Chapter Three

Simulation-Based Analysis and Training (SimBAT)

Wargaming in the Office of Naval Intelligence

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SIMULATION-BASED ANALYSIS AND TRAINING (SIMBAT) PROGRAM OVERVIEW

This chapter reports on the history, concept, and status of a wargame-based training and analytic support program the author devised and has implemented in the Office of Naval Intelligence (ONI) since 2008, explaining its pedagogical bases and objectives for learning and development in a military intelligence organization.

Program History and Status

SimBAT originated in two mid-level training courses conducted as concept demonstrators in 2004, both wholly in-house efforts with no contractor support. For the first, the author assembled a team and organized a Battle of Jutland wargame using Avalon Hill’s 1967 game on the World War I naval battle.¹ In the second, the team wargamed the Battle of Midway using Avalanche Press’s game.² They modified both products for Naval War College-style white cell adjudication, emphasizing blind search on the part of the blue and red (or in this case black) player cells.³ For both of these early efforts, lecture-based train-

¹ James F. Dunnigan, Jutland (Baltimore, MD: Avalon Hill, 1967).
² Michael Bennighof and Brian L. Knipple, Midway, Second World War at Sea series (Irondale, AL: Avalanche Press, 2002).
ing was limited to a substantial briefing on naval warfare in the respective eras.

SimBAT proper commenced in 2008, running full scale until the federal budget crisis of 2011 (sequestration), when the program was temporarily cut, resuming in 2014, and then only in truncated form. From 2008 to 2011, the SimBAT team ran a dozen iterations of six different mid-level courses. They commenced first with higher-level hex-and-counter simulations at the mid level but many of the students were junior and found these more quantitative models a discouraging challenge to learn, even with intensive coaching. The team then ratcheted back the complexity of the simulation models, while simultaneously augmenting the content and structure of the larger pedagogical design and method of delivery. Thus, embedded in sound pedagogy (explained below), the wargames provided the warfare model students analyzed in class and then experienced in each course’s simulation laboratory.4

The team found the *Axis and Allies* game series highly suitable to meet the learning and analytic skills-development needs of ONI’s targeted training audience, which consists of analysts primarily in components charged with strategic, operational, and tactical warfare and technical systems analysis.5 As fellow wargame *grognards* might imagine, the team was loath to foist on fellow analytic professionals a simulation model featuring plastic miniatures of tanks, ships, planes, and infantry.6 However, it was sufficiently well received to warrant adoption as the standard simulation toolset.

The main courses focused on strategy in the Second World

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4 Technically, *andragogy* or the principles and practices of adult education.
5 Larry Harris, *Axis and Allies* (various titles) (Baltimore, MD: Avalon Hill, multiple publication dates).
6 The original definition of the term *grognard* refers to an old soldier, or a “grumbler.” In current usage, it refers to individuals with deep and extensive expertise in wargaming.
War in Europe and the Pacific and operations during the Solomon Islands campaign of 1942. The team has run other courses on the Spanish-American War, the Battle of the Atlantic, and tactical air combat.

**Program Structure: SimBAT Analysis and SimBAT Training**

SimBAT consisted originally of two elements: SimBAT Analysis (SimBAT-A) and SimBAT Training (SimBAT-T). SimBAT-A uses campaign- and mission-level computational modeling and simulation (M&S) to support production analysis. The team ran two such projects in 2004 and 2011. SimBAT-T uses manual tabletop wargaming and historical scenarios. They resumed a few years after sequestration, albeit at a reduced scale. The return of great power conflict (GPC) appears to be increasing demand for resumption on a larger scale.

Both applications follow the same methodology and business process. Being a vehicle for organizational development and learning as well a process for intelligence discovery, SimBAT is governed by specific discovery and learning objectives and is intended to promote a substantial advance in intelligence analytic methodology.

**SimBAT Methodology:**

**Synergy through Paradigm Integration**

SimBAT employs mixed-methods analysis and synthesis, integrating intelligence community (IC) analytic tradecraft and Department of Defense (DOD) analytic methodology. The two paradigms are highly complementary in functional capability, each providing a combined arms capability the other lacks and needs. IC analytic tradecraft is informal and qualitative in nature, serving best for the generation and initial vetting of hypotheses. DOD methodology is much more formal and quantitative, complicating the generation of multiple wide-ranging
alternative hypotheses; however, it is much better for testing hypotheses.\textsuperscript{7}

Service intelligence centers occupy the nexus between the DOD and the IC, positioning them to lead this methodological paradigm integration (figure 2).

IC analytic tradecraft, as applied in SimBAT, serves the methodological functions of inductive and abductive synthesis, and emphasizes the following methods and techniques:

1. Collaborative teaming
2. Facilitated brainstorming
3. Critical Thinking and Structured Analysis (CTSA) using Structured Analytic Templates (CTSA/SATs) to
4. Generate alternative hypotheses

The DOD analytic methodology, as applied in SimBAT, serves the function of deductive analysis and emphasizes:

1. Formal and quantitative modeling
2. Simulation-based hypothesis testing

The SimBAT process pursues a discovery and learning spiral commencing with team formation and structured brainstorming and proceeding through the definition of variables and generation and testing of hypotheses, followed by further spirals as needed (figure 3).

