resolve the situation/summoning a 'paramedic'/ contacting the 'game master' or the 'home base' for assistance.
3. The female soldier/interpreter (either from the squad or summoned from elsewhere) approaches the woman, greets her, talks to her and offers basic medical assistance (in SL, e.g. dropping a medical kit from the inventory close to the woman). The woman appears calmed down, the Malik is neutral => to debrief 2/zone 7.
4. ('Best case'): The female soldier/interpreter (either from the group or summoned from elsewhere) approaches the woman, greets her, talks to her and offers basic medical assistance, gets assistance from a summoned paramedic who brings medications and bandages => the woman calms down, thanks, the Malik/husband appear satisfied => to debrief 2/zone 7.

These scripts provide an aid for further development of the role-play, for game facilitators and those playing the role of the 'Afghans', constituting a 'skeleton' for improvisation.

4. Design of the virtual environment

The project scenario describes the main location for the educational simulation – the virtual environment Afghan village. The design and development of the environment went through several stages, in an iterative manner and were influenced by a number of factors. We believe that the overview provided in this section could serve as an aid for educators for creating adjustable and low-cost simulations, especially in a military context, with a focus on resource reuse.

First iteration: Initial requirements and basic elements. The requirements have been formed by the scenario as a whole and the individual scenes. According to these requirements, the Afghan village should have a number of basic objects, such as houses, animals, landscape elements, and furniture. It was also required to create authentic clothing for avatars. The information was collected from the Norwegian Armed Forces photo database and various sources in the Internet (Fig. 4).

The village was built on a skybox on an Akershus Fortress island in Second Life, belonging to the Norwegian Armed Forces. The skybox is a floating platform at a height of 500 meters. For security reasons, the platform was not visible from the Akershus ground level, but was connected with a teleport. Access to the whole area was restricted.

Figure 4. Afghan village in Second Life

The objects/artifacts and avatar clothing used in the virtual Afghan village included both generic and custom-made ones. The generic ones have been mostly acquired from the SL marketplace (a portal for trading virtual content) as well as searching free objects everywhere in SL. Some basic landscape elements (bushes, rocks, and trees), furniture, old rusty buildings, and relevant textures (sand, rugs, and stone walls) have been acquired this way.

Second iteration: Assembling of the basic elements, design of typical elements. After the platform was set up, it was possible to start building and co-locating some typical elements of the environments. The typical elements included such objects as large rocks, hills, walls, windows, furniture, pieces of road, and fences. 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**.**

The process of assembling environment elements and locating them on the map began when the detailed version of requirements was ready. The new requirements contained a number of additional buildings to be implemented, such as a school and a mosque. At this stage, the environment was visited by the subject experts for a number of times. They advised on how to make it more authentic.

Scenario-specific artifacts and avatars. The project scenario was relying on the use of a number of key objects – artifacts. These objects were acquired from the SL marketplace and included a ball, a medical kit, a photo camera, and tableware.

Two groups of avatars were prepared for the simulation: local Afghans and Norwegian soldiers. The uniform and weapon for the soldiers were

ordered and developed by a private company in SL. Each avatar though had to be 'dressed' in the uniform and female uniform had to be modified to fit the avatar's body. The weapon had two modes (active and passive) and could be switched from one to another. The clothing for the Afghan people was partly designed and partly bought on the SL marketplace, while most of the articles were modified in accordance with the comments from the experts.

5. Evaluation

In this section, we present a summary of the findings from the data analysis. Two types of data were collected and analyzed: qualitative (conversations, interviews) and quantitative (questionnaires).

5.1. Summary of qualitative data

During the simulation, the participants learned from taking different perspectives, by facing dilemmas and observing squad leader actions, as appears from interaction data and interviews. In order to illustrate this, we present two examples from the actual role-play in SL highlighting the interactional aspects of the simulation.

Scene 2/6. In the excerpt below, the soldiers in the squad are talking 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 (Fig. 3).

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.

