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While wargaming has a long history in military education, there is currently a gap in the academic literature as specifically regards wargaming as an adult educational tool. Scientific study has focused on adult education theory and models generally; with the highlight being the identification of four different learning experiences, each tied to a learning style. Preliminary data collection indicates that student designed wargame Exercise ABLE ARCHER - 83, and associated assessment tools, effectively engage each of the four learning experiences and styles.

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MASTER OF MILITARY STUDIES

Educational Wargaming: Assessment of Student Designed Wargame
Exercise ABLE ARCHER '83

SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF MILITARY STUDIES

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Executive Summary

Title: Educational Wargaming: Assessment of Student Designed Wargame – Exercise ABLE ARCHER '83

Author: Major Peter C. Combe II, United States Marine Corps

Thesis: By designing a wargame to effectively engage diverse learning styles wargames generally, and student designed wargame *Exercise ABLE ARCHER '83* in particular, will demonstrate educational utility by grounding wargame design and assessment in sound adult education theory and models.

Discussion: In light of the 2020 Commandant of the Marine Corps Planning Guidance (CPG), there is a renewed emphasis on educational wargaming in professional military education (PME). While wargaming has a long history in military education, there is currently a gap in the academic literature as specifically regards wargaming as an adult educational tool. Scientific study has focused on adult education theory and models generally; with the highlight being the identification of four different learning experiences, each tied to a learning style. These experiences and styles are: Concrete Experience (CE), which suits those with a “diverging” learning style; Abstract Conceptualization (AC), which suits those with the “converging” learning style; Reflective Observation (RO), which suits those with an “assimilating” learning style; and Active Experimentation (AE) which suits those with an “accommodating” learning style. By effectively engaging each of these four experiences, educational wargaming can have educational utility for a diverse array of learning styles.

Conclusion: Preliminary data collection indicates that student designed wargame *Exercise ABLE ARCHER '83* effectively engages various learning experiences and styles. In addition, the student design team assessed two key lessons learned. The first lesson is that the assessment tools, in particular a group or guided discussion and post-test, are critical to engaging the RO learning experience. The design team also identified some degree of disconnect between learning objectives, game design, and assessment tools, which hampered thorough evaluation of the educational utility of the wargame and require future refinement to fully assess.

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THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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Preface

I undertook this research because, as a Judge Advocate, I was interested in tackling a subject with which I was generally unfamiliar. Though familiar with wargaming generally, I'd never thought specifically about wargaming or "serious games," as an educational tool. In undertaking this research, I learned more than I have been able to capture within the bounds of this paper, which is focused on assessment of the educational utility of games generally, and our design team's student wargame specifically. In terms of the historical backdrop of our game, I learned much about Soviet perceptions of President Reagan, and how his relative naiveté in international relations was both a "feature" and a "bug."

I also learned a great deal about game design, how to tie game design to educational objectives, and how to assess whether students were learning anything (or more importantly, what we wanted to teach them!). Perhaps the biggest lesson I learned though, is that it is difficult to get three smart, Type-A personalities on the same page. Despite our best efforts and intentions, time was a significant constraint in developing a fully realized wargame and assessment strategy. I'm confident that with more time than the academic year, we'd have continued to iterate on the game and assessment tools to develop a fully realized educational wargame.

I would like to thank the members of our student design team; Chris Sneed and Samuel "ROBBY" Robinson. Despite a few hiccups, the game and my paper on assessment are frankly better than they have any right to be. I would also like to thank our instructors (Dr. Paul Gelpi, Dr. Craig Hayden, and Prof. Sebastien Bae) for your guidance, and more importantly patience as we progressed by fits and starts. Kate Kuehn provided invaluable assistance on development and understanding of assessment methods and tools. I would also be remiss if I didn't offer thanks to

those students who agreed to play our game, and give us some data upon which to draw initial conclusions; your contributions were perhaps the most valuable, as those of us on the design team were often too close to the game to see the problems which your play readily identified.

Lastly, I would like to thank my wife Deana, and my children. Both Deana and my stepdaughter, Rebecca were more patient with my endless descriptions of wargaming and Cold War statecraft than could have been reasonably (or unreasonably) expected. Deana, as is my habit, also reads all of my writing. If it makes sense to her, then I'm pretty sure it makes sense. My sons, Emile and Georges, helped with construction of some of the game components, and played through a couple of rounds with me. "Dad, I don't get it," was a glaring signal that something needed to change. I couldn't have done it without you, and I love you all!

I. Introduction

The Commandant of the Marine Corps has called for an increased emphasis on wargaming as both a tool to assess new concepts, and as a means to get Marines “reps and sets,” in education and training in order to improve combat decision-making skills.¹ While wargaming has a long history in military education, a trend which spans several nations, there doesn’t appear to be a holistic approach to assessment of the educational value of wargames for the students. This thesis will provide background on adult education theory and models; a brief discussion of wargaming as an educational tool in the military; and a discussion of “serious games” and simulation assessment. This thesis will conclude with a review of initial data gathering and assessment of the student designed wargame Exercise ABLE ARCHER ‘83 (AA83).

Preliminary data collection indicates that student wargame AA83 demonstrates educational utility across all three learning objectives (LO). The learning objectives used in gathering data for AA83 were:

- (1) LO 1: Player identifies that the execution of a national strategy requires balancing of priorities, risks, and resources across all elements of national power.
- (2) LO 2: Player understands the dynamic and changing nature of the security environment in which actions are taken.
- (3) LO 3: Player appreciates the role of ambiguity / imperfect information in executing a strategy.

However, data indicates that AA83 is most successful in teaching with respect to LOs 1 and 2, and weakest with respect to LO 3. Furthermore, preliminary data collection supports a determination that there is a disconnect amongst the learning objectives, game design, and

¹ Berger, D. (Gen), *Commandant’s Planning Guidance: 38th Commandant of the Marine Corps*.

assessment tools. This disconnect comes in both substantive,² and procedural forms.³ Further recommended refinements to these aspects of the wargame and assessment tools are discussed in section IV, below.

The student wargame for AA83 was built using three components of game context: the Exercise itself,⁴ the 2018 unclassified Summary of the National Defense Strategy,⁵ and the newly designated warfighting function of Information.⁶ The group then examined the key aspects of these components of the game context, and used those to develop the primary educational objectives of the wargame.⁷ Those key aspects, by game context component, are as follows.

A. Exercise ABLE ARCHER '83

Exercise ABLE ARCHER '83 has been characterized as the nearest that the U.S. and U.S.S.R. came to nuclear war since the Cuban Missile Crisis in 1962.⁸ The Exercise is critical, but is the culmination of the previous 2 years of the Reagan Presidency. Heightened rhetoric on both sides, exemplified in part by President Reagan designating the U.S.S.R. as “the focus of evil in the world,” and an “evil empire,” contributed to a tense security environment.⁹ Though Exercise ABLE ARCHER '83 included many new aspects not previously included in a U.S.

² For instance, keeping an opponent’s current score hidden may actually frustrate teaching with respect to ambiguity / imperfect information as described in LO 3.

³ For instance, there is a mismatch in terminology used between the game, and the Pre-/Post-Test assessment tool.

⁴ See, Companion/Team Member papers.

⁵ Department of Defense, *Summary of the 2018 National Defense Strategy of The United States of America: Sharpening the American Military’s Competitive Edge* (2018).

⁶ See, e.g., Marine Corps Bulletin (MCBul) 5400, *Establishment of Information as the Seventh Marine Corps Warfighting Function*, 17 JAN 2019.

⁷ Appendix 1, *GSP: Design Brief*, DTG 20210419.

⁸ Ben B. Fischer, *The 1983 War Scare in US-Soviet Relations*, CIA Studies in Intelligence, 61 (ca. 1996).