SimBAT-T trains analysts in cognitive orientation and reasoning and helps provide the pattern recognition and anomaly detection skills required for effective threat assessment and

\textsuperscript{7} Neither DOD nor IC methodology/tradecraft are documented in any single reference work. Any comprehensive citation would require a bibliographical annex. Military analytic methodology supports the requirements of force and operations planners, including, inter alia, the full range of threat and net assessment, force-structure analysis, campaign modeling; capabilities- and requirements-based analysis and planning, technical systems analysis and design; and the military planning and decision-making processes (MPP/MDMP). All of these involve at least some degree of quantitative rigor, and they include M&S, wargaming, and operations research. Intelligence analytic tradecraft is well-named, for except in military applications, it emphasizes qualitative methods supported occasionally by structured methods for creative and critical thinking, some of which will be touched on below.
Figure 2. SimBAT methodology combines the best of two philosophies

SimBAT

IC METHODOLOGY:
- Creative and informal critical thinking.
- Excellent for generating alternative hypotheses.

DOD METHODOLOGY:
- Rigorous critical thinking.
- Excellent for formalizing and testing hypotheses.

Source: courtesy of the author, adapted by MCUP.

Figure 3. SimBAT learning spiral

Truth, intelligence discovery, and warning

Interdisciplinary team collaboration

Facilitated brainstorming

Mathematical analysis of experimental results

Simulation-based experimentation

CTSA/SAT

Definition of variables

Computational modeling

Multiple alternative hypotheses

Source: courtesy of the author, adapted by MCUP.
warning. SimBAT-A works directly by teaching military modeling and simulation. Beyond that, however, SimBAT-T supports analysis across the command by training analysts in the basics of military affairs and warfare at the strategic, operational, and tactical levels.

The following images convey the look and feel of SimBAT materials and activity (figures 4 and 5).

**THE NEED FOR ADVANCED ANALYSIS AND TRAINING**

SimBAT is designed to develop and institutionalize advanced methodology in intelligence analysis and production. The program integrates today’s advanced qualitative methods and

![Figure 4. SimBAT-T materials](image-url)

Source: courtesy of Avalanche Press and Hasbro, adapted by MCUP.
Figure 4. SimBAT-T materials (continued)

Source: courtesy of Avalanche Press and Hasbro, adapted by MCUP.

techniques while simultaneously laying the foundation for the adoption of more sophisticated and rigorous logical and quantitative methods and tools.

Consistent with today’s analytic tradecraft, the SimBAT program emphasizes critical thinking and structured analysis.
Figure 5. SimBAT Course: Naval Intelligence and Strategy; Scenario: Pacific War, 1941–45; Wargame: *Axis and Allies Pacific*

Source: courtesy of the Office of Naval Intelligence, adapted by MCUP.
ONI’s implementation, however, is more tailored to the military intelligence problem set than it is basic intelligence analytic tradecraft. SimBAT is designed as an integral component of an analyst’s career development, and could in the future be offered for IC-wide analytic training. As such, SimBAT is designed to promote ONI and wider IC analytic tradecraft, quality standards, and analytic training requirements.

The author proposes a methodology of “cognitive and computational collaboration” designed to enable organizations to implement this checklist with maximal effectiveness in actual analysis and production. The intent is to reduce the threat of intelligence failure and surprise through facilitated, laboratory-based collaboration designed to maximize the number of alternative hypotheses analytic teams conceive and explore and to test them all as rigorously as time and money allow. Emerging assessments and forecasts then can be fleshed out with associated indications and warnings (I&W) indicators and potential adversary branches and sequels. The resulting products and support would arm national and theater commanders with deeper insight into the adversary, and a broader scan of the horizon, than intelligence has ever before supplied.

This analytic methodology can be developed with reduced costs and risks by inaugurating it as a training program—one that is conducted as a rehearsal for the real thing—that is, as an analytic project that produces everything but the final intelligence product.

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Today’s Advanced Methodology: Cognitive Collaboration
The current generation of advanced qualitative methods and techniques subsumed under the rubric IC analytic tradecraft includes interdisciplinary collaboration, facilitated team brainstorming, and Critical Thinking and Structured Analysis (CTSA). CTSAs include a variety of Structured Analytic Techniques (SATs), such as red cell brainstorming, key assumptions checks (KACs), multiple alternative hypotheses, and the analysis of competing hypotheses (ACH). These concepts are taught at the Central Intelligence Agency’s Sherman Kent School for Intelligence Analysis and at DIA’s Joint Military Intelligence Training Center (JMITC).⁹ The core principles involve the penetration of the adversary mindset and the generation and serious consideration of multiple alternative hypotheses concerning their capabilities and intentions. Fully implemented, advanced qualitative methodology can foster a dramatic improvement in the quality of intelligence analysis, especially in nonquantitative domains such as social and political intelligence. For highly quantitative domains such as warfare (and economics, science and technology, etc.), qualitative methodology, although absolutely necessary, is insufficient, failing to exploit quantitative methods and tools widely available outside of the IC for analyzing complex problems.

Tomorrow’s Advanced Methodology: Computational Collaboration
To master the science of prediction, and indeed, simply to remain relevant and effective, the IC must take advantage of quantitative and computational methodology, especially in the military domain. Although standard in other knowledge-

oriented professions, including DOD and the Services, advanced quantitative and computational methods and tools are less familiar within the IC. The quantitative disciplines most applicable to defense intelligence analysis consist basically of statistics, probability, and operations research (OR), all of which subsume a vast array of methods and tools. These include everything from basic spatiotemporal plotting and calculation to Bayesian probability (named for Thomas Bayes), systems and process modeling, and Monte Carlo simulation. Simulation modeling includes technical systems modeling, network modeling, project management modeling, and comprehensive systems-of-systems modeling, including advanced complex adaptive systems techniques such as evolutionary algorithms and agent-based modeling. All of these come under the broad rubric of M&S, which uses statistics and probability and can be classified under OR.