In this situation the soldiers got an understanding of the importance of the gender perspective by observing the Afghan woman's reactions on their and the squad leader's actions (e.g. choosing to stay outside the woman's house and letting the female soldiers inside her house to provide the necessary assistance). The squad leader stayed outside during the conversation since foreign men are not allowed to enter a woman's house while she is alone inside. The Afghan woman could hear the squad leader's conversation with a male paramedic who was ready to help her. Therefore, she emphasized that she wanted a woman to take care of her wound. It is worth mentioning that the cadet playing the squad leader in this round had previous experience from Afghanistan.

The squad leader in the second round (the one without previous field experience) started with a male interpreter. The Afghan woman was one of the first village inhabitants they met. Though the squad leader had a female interpreter available, he continued using the male interpreter in the dialog with the woman. In addition, the soldiers (avatars) were standing too close to the woman.

Scene 8. The excerpt below shows a dialog between the squad leader and the Malik. It takes place in SL in Malik's compound towards the end of the first round of the role-play. 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. 5).

Figure 5. Visiting the village chief in his compound during Ramadan

Squad leader:	It is a nice compound you have here, looks like life is good here.
Interpreter /Malik:	Yes, life is good here. (..)
Squad leader:	Nice to hear. How many people live in this village?
Interpreter /Malik:	About a thousand
Squad leader:	I noticed you have a nice mosque in the village. (…) Who is the imam?

Interpreter /Malik	Yes, our mosque is very beautiful. Haven't you met the imam in the mosque?
Squad leader:	It is possible we have met him, but unfortunately we did not have an opportunity to greet him properly.
Interpreter /Malik	He has been mullah in the mosque for eight years. His father was mullah in this mosque, too.

During this dialog, the squad leader gets an answer to two central questions about the village: how many inhabitants the village has and who is the imam in the mosque. Both answers come after a short introduction ('small talk') including some compliments (e.g. "nice compound", "nice mosque"). This is one of the several social protocols that the soldiers need to master in order to get important information from the Malik.

The excerpt below shows a dialog that took place by the end of the conversation between the squad leader and the Malik.

Squad leader:	Nice to hear that everything is OK in the village. It looks like the security situation is OK here, too.
Interpreter /Malik:	No, the security situation in the village is not that good. Taliban attacked us and the ISAF soldiers fired back. ISAF soldiers come here and ransack the village. This makes people very angry.
Interpreter /Malik:	The soldiers believe that people here in the village are Taliban, but there are no Taliban in the village. Taliban are in Pakistan.
Interpreter /Malik:	We don't have Pakistani or Chechens here. Our people are decent, all of them.
Squad leader:	Yes, but you mentioned that Taliban attacked you, did they come all the way from Pakistan to attack you?
Interpreter /Malik:	They come from Pakistan, hide in the area and attack us

As illustrated in the transcription of the dialog above, the squad leader makes the Malik to 'open up' by starting the conversation with some 'small talk'. The goal of this scene is to behave in a correct and culturally sensitive way towards the Malik and his men, exchanging polite phrases. The squad leader succeeds in this, obtaining the information he needs about Taliban activity in the area.

The qualitative data results provide an example of the type of interactions the cadets were engaged in in the scenario, and they were generally positive to the use of 3D VW technology for learning about cultural awareness in this way.

The qualitative data identified settings in SL that are very useful for assessing learning, comparing soldiers' and local inhabitants' tackling of challenging communicative situations. As the two groups of players did not know each other from before, and were located in different rooms, we can say their interactions approximated a high degree of realism. We found that Perspective taking and Gender perspective are two categories that can describe at a general level of accuracy how the soldiers successfully (or unsuccessfully) interacted with an injured Afghan woman. We attribute this to the fact that the setting created a range of different responses from the soldiers, as revealed by the dialog excerpts in scene 2/6.

The way we assess learning is by observing how the cadet's understanding of cross-cultural issues changed over time during the course of the experiment as rendered by their spoken interactions [15], and by comparing the qualitative data with the quantitative data (questionnaire data), which we summarize below.