⁹ *Id.*

nuclear command post exercise,¹⁰ the exercise itself was but one component of this environment,¹¹ in which the risk of strategic miscalculation was heightened.¹²

A significant part of this miscalculation was based upon the fact that President Reagan caught the Soviets off-guard.¹³ Rather than continue the conciliatory approach of President Carter, or revert to the “realist detente” approach of his fellow Republican President Nixon as the Soviets expected, President Reagan adopted a much more aggressive approach.¹⁴ While this approach had its merits, it also had the unintended or unforeseen consequence (in part due to President Reagan’s relative foreign policy naivete) of signaling to the Soviets that the U.S. was preparing to launch a secret and preemptive nuclear strike.¹⁵ As a result, and after being briefed on intelligence community estimates of Soviet fears, President Reagan recognized the need to adopt a more stable and predictable approach, which was less provocative.¹⁶

B. 2018 National Defense Strategy

Student wargame AA83 also incorporates the 2018 National Defense Strategy imperative to shift strategic focus from Violent Extremist Organizations (VEO) to long term strategic competition with nation state adversaries.¹⁷ In many ways AA83 provides a useful parallel to today’s strategic environment, particularly vis-a-vis Russia, as Russian President Vladimir Putin

¹⁰ *Id.*, at 69. Some of these elements included participation by National Command Authority in the U.S. and U.K., as well as a “full-scale” mock nuclear weapons employment.

¹¹ See, e.g., Colin L. Powell Memorandum, *Significant Military Exercise NIGHT TRAIN 84*, 8 Dec 1983. Exercise NIGHT TRAIN 1984 was another nuclear command post exercise, which included live fly portions by Strategic Air Command, live launches of U.S. navy Poseidon missiles, a concurrent (though separate) NORAD exercise, as well as participation by the Office of the Secretary of Defense and Joint Chiefs of Staff.

¹² *Id.*; Ben B. Fischer, *The 1983 War Scare in US-Soviet Relations*, *supra*, FN 8, at 62.

¹³ Dr. Francis H. Marlo (Dean of Academics, Institute of World Politics), Interview with Christopher Sneed, Maj Samuel Robinson, and Maj Pete Combe, DTB 18 November 2020.

¹⁴ *Id.*; Ben Fischer, *A Cold War Conundrum: The 1983 Soviet War Scare*, Sept. 1997 (CIA Monograph).

¹⁵ Dan Oberdorfer Papers (unpublished), *Interview with Bud McFarlane (National Security Advisor)*, 18 Oct. 1989.

¹⁶ *Id.*

¹⁷ *2018 National Defense Strategy*, *supra*, FN 5 at 2.

is a product of the Soviet system, and exhibits much of the same decision-making that pervaded Soviet strategic thought.¹⁸ In addressing this component of the AA83 game context, the designers sought to focus educational goals on the dynamic and volatile nature of the AA83 and current security environments,¹⁹ as well as the need to integrate DoD assets with all of the other instruments of national power to achieve U.S. objectives.²⁰

C. Warfighting Function - Information

Though somewhat more broad than the warfighting context, deterrence is all about information. Strategic deterrence requires not only a demonstrated capability;²¹ it also requires an understanding of adversary's perceptions²² and motivations.²³ Part of the difficulty in understanding an adversary's perceptions and motivations is a tendency to towards believing that the adversary sees and perceives actions and events either as intended, or as the actor seeking to deter would view them.²⁴

This disconnect, often described as “mirror-imaging” was prevalent in the context of AA83. Not only did Soviet analysts and policy makers misapprehend President Reagan's approach, but to a significant degree the U.S. policy makers and analysts misunderstood the Soviets as well.²⁵ This mirror-imaging can lead to strategic miscalculation when operating in an environment characterized by imperfect information. Furthermore, it is important to realize that,

¹⁸ Dr. Marlo Interview, *supra*, FN 13.

¹⁹ 2018 National Defense Strategy, *supra*, FN 5 at 1.

²⁰ 2018 National Defense Strategy, *supra*, FN 5 at 4.

²¹ Tami Davis Biddle, *Coercion Theory: A Basic Introduction for Practitioners*, 3 Texas Nat'l Scty. Rvw 95, 106 (Spring 2020).

²² Robert Jervis, *Deterrence and Perception*, 7 Int'l Scty, 3 (1983).

²³ Janice Gross Stein, *The Micro-Foundations of International Relations Theory: Psychology and Behavioral Economics*, 71 Int'l Organization 249, 256, 259 (2017).

²⁴ Thomas G. Mahnken, *Secrecy & Stratagem: Understanding Chinese Strategic Culture*, Lowy Institute for International Peace, 3, 12, 16 (Feb. 2011).

²⁵ Dr. Marlo Interview, *supra*, FN 13.

whether in a warfighting or larger strategic context, every action sends a message to an adversary.²⁶ Furthermore, in addition to messaging the adversary (or Target Audience), other stakeholders such as the civilian population or regional allies may receive a message (though not necessarily the one intended) as well.²⁷

By focusing on these key aspects of the game context, the design team developed the learning objectives in Appendix 1;²⁸ and further refined into themes/subthemes in Appendix 2.²⁹ With the identification of those learning objectives, the value of wargaming as an educational tool must be identified.

II. Adult Educational Theory and Models

The value of experiential learning is well known.³⁰ Key concepts which contribute to the effectiveness of experiential learning include individual factors,³¹ instructional factors,³² and environmental factors.³³ These concepts are all tied to the science of learning, within which there is a particular discipline related to adult education (andragogy) as opposed to childhood education (pedagogy).³⁴ Experiential learning in particular can prove valuable to military professionals, as it can

²⁶ MCWP 3-32, *Marine Air-Ground Task Force Information Operations*, 3-7 (2016); Joint Doctrine Publication 3-13, *Information Operations*, I-3 II-1 (w/CH 1, Nov. 2014); MAGTF Information Environment Operations Concept of Employment, 24 (06 Jul. 2017) [hereinafter, MAGTF IE-COE].

²⁷ See, MCWP 3-32, *MAGTF Information Operations*, *supra*, FN 26 at 3-3; JP 3-13, *Information Operations*, *supra*, FN 26 at VI-1; MAGTF IE-COE, *supra*, FN 26 at 22.

²⁸ Appendix 1, *supra*, FN 5 at slides 4 and 5. Critical aspects of the game context components are in bold, and represent the design team's identified learning objectives.

²⁹ Appendix 2, Textual Analysis Framework.

³⁰ Headquarters, U.S. Marine Corps, *Learning*. MCDP 7, Washington, DC: Headquarters U.S. Marine Corps, February 20, 2020 (1-1).

³¹ *Id.* at 1-9.

³² *Id.* at 2-9, 10.

³³ *Id.* at 3-4 to 3-14.

³⁴ *Id.* at 1-12.

foster adaptability and problem solving.³⁵ Some authors have broken theories of adult education into three subsets; andragogy,³⁶ self-directed learning,³⁷ and transformational learning.³⁸

A. Adult Education Theory Generally

Andragogy makes a series of assumptions about adult learners, which assumptions are based on increased maturity, experience, desire to learn, and a focus on practical or problem-centric learning.³⁹ Based on these assumptions, there are a number of steps which educators should implement to improve the adult learning experience. These measures include setting a cooperative environment, in which educators and learners work collaboratively, to achieve objectives (solve problems) aligned with the learner's particular interests.⁴⁰ Foundational to this approach is that adults desire to understand why they are learning, and that they learn more effectively by doing, rather than memorization of facts. One criticism of andragogy as a theory is that it can lead to "culture blind" approaches, which minimizes the value of an authoritative instructor central to many cultures.⁴¹

Self-directed learning is widespread with some seventy percent of adult learning being self-directed,⁴² and an estimated ninety percent of adults completing at least one self-directed learning exercise per year.⁴³ Self-directed learning is a largely informal process, which the learner takes on of their own accord. One benefit of self-directed learning is that it can be easily incorporated into the

³⁵ *Id.* at 2-4 to 2-6.

³⁶ Knowles, M., *The Modern Practice of Adult Education: Andragogy versus Pedagogy*, Cambridge Adult Education (1980, revised).

³⁷ Knowles, M., *Self-Directed Learning: A Guide for Learners and Teachers*, Follet Publishing Co. (1975).

³⁸ King, K., *The Adult ESL Experience: Facilitating Perspective Transformation in the Classroom*, 10 *Adult Basic Education* 69-89 (2000).

³⁹ Knowles, *The Modern Practice of Adult Education*, *supra*, FN 36.

⁴⁰ Knowles, M., et. al., *Andragogy in Action: Applying Modern Principles of Adult Learning*, Jossey-Bass (1984).