Although M&S is well-established in scientific and technical intelligence, traditional IC capabilities, as found in general military intelligence (GMI), have not advanced to include formal modeling and simulation-based assessment, and the and culture in fact resists any such advance. And unfortunately, traditional DOD and Service M&S not only is hugely expensive; it is highly rigid and extensively prescribed, making it inappropriate to the wide-ranging exploratory requirements of intelligence discovery. Defense intelligence centers cannot simply import high-end DOD tools and techniques. They need their own intelligence-tailored quantitative analysis capability.

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11 For example, in a keyword search through any authoritative text on intelligence tradecraft, the seeker is unlikely to find results for scientific method, methodology, wargaming, modeling, simulation, M&S, stochastic, Bayes, or any variant of these or similar terms.
Getting There from Here
To develop this competence, the intelligence centers need to find an easier way to explore M&S and define their internal methodological and system requirements. Fortunately, an easy way is readily available: *wargaming*. One highly effective but inexpensive method for this is Naval War College-style manual wargaming using paper components on tabletop gameboards or even occasionally on the floor, as used to be done in McCarty Little Hall. Commercial hobby wargamers have developed thousands of historical wargames that can, at negligible cost in money and time, be adapted to meet or support a wide range of internal capability development requirements, including:

1. **Modeling**: basic principles of systems and warfare modeling using aggregated systems characteristics and performance (S&T/C&P) data and unit/force order of battle and organizational data (OB/TO&E), all integrated through algorithms (i.e., rules, matrices) defining systems/unit behaviors and interactions;

2. **CTSA**: scenario- and simulation-based analytic projects provide a fertile environment for the deployment of today’s advanced techniques, with special reference to the development of alternative red cell hypotheses. They also afford the opportunity to incorporate traditional military command and staff tools and techniques such as checklists and planning matrices and organize the entire team-collaborative process and product within the format of a five-paragraph operations order;

3. **Simulation**: experimental testing of multiple alternative hypotheses. Manual gaming can realistically test only a very few hypotheses compared to computational Monte Carlo simulation; however, it engages the...
entire analytic team in the action, providing a superb environment for training, familiarization, brainstorming, and reconceptualization. Manual wargaming can help shape scenarios for testing via computational M&S, which in turn can test many different variables and hypotheses through high-speed batch runs.

Commercial hobby and research board games are highly adaptable and applicable to both intelligence training and advanced analytic support requirements. Many games are historical, but a good number are available on modern and even future-hypothetical scenarios. Commercial computer games offer potential opportunities as well, but by design they are not typically manipulable or adaptable by users, limiting their utility. Moreover, few are designed to be used on local area networks, and all would pose IT challenges for information assurance and systems administration.

The SimBAT program encourages progress by small stages from today’s world of individual analysts huddling alone at their desks using largely intuitive reasoning, through team-based brainstorming and CTSA, and then wargame-based simulation experimentation, toward a full-scale computational analytic capability. At this fully mature stage, team debating techniques and flipchart matrices will be supplemented by computational mathematical tools, while the board wargames will be complemented and completed through the use of computational warfare M&S.

**SimBAT Insight, Knowledge, and Discovery**

As part of low-risk development, SimBAT commenced with training. The team conducts simulation-based training as a graduate seminar with a lab. The pedagogical philosophy emphasizes active, experiential, discovery learning, and the basic format consists of courses combining instruction and simulation. Extensive materials are developed for each phase.
Seminars are conducted through elicitation—the Socratic (dialogue) method of guided inquiry rather than lecture. This takes the form of facilitated brainstorming and structured analysis using predefined templates.

The lab, of course, is the wargame. For the instructors, it functions as a demonstration experiment; for the students, however, it provides an opportunity for exploration and discovery. The wargames follow the Naval War College (NWC) format. The instructors become controllers (the white cell), while the students divide into national teams (the blue and red cells), both of which perceive only those parts of the battlespace where they have assets and communications. Using the instructor-supplied background data and worksheets, which have been studied and filled out in the pregame seminar sessions, the teams formulate alternative hypotheses as to enemy capabilities and intentions and then develop an own-force operational plan (OPLAN) based on the assessed threat and expected enemy action. They then formulate all of this in a five-paragraph operations order (OPORD). Finally, they attempt to execute their plan and thwart that of the enemy in the wargame. The white cell subjects the teams to some of the fog and friction of real operations to convey the challenges of operational command and decision making under conditions of uncertainty and at least modest stress.

Fog, Friction, and Surprise: Preparing Analysts for Crisis and War
One of the implicit learning objectives intelligence education should address is the very real threat of surprise. History is a litany of contingency and unforeseen consequences. Intelligence failure and policy/strategy misjudgment (based on misperception and/or misconception and poor collection, analysis, and decision) is a common occurrence, and catastrophic national security consequences occasionally follow. Recent research demonstrates the extent of judgmental overconfidence
among analysts and decision-makers, and hence susceptibility to deception and vulnerability to surprise.\textsuperscript{13}

Traditional pedagogy contributes to this judgmental over-confidence, leaving students and graduates cognitively disarmed for the challenges of intelligence and war. Deskbound “chalk and talk” education and the social order of the schoolhouse and classroom inculcate in students a belief system built around an image of people as truthful and cooperative and the world as orderly, knowable, and controllable. Routine intelligence deskwork and current reporting do little to counteract this complacent worldview, and thus provide poor preparation for analysts charged with anticipating and warning of emergent threats posed by adversaries who can exploit deception, maneuver, and unexpected American vulnerabilities.\textsuperscript{14}

Simulation, by contrast, and especially historical simulation, provides a superb training laboratory for experiencing the unexpected. Player teams often form conflicting images and definitions of the situation, especially under NWC conditions in which the belligerent teams huddle in separate rooms. Adversary gambits seek to exploit vulnerabilities. White cell injects intelligence of mixed quality and timeliness (fog) and of command and control vicissitudes (friction) that disrupt the pat image of a predictable world.