5.2. Summary of quantitative data

The results of the post-tests demonstrated that 92% agreed or strongly agreed that they learnt SL interface quickly enough (8% neutral), 100% did not consider the navigating in SL difficult, and 92% disagreed or strongly disagreed that the difficulty level of the simulation was too high (8% neutral). In addition, 69% of the participants felt engaged in the role-play (23% neutral and 8% strongly disagreed), 84% considered the experience fun/motivating (12% neutral).

The interview data provides further indications that the cadets' 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"*.

An unexpected finding from the study was two types of participation: active and passive. Some cadets were assigned the task of securing the area upon entering the village. This is the appropriate action to take in real-life operations, but it was not taken into consideration when preparing the

scenarios. A consequence of this was that some soldiers remained on their posts during the whole course of the role-play and could only passively observe their squad by manipulating their SL cameras. As a result, these solders felt less engaged. This finding was revealed in the questionnaire data.

Data from the questionnaires give tentative evidence of an increased understanding of the cultural and religious aspects such as the gender perspective, cultural artifacts, use of language, social interaction, and local customs. However, some of this learning should be attributed to a debrief sessions. Furthermore, some of the soldiers disagreed that the experience in SL was suitable for correct evaluation of the threat situation. This can be attributed to the very few inhabitants in the virtual village and the low level of realism of action other than speech.

On the overall, the participants 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. First, a limited selection of avatar gestures and body language complicated expression and perception of certain cultural and social aspects. Second, limited 'voice' range in SL made communication within the squad rather fragmented on certain occasions comparing to the real-life radio communication during a mission. This issue could be resolved by moving the SL camera, something not all the participants found easy and intuitive enough to use.

In addition, the participants provided some improvement suggestions, such as:

- Differentiation of scenarios and challenges according to the different roles, for example soldiers and interpreters, active and peripheral participants (e.g. a Taliban attack).
- Crowd simulation as it is important for threat identification. For example, during the role-play, due to the shortage of players, we had very few 'extras' representing civilians, something that in a real-life situation is likely to be a sign of an ambush. This could be solved by introducing agents/non-playing characters with simple functionalities.

6. Conclusions and future work

In this paper, we have explored different aspects of using 3D Virtual Worlds for cultural awareness training in a military context, focusing specifically on scenario and design methodology for producing low-cost, easy-to-use solutions.

The resulting 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 [9, 16], these scripts provide 'patterns' necessary for making decisions under critical conditions and a basis/'skeleton' for further improvisation. The experiment has showed the necessity of further development of the methodology:

- Extension of the existing learning goals and corresponding mini-scenarios 'database', to accommodate for a greater variety of possible educational simulations
- Adjustments for different destinations and different user groups, for example interpreters, officers, medical workers, as well as countries other than Afghanistan
- Enhancing scenarios and the virtual environment with 'dramatic' elements for a more engaging user experience
- Formalization of role definitions, especially matching between military rank and difficulty levels in the scenarios

Our experiences show that generic social virtual worlds are suitable for developing efficient, but at the same time flexible and inexpensive simulations. Such environments are also suitable for distance education and allow 24/7 access wherever internet connection is available. In addition, as opposed to a number of existing game-based solutions, SL provides support for collaborative work and learning.

At the same time, there are a number of technical weaknesses. In addition to the unsatisfactory voice range and limited body language, as noted by the experiment participants, 100% security cannot be guaranteed. This is rather crucial when military applications are concerned. In addition, SL provides limited possibilities for certain tactical tasks, such as firing exercises. There are platforms that are technically superior to SL such as Olive, which can be installed and used on an Intranet with restricted access. However, it is rather expensive in terms of both acquisition and development of scenarios. Furthermore, it has limitations similar to those of SL in relation to tactical exercises.

The results of the study demonstrate that simulations in VWs cannot fully replace cultural awareness training in a classroom and associated practical training sessions, as they have a number of limitations. Nevertheless, in comparison with traditional learning arenas, VWs, especially when configured and modeled for the actual operational areas, represent exciting solutions serving as a supplement to traditional learning.

The project provided recommendations for the Norwegian Armed Forces that apart from cultural awareness training, 3D VWs can be potentially used for language training, training negotiation skills, reconvalescence, recruitment, 'Command and Control' training, all types of collaboration, mission rehearsals, and dilemma training.

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