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Game for Peace: progressive education in peace operations

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Abstract

We present a modeling and simulation approach that clearly increases the efficacy of training and education efforts for peace support operations. Our discussion involves how a computer simulation, the Peace Support Operations Model, is integrated into a training and education venue in Kyrgyzstan for a "*Game for Peace*." On September 12–23, 2011 members of NATO's Partnership for Peace Training and Education Centers collaborated to instruct a United Nations' Peacekeeping Operations course at the Kyrgyz Separate Rifle Battalion in Bujum, Kyrgyzstan. Phase II of the course was also conducted on October 17–21, 2011 for members of the Peacekeeping Brigade of the Kazakhstan Army (KAZBRIG) in Almaty, Kazakhstan. Although such courses are a mainstay in NATO support in preparing member nations for peace support operations, the application of a computer simulation is unique. We relate the decision to use a computer simulation to support the training event and provide an overview of the methodology for planning and executing the game. Insights from the game about training and educating future peacekeepers and lessons for using computer simulations are instructive for future efforts and mark the way to leverage the advantages of computer simulations.

Keyword

Peacekeeping, education, wargame, modeling and simulation, peace support operations, military and defense, scenario construction, peace support operations model

1. Introduction

This paper provides a summary of the development and application of a new simulation-facilitated gaming exercise designed to support a United Nations (UN) Peacekeeping Operation (PKO) course presented to the Kyrgyz Separate Rifle Battalion in Bujum, Kyrgyzstan, October 17–21, 2011, and the Peacekeeping Brigade of the Kazakhstan Army (KAZBRIG) in Almaty, Kazakhstan. October 17–21, 2011. The course was part of the Global Peace Operations Initiative (GPOI) and was organized by the Naval Postgraduate School (NPS), the designated United States Partnership for Peace Training and Education Center (USPTC). The NPS works closely with other Partnership for Peace Training and Education Centers and allied institutions to help build training and educational capabilities for Peace Support Operations (PSOs) within partner countries. The USPTC formed a team of subject matter experts with extensive PSO experience, diverse civilian, military, and defense backgrounds, and state-of-the-market expertise in simulation-based technologies and methods. The team included native Russian and Kyrgyz language speakers and cultural advisors that translated training materials, and enabled simultaneous and sequential translation of presentations and discussions.

The training team that delivered the course consisted of instructors from the NPS, the Bosnia and Herzegovina Peace Support Operations Training Centre, and the Finnish Defence Forces International Centre. The team

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implemented the educational program in two one-week phases. Phase I involves lectures and group discussions to introduce UN PKO concepts and procedures. Phase II culminates with a ''Peace Gaming'' exercise to reinforce the participants' understanding of the material presented in Phase I and facilitate staff decision-making processes for a PKO using the Peace Support Operations Model (PSOM).

The course was delivered to participants with various backgrounds. Attendees ranged from senior noncommissioned officers to colonels, logisticians to special forces, and staff officers to commanders. While all of the participants had received formal education in conventional warfare and the application of wargaming sometime during their careers, few had been exposed to UN PKO concepts and the use of computers to facilitate gaming exercises. The participants from both countries plan to deploy in support of PSOs, or serve as instructors for similar courses in the future. *Game for Peace* was designed as a comprehensive, modular gaming exercise to engage our participants, reinforce their understanding of UN PKO concepts and procedures, and facilitate staff decision-making processes for a PKO. The educational goals of the course are further described in Section 3.

There are six sections in this paper. Section 1 provides an introduction to the educational program and an overview of the paper's content. Sections 2 and 3 describe the increasing need to improve modeling and simulation practices to enhance training and education for PSOs and how a wargame exercise can be interfaced with the PSOM to fulfill that need. Section 4 describes key components of the exercise. Section 5 provides a discussion of outcomes during the exercise, insights gained during the process, and recommendations of how to leverage the peace gaming exercise with the PSOM during future engagements. Finally, Section 6 provides our conclusion.

2. Background

Sun Tzu receives credit for developing the first wargame.[1] Many military leaders understand how games can educate officers in the art of war, develop their decision-making abilities, and help them to gain insights into the effectiveness of strategies and tactics.[1] Subsequently, wargaming as a part of military science was adopted as part of the curriculum in academic institutions and military schools around the world.[1]

The formation of operations research as a scientific approach to decision-making during World War II advanced the application of mathematical models within the military and defense communities.[2] During the Cold War, the Soviet Union and the United States (US) used mathematical models and computer simulations to understand and identify capability gaps and underpin acquisition program decisions that helped fuel the arms race.[1] In recent years, the US military has rediscovered wargames as an effective way to explore and gain insights into complex environments, such as Irregular Warfare (IW) and counterinsurgency (COIN) operations.[3] Researchers have recognized the potential of the ever-increasing processing power of computers to help explore the problem-space of non-traditional missions, specifically the human, social, cultural, and behavioral domains.[4–6]

The combination of a wargaming environment with a computer simulation provides a flexible tool that allows the assessment of human decisions in a complex environment represented by the computer. Computers serve as tools to support the execution of the games.[1] Combined with participants and a set of game procedures, the computer facilitates play by shaping the evolving scenario in order to stimulate the players to make decisions and take actions. The computer's power is in its speed and compact storage of information and data: scenario, force structures, combat systems, formulas, etc. Non-traditional missions, such as COIN operations and PSOs, involve complex environments that demand the advantages of computers.

The US and UK militaries, as well as the North Atlantic Treaty Organization (NATO), use table-top wargaming to facilitate decision-making and course of action (COA) development during their planning processes.[7–9] While wargaming has been a mainstay for these organizations for decades, the one-off nature of a table-top game limits the game sponsor's ability to address ''what-if'' scenarios given the complex environment in which most military operations occur. The computations for adjudicating human interactions, as well as the myriad of variables that must be considered, let alone simultaneous actions, would require panels of subject matter experts and extensive deliberations for each and every action. By blending wargaming with a computer simulation, the decisions that occur in each game ''turn'' are quickly adjudicated in the simulation, providing results in terms of numerical and visual information that engages players to make new decisions for the next turn. Game designers must leverage the ever-increasing power of computers and the complexities that they can represent. In this regard, researchers are making significant improvements in defense modeling and simulation practices, technologies, and methodologies.

For the past few years, the Simulation Experiments and Efficient Designs (SEED) Center for Data Farming at the NPS in Monterey, California, has led several modeling efforts to support the emerging use of Human Social, Cultural, and Behavior (HSCB) models and simulations. A significant SEED effort focuses on the PSOM.[10]

The UK's Defense Science and Technology Laboratory (DSTL) developed the PSOM as a response to socio-economic issues at the strategic level. A joint development effort between the DSTL, the US Joint Staff J-8 Warfighting Analysis Division (WAD), and the Office of the Secretary of Defense (OSD) Cost Assessment and Program Evaluation (CAPE)[11] has emerged. The NPS uses the PSOM in different arenas, to include training and education to support the USPTC. This unique application in the study of PSO training is the major subject of this paper. We provide a more descriptive overview of the PSOM in the next section.

3. Peace Support Operations Model

The DSTL in the UK developed the PSOM to study PSOs, as well as other non-traditional military operations. Originally designed to support force development, training, educational requirements, and decision-making within the UK Ministry of Defence (MOD), the PSOM's applications have extended to support other partner nations' government and military organizations.[12] In 2007, the UK and US established a bilateral agreement, forming a collaborative US–UK effort.[11] During the last few years, the PSOM has captured the interest of several countries, including Australia, Canada, Japan, and Sweden.[12]

The PSOM incorporates concepts from COIN and stability operations doctrine developed by the US and UK. The model is designed to link policy and strategic decisions to outcomes in an operational environment.[11] It is capable of modeling multiple entities consisting of the population, political factions, tribal or ethnic groups, militias, military units, non-governmental organizations (NGOs), other government departments (OGDs), and insurgent elements.

The PSOM is a turn-based, semi-agent-based, stochastic, human-in-the-loop model developed to represent military and civilian components of PSOs.[11] Each turn of the game begins with players making decisions and assigning activities to the specific elements (units, organizations, factions, etc.) that they represent. The assigned activities are transferred to the model using a graphical user interface (GUI; see Figure 1) and implemented during the next run of the simulation. Progress (improvement or decline) in the scenario can be measured using a variety of metrics to include: security of the population, availability of humanitarian aid, legitimacy of the government, level of criminality within the region, and development and reconstruction.

There are stochastic models within the PSOM. For example, there is randomness associated with force-on-force engagements, and intelligence gathering and sharing.[13] Therefore, there is variability in the observed outcome measures. Each simulation run produces an estimate of the modeled scenario's response surface for a specific set of input parameters.[14] Thus, a single game is often inadequate to answer all the questions a game sponsor may have. Therefore, the process of post-game analysis can benefit by using advanced design of experiment technologies,[10,15,16] as described in Section 5.3 of this paper.

The model consists of both playable and non-playable entities. Playable entities are identified as units that may include one or more military or civilian elements, such as conventional military forces, NGOs, OGDs, or insurgents. Non-playable entities consist of Population Agents representing civilians residing in the area of operations (AO). Factions include playable and non-playable components representing political entities, as well as infrastructure and human capital assets of the civilian population.[13] The semi-agent-based approach couples the activities of the non-playable entities with player inputs for playable units via human-in-the-loop integration that makes up the wargame element of the exercise.

The developers of the PSOM define two levels of decision-making within the game structure: the Strategic Interaction Process (SIP) and the Operational Game.[17] The SIP provides a framework by which the political and diplomatic dimensions can be integrated into the exercise to shape the overall strategic environment. The Operational Game describes the process by which game participants make decisions, assign actions to units, evaluate observed changes and effects seen within the simulated environment, and modify unit actions in follow-on decision cycles as the game progresses.

In 2010, the developers identified several potential applications for the PSOM.[11] We demonstrate one of the applications, education and training, to support the educational goals of the USPTC and its partners with the *Game for Peace* during the PKO course in Kyrgyzstan and Kazakhstan. The educational goals for the course are as follows:

- introduce the application of the Military Decision Making Process (MDMP) in PKOs;
- improve knowledge and skills for applying the MDMP in preparation for and execution of complex PKOs;
- demonstrate the ability to apply tactical and operational knowledge in a multi-dimensional, complex peacekeeping environment as a member of a battalion or brigade-level staff;
- demonstrate the ability to plan and deploy units in a PKO;
- plan and assess the short-term impact of a UN PKO in multi-dimensional, complex PKOs;
- plan and assess the long-term impact of a UN PKO in multi-dimensional, complex PKOs.

To create the *Game for Peace*, we selected the Operational Game process as described by the PSOM developers.[17] We modified the process in order to create an exercise that would engage the Kyrgyz and Kazakh military officers and allow them to practice and explore staff decision-making and analysis for a UN PKO.