Historical simulation strengthens this teaching lesson. Most education conveys a teleological sense of history as determined and inevitable, reinforcing students’ sense of predictability in world affairs. In fact, however, historical events often turn on contingencies that could have gone the other way. This is especially true in naval affairs. Confederate army general Robert E. Lee might not have been able to win at Gettysburg, nor Adolf Hitler in Russia, but the outcomes of many naval en-


\textsuperscript{14} See Johnston, \textit{Analytic Culture}; and Cooper, \textit{Curing Analytic Pathologies}.
gagments result from contingent and fleeting combinations that could more easily have gone the other way. Consider, for example, the stunning victory of the French admiral François-Joseph-Paul de Grasse over British admiral Thomas Graves at the Battle of the Chesapeake in 1781 that sealed the fate of Charles Cornwallis at Yorktown and thereby ensured the independence of the American colonies, and the temporary disarray in the Japanese carrier force at Midway that enabled the Americans to inflict sudden, catastrophic damage. Wargaming exposes participants to these unexpected outcomes. Intelligence analysts, and especially naval intelligence analysts, therefore need the kind of preparation for unexpected emergencies and sharp shifts in fortune that only fog-and-friction-riven simulation can provide.

**Team Bonding, Morale, and Retention**

This assault on junior analysts' comfortable image of life and the world, however, induces a certain level of stress. Simulation confronts them simultaneously with uncertainty and with perceived stakes for judgmental error. It does so in the lab, however, not in the National Military Command Center, Combatant Commands, Joint Task Force Headquarters, or afloat staff, where the consequences are far more severe. Student stress is real but manageable. And, as military trainers have known for centuries and modern pedagogical theory has rediscovered, moderate stress can intensify learning while forging interpersonal and institutional bonds—morale and *esprit de corps*.

Simulation seminars are designed to contribute to this organizational objective. The social dynamics of team-based wargaming involve both collaboration and competition. Ego and emotions engage. Participants long remember these experiences. They feel challenged individually while they bond collectively. Extensive exposure to simulation training across the analytic workforce could build a culture of unity and cohesion.
across the command, potentially contributing to improved retention in the long term.

**Analytic Standards and Methodological/Pedagogical Model**

Armed Services have known for centuries the pedagogical power of combined schoolhouse and exercise-based training, whether the exercises be tactical problems, NWC wargames, command-post exercises, or full-scale field and fleet exercises.\(^{15}\) The simulation seminar brings that pedagogical power to ONI.

Being experiential education, however, the program teaches cumulatively: it is as much enculturation and indoctrination as it is instruction. It both builds an analytic culture (integrated set of beliefs, values, principles, and practices for intelligence production), and socializes analysts into that culture—a process that can succeed only cumulatively. Each individual course, typically two to five days in length, contributes to a broader campaign to enhance the expertise of the analytic workforce.

Each course provides great breadth of exposure to concepts, principles, and practices. Each exposes the trainee teams to the full range of command staff data analysis, assessment, and decision making concerning the operational theater, the enemy, and their country/force, involving both capabilities and intentions and enemy course-of-action assessment. It is an immersion and experiential overload that is challenging, even stressful and perhaps somewhat frustrating (especially first-time exposures for complete novices). What the trainees take away is a highly memorable orientation toward the military operational problem domain and the command staff solution (intelligence, planning, and decision making).

Simulation participants typically remember the experi-\(^{15}\) See, for instance, Perla, *Art of Wargaming.*
ence, especially when their role requires publicly visible leadership or decision making that then is tested and succeeds or fails. Though it all might seem chaotic while immersed, multiple high-intensity exposures deepen the trainees' understanding of the fundamentals of warfare and intelligence, especially for operating in the wartime arena.

Cognitive Diversity and Thinking/Learning Styles
Simulation and lab-based education in general help meet the needs of diverse cognitive and learning styles across typical student populations. Two schools contend in educational theory: one argues that human cognitive development progresses up universal developmental stages and the other contends that humans vary by personality and cognitive profile. The stage model is associated with Swiss psychologist Jean Piaget, whose schema and clinical studies track students (children, specifically, where most educational research naturally focuses) along stages from physical and emotional development to cognitive and intellectual.\textsuperscript{16}

The adolescent and adult cognitive modes are “concrete and formal operations.” Individuals in the concrete operational stage reason rationally but narrowly, focusing closely on factual empirical data and current events. The skills they lack are those associated with full development into formal operations: the ability and tendency to generalize and abstract from observed data, seek and recognize universals, and theorize, exploiting the power of counterfactual (hypothetical) reasoning. Formal operators have well-developed pattern recognition skills, including trend detection, and as such they can and do extrapolate, hypothesize, and predict.\textsuperscript{17}

The human variability model is associated with personality


\textsuperscript{17} Bybee and Sund, \textit{Piaget for Educators}. 
theory and cognitive psychology. It holds that humans differ in their cognitive aptitudes as they progress developmentally, and that these traits tend to persist throughout life.\(^{18}\)

The two most well-known personality models are the Myers-Briggs inventory and the academic Five-Factor Model (FFM, a.k.a. Big Five Personality Traits). The Myers-Briggs Type Indicator’s (MBTI) power for understanding “knowledge workers” lies in its focus on perceptual-cognitive traits, while the FFM is more of a generic personality inventory. The MBTI distinguishes 16 personality types, each of which possesses particular perceptual, cognitive, and practical strengths and weaknesses.\(^{19}\) The FFM is similar and, although currently less well-tailored to support pedagogical design, is the subject of extensive research. The MBTI differentiates personality types across four binary character oppositions:

1. Extroverted (E) \textit{versus} introverted (I) (self-explanatory);
2. Intuitive (N) \textit{versus} sensory (S) (formal versus concrete, à la Piaget above);
3. Thinking (T) \textit{versus} feeling (F) (cognitive versus emotional); and
4. Judging (J) \textit{versus} perceiving (P) (convergent/conclusive versus divergent/open).

Individuals vary also in their learning styles and modes of processing information—note that learning is not just what knowledge workers do in training; it is what they do for a living: acquire and develop new knowledge, with intelligence analysis and production being a form of learning. In his Experiential Learning Theory (ELT), David A. Kolb has developed a model

\(^{18}\) For an overview, see Thomas J. Smith et al., \textit{Variability in Human Performance} (Boca Raton, FL: CRC Press, an imprint of Taylor & Francis, 2015).

of learning styles highly consistent with Piaget and the MBTI, which postulates the following orientations:  

1. **Methods of grasping experience:**
   - Concrete experience;
   - Abstract conceptualization;

2. **Methods of transforming experience:**
   - Reflective observation;
   - Active experimentation.

Combining Piaget and Kolb in alignment with principles from analytic methodology suggests the relationship depicted in the following matrix, producing four learning styles in two binary pairs: divergent versus convergent and assimilating versus accommodating (table 3).  

Kolb’s resulting experiential learning theory (ELT) argues that the optimal pedagogical method engages all four of these cognitive modes.

The concept of cognitive variability has been applied to pedagogical theory in recent years, such as that by Howard Gardner and Mel Levine. Their very similar schemata, multiple intelligences (Gardner) and neurodevelopmental systems (Levine), differentiate individual cognitive traits in ways that appear highly applicable to professional education, especial-

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21 Assimilation and accommodation are also Piagetian concepts. Assimilation refers to the tendency to perceive incoming information as consistent with extant beliefs. Accommodation refers to a tendency to change beliefs based on new data. See Bybee and Sund, *Piaget for Educators*. This issue is critical for intelligence assessment and is the core question in modern cognitive psychology, as distilled by Richards J. Heuer Jr., *Psychology of Intelligence Analysis* (Washington, DC: Center for the Study of Intelligence, Central Intelligence Agency, 1999). Heuer’s analysis of competing hypotheses and related decision-theoretic tools and techniques are designed in great part to help analysts choose between assimilation and accommodation.

Table 3. Learning styles framework for SimBAT

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<tr>
<th>Kolb's learning styles</th>
<th>Concrete experience</th>
<th>Abstract conceptualization</th>
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<tbody>
<tr>
<td>Reflective observation</td>
<td>Divergent</td>
<td>Assimilation</td>
</tr>
<tr>
<td>Active experimentation</td>
<td>Accommodation</td>
<td>Convergent</td>
</tr>
</tbody>
</table>


Table 4. Multiple intelligences/neurodevelopmental systems

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<th>Levine's neurodevelopmental systems</th>
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<tr>
<td>Attention control</td>
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<td>Control</td>
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<th>Gardner's multiple intelligences</th>
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Ly that of knowledge workers (table 4). They also incorporate the noncognitive modes of experience and learning that often form the implicit, latent, or subconscious but emotionally and behaviorally important substratum that lays the foundations for success in the explicit, manifest element, thus achieving the instructional learning objectives.

Finally, individuals vary in their perceptual learning styles.

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The oft-cited VARK schema delineates four preferences:\(^{24}\)

1. Visual;
2. Auditory;
3. Reading/writing; and

Broadly speaking, human learning, reasoning, and problem-solving involve a range of different traits and aptitudes, some more or less optimal for productive, insightful analytic-synthetic knowledge acquisition and creation, but all being present in greater or lesser proportion across the analytic workforce (table 5). To summarize, analyst-learner aptitudes and preferences range across the following dimensions:

1. **Cognitive:**
   
   | Abstract | versus | concrete; |
   | Conceptual | versus | factual; |
   | Theoretical | versus | experiential/experimental; |
   | Intellectual | versus | emotional; |

2. **Sensory:**
   Visual, auditory, or tactile.

   This variability demands what in modern business theory is known as mass customization, the ability to meet variable demand with a single multidimensional family of products or services. Simulation-based training meets this need by combining four basic pedagogical modes:

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1. Classroom and study:
   • Readings/study materials;
   • Lecture/briefings;
2. Lab and exercises:
   • Elicitation and structured brainstorming using templates;
   • Simulation gaming (lab experimentation).

This combination is designed to help diverse students progress from concrete to formal operational skills and attitudes, whatever their cognitive tastes and learning styles. An implementation overview is provided below; individual courses are detailed in their associated course guides and syllabi. Table 5 compares the strengths of traditional schoolhouse education with multidimensional simulation-based education.

Integration with Intelligence Analytic Career-Development
Reform based on the principles advocated above should proceed in complementary interdependence with the existing program of analyst career development. Current training and development consist of day-to-day job experience (reading and writing factual, peacetime intelligence reports), the prescribed analytic progression along the agency/community curriculum, and the IC’s interagency Analysis 101 and Intelligence Community Advanced Analysis Program (ICAAP) curricula, as well as deception analysis, asymmetric warfare, and other courses. Much of the associated instruction in structured analytic techniques is generic, using examples in political intelligence, law enforcement, the war on terrorism, money laundering, noncombatant evacuation operations (NEOs), human intelligence source evaluations, etc. Many exercises are lifted from critical thinking texts unrelated to military problems. Military examples are relatively rare and naval ones even rarer.

ONI-based maritime mission-tailored simulation instruction is designed both to prepare analysts to master the IC’s
CTSA curriculum, priming their cognitive readiness to extract maximum value from the coursework, and to then apply CTSA directly to ONI’s functional responsibilities in intelligence production. Within the ONI in-house program, maritime and naval examples are used primarily, both sea chases for operational intelligence watch and civil maritime training, and wars, campaigns and battles for general military intelligence (GMI) training. And again, the classic military command-and-staff CTSA analysis and planning techniques are introduced.

By bridging the gap between the analyst’s career development and ONI’s mission area, this in-house training program provides maximal learning transfer in both directions between the schoolhouse and the workstation.

Integration with the IC and ONI Analytic Standards

The command staff process enacted in simulation seminars drills analyst trainees in the step-by-step implementation of the checklists specified in IC analytic tradecraft.

At the same time, the Office of the Director of National Intelligence (ODNI) has promulgated guidance on analytic tradecraft. The simulation seminar program maps directly to these standards and to the structured analytic techniques that implement them, as shown in tables 6–9.

These tables demonstrate how the analytic quality standards promulgated in ICD 203 and ONI’s analytic tradecraft instruction can be implemented through structured analytic techniques and simulation-based training. In fact, full-scale development of simulation courses should afford enough scripted intelligence feed to support the incorporation of these structured techniques directly into team decision making in the simulations.

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Table 6. Intelligence Community Directive 203, “Analytic Standards”

1. Objectivity
2. Political independence
3. Timeliness
4. Based on all sources of intelligence
5. Proper standards of analytic tradecraft:
   a. Properly describes quality and reliability of underlying sources;
   b. Properly caveats and expresses uncertainties or confidence in analytic judgments;
   c. Properly distinguishes between underlying intelligence and analysts’ assumptions and judgments;
   d. Incorporates alternative analysis where appropriate;
   e. Demonstrates relevance to U.S. national security;
   f. Uses logical argumentation;
   g. Exhibits consistency of analysis over time, or highlights changes and explains rationale; and
   h. Makes accurate judgments and assessments.


Analytic Capabilities and Learning Objectives
Organizational-Developmental and Educational Purpose:
Strategic Learning Objectives
Beyond training analysts in individual skills, the simulation seminar program is designed to foster a multiplier effect across the organization as more students are run through multiple courses. As such, it is intended to serve as a program of organizational learning for the purposes of organizational development and business process reengineering in analytic methodology.

These organizational and individual developmental objectives can be summarized as follows:

For the command:

- Provide organizational learning/development that fosters methodological modernization, specifically in the development and application of cognitive collaboration and eventually computational collaboration.
Table 7. Standard Intelligence Community Structured Analytic Techniques

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<th>Diagnostic techniques:</th>
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<td>1. Key assumptions check</td>
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<td>2. Quality-of-information check</td>
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<td>3. Indicators of change</td>
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<tr>
<td>4. Deception check</td>
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<tr>
<td>5. Analysis of competing hypotheses (ACH)</td>
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<tr>
<th>Imagination techniques:</th>
</tr>
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<tbody>
<tr>
<td>1. Brainstorming</td>
</tr>
<tr>
<td>2. Outside-in</td>
</tr>
<tr>
<td>3. Red team</td>
</tr>
<tr>
<td>4. Alternative futures (multiple scenarios)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contrarian (reframing) techniques:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Devil’s advocacy</td>
</tr>
<tr>
<td>2. Team A/team B</td>
</tr>
<tr>
<td>3. High-impact/low-probability</td>
</tr>
<tr>
<td>4. What if</td>
</tr>
<tr>
<td>5. Quadrant crunching</td>
</tr>
</tbody>
</table>


For students:
- Inculcate student analysts in fundamental principles of war, seapower, command decision making, and intelligence analysis, while instilling the associated cognitive and behavioral skills and abilities;
- Build instruction around the fundamentals of naval warfare, command and staff processes, warfighting capabilities and intentions, and critical thinking and structured analysis (CTSA); and
- Prepare analysts for CTSA coursework in intelligence community schoolhouses, and provide naval warfighting exemplification and application of the standard curriculum of CTSA concepts and techniques.

For instructor/facilitators:
- Provide instructors/facilitators (analysts and managers) experience in the design, planning, coordination,
Table 8. Mapping: Implementation of Intelligence Community Directive (ICD) 203, “Analytic Standards” via Structured Analytic Techniques

<table>
<thead>
<tr>
<th>ICD 203, “Analytic Standards”</th>
<th>Structured Analytic Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Objectivity</td>
<td>Contrarian techniques 1 and 2: devil’s advocacy and team A/team B</td>
</tr>
<tr>
<td>2. Political independence</td>
<td></td>
</tr>
<tr>
<td>3. Timeliness</td>
<td>(not applicable: unlike interactive wargames, scenario exercises will not exercise time-critical intelligence cycling)</td>
</tr>
<tr>
<td>4. Exploitation of all sources of intelligence</td>
<td>Imagination technique 1: brainstorming</td>
</tr>
<tr>
<td>5. Proper standards of analytic tradecraft:</td>
<td>Promoted by:</td>
</tr>
<tr>
<td>5.1. Properly describe quality and reliability of underlying sources</td>
<td>Diagnostic techniques 2 and 3: quality-of-information check and deception check</td>
</tr>
<tr>
<td></td>
<td>Contrarian technique 1: devil’s advocacy</td>
</tr>
<tr>
<td>5.2. Properly caveat and express uncertainties or confidence in analytic judgments</td>
<td>Diagnostic techniques 1 and 3: key assumptions check and deception check</td>
</tr>
<tr>
<td></td>
<td>Contrarian technique 1: devil’s advocacy</td>
</tr>
<tr>
<td>5.3. Properly distinguish between underlying intelligence and analysts’ assumptions and judgments</td>
<td>Diagnostic techniques 1, 2, and 3: key assumptions check, quality-of-information check, and deception check</td>
</tr>
<tr>
<td></td>
<td>Contrarian technique 1: devil’s advocacy</td>
</tr>
<tr>
<td>5.4. Incorporate alternative analysis where appropriate</td>
<td>Diagnostic techniques 1–5: key assumptions check, quality-of-information check, indicators of change, deception check, analysis of competing hypotheses (ACH)</td>
</tr>
<tr>
<td></td>
<td>Contrarian techniques 1–5: devil’s advocacy, team A/team B, high-impact/low-probability, what if, and quadrant crunching</td>
</tr>
<tr>
<td></td>
<td>Imagination techniques 1–4: brainstorming, outside-in, red team, alternative futures</td>
</tr>
<tr>
<td>5.5. Demonstrate relevance to U.S. national security</td>
<td>(Exercises will train analysts to understand warfare and military threats and perform analytic work that supports U.S. national security.)</td>
</tr>
</tbody>
</table>
and implementation of projects, with special reference to training courses and analytic-support projects that result in intelligence discovery, new findings, and new production.

SimBAT Organizational and Individual Learning Program: Specific Learning Objectives

Since warfare simulation exposes analysts/students to the full range of operational and planning variables, the range of supported learning objectives is vast. Table 9 (and the following chapter addendum) lists these with text boxes on the right that specify seminar and/or simulation activities that fulfill the objectives.

At the same time, participating in the development and execution of simulation seminars offers career-enhancing training benefits to participating instructor/facilitators (table 10).
Table 9. Simulation-based analysis and training learning objectives

<table>
<thead>
<tr>
<th>I. Substantive principles and practices/KSAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.1. Strategy, doctrine, capabilities, and operations</td>
</tr>
<tr>
<td>I.1.1. Strategic requirements of different belligerent powers/postures;</td>
</tr>
<tr>
<td>I.1.2. Principles of war</td>
</tr>
<tr>
<td>I.1.3. Naval roles and missions</td>
</tr>
<tr>
<td>I.1.4. Principles, roles, and missions associated with different strategic postures</td>
</tr>
<tr>
<td>I.1.5. Operational capabilities required for different principles, roles, and missions</td>
</tr>
<tr>
<td>I.1.6. Force/units types associated with different capabilities</td>
</tr>
<tr>
<td>I.1.7. Basic principles of operational doctrine and tactics</td>
</tr>
<tr>
<td>I.2. Systems, tactics, and operations</td>
</tr>
<tr>
<td>I.2.1. Interpreting technical data: characteristics, performance, and tactical capabilities</td>
</tr>
<tr>
<td>I.2.2. Tactical doctrine</td>
</tr>
<tr>
<td>I.2.3. Operational implications of tactical capabilities</td>
</tr>
<tr>
<td>I.2.4. Operational doctrine</td>
</tr>
<tr>
<td>II. Methodological principles and practices</td>
</tr>
<tr>
<td>II.1. Command and staff: intelligence, decision making, and planning</td>
</tr>
<tr>
<td>II.1.1. Intelligence operations</td>
</tr>
<tr>
<td>II.1.1.1. Threat of surprise</td>
</tr>
<tr>
<td>II.1.1.2. Intentions, alternative hypotheses/courses of action (COAs)</td>
</tr>
<tr>
<td>II.1.1.3. Capabilities, alternative hypotheses</td>
</tr>
<tr>
<td>II.1.1.4. Collection: I&amp;W, essential elements of information (EEIs), and collection planning</td>
</tr>
<tr>
<td>II.1.1.5. Assessment: threats/opportunities; CTSA (e.g., ACH)</td>
</tr>
<tr>
<td>II.1.2. Command: operational decision and planning</td>
</tr>
<tr>
<td>II.1.2.1. Operational planning, alternative options/COAs: principles of war; roles/missions; phasing; plotting</td>
</tr>
<tr>
<td>II.1.2.2. Force organization, orders of battle and tables of organization and equipment (OB/TO&amp;E)</td>
</tr>
</tbody>
</table>
Table 9. Simulation-based analysis and training learning objectives (continued)

II.1.2.3. Command, control, and communications

II.1.2.4. Logistics and supply

II.1.2.5. Operations order (5-paragraph OPORD)

II.1.3. Command: execution and adaptation

II.1.2.1. Command, control, communications, computers and intelligence, surveillance, and reconnaissance (C4ISR) cycle (i.e., the observation, orientation, decision, and action [OODA] loop)

II.1.2.2. Contingency response (recover, adapt, exploit)

II.2. Cognitive reasoning (critico-creative thinking)

II.2.1. Situation, threat, and net assessment (Critical Thinking and Structured Analysis)

II.2.1.1. Inductive synthesis: data collation; data comparison/evaluation; CTSA: matrices, timelines, network diagrams; generation, multiple alternative hypotheses.

II.2.1.2. Deductive analysis

- Deduction of hypotheses probable or necessary correlates: Prerequisites; Implications; diagnostic observables (indicators)
- CTSA: key assumptions checks (checklists, matrices), analysis of competing hypotheses (ACH), etc.

II.2.1.3. Integrative synthesis

- Elimination of least plausible hypotheses
- Elaboration of most plausible
- Comprehensive scenario development

II.2.2. Decision making/planning

II.2.2.1. Alternative options

- Ends versus means
- Threat versus opportunity

II.2.2.2. Selection of best

- Multiple competing objectives
- Expected utility/optimization
- Decision
Table 9. Simulation-based analysis and training learning objectives (continued)

<table>
<thead>
<tr>
<th>II.2.2.1. Cognitive processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decision</td>
</tr>
<tr>
<td>• Judgment/decision making under uncertainty</td>
</tr>
<tr>
<td>• Cognitive virtues</td>
</tr>
<tr>
<td>• Incisiveness; prudence; boldness; imagination; creativity; decisiveness</td>
</tr>
</tbody>
</table>

II.2.3. Staff process

II.2.3.1. Leadership

| • Authority/influence |
| • Decision making     |

II.2.3.2. Teamwork

| • Collaboration |
| • Team self-organization |

II.2.3.3. Management

| • Time management |
| • Stress management |
| • Execution       |

II.3. Scientific methodology (quantitative and computational analysis)

II.3.1. Modeling

| • Structural architectures: objects, properties, networks (quantification of military capabilities); |
| • Functional processes: relationships, causal algorithms, probability; |

II.3.2. Simulation

| • Experimental design: hypothesis formulation, scenarios, variables, excursions; |
| • Hypothesis-testing: Monte Carlo randomization, sensitivity analysis, analysis of experimental results. |

Source: author’s pedagogical design for SimBAT.
### II. Leadership and management

#### III.1. Preparation and planning

##### III.1.1. Course design

- III.1.1.1. Learning objectives
- III.1.1.2. Syllabus
- III.1.1.3. Agenda
- III.1.1.4. Selection of conflict scenario for case study
- III.1.1.5. Selection of simulation game (e.g., commercial hobby wargame)
- III.1.1.6. Design of scenario exercise when COTS product unavailable

##### III.1.2. Instructional materials

- III.1.2.1. Design adaptation of wargame(s)
- III.1.2.2. Graphics/photographic reproduction of materials (if needed)
- III.1.2.3. Development of templates (tables, charts, and checklists for facilitation/structured analysis)
- III.1.2.4. Preparation of additional background materials (readings and reference data, evaluation forms)

##### III.1.3. Command participation

- III.1.3.1. Eliciting support from ONI managers
- III.1.3.2. Eliciting participation by ONI analysts/students

#### III.2. Implementation

##### III.2.1. Event management

- III.2.1.1. Leadership of white cell
- III.2.1.2. Leadership of students
- III.2.1.3. Time management
- III.2.1.4. Maintenance of the objective(s)
- III.2.1.5. Maintenance of morale

##### III.2.2. Instruction

- III.2.2.1. Facilitation/elicitiation (Socratic method)
- III.2.2.2. Student participation
- III.2.2.3. Balance (objectives versus time)
Table 10. Learning objectives for instructor/facilitators (continued)

<table>
<thead>
<tr>
<th>IV.1. Evaluation, lessons, and action</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IV.1.1. Evaluations</strong></td>
</tr>
<tr>
<td>IV.1.1.1. Design of the student course evaluation form (mapped to learning objectives)</td>
</tr>
<tr>
<td>IV.1.1.2. Distribution</td>
</tr>
<tr>
<td>IV.1.1.3. Agenda</td>
</tr>
<tr>
<td>IV.1.1.4. Elicitation of participant submission of course evaluations</td>
</tr>
<tr>
<td>IV.1.1.5. Collation of findings</td>
</tr>
<tr>
<td><strong>IV.1.2. Program improvement</strong></td>
</tr>
<tr>
<td>IV.1.2.1. Lessons learned</td>
</tr>
<tr>
<td>IV.1.2.2. Design of program improvements</td>
</tr>
<tr>
<td>IV.1.2.3. Implementation</td>
</tr>
<tr>
<td><strong>IV.2. Reports to management</strong></td>
</tr>
<tr>
<td>IV.2.1. Reports</td>
</tr>
<tr>
<td>IV.2.1.1. Drafting of report</td>
</tr>
<tr>
<td>IV.2.1.2. Development of brief</td>
</tr>
<tr>
<td><strong>IV.2.2. Presentation</strong></td>
</tr>
<tr>
<td>IV.2.2.1. Dissemination of report</td>
</tr>
<tr>
<td>IV.2.2.2. Presentation of brief</td>
</tr>
</tbody>
</table>

Source: author's pedagogical design for SimBAT.