⁴¹ Brookfield, S.D., *Pedagogy and Andragogy*. In, A DiStefano, K. Rudestam, R. Silverman, & S. Taira (Eds.), *Encyclopaedia of Distributed Learning*, Sage Pub. (2003).

⁴² Cross, K. P., *Adults as Learners: Increasing Participation and Facilitating Learning*, Jossey-Bass (1981).

⁴³ Tough, A., *The Adult's Learning Projects*, Ontario Institute for Studies in Education (1971).

learner's daily routine; however, it can be difficult for those with low literacy levels or those who prefer a more structured educational environment.⁴⁴

The third type of learning is transformational. Transformational learning changes the way individuals think about themselves or their environment.⁴⁵ Transformational learning has been described as a rational process in which learners reflect upon, and discuss their learning experience.⁴⁶ In order to facilitate this reflection and discussion, it is imperative that the learning environment be free from bias, be based upon an accepting environment, and the instructor must ensure that all participants have free and complete information.⁴⁷ However, there have been two main critiques leveled at transformational learning. The first is that it fails to account for different "frames" of experience based upon race, culture, or historical experience of many different learners in a single learning environment.⁴⁸ The other critique is that transformational learning is "hyper-rational," and minimizes intangible aspects of learning such as relationships and emotion.⁴⁹ Critical aspects of transformational learning include: the provision of immediate and helpful feedback,⁵⁰ tailoring learning activities to student strengths and weaknesses,⁵¹ and developing learning strategies that incorporate different perspectives and "frames."⁵² Regardless

⁴⁴ Brookfield, S., *The Continuing Educator and Self-Directed Learning in the Community*. In, Brookfield (Ed.), *New Directions for Continuing Education*, 25. Jossey-Bass (1985).

⁴⁵ King, *The Adult ESL Experience*, *supra*, FN 38.

⁴⁶ Mezirow, J., *Learning to Think Like an Adult: Core Concepts of Transformation Theory*. In, Mezirow, J. (Ed.), *Learning as a Transformation: Critical Perspectives on a Theory in Progress*, Jossey-Bass (2000).

⁴⁷ *Id.*; Mezirow, J., *Transformative Learning in Action: Insights from Practice*, 74 *New Directions for Adult and Continuing Education* 5-12 (1997).

⁴⁸ Corley, M., *Poverty, Racism, and Literacy*, 243 *ERIC Clearinghouse on Adult, Career and Vocational Education*, Ohio State University (2003).

⁴⁹ Silver-Pacuilla, H., *Transgressing Transformation Theory*, 52 *National Reading Conference Yearbook* 356-368 (2003).

⁵⁰ Taylor, E., *The Theory and Practice of Transformative Learning: A Critical Review*, Center on Education and Training for Employment (1998).

⁵¹ Cranton, P., *Teaching for Transformation*, In, Ross-Gordon (Ed.), *Contemporary Viewpoints on Teaching Adults Effectively*, 93 *New Directions for Adult and Continuing Education* 63071 (Jossey-Bass, 2000).

⁵² *Id.*

of the approach, authors have attempted to articulate practical advice to achieve best outcomes in adult education.⁵³

These tools include efforts to make the learning environment mirror the working environment. The more the educational environment adheres to the learner's work environment, the greater application of learning outcomes to real world scenarios. Educators can achieve this goal by using real world examples, or fostering small team or group work instead of individual effort. This is tied to the adult student's desire for practical application of their knowledge, as opposed to theoretical understanding divorced from practical use. This practical advice on improving adult education makes more sense when viewed from the perspective of learning styles, and associated educational course design.

Alice and David Kolb focus on experiential learning, and advance six basic propositions about learning.⁵⁴ First is that learning is best conceived as a process, as opposed to a series of outcomes. This process should engage students, and provide regular and useful feedback. Second is that all learning is "relearning," in the sense that it draws on the learner's beliefs and ideas. During learning these beliefs and ideas are tested and integrated with more refined beliefs and ideas. Kolb & Kolb also posit that learning requires resolution of conflict between opposing modes of adaptation to the world. In this view, conflict and disagreement drive learning, as the learners seek to reconcile the apparently contradictory information. Kolb & Kolb also describe learning as a holistic process of adaptation comprised of a tension between 4 mental models: thinking, feeling, perceiving, and behaving. In this environment of tension, learners achieve

⁵³ Kisamore, Aldridge, Alexander, and White, *Educating Adult Learners: Twelve Tips for Teaching Business Professionals*, Organizational Dynamics, Reflection on Theory and Practice, University of Oklahoma, Tulsa (June 2018).

⁵⁴ Kolb, A. and Kolb, D., *Learning Styles and Learning Spaces: A Review of the Multidisciplinary Application of Experiential Learning Theory in Higher Education*, Learning & Learning Styles (Nova Publishers, 2006).

results through continuous transactions between themselves, other participants, and their environment. Lastly, Kolb & Kolb offer that learning is the process of creating knowledge through experience. At least one author has posited that educational games are particularly effective and impacting the experimentation phase of the learning cycle, and that the knowledge gained through experimentation, reflection on the results of a player move, and conceiving of a new move or strategy is emblematic of this cycle of learning through experience.⁵⁵

From this backdrop, Kolb & Kolb offer that there are “grasping” experiences, in which learners understand the concepts being taught; and “transforming” experiences, which change the way learners think about a particular issue. Grasping experiences are broken out into Concrete Experience (CE) and Abstract Conceptualization (AC). Transformational experiences are broken out into Reflective Observation (RO) and Active Experimentation (AE). All learning involves some component of each of these experiences. These experiences tie to a learning cycle of experience (CE), reflection (RO), thinking (AC) and action (AE). These learning experiences are tied to 4 basic learning styles.

The first learning style is “diverging.” These learners are best at viewing concrete situations from many points of view. They learn best through CE and RO experiences. The opposite learning style is “converging,” which learners tend to be best at finding practical applications for ideas and theories. Converging learners learn best in the AC and AE experiences; such as iterative practical application of an idea or process, by which the learner can experiment with new knowledge (AE), observe or reflect upon the results, and conceive of new approaches to the learning scenario in real time (AC).⁵⁶ Assimilating learners are best at

⁵⁵ Elg, J., *Wargaming in Military Education for Army Officers and Officer Cadets*, 50 King’s College London (2017).

⁵⁶ Saul McLeod, *Kolb’s Learning Styles and Experiential Learning Cycle*, Simple Psychology (2017)

understanding a wide range of information, and boiling it down to a concise and logical form. Assimilating learners learn best through AC and RO experiences. Lastly are accommodating learners. Accommodating learners tend to be hands on, focusing on their first inclination rather than logical analysis. Their dominant learning abilities are found in the AC and AE experiences. Though overlapping with the learning experiences for converging learners, accommodating learners tend to draw the most educational utility from the AC or “thinking” portion of the experience as opposed to the AE or “doing” portion of the experience.⁵⁷

B. Wargames and “Serious Games” as Educational Tools

While “gaming” often has a negative or pedantic reputation in educational circles, it has a long history in the military educational system,⁵⁸ and a number of authors have attempted to describe why wargaming is a useful educational tool. Discussion has included the “laws of learning,” and how those apply in the wargaming context.⁵⁹ The literature has identified six laws of learning, and those aspects of wargaming or game design that support the application of those principles. In essence these “laws” are what give wargames or other experiential learning tools their utility; they make knowledge “stick.”

The first “law” is readiness; essentially that the learner is mentally, physically, and emotionally ready to learn.⁶⁰ Adult learners, as previously discussed, are often more motivated to learn, and thus ready.⁶¹ Similarly, games generate “flow,” or the state in which a player focuses on the game to the exclusion of external stimuli.⁶² Flow is created by the narrative

⁵⁷ *Id.*

⁵⁸ Elg, J., *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁵⁹ Curtiss Murphy, *Why Games Work and the Science of Learning*, Alion Science and Tech.