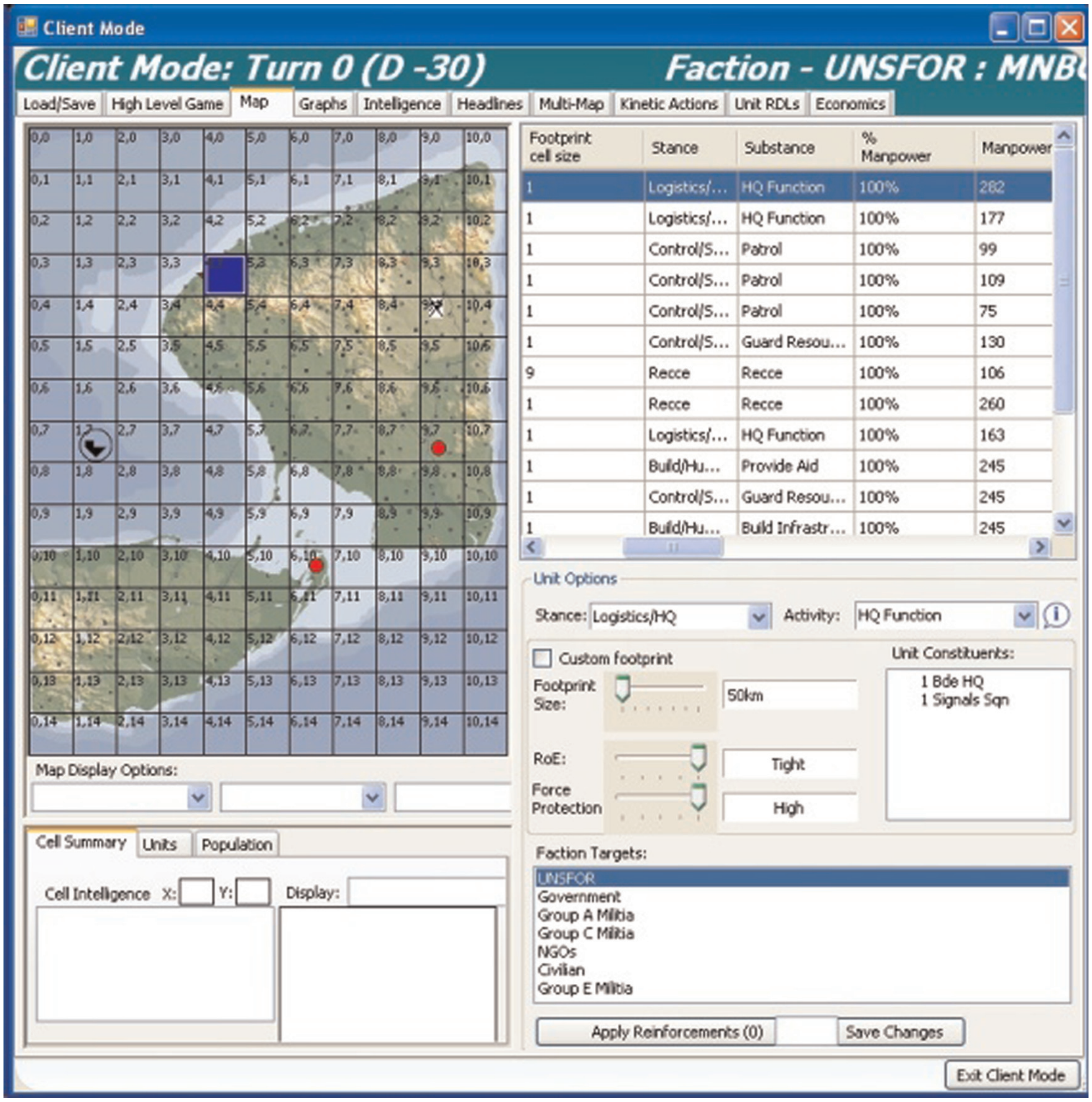

Figure 1. Peace Support Operations Model client mode graphical user interface.

The next section introduces the *Game for Peace*, the design elements of the exercise, and the overall process that we used to facilitate the game to support our educational goals for the program.

4. Game for Peace Exercise

The *Game for Peace* Exercise for *Progressive Education in Peace Operations* is a comprehensive gaming exercise that consists of several design elements which include supporting documents and delivery tools, coupled with student/instructor interaction, and facilitated by the PSOM.

During the exercise, students play the role of brigade-level staff members deployed as a UN peacekeeping force consisting of three brigade-sized elements. The students enter into the exercise with the forces deployed to the fictitious country of *Yellowstone*[18] following a second deployment as part of a Relief in Place (RIP).

At the beginning of the game, students assess prepared COAs reflecting unit tasks and commander's intent as outlined in a baseline operational plan for the scenario. As the exercise progresses, students prepare and assess their own COAs. Instructors present COAs in an abbreviated MDMP. This adjustment to the MDMP allowed students to focus on unit locations, mission, intent, and activities associated with PKOs. In this manner students have the time to assess the COAs using selected measures of effectiveness (MOEs) from the PSOM.[19]

The students evaluate the COAs with respect to five MOEs: security of the population; availability of humanitarian aid; legitimacy of the government; level of criminality within the region: and infrastructure. As the students analyze the COAs, they consider unit activities and desired effects in terms of first-, second-, and third-order effects. A first-order effect is a direct result of an action, with no intermediate consequences between the action and the effect. Additional outcomes that are caused by a first-order effect are known as second- and third-order effects. Consideration of second- and third-order effects during the planning process can help peacekeepers develop more effective and flexible plans.

The *Game for Peace* consists of several sub-events that, when executed in sequence by the training team, create a week-long, dynamic educational experience. The *Game for Peace* cycle consists of an introduction to the scenario by the training team, student preparation, several turns of the game, and an After Action Review (AAR).

The next section describes the design elements of the exercise, the intent of the supporting documents and delivery tools, and how the components are integrated into the overall exercise.

4.1 Design elements of the exercise

Our intent for the *Game for Peace* was to produce a comprehensive, modular gaming exercise to engage participants, reinforce their understanding of UN PKO concepts and procedures, and facilitate staff decision-making processes for a PKO. For our scenario, we employed the elements described by Perla in his book, *The Art of Wargaming*.[1] The following bullets outline the principle design elements that a game scenario must incorporate.

- **Scenario**: background information, parties involved, party objectives, relationships, resources, and narratives.
- **Database**: quantitative relationships for scenario elements.
- **Delivery tools**: exercise modules, handouts, and situation updates.
- **Model**: abstraction of the real-world environment described in the scenario.
- **Procedures**: designed to monitor player actions, assess interactions, and inform players on the outcomes.

We selected the Yellowstone scenario to provide the strategic and political background for our game.[18] The DSTL developed Yellowstone to serve as a demonstration for PSOM training sessions. We adapted the scenario to meet the educational goals of our program and built the *Game for Peace* exercise around it. The Yellowstone scenario provided a realistic environment with enough complexity to engage our participants. The scenario's strategic and political background is representative of many conflict regions around the globe, while the fictional component allowed us to manage sensitivities that may exist within diverse training audiences. The Yellowstone scenario consists of six supporting documents and multiple PSOM data files as follows.

1. **Scenario brief**. Provides an overview of the Yellowstone scenario.[20]
2. **Yellowstone background**. Describes the country of Yellowstone, the strategic and political background, its infrastructure and resources, population data, factions involved, and the significant events that led to the destabilization of the region and the UN PKO.[18]
3. **UN Security Council Resolution (UNSCR)**. Provides a notional UNSCR that serves as the mandate for the UN deployment to Yellowstone.[21]
4. **Operational Plan (OPLAN)**. Provides a notional OPLAN outlining the higher commander's intent, supporting effects, scheme of maneuver, main effort, and tasks to subordinate units.[22]
5. **Intelligence summary**. Provides an initial situation update and intelligence summary at the start of the exercise.[23]
6. **Stance guide**. Provides a description of the stances and activities that the units and factions can take during the simulation. The training team used this document when translating the student-designed COAs with associated mission, intent, and unit tasks into the PSOM operational order files that best represent the students' intent. Figure 2 displays the *Build/Humanitarian Aid* stance and associated activities found in the stance guide.[24]

Stance	Activity
Build/Humanitarian Aid	Build Infrastructure
	Train Human Capital
	Provide Aid
	Build Capability

Figure 2. Build/Humanitarian Aid Stance and associated activities from the Peace Support Operations Model stance guide.

7. **Data files**. Consists of PSOM data files that represent the starting conditions as described in the background documents for the scenario. The data files model the factions and their associated parameters within the scenario, providing an abstract representation of the commander's intent, scheme of maneuver, and tasks to subordinate units provided in the scenario's OPLAN.

The *Game for Peace* exercise material consists of a set of exercise modules to help guide student participation during the game, situation updates for each turn of the game, and case studies to enhance the educational material presented in Phase I. We also developed several supporting documents to assist with the delivery of the material to the students as well as train multiple mobile instructor teams in the future. The supporting documents include introductory presentations, instructor notes, student notes and handouts, and exercise event-sequencing guides. The three primary components of the exercise material are as follows.

- **Exercise modules**. The exercise modules include several presentations and documents. The modules serve as the primary delivery tools for the game and are designed to introduce students to each phase of the exercise as well as guide student participation during the game. The material includes an overview of the exercise, an introduction to the game's sequence of events, narratives and data for multiple turns, instructor notes, and student handouts.
- **Situation updates**. The situation updates provide a narrative of the current situation at the beginning of each turn. All three brigades receive a unique update that is specific to their AO within Yellowstone. Figure 3 provides an example of a Situation Update.
- **Case studies**. Two case studies were designed to augment the educational material presented during the first week by linking the concepts to the *Game for Peace* exercise conducted in the second week. The case studies are modules focusing on public affairs and operational law issues. Both engage the students with media and public affairs issues, and address components of Chapter VII of the UN Charter.

Situation Update

Members of Ethnic Group A continue to protest the distribution of gold revenue to the rest of the nation. The Government seems minimally concerned with the protests, as a majority of its members belong to Ethnic Group A. However, some in the government believe that this link will serve to delegitimize their rule and increase ethnic tensions.

In an effort to improve conditions across the nation and, particularly the areas near the Internally Displaced Persons (IDP) camp, agencies are attempting to increase humanitarian aid. However, poor roads and rail lines in Operational Region 1 have greatly hindered their attempts. Humanitarian supplies are being delayed, and in some cases, not reaching their final destinations. Unable to deal with these difficulties alone, NGOs in the area have sent out requests for assistance in humanitarian relief delivery.

The effects of the IDP camp are now seen as "spilling over" into Operational Region 1 due to the discovery of a large cache of bomb making material northeast of the camp. The populace anticipates more violence in the area.

Figure 3. *Game for Peace* Situation Update.

The exercise includes six prepared situation updates. Each update provides a narrative for the current situation within the Yellowstone scenario. While the situation updates were prepared ahead of time, they reflect a reasonable environment that the students (as well as training team) can expect as the exercise proceeds. The situation updates can be modified by the training team during the game and augmented with significant activities generated by the PSOM after each turn.

The PSOM provides significant activities after each simulation run as output components from the model. The significant activities consist of military and civilian casualty counts, inter-ethnic fighting engagements, and changes to several MOEs. While the model-generated significant activity reports provide context to the evolving scenario, the meaning and overall ''story line'' is left to the instructor team and students for discussion and follow-on action.

The situation updates are intended to augment the significant activities and simulation results from turn to turn. The situation updates provide a robust narrative that is intended to motivate critical thought and extend student discussion from simple tactical events and intended consequences (first-order) to higher-level discussions of second- and third-order effects.

The next section provides a brief introduction to the Yellowstone scenario.

4.2 Yellowstone scenario

The population of the island group Yellowstone (approximately 10 million) is split into five main ethnic groups (A, B, C, D, and E). The Yellowstone Government is formed largely from the ruling party of Ethnic Group A with President Able in charge. The country is on the verge of political fragmentation. Discovery of gold on North Island and subsequent imbalance in the distribution of wealth has destabilized the fragile unity government and reignited inter-ethnic tensions.

South Island is the poorer of the two Islands within Yellowstone. It has a primarily agricultural economy and is populated by Ethnic Group E. Large decreases in world gold prices lead to a reduction in national revenues, which highlight the disparity between the rich and poor ethnic groups. Ethnic tensions erupt into open violence following the formation of ethnic-based militias that the Government could not contain.

Press images of atrocities by both Ethnic Groups A and C militias lead to significant external pressure on their respective leaderships to stop the violence. Open negotiations between the various parties eventually culminate in the signing of the Rome Peace Treaty in July 2011.

A UN Stabilization Force (UNSFOR) was deployed to the country under a Chapter VII mandate (UNSCR 2112 (2011) dated 21 July 2011)[21] in September 2011 to enforce a ceasefire between all warring parties and assist with humanitarian aid and reconstruction.

The next section describes the *Game for Peace* execution and key events that make up the exercise.

4.3 Game for Peace execution

The Game for Peace consists of several events that, when executed in sequence by the instructor team, create a week-long, dynamic educational experience. The events include an introduction to the scenario, student preparation, several turns of the game, conclusion of the game, and an AAR.

The instructor team prepared the students by introducing them to the PSOM and the Yellowstone scenario in a series of brief presentations. Four background documents intended to be read by the students prior to the start of the exercise were also provided:

1. Yellowstone background;
2. UNSCR;
3. OPLAN;
4. intelligence summary.

After the students read the background material (the Kyrgyz participants read the material over the weekend between Phases I and II), the instructor team presented an overview of the tasks and techniques the students would perform during the *Game for Peace*.

The exercise consisted of several turns of the game. Each turn represented a cycle of the game in the computer and consisted of 30 simulated days in the Yellowstone scenario. The students conducted one or two turns each day. Students started the exercise by considering a COA. During the first two turns, the COAs were prepared by the instructor team with pre-determined unit locations, mission, intent, and unit tasks. In subsequent turns, the students developed their own COAs.

The students evaluated the initial COAs with respect to five MOEs: Security, Humanitarian Aid, Host Nation Government Legitimacy, Level of Criminality, and Infrastructure.[19] As the students analyzed the COAs, they considered their intended consequences, as well as second- and third-order effects.

Once the students evaluated the COAs and discussed the intended consequences and effects, the instructor team ran the simulation. For the turns requiring student-developed COAs, the instructor team updated the model with the appropriate unit activities that best represented the students' intent.

Following a simulation run, the students received an update brief. During the brief, the instructor team presented the changes observed in the MOEs using maps of the region, shaded with red and green. Red indicated negative-trending changes to MOEs across the associated regions of the island and green represented positive-trending changes.

The team described the changes for each of the five MOEs and postulated possible reasons why these changes occurred. During this discussion, students were asked to reflect on these outcomes with respect to second- and third-order effects.

After the students had time to discuss the results, the instructor team presented a new situation update. The update was in paragraph form and provided a narrative for the current situation for each of the three brigades within the scenario. Using this new narrative, reflecting the current state-of-affairs for Yellowstone, the students continued the process by either considering or developing a new COA.

The five turns are summarized below. During the Kyrgyzstan exercise, the students formed three groups (one group for each brigade) and considered follow-on actions within their AO as the scenario evolved.

- **Turn 1 – guided COAs**. During the first turn, students evaluated prepared COAs for all three brigades. The evaluation was conducted with the entire class participating together as a single group. Our intent was to ensure that the students develop a good understanding of the game process early on in the exercise.

- **Turn 2 – team competition**. The second turn consisted of an evaluation of a prepared COA for the second brigade on the North Island of Yellowstone. The students were asked to form two groups and evaluate the proposed COA. This turn was designed in the form of a competition between the student groups. Our intent was to generate esprit de corps as the week continued. Each group evaluated the prepared COA independently and presented their predictions for the anticipated changes to each of the MOEs. At the end of the turn, the simulation results were presented and the teams' predictions were compared. The team with the greatest number of correct predictions was identified as the ''winner''.
- **Turn 3 – student designs**. During the third turn, student teams developed and evaluated their own COAs for the second brigade. Again, the student groups competed against each other by trying to correctly predict changes to the MOEs. In addition, the instructor team selected two students to serve as a ''red'' team. The red team played the role of insurgent elements within the game. The intent of red team role playing was to introduce the participants to the dynamics of the PSOM and highlight its capabilities during the exercise.
- **Turn 4 – student designs**. During Turn 4, student teams created and evaluated their own COAs for all three brigades. The students formed three groups representing one of the three brigades. As in Turn 3, two students were selected to serve as red team elements. The intent of this turn was to build on the lessons learned during the exercise.
- **Turn 5 – student designs**. Turn 5 was similar to Turn 4. Student teams developed and evaluated their own COAs for all three brigades. However, the instructor team did not allow for a student-driven red team. The intent of this run was to continue to reinforce our educational goals and allow for the environment to stabilize as we prepared for the conclusion of the exercise.

Between Turns 4 and 5, the instructors introduced one of the two case studies focusing on public affairs and operational law issues. The case study leveraged events described in the situation updates and the material presented in Phase I of the program. At the conclusion of the exercise, the instructor team guided the students through an AAR, reviewing the significant events during the game and insights gained during the week.

The next section describes the MOEs that we selected as measures to evaluate student actions and outcomes during the exercise.

4.4 Measures of effectiveness

Students evaluated the brigades' overall activities with respect to five MOEs: Security, Humanitarian, Legitimacy, Criminality, and Infrastructure. The MOEs were selected from numerous output measures that the PSOM is capable of generating after each game turn. The MOEs are described below.

- **Security**. The perceived risk of death by the population agents within each faction. The unit of measure for Security is represented by the number dead per 100,000 man years normalized to a 0–10 logarithmic scale.[13,25]
- **Humanitarian**. The level of a particular good provided directly from a faction or unit to the population. Goods include resources and/or services such as potable water, healthcare, education, and internal order.[13]
- **Legitimacy**. An aggregate of several measures that indicates the population agents' ''acceptance'' of the regional governing authority.[25] Five measures are used to determine the level of *Legitimacy* in the model: *Rule of Law*; *Corruption*; *Consent to Faction*; *Average Security*; and *Essential Services Restored*.
- **Criminality**. The level of criminal activity conducted by population agents within the model. The ''extent'' of criminal activity is based on several factors: population agents' income level; the average income of other population agents in a region; the average prison term; the total population in a region; and the number of police units in a region.[25]
- **Infrastructure**. The level of various installations and equipment required to be operated by trained workers in order to produce goods and provide services.[13]

The image displayed in Figure 4 is known as a ''dendritic'' for its ''branching'' appearance. Dendritic diagrams are used to help organize objectives and associated activities that support those objectives. The test and evaluation community uses dendritic diagrams to link critical operational issues (COIs), MOEs, measures of performance (MOPs), and data requirements (DRs) for systems under test in acquisition programs.[26]

The dendritic in Figure 4 is used in a similar fashion to link the commander's five priorities for the PKO and possible unit activities that support the commander's intent and overall mission. The dendritic is organized in the following way.

- **Operational objectives**. The five objectives are derived from the commander's priorities in the

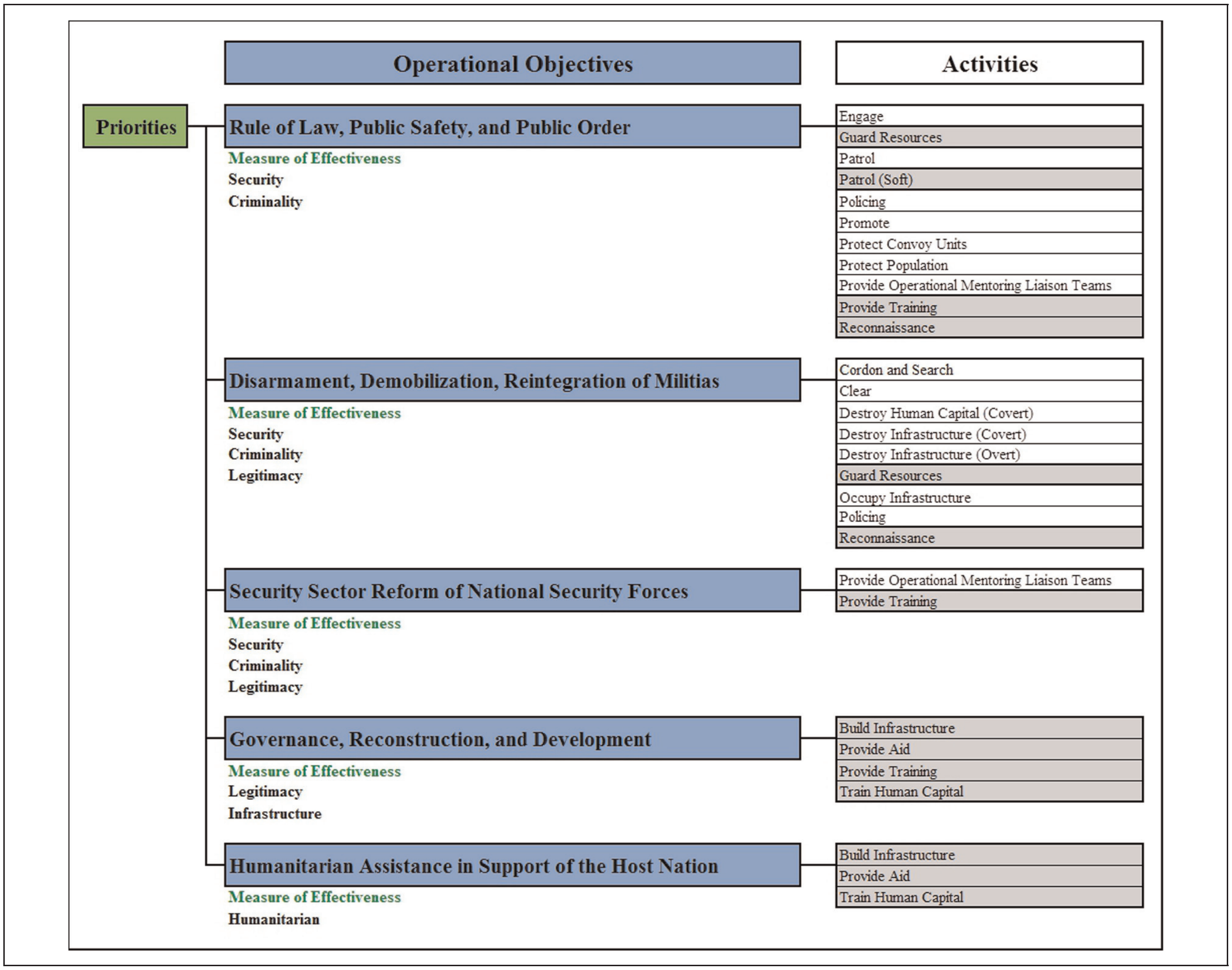

Figure 4. Dendritic diagram linking commander's intent and Operational Plan objectives to unit activities.

baseline operations order that was provided as a read-ahead to the students. The five priorities were: (1) Rule of Law, Public Safety, and Public Order; (2) Disarmament, Demobilization, Reintegration of Militias; (3) Security Sector Reform of National Security Forces; (4) Governance, Reconstruction, and Development; and (5) Humanitarian Assistance in Support of the Host Nation.

- **MOEs**. Under each of the objectives are one or more MOEs. The MOEs serve as a measure for evaluating the progress (improvement or decline) of the objectives over time.
- **Activities**. Activities generate data that result in changes to the MOEs. The activities listed in the right-most branch of the dendritic represent possible unit tasks that can be assigned to each of the subordinate units within the brigades. Activities associated with PKOs were identified and selected from the PSOM stance guide. By selecting appropriate activities for each subordinate unit, the students attempted to achieve desired effects during the exercise.

Several of the activities have been shaded in gray. The shaded activities represent the unit activities (tasks) for the second brigade outlined in the exercise OPLAN.

Figure 5 displays the five MOEs and a notional prediction of the anticipated change to those measures that a selected COA is anticipated to achieve during future time horizons.

The students were asked to evaluate the COAs with respect to the five MOEs. They ‘‘predicted’’ whether each MOE will improve, decline, or remain the same. They were reminded to consider intended consequences, and second- and third-order effects. The following provides an example discussion of this process.

Measures of Effectiveness	Predicted Change
Security	↑
Humanitarian	↑
Legitimacy	↑
Criminality	↑
Infrastructure	↑

Figure 5. Predicted changes to measures of effectiveness for a selected course of action.

- **Security**. The overall security of the region will improve based on this course of action. While we have balanced our actions between rebuilding infrastructure and humanitarian relief efforts, sufficient forces have been assigned the task of Guarding Resources and conducting Soft Patrols. Soft Patrols are designed to mitigate criminal activity, inter-ethnic fighting, and encourage support and trust of the local population.
- **Humanitarian**. Availability of humanitarian aid is anticipated to improve over the next time period. The Civil Military Cooperation (CIMIC) teams are focused on Providing Aid. In addition, we have one of our engineer companies Training Human Capital, which should enhance our long-term sustainability of future humanitarian efforts. The synergistic effects of patrol, providing aid, and training should reduce the level of Criminality and improve the Security and Humanitarian situation in the region.
- **Legitimacy**. As security and humanitarian aid improve, the second-order effects of improved Legitimacy of the Yellowstone government should begin to be realized.
- **Criminality**. We anticipate that the level of criminality across the islands should decline. This should result in an overall improvement with respect to the level of Criminality.
- **Infrastructure**. The balanced approach of this example COA should also help improve the Infrastructure across the islands. One engineer company is focused on building infrastructure during the next time period.

After each simulation run, the instructor team presented a slide similar to the one displayed in Figure 6. The slide consists of color maps representing changes to the five MOEs. The green regions represent improvements to the MOE and red represents declines.

The instructor team leveraged the numerical and visual information generated by the PSOM to engage the participants during the exercise. The students were asked to reflect on the second- and third-order effects that could have resulted in the actual changes to the MOEs, as depicted in Figure 7. Discussions of this nature were facilitated by members of the instructor team with real-world experience from peacekeeping deployments. The instructors used examples from their previous deployments to highlight educational material presented in the first week and linked key points to the events as the simulated environment changed during the exercise in the second week.

The next section describes how the instructor team elevated discussions centered on primary effects to more complex interactions involving secondary and tertiary effects.

4.5 Secondary and tertiary effects

PKOs occur in complex environments. The parties involved represent multi-national, inter-agency, and possibly warring factions. Each of these parties operates from its own point of view. In order to achieve desired end states, the UN force must take a comprehensive approach. The approach involves not only considering intended consequences, but second- and third-order effects when evaluating COAs.

Intended consequences represent the desired outcomes for the operation. For example, the intended consequences of a recommended COA may include the following:

- Yellowstone demonstrates the ability to maintain security and employ forces;
- the host nation is empowered to provide security and humanitarian relief;
- proven near-term security and development of long-term capability;
- humanitarian relief efforts supported and sustainable;
- stronger host nation and UNSFOR partnership;
- increased national loyalty and rejection of inter-ethnic fighting;
- positive media coverage and local/international opinion.

There may be several COAs that a UN force could take to produce the positive outcomes as described above. However, in order to be successful, we must consider second- and third-order effects. Second- and third-order effects may not be as apparent as our intended

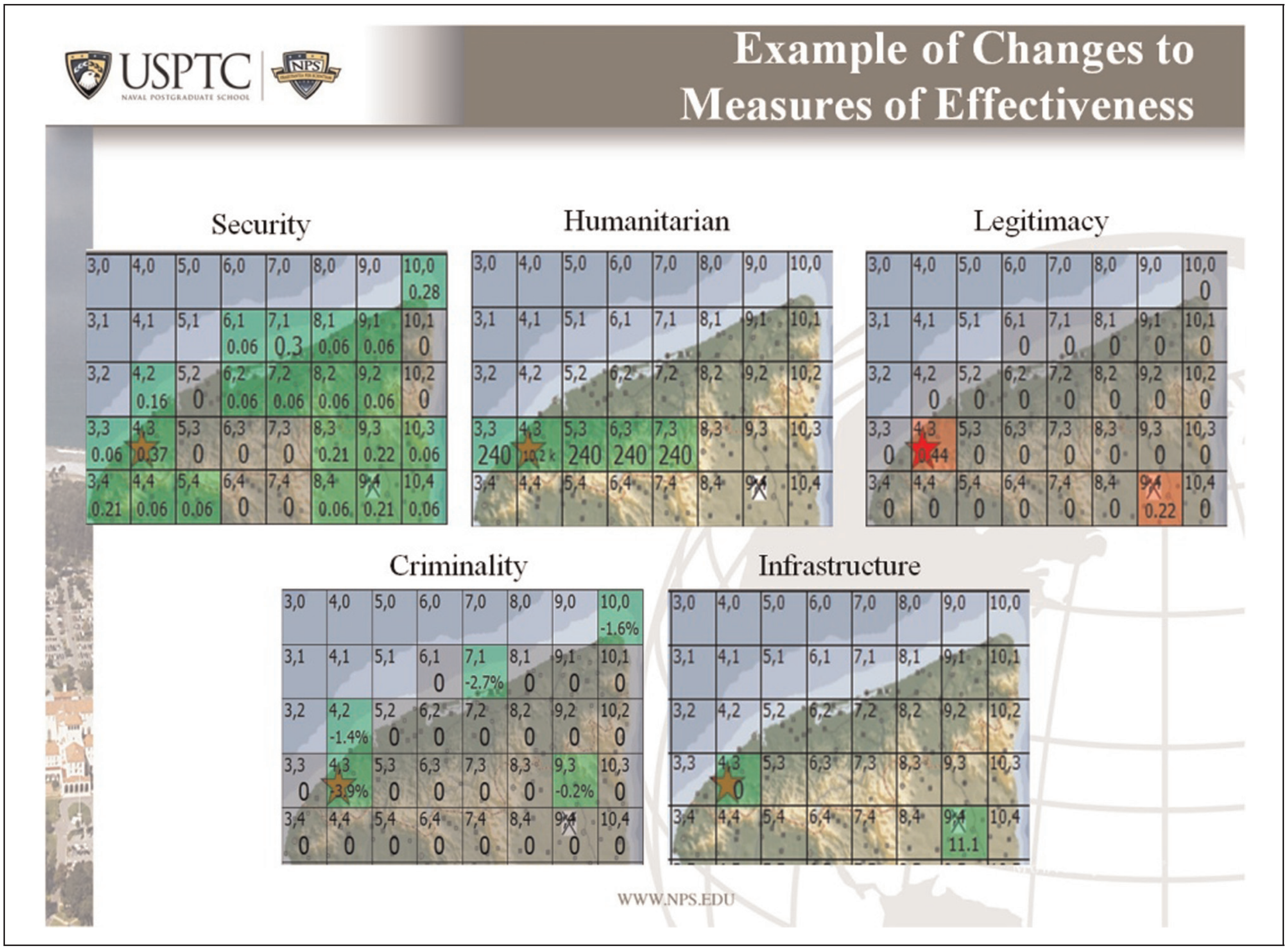

Figure 6. Example of visual information presented to Game for Peace participants depicting changes to measures of effectiveness. (Color online only.)

consequences. Critical thought is required to uncover how our initial actions may create conditions for follow-on changes to occur. Some of these changes may be positive, others may be negative.

One way to identify second- and third-order effects is to identify risks, consequences, and additional effects of a given action. We should ask, ''What are the risks associated with a given action?'' Suppose we plan to deploy forces throughout the AO with the desired effect to improve security. What are the risks if we deploy forces throughout the AO? Our units will become more dispersed. The dispersion will extend our lines of communication. The increased dispersion may result in our convoys being subject to additional attacks. Additional attacks may result in unfavorable media and additional strain on force protection requirements. In order to address the security risks along the lines of communication, we may increase patrols to protect our convoys. Increased patrols may increase our visibility across the region and inadvertently strain relations, resulting in loss of host nation support. The loss of support may result in restricting our movement, putting follow-on PKOs at risk.

The instructor team further emphasized the importance of second- and third-order effects by incorporating student-led ''red'' teams during the exercise. The red teams played the role of insurgent elements within the game. The teams added to the dynamics of the exercise by creating an opposing force, in addition to the simulated factions within the model, which was attempting to counter the intended effects of the participants' actions. During the discussion phase that followed each turn, the red teams presented the actions that they took during the previous turn and what caused them to take those actions. The peer-to-peer discussions that followed were very effective at highlighting secondary and tertiary effects.

Not all secondary and tertiary effects will be easy to uncover. In fact, most likely, we will not be able to predict all of the effects resulting from our initial actions.

Measures of Effectiveness	Actual Change
Security	↑
Humanitarian	↑
Legitimacy	↓
Criminality	↑
Infrastructure	↑

Figure 7. Actual changes to measures of effectiveness for a selected course of action.

However, an active consideration of second- and third-order effects during the planning process can help us develop more effective and flexible plans that are better suited to accomplishing our desired end states and more adaptable to future opportunities and uncertainties.

The next section describes how the instructor team used the PSOM to replicate student-designed COAs and provide updates as the exercise progressed.

4.6 Interfacing with the PSOM

The PSOM is a flexible simulation that permits the assessment of country-wide plans for complex IW and COIN environments. With flexibility comes complexity, so one of the keys to success was to have trained PSOM experts support the exercise. These experts had to have four distinct skills. Firstly, they needed to have a detailed understanding of how the PSOM worked. Secondly, they needed to understand the complexities of the scenario, and how lower-level actions would impact the achievement of the higher-level objectives. Thirdly, they had to understand how the metrics related to the achievement of the higher objective. Fourthly, they had to be able to translate the peacekeeper's intentions, typically described in military terms, into discrete and distinct actions to be input into the model. Having this expertise was one of the keys to success.

4.7 After Action Review

At the conclusion of the week-long exercise, we conducted an AAR. We focused on the importance of not only considering intended consequences of unit actions, but using critical thought to uncover second- and third-order effects that are unique to the peacekeeping environment. We highlighted how the PSOM facilitated the exercise by creating a robust environment for the scenario and adjudicated significant events in ways that would have been infeasible or impractical using a manual approach.

We asked the students how this process has helped them prepare for future PKOs in ways that they previously did not anticipate prior to the exercise. The AAR uncovered lessons learned that are highlighted in the discussion of outcomes, insights, and leveraging opportunities in the next section.

5. Outcomes, insights, and leveraging opportunities

The outcomes from both exercises are summarized here. In addition, insights about the effectiveness of the course of instruction are highlighted. Finally, opportunities for leveraging the methods, models, and tools developed for this exercise to better explore important PKO concepts and planning techniques are discussed.

5.1 Outcomes

The assessments conducted in Kyrgyzstan and Kazakhstan were tremendously valuable for both understanding how well the content of the Phase I instruction was understood, and building on the Phase I knowledge to provide a more in-depth knowledge of UN PKO to the students. Because the exercise focused on groups assessing and designing COAs, individuals benefitted from the experience and knowledge that their peers shared, and students quickly gained confidence in their knowledge when reinforced by the other students. As the week-long exercise progressed, the confidence of the students in their knowledge of UN PKO grew, and each COA exercise was conducted more quickly than the previous one.

5.2 Insights

Using student groups brings key advantages to the educational and assessment process. Students are less apprehensive about asking questions or clarifying points when they can first discuss points of contention with peers. This is especially important when the instruction is provided through translators. We also discovered that the basic MDMP is not universally understood, revealing a need for a PKO-focused MDMP block of instruction. Although the Yellowstone scenario is well-designed and extremely useful for assessing the UN PKO, it is fictitious. Uniformly, students would like a ''real-world'' scenario. While understandable, this poses several challenges. First is sensitivity – typically real-world scenarios need real data, and that often means classified data. Second, each UN PKO is unique – the challenges in Kashmir are far different than those in Darfur. This might necessitate a repository of scenarios, each focused on teaching and assessing several different UN PKO learning objectives.

5.3 Leveraging opportunities

Simulation games are extensible to study issues and questions that are not addressed during the game. Game sponsors frequently have more questions than a game can answer. In addition, decision makers often require quantifiable information to support assessments from the game. Computer experimentation offers a means to meet these demands. Whereas a simulation-assisted game requires human interface, computer experiments require a closed, constructed model. The administered game is necessarily the foundation for the computer experiment. However, for the PSOM and other human-in-the-loop simulations, this process requires that the human inputs be scripted. Using the PSOM as an example, several unique lines of operation can be explored by linking specific stance/activity combinations to the units in the scenario. Since there are often numerous variables to explore, this process can benefit by using advanced design of experiment techniques.[10,15,16] Through stakeholder analysis, analysts transform the game into a closed, constructed model, develop the experimental design, and provide decision makers with rigorous analysis from the resulting data. This methodology is applicable for examining and refining operational plans, studying the effectiveness of training and education efforts, posing ‘‘what-if’’ scenarios, and developing scenarios for exercises, as well as test and evaluation events. Application of this process is currently supporting studies for contingency operations.

6. Conclusion

The *Game for Peace* offers a modeling and simulation approach that clearly increases the efficacy of training and education efforts for PSOs. The instructor team diversity and expertise created a robust educational experience that enhanced the learning environment for the game participants. The PSOM generated real-time, quantifiable MOEs based on students' decisions, which facilitated interactive discussion of effects and knowledge assimilation. Emphasis on secondary and tertiary effects elevated key learning points from tactical to operational and strategic insights. Insights from the game about training and educating future peacekeepers and lessons for using computer simulations mark the way to leverage the use of computer simulations to significantly improve the educational outcomes, and core competencies for PSOs.

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