⁶⁰ *Id.*

⁶¹ *Id.*; Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁶² Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

aspects of the game, as well as the give and take feedback between the player, the game, and the opponent (in multi-player games).⁶³

The second law of learning is “exercise,” or that the learning experience causes the student to exercise or use a skill.⁶⁴ Wargames excel in this context, as they require students to make decisions, and better support development of critical thinking and decision-making than other non-experiential forms of learning.⁶⁵ This problem based learning provides context and purpose for the exercise of critical thinking and decision-making skills, and⁶⁶ provides practice in a simulated environment that closely matches the decisions military professionals will need to make.⁶⁷ Military officers may also adapt their player behavior to best suit the requirements of the game, and the nature of their opponent.⁶⁸ Players may be openly antagonistic to one another, or they may cooperate in achieving a common goal; often, the strategy adopted from one play to another will vary based upon the opponent or simply the way the game plays out.⁶⁹

The third law of learning is “effect.” In essence, effect means that students learn more with positive emotions.⁷⁰ A well designed wargame should increase positive emotions by simply being fun to play.⁷¹ Effect is closely tied to the fourth law of learning, “intensity.” The more intense the feelings or emotions associated with a learning experience, then the more effectively

⁶³ Perla, P. and McGrady, E., *Why Wargaming Works*, 64 *Naval War College Review* 1-20 (2011).

⁶⁴ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

⁶⁵ Wong, J., *Wargaming in Professional Military Education: A Student’s Perspective*, Strategy Bridge (14 July 2016).

⁶⁶ Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁶⁷ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59; Sabin, P., *Simulating War: Studying Conflict through Simulation Games*, 37, Bloomsbury (2012).

⁶⁸ Perla and McGrady, *Why Wargaming Works*, *supra*, FN 63.

⁶⁹ Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁷⁰ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

⁷¹ Id., Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55; Zhonggen, Y., *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *International Journal of Computer Games Technology* (2019).

the student assimilates the learning objectives.⁷² In particular in military education, the competitive aspect of the “contest of wills,”⁷³ can increase the intensity of feelings or emotions amongst military officers, leading to greater concentration on the task(s) at hand, and thus improved learning outcomes.⁷⁴

The final two laws of learning are related, primacy and recency. Primacy is essentially the concept that students learn more readily when a concept is reinforced as important in a real and personal way.⁷⁵ Recency means that students learn more readily when the educational goal is quickly and readily reinforced or tested.⁷⁶ Games contribute to this by adequately designing feedback loops which reinforce the importance of certain player or opponent actions.⁷⁷ Furthermore, games often include immediate consequences for poorly planned or executed player actions, contributed to a personalized understanding of why the decision lead to certain consequences.⁷⁸

One researcher has even tied wargames to a learning cycle very much akin to Kolb & Kolb’s learning cycle.⁷⁹ Johan Elg has proposed that wargames encourage a cycle of learning as follows. First is proposition, in which the player considers which actions to take and makes a decision or proposition as to which best suits the scenario. Elg then posits that the player tests their proposition by making a game move. The play result will provide feedback, in the form of

⁷² Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

⁷³ Sabin, *Simulating War*, *supra*, FN 67.

⁷⁴ Lacey, J., *Wargaming in the Classroom: An Odyssey*, War on the Rocks (19 April 2016); Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 53; Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

⁷⁵ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

⁷⁶ *Id.*

⁷⁷ Perla and McGrady, *Why Wargaming Works*, *supra*, FN 63.

⁷⁸ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 54; Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁷⁹ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54.

what Elg calls a reaction. From this, the player enters what both models term reflection, by which the player assimilates new information and may change their playing style to suit the new mental model. With this perspective, it appears that wargames have the potential to impact each stage of Kolb & Kolb's adult education cycle.

Other researchers have examined the effectiveness of "serious games,"⁸⁰ and scenario based simulation in education.⁸¹ Evidence supports the effectiveness of serious games as an educational tool; however, there does appear to be a detrimental impact to learning effectiveness in games which impose an excessive mental workload.⁸² Thus, there is good reason to believe that wargaming as an educational tool is founded upon solid adult educational theory. However, both experiential learning theory generally, and wargaming specifically encounter difficulty in assessing their ability to achieve educational goals.⁸³

III. Assessment Methodology and Tools

Evaluation of adult learning can often be difficult, in part because effective adult education often involves evaluation that emphasizes comprehension over rote memorization.⁸⁴ Another challenge is presented by the fact that experiential learning includes diverse instruction methods, and requires equally diverse assessment methods.⁸⁵ The drive toward standardization in education pressures educators to assess achievement of educational goals in a standardized way. Despite the wealth of research on experiential learning theory, and extensive use of

⁸⁰ Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71. Serious games are those played for purposes other than solely for entertainment. Other such purposes for "serious games," can include education, assessment of individuals, or testing new concepts.

⁸¹ Battista, A., *An Activity Theory Perspective of How Scenario-Based Simulations Support Learning: A Descriptive Analysis*, *Advances in Simulation* (USUHS, 2017).

⁸² Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71.

⁸³ Perla and McGrady, *Why Wargaming Works*, *supra*, FN 63; Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 52.

⁸⁴ *Id.*

⁸⁵ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54.

wargaming in professional military education, there does not appear to be a discussion of assessment methodologies for wargaming as an educational tool, nor an application of those assessment methodologies. Especially in the context of adult education, which values teaching concepts as opposed to rote memorization,⁸⁶ a combination of qualitative assessment tools would appear most useful. The goal is to incorporate an assessment model that accommodates each type of learner, in an effort to assess the utility of the wargame in teaching each type of learner.⁸⁷

A. Survey

One promising means of assessment would appear to be post-play reflection or interview of players, to assess learning outcomes.⁸⁸ This reflection most often takes the form of group discussions, interviews, or questionnaires;⁸⁹ however, surveys can also be an effective means of engaging player reflection as an assessment tool.⁹⁰ Surveys have a number of strengths as an assessment tool. In particular, they can provide an accurate perspective as to the relative emphasis or importance that respondents placed upon a particular issue. Surveys are also effective generalized assessment tools, when specific information is not required. Surveys can also be used to gather and protect personally sensitive or classified information (which does not appear to be at issue in the context of student wargame AA83.⁹¹ On the contrary, surveys are prone to bias of the respondents, and are not effective tools for getting detailed or in depth information from respondents.⁹²

⁸⁶ Kisamore, et. al., *Educating Adult Learners*, *supra*, FN 53.

⁸⁷ Margaret Harrell and Melissa Bradley, *Data Collection Methods: Semi-Structured Interviews and Focus Groups*, RAND Corp, 12 (2009).

⁸⁸ Mezirow, *Learning to Think Like an Adult*, *supra*, FN 46; Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54; Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55.

⁸⁹ Smith, S., Blackmore, K., and Nesbitt, K., *A Meta-Analysis of Data Collection in Serious Games Research*. In, C.S. Loh, et. al. (Eds.), *Serious Game Analytics, Advances in Game Based Learning*, Springer International (2015).

⁹⁰ Margaret Harrell and Melissa Bradley, *Data Collection Methods*, *supra*, FN 87 at 10-11.

⁹¹ *Id.*, at 10.

⁹² Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 47.

Despite the weaknesses of surveys,⁹³ they can form a valuable component of a more holistic assessment methodology; in particular connecting with the reflective stage of learning and those who learn best through reflective observation (RO).⁹⁴ In accord with MCU regulations,⁹⁵ the design team developed a series of survey questions based upon a Likert-type scale of responses.⁹⁶ This survey is included at Appendix 3,⁹⁷ and will be combined with other forms of assessment to formulate a more holistic and comprehensive qualitative data set.⁹⁸

B. Guided Discussion / Interview

Reflection can also include the use of interviews,⁹⁹ and in this case the design team opted for a group guided discussion, or After-Action-Review (AAR). Much as with surveys, the reflective nature of a focus group or group discussion can tie to those who learn through an RO learning style, as well as those who learn through thinking and abstract conceptualization (AC).¹⁰⁰ This format was chosen not only to assess the preliminary educational utility of the AA83 wargame; but also to refine the wargame as needed. In developing the interview protocol for this guided discussion, the design team used an inverted funnel methodology;¹⁰¹ starting with very broad questions, and narrowing as the discussion progressed. The design team also included a topic/probe format to generate further discussion.¹⁰²

⁹³ *Id.*

⁹⁴ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54.

⁹⁵ *See, e.g.*, Marine Corps University Academic Regulations, Chapt. 4, Paras. 5.a.i and 6.c.ii.

⁹⁶ Wade M. Vagias, *Likert-Type Scale Response Anchors*, Clemson University (2006).

⁹⁷ Appendix 3, Student Wargame AA83 - Survey Questions.

⁹⁸ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 48.

⁹⁹ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89.

¹⁰⁰ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54.

¹⁰¹ Margaret Harrell and Melissa Bradley, *Data Collection Methods*, *supra*, FN 87 at 50; Stacy A. Jacob & S. Paige Fugerson, *Writing Interview Protocols and Conducting Interviews: Tips for Students New to the Field of Qualitative Research*, 17 *The Qualitative Report* 1 (2012).

¹⁰² Laura Sefton & Linda Cabral, *Creating Solid Interview Guides*, American Evaluation Association (2019).

Guided or group discussion can complement data gathering during a survey in a number of ways. In particular, group discussions or focus groups are good at gathering detailed or in-depth information, and at resolving conflicting or apparently contradictory claims; for instance, when players' educational outcomes vary based upon the role played during the game or the specific manner in which game play progressed.¹⁰³ Group discussions or focus groups can also explain why people conducted certain actions, or took certain lessons away from a gaming experience.¹⁰⁴ However, guided discussions or focus groups can be subject to a number of biases based upon the relationships between or perceptions of certain group members.¹⁰⁵ Unless the sample size is large enough, it may also be difficult to ascertain if a group provides a representative sample of the relevant population as a whole.¹⁰⁶ Other group member biases may also impact their responses, such as individuals attempting to appear in a more favorable light to the moderator or other group members.¹⁰⁷

For the purposes of this thesis the student design team used the guided discussion / interview protocol at Appendix 4.¹⁰⁸

C. Pre- and Post-Test

Pre- and Post-Test assessments can also provide a useful methodology. Due to the nature of the material covered, the questions presented in the pre-post test format are qualitative rather than quantitative.¹⁰⁹ Pre- and Post-Test assessments can tie educational outcomes to those who

¹⁰³ Margaret Harrell and Melissa Bradley, *Data Collection Methods*, *supra*, FN 87 at 10; Elg, *Wargaming in Military Education for Army Officers and Officer Cadets*, *supra*, FN 55 at 48.

¹⁰⁴ *Id.*, at 82.

¹⁰⁵ *Id.*, at 93-94.

¹⁰⁶ *Id.*

¹⁰⁷ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 47.

¹⁰⁸ Appendix 4, Student Wargame AA83 Guided Discussion Protocol.

¹⁰⁹ Appendix 5, Student Wargame AA83 Pre / Post-Test Questions.

learn best through concrete experience (CE) and active experimentation (AE), by assessing changes or improvements in player understanding of certain concepts through gameplay.¹¹⁰

Pre- and Post-Test method's primary strength is in identifying changes in knowledge or behavior as a result of the assessed activity.¹¹¹ Post-test assessments can also provide subjective feedback as to the "why" behind changes in player behavior, or in identifying game satisfaction.¹¹² On the contrary, pre- and post-test methodologies may fail to account for psychological or cognitive differences in players when assessing learning outcomes.¹¹³ Other biases which may present in a post-play testing include the recency bias, in which players knew or understood a concept, but perform better on a post-test assessment because the topic is fresh in their mind.¹¹⁴

Effective pre- and post-test administration may also require two groups; a test group and control group to truly draw statistically significant conclusions.¹¹⁵ Questions may also be poorly crafted to get the data sought, or may be poorly understood by the students.¹¹⁶ In particular with pre-test assessments, they may require some previous knowledge or understanding of a concept on the part of students in order to truly assess learning outcomes.¹¹⁷

D. Observation

¹¹⁰ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 52.

¹¹¹ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 48.

¹¹² *Id.*, at 49.

¹¹³ *Id.*

¹¹⁴ Curtiss Murphy, *Why Games Work and the Science of Learning*, *supra*, FN 59.

¹¹⁵ Richard A. McConnell & Mark Gerges, *Seeing the Elephant: Improving Leader Visualization Skills through Simple War Games*, *Military Review* 107, 114 (July - August 2019). For this thesis, no control group was used, thereby perhaps undermining the reliability of the post-test assessments.

¹¹⁶ Sylvester Arnab, et. al., *Mapping Learning and Game Mechanics for Serious Game Analysis*, 46 *British Journal of Educational Technology*, 391, 405-06 (2015).

¹¹⁷ *Id.*, at 407-08.

Another possible assessment methodology for wargaming, or other scenario-based teaching methods is observation. This assessment can be either in terms of personal observation or real time computer based data capture.¹¹⁸ Furthermore, observation in the context of wargaming could be direct or indirect. Direct observation includes real-time observation while the player or person being assessed is aware of the observation.¹¹⁹ Indirect observation would be conducted in an environment where the players are not aware of the observer, which has the benefit of not biasing the players' actions at the expense of being more difficult.¹²⁰ For the purposes of this thesis, the observation checklist at Appendix 3 was used during a direct observation approach.¹²¹

Studies on the utility of observation as an assessment methodology in scenario-based simulations have concluded that scenario based training provided good educational value.¹²² In reaching that conclusion, the author applied two assessment methods. The first was observation of video-recorded performance during the simulation, and the second was reflective interviews with participants. The study concluded, primarily through observation, that students learned both in the performance of “clinically relevant” activities, as well as emergent behaviors based upon interaction with other participants.¹²³ However, the author acknowledges that it was in part limited by the amount of time and resources required to complete the study, as well as the focus on more experienced learners as opposed to novices.

¹¹⁸ Kim and Ifenthaler, *Game-Based Assessment Revisited*, Springer Nature Switzerland AG (2019); Battista, *An Activity Theory Perspective of How Scenario-Based Simulations Support Learning*, *supra*, FN 81.

¹¹⁹ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 34-35.

¹²⁰ *Id.*

¹²¹ Appendix 6, Student Wargame AA83 Observation Checklist.

¹²² Battista, *An Activity Theory Perspective of How Scenario-Based Simulations Support Learning*, *supra*, FN 81.

¹²³ *E.g.*, other students, role-play patients, the presence of instructors. The use of “serious gaming,” and scenario based training appears relatively common in the medical training community. *See, e.g.*, Battista, *An Activity Theory Perspective of How Scenario-Based Simulations Support Learning*, *supra*, FN 81; and Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71.

Assessment methodologies also included real-time observation in games based assessment of educational outcomes; however, those have focused on computer based games separate and apart from the wargaming context,¹²⁴ or have been applied to pedagogy rather than adult educational models.¹²⁵ That said, the use of computer based real-time data capture can be viewed as a form of direct/real-time observation as an assessment tool. In relying primarily on observation, a number of studies have concluded that wargames or serious games have educational utility.¹²⁶ Similarly, they provide a range of assessment methodologies to determine the effectiveness of games as educational tools.¹²⁷ Many of these tools are based specifically on computer based games.¹²⁸ However, there remain gaps in literature discussing the design and assessment of wargaming specifically, as a subset of serious games.¹²⁹

Direct observation, as applied in this context, can provide insight into those who learn through concrete experience (CE) or active experimentation (AE) learning styles,¹³⁰ and have the benefit of providing players an uninterrupted setting in which to play the wargame.¹³¹ Furthermore, assuming that the student observation checklist is appropriately crafted, the data gathered through direct observation can indicate real changes in behavior or thinking based upon the game context.¹³² However, these changes in player behavior may be artificial and not readily

¹²⁴ Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71; Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89.

¹²⁵ Ifenthaler, Ge, Eseryel, *Assessment in Game-Based Learning Part 1 & 2 - Panels*, retrieved from ResearchGate at <https://www.researchgate.net/publication/235257401>; Kim and Ifenthaler, *Game-Based Assessment Revisited*, *supra*, FN 118.

¹²⁶ *Id.*; Kim and Ifenthaler, *Game-Based Assessment Revisited*, *supra*, FN 118; Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71.

¹²⁷ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 84; Kim and Ifenthaler, *Game-Based Assessment Revisited*, *supra*, FN 118.

¹²⁸ *Id.*

¹²⁹ Zhonggen, *A Meta-Analysis of Use of Serious Games in Education over a Decade*, *supra*, FN 71.

¹³⁰ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 54.

¹³¹ Smith, et. al., *A Meta-Analysis of Data Collection in Serious Game Research*, *supra*, FN 89 at 35.

¹³² *Id.*

translatable to actual practice.¹³³ Furthermore, under direct observation the players will be aware of the observer, which may present a distraction.¹³⁴ Lastly, observation may not provide the “why” for certain player actions.¹³⁵

In conducting assessment by observation, the design team developed an observation checklist to standardize data collection across game-play groups and iterations.¹³⁶ These checklists were developed using the learning objectives identified in the game framing context, and grouping questions into broad categories of expected behaviors or reactions to those key game components.¹³⁷

IV. Discussion: Assessment of Student Wargame Exercise ABLE ARCHER ‘83

Preliminary data gathered included 9 players across 5 games; two players also played a subsequent game against one another. One play test session was comprised of the proctor/observer’s peers;¹³⁸ another session was comprised of personnel significantly junior to the proctor/observer.¹³⁹

The data gathered to assess student wargame AA83 included both deductive, and inductive components. Survey data, in that it largely involves student answers to the same questions, is primarily deductive; however, the remainder of data gathered is primarily inductive in that the design team can draw conclusions from themes or patterns of player behavior or responses. The design team sought to draw on specific observations of student designed

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ *Contra, e.g.,* Margaret Harrell and Melissa Bradley, *Data Collection Methods, supra*, FN 87 at 82.

¹³⁶ Philip Shayne, et. al., *Reliability of a Core Competency Checklist Assessment in the Emergency Department: The Standardized Direct Observation Assessment Tool*, Society for Academic Emergency Medicine (2006).

¹³⁷ *See, e.g.,* Eng Tek Ong, et. al., *The Character of Teaching Practices in a Teacher Education Institution: Findings from Observation Checklist*, 7 *Journal of Research, Policy & Practice of Teachers & Teacher Education* 33, 35, 37 (2017).

¹³⁸ Five players playing a total of three games.

¹³⁹ Four players playing a total of two games.

wargame AA83, in order to draw larger conclusions about the educational utility of wargames, design methodology to produce an effective educational tool, and the best methods to assess learning by those with various learning styles. Pre- and post-test responses, observation, and the guided discussion focused more on themes and subthemes as a means to assess whether, and why (or why not), student wargame AA83 has educational utility.¹⁴⁰ In support of this inductive analysis, the team conducted a textual analysis, searching for themes and subthemes based around the game context and educational objectives.¹⁴¹ By coding these themes and subthemes in advance, and analyzing any emergent themes or subthemes, the student design team was able to identify patterns useful in assessing student wargame AA83. In support of textual analysis, the student design team used the Analysis Matrix¹⁴² at Appendix 2.

Initial data supports two broad conclusions, as well as providing two areas of necessary improvement. The first conclusion is that the game has educational utility, particularly in the areas tied to learning objectives associated with constructing a strategy, integrating all elements of national power, and dealing with a complex security environment.¹⁴³ The second conclusion is that three of the assessment tools provided usable and relevant data to assess the educational utility of the game: the student survey, student observation checklist, and the text analysis matrix. Two areas of necessary improvement also presented.

The first needed improvement is to ensure that game design better supports all of the identified learning objectives. Game design fell short in supporting the learning objectives related to the information environment and imperfect information.¹⁴⁴ The second area which

¹⁴⁰ Margaret Harrell and Melissa Bradley, *Data Collection Methods*, *supra*, FN 87 at 100.

¹⁴¹ *Id.*, at 102.

¹⁴² *Id.*, at 111-12.

¹⁴³ LOs 1 and 2.

¹⁴⁴ A specific recommendation for improvement is provided below in the section on Limitations.

needs improvement is to ensure that assessment tools are more closely linked to, or coincide with game design. In particular, this issue presented with the Pre / Post-Test assessment tool.

Discussion of the data gathered, and limitations associated with each assessment tool follows.

A. Survey Data Results¹⁴⁵

Survey respondents indicated that the preparatory materials¹⁴⁶ supported an understanding of game play, as well as the learning objectives. Preparatory materials included a written rule book, as well as a pre-brief and opportunity for players to ask questions of the proctor/observer. One area of recommended improvement was to explicitly include the learning objectives in the rule book, as opposed to relying on the pre-brief so as to eliminate ambiguity and/or inconsistency amongst multiple game play sessions or iterations.

Survey respondents also indicated on average that game complexity was sufficient to present challenging decision-making choices; though complexity on a first attempt forced several players to focus more on learning the game than achieving learning objectives. Several players commented that more than a single iteration would be required to truly realize the educational benefits of the game. On average, respondents also indicated that the game forced them to adapt their strategy or game play in order to achieve their own goals, and frustrate their opponent's.

Two players played a subsequent iteration. One of these players made the comment that "it's a fun little game;" indicating that for at least one player some degree of "flow" was achieved.¹⁴⁷ Another player asked the question as to whether the intent was to teach balancing of the components of DIME; upon an affirmative reply, the player responded, "you've done it."

¹⁴⁵ Appendix 7 shows average Likert scale responses for the survey questions contained in Appendix 3.

¹⁴⁶ In particular the Rule Book.

¹⁴⁷ Perla, P. and McGrady, E., *Why Wargaming Works*, *supra*, FN 63.

Survey results are limited in utility, as they are based upon students' self-identified observations. Some students may not have fully integrated the knowledge, and may have better recall or understanding upon reflection through the guided discussion / After Action Review (AAR). Thus, the survey results are one piece of a successful and integrated assessment strategy.

*B. Guided Discussion / Interview Results*¹⁴⁸

The guided discussion provided a high degree of qualitative feedback on both where the game was successful as both an enjoyable undertaking, and as an educational tool. Proctors / observers took detailed notes during the guided discussion, and used the Text Analysis Matrix¹⁴⁹ to identify the frequency of player comments across the various themes and subthemes. The most commonly discussed themes and subthemes related to the ways in which a player's early actions could permit or preclude subsequent options, the necessity to balance efforts across multiple strategic priorities, and the ways in which the player's own strategy was enabled or frustrated by that of the opponent.

The guided discussion also allowed multiple players to discuss and integrate concepts from each other. This group reflection helped illustrate differences between the strategies and approaches each player took, in particular as the U.S. and U.S.S.R. player decks are designed to play somewhat differently. Thus, in addition to its utility as an assessment tool, the group guided discussion is a valuable educational tool in itself as a form of group reflection to better integrate the learning objectives.¹⁵⁰

As formatted, the guided discussion and text analysis worksheet are not really susceptible to qualitative analysis. As a result, the quantitative results do not provide the qualitative feel.

¹⁴⁸ Guided Discussion Protocol at appendix 4.

¹⁴⁹ Completed Text Analysis Matrix is at appendix 9.

¹⁵⁰ Kolb & Kolb, *Learning Styles and Learning Spaces*, *supra*, FN 52.

The proctor/observer's sense is that students enjoyed the game, and believed it had educational utility; though perhaps that utility would be improved on subsequent game play. Furthermore, the text analysis worksheet was applied to not only the guided discussion, but to the Pre-/Post-Test and player comments made during gameplay and recorded on the observation checklist as well. For future assessments, the author recommends breaking out each of those three sources of data on a separate text analysis worksheet.

C. Pre/Post-Test Results¹⁵¹

As previously identified, there was a disconnect between game design and the learning objectives. In particular, game design doesn't appear to have fully supported the learning objective related to an ambiguous information environment, and the ways in which imperfect information can complicate decision-making. In addition, specific terminology in the post-test was not similarly incorporated into the game.¹⁵² In light of these two faults, the Pre-/Post-Test as currently formulated lacks real utility as an assessment tool. This may be an issue with Pre-/Post-Test and game design being complementary; rather than an indication the students didn't learn the concept.

D. Observation Results¹⁵³

The student observation checklist provided the greatest amount of relevant and quantifiable data. Furthermore, observation provided qualitative feedback in the form of student comments or questions which also informed the text analysis matrix. The observation checklist supports the conclusion that the game effectively incentivized students to balance resources and

¹⁵¹ Pre-/Post-Test at appendix 5.

¹⁵² For example, the term "mirror-imaging." Thus, player feedback on this particular question was inconsistent (though not necessarily incorrect) with the game design team's understanding or application of that term.

¹⁵³ Observation checklist totals are shown in Appendix 8. In addition, proctors/observers catalogued student comments and made additional observations.

opportunities to achieve their chosen win-conditions.¹⁵⁴ Additionally, players frequently identified that early game play choices could support or impede subsequent actions.¹⁵⁵

Several behaviors presented less frequently, but still support a conclusion that the game effectively incentivized players towards the learning objectives. In particular, players demonstrating the need to change their own gameplay based upon the opponent's actions or the unfolding game play situation.¹⁵⁶ Additionally, 3 player iterations showed that players identified the ways in which their own National Security Strategy was either complemented or frustrated by the opponent's.¹⁵⁷

In addition to the survey and guided discussion results, a number of players commented during their play session that the first play iteration they were focused on learning the rules and understanding the mechanics of the game. Several players commented during their games that subsequent iterations would allow them to better focus on achieving their strategic priorities, balancing risks and opportunities, and assimilating the learning objectives. This conclusion is supported by the single iteration in which players played for a second time. One player very clearly chose a card deck which better supported his chosen strategy than in the first game. The other player also observably “hedged” in the event he needed to change his approach based upon the mid-to-late game situation. Both of these players also commented on the fact that their own actions could help or harm their opponent.

¹⁵⁴ 7 of 10 player iterations showed this behavior, a total of 11 times across all 5 games.

¹⁵⁵ 8 of 10 player iterations showed this behavior, a total of 13 times across all 5 games.

¹⁵⁶ 5 of 10 player iterations showed this behavior, a total of 6 times across all 5 games. In addition, 4 player iterations resulted in a player changing either their own or their opponent's approach through the “Change NSS Agency” event card; and three player iterations resulted in players adjusting their game play based upon the way the game was unfolding as opposed to specifically upon opponent actions.

¹⁵⁷ Of note, all three of these instances presented with the players significantly junior in rank/grade to the proctor/observer. Thus, in this group 3 of 4 players demonstrated this behavior.

Many of the observed behaviors are based upon contemporaneous comments; in particular those related to player's recognizing or identifying certain effects upon their own or their opponent's game play. This presents an area of possible refinement to the observation and text analysis protocols, which the proctors/observers worked around by cataloguing those comments and incorporating them into the text analysis worksheet. This does present the possibility that some of this data is being "double counted" in both the observation checklist, and text analysis.

Two other observations bear mention. During the session with significantly junior personnel, all players took significantly longer building their decks than the proctor's / observer's peers. Average time was approximately 25 minutes, as opposed to approximately 10 minutes with peers. In addition, the play test with junior personnel provided perhaps the best lesson in terms of imperfect information¹⁵⁸ complicating decision-making. The U.S.S.R. player was postured to win, having achieved win-conditions in two strategic priorities, while the U.S. player had achieved win-conditions in only one. On the U.S.S.R. player's last turn he played a card which resulted in the U.S. player achieving win-conditions in all three strategic priorities, and thus a U.S. player overall win. This was further highlighted during the group discussion with all four players from this session.

E. Overall Game Design and Assessment Limitations

The assessment of AA83 as an educational tool, while showing promising preliminary results, is hampered by three limitations. The first is that game design may not have been clearly geared towards learning objectives, in particular with respect to teaching the warfighting

¹⁵⁸ In particular, being "blind" to the opponent's win-conditions.

function of information.¹⁵⁹ Second, as discussed previously, some of the assessment tools (in particular the Pre / Post-Test) do not match particularly well with the game design, and as a result do not provide high utility as an assessment tool. Finally, though the intent of the design team was to test whether our specific assessment tools could assess educational utility and not to draw statistically significant data about the educational utility of the game overall, the sample size is far too small to draw any conclusions with a reasonable degree of certainty (the entirety of the data set included 9 players, and 5 different game sessions).¹⁶⁰

Much of the terminology included in the Pre / Post-Test was not incorporated into the game itself, limiting the utility of its ability to actually assess whether players learned the concepts. Similarly, the textual analysis should be more closely tied to the final learning objectives, and applied separately to students comments made during the Pre-/Post-Test, gameplay, and the guided discussion to identify with more specificity which learning experience best contributed to meeting the learning objectives.

Both procedural and substantive improvements could remedy these issues. Better coordination between students tasked with the separate game design and assessment tasks should remedy problems associated with clearly tying learning objectives to game design, and game design to assessment tools. Similarly, continued refinement and iteration of the game and assessment tools should follow each playtest session. Substantive improvements in game design could include providing players with more information about certain aspects of the opponent's

¹⁵⁹ One potential adjustment would be to have win-conditions remain secret, but allow each player to see the opponent's actual scores on the NSS priority scales. This could introduce a mirror-imaging problem or bias, in which a player sees one or more high NSS scale scores for the opponent; however, this may not contribute to the opponent's win conditions as perceived.

¹⁶⁰ For the importance of sufficient sample size in developing a data set upon which conclusions may be drawn with sufficient confidence and validity, *see, generally*, David A. Kenny, *Statistics for the Social and Behavioral Sciences*, Chapter 13, Little Brown Pub. (Boston, 1987); Andrew J.B. Fugard and Henry W.W. Potts, *Supporting Thinking on Sample Size for Thematic Analyses: A Quantitative Tool*, 18 *International Journal of Social Research Methodology* 669 (2014).

status, but keeping win conditions secret. Furthermore, the game and assessment tools should use the same terminology. Finally, assessment tools should be built once the game design is finalized; constructing the game and the assessment tools in parallel contributed to the difficulty in coordinating these efforts.

V. Conclusion

Student wargame AA83 provides educational utility in teaching concepts related to strategy, balancing of instruments of national power, and the role of ambiguity or imperfect information in state competition. The game accomplishes this through engaging all four of the learning experiences: concrete experience and abstract experimentation are engaged through game play; while reflective observation and abstract conceptualization are engaged post-play through the Post-Test, survey, and guided discussion / AAR. Thus, the assessment tools used to determine the educational utility of AA83, are also a critical component of the educational experience by engaging all four learning experiences; and thus accommodating multiple learning styles.

Student wargame AA83 is also in need of refinement. In particular, the wargame itself could better coincide with the learning objectives, and the assessment tools could better correspond to the wargame. This disconnect in substance and terminology contributed to suboptimal assessment data, and likely less than ideal educational utility. Through a combination of procedural and substantive improvements, including design of assessment tools upon completion of the wargame rather than simultaneously, these concerns could be addressed.

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Educational Wargaming: EX ABLE ARCHER '83 Textual Analysis
Guided Discussion & Pre/Post-Test Assessment Tools

Themes:

1. ABLE ARCHER '83 / Strategic Context
 - a. Recognition that individual events occur within a larger strategic environment.
 1. May need to meet certain prerequisites to take certain actions.
 2. Actions may be precluded by conditions.
 3. Actions may impact environment in unforeseen/unpredictable ways.
 4. Accumulation of seemingly small events
 - b. Difficulty in understanding / assessing motivations and perceptions of opponent.
 1. Opponent strategy frustrates your own.
 2. Opponent strategy bolsters your own.
 3. Opponent responds in unforeseen/unpredictable ways.
2. 2018 National Defense Strategy
 - a. Complex & volatile security environment.
 1. Game unfolding required a change to initial strategy.
 2. Opponent acted unpredictably.
 3. Environment / context had unpredictable/unforeseen reactions.
 - b. Integration of all instruments of national power.
 1. Must balance resources to achieve NSS goals.
 2. Competing NSS goals complicated card building.
 3. Competing/changing NSS goals complicated game play.
 4. Had to change / adjust strategy based upon game inputs.
 5. Had to change / adjust strategy based upon player inputs.
3. Warfighting Function - Information
 - a. Deterrence requires an understanding of opponent's perceptions / motivations
 1. Danger of mirror-imaging.
 2. Changed approach upon gaining understanding of opponent's goals
 3. Changed approach upon gaining an understanding of opponent's reactions
 4. Disconnect between message sent / message received
 - b. Imperfect information (Environmental)
 1. Players wish they'd known/seen XXX
 2. Lack of information on XXX impacted gameplay
 3. Ambiguity in opponent response or motivation
 4. Revelation of XXX resulted in YYY

Analysis Matrix

Theme / Subtheme	Frequency of Occurrence
1.a.: Role of larger strategic environment.	
1.a.1: Required prerequisites for actions.	
1.a.2: Actions precluded.	
1.a.3: Unforeseen / unpredictable game input.	
1.a.4: Accumulation of small events.	
1.b.: Difficulty in assessing perceptions and motivations of opponent.	
1.b.1: Opponent strategy frustrates your own.	
1.b.2: Opponent strategy bolsters your own.	
1.b.3: Opponent responds in unforeseen / unpredictable ways.	
2.a: Complex & volatile security environment.	
2.a.1: Game inputs required strategy change.	
2.a.2: Opponent acted unpredictably.	
2.a.3: Unforeseen / unpredictable game inputs.	
2.b: Integrate all instruments of DIME	
2.b.1: Balance resources to achieve NSS goals.	
2.b.2: Role of competing NSS goals in deck building.	
2.b.3: Role of competing/changing NSS goals in game play.	
2.b.4: Adjust strategy based upon game inputs.	
2.b.5: Adjust strategy based upon opponent turns.	
3.a: Need to understand opponent's perceptions / motivations.	

3.a.1: Danger of mirror-imaging.	
3.a.2: Changed approach upon understanding opponent goals.	
3.a.3: Changed approach upon understanding opponent's reactions.	
3.a.4: Disconnect between "message" sent/received	
3.b: Imperfect Information	
3.b.1: Players wish they'd known/seen XXX	
3.b.2: Lack of information on XXX impacted gameplay.	
3.b.3: Ambiguity in opponent response / goals.	
3.b.4: Revelation of XXX resulted in YYY	

Wargame ABLE ARCHER 1983

Post-Play Survey

Learning Objective Focused

Please indicate to what degree you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The activity had clear learning outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The activity supported learning outcome achievement	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preparatory materials supported gameplay and learning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Game products (e.g., briefs) reinforced the learning outcomes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The game context and scenario contributed to the learning objectives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Activity / Game-Play Focused

Please indicate whether you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The amount of time spent learning the rules was appropriate.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Game complexity was sufficient to challenge my decision-making.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The game was sufficiently intuitive or playable, so as not to get "bogged down."	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Game play was intuitive once I was familiar with the rules.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Game inputs encouraged me to adapt my strategy or style of play to achieve my goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Game inputs encouraged the me to adapt my strategy or style of play to prevent my opponent from achieving his/her goals.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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After Action / Group Discussion Focused

Please indicate whether you agree or disagree with the following statements:

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
The group discussion/AAR contributed to a greater understanding of the learning objectives.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The group discussion/AAR provided greater context to player moves and game events.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>Introduction (5 Min)</p>	<p>Thank you for agreeing to play our wargame, and for agreeing to meet with us.</p> <p>My name is _____, from Marine Corps University in Quantico, VA. With me are my fellow game designers/students, _____.</p> <p>We are speaking with students who have played our game to help us understand its potential utility as an educational tool. This is part of an academic course of instruction, specifically the Command & Staff College Gray Scholars Program on Educational Wargaming. This is also a focus of several recent Marine Corps efforts to reinvigorate wargaming as both a means to assess new warfighting concepts, and within Professional Military Education.</p> <p>As part of our program, we would like to speak with you about your impressions of our game, it's utility as an educational tool to teach concepts related to deterrence, strategic communication, and the information environment. I expect that this will take about an hour.</p> <p>We will treat all of your responses as confidential, and will not include your names or any other personally identifiable information in our student research theses. We will destroy all notes and/or audio/video recordings after we complete, and submit our theses.</p> <p>Are you all willing to participate in this discussion? Does anyone have any questions about the purpose of today's discussion?</p>
<p>Topic 1 (15 Min)</p>	<p>Topic 1: Constructing and Executing a Strategy (Volatile and Complex Environment)</p> <ol style="list-style-type: none"> 1. Please give us your overall impressions of whether and how the game incentivized you to plan towards achieving your goals. <ol style="list-style-type: none"> a. PROBE: How did the NSS card impact your selection of action/actor cards? b. PROBE: Why did you choose the NSS card that you did? c. PROBE: How did you prioritize resources to employ actions and/or actors? d. PROBE: How did your early actions/turns help/hamper your ability to achieve your goals? 2. (If an NSS change occurs during gameplay). Please tell us how you responded to the change in your NSS when you drew the [Event] card? <ol style="list-style-type: none"> a. PROBE: How did the action/actor cards you'd already selected help or hamper you in executing the new NSS? b. PROBE: How did your initial resource allocation help or hamper you in executing your new NSS? 3. Is there anything that you would do differently if playing in the future?
<p>Topic 2 (15 Min)</p>	<p>Topic 2: Imperfect Information - Mirror Imaging / Misunderstanding the Opponent</p> <ol style="list-style-type: none"> 1. Did any outcome or opponent action surprise you? <ol style="list-style-type: none"> a. PROBE: What [Event Card] most impacted or changed your gameplay? b. PROBE: What action/actor by your opponent most impacted your gameplay? c. PROBE: How did you change your mindset or assumptions based on the above? 2. What do you wish you'd known about your opponent's cards, NSS, etc.? <ol style="list-style-type: none"> a. PROBE: What would you have done differently if you'd known one or more of your opponent's "win conditions?"

	<ul style="list-style-type: none"> b. PROBE: What opponent actor/action most surprised you, or impacted your own strategy? 3. Were there any ways in which your NSS complemented or conflicted with your opponent's? <ul style="list-style-type: none"> a. PROBE: Was there anything that your opponent did that helped you? b. PROBE: What action by the opponent was most damaging to your achieving your goals?
<p>Topic 3 (15 Min)</p>	<p>Topic 3: Balancing Deterrence / Provocation</p> <ul style="list-style-type: none"> 1. How did you strike a balance between achieving your NSS, and managing your resources? <ul style="list-style-type: none"> a. PROBE: What did you think your opponent's goal was? b. PROBE: Was there anything you did, where you were surprised by the opponent's reaction? c. PROBE: What resource (financial or diplomatic) did you wish you'd had more of, and why? 2. How did your earlier actions impact the balance between achieving your goals, and escalating the DEFCON level? <ul style="list-style-type: none"> a. PROBE: Were there cards you wanted to play, which you couldn't because you failed to meet the prerequisite conditions? b. PROBE: Where there turns that you thought were relatively mild, that turned out to be more provocative? c. PROBE: Was there anything you did, where you were surprised by the way it changed the DEFCON scale?
<p>Final Thoughts (10 Min)</p>	<p>Those are all of the substantive questions we wanted to ask.</p> <p>Do any of you have any final thoughts, or recommendations for improving the game that you'd like to share?</p> <p>Thank you for your time.</p>

Pre / Post-Test Protocol¹⁶¹

1. Identifying and Security National Security Interests (adapted from 4105 Lesson Card - Issues for Discussion)
 - a. How do the elements of national power mutually support one another?
 - b. How are the different elements of national power in tension with one another?
 - c. In what ways is the pursuit of national interest bound to other nations?
 - d. **Post-Test only:** Has your perception of the above questions changed after playing AA83, and if so, why?

2. Prioritizing Interests and Balancing Risks (adapted from 4106 Lesson Card - Issues for Discussion)
 - a. How is risk analysis different in the strategic context?
 - b. What is “mirror-imaging,” and why can it negatively impact national security decision making?
 - c. **Post-Test only:** How has AA83 affected your ability to assess and prioritize interests and risk? Why?

3. Foreign Policy Decision Making (adapted from 4108 Lesson Card - Issues for Discussion)
 - a. How do biases or assumptions impact national security decision making?
 - b. How might two countries’ foreign policies frustrate one another? Complement one another? Lead to unexpected or unintended conflict?
 - c. **Post-Test only:** Has student wargame AA83 impacted your understanding of the role that biases or assumptions play in foreign policy formulation? Why or how?

4. Warfighting Function - Information (adapted from 6110 and 6111 Lesson Cards - Issues for Discussion)
 - a. What unique challenges are posed in the information environment?
 - b. How can “information” or strategic communication impact national security goals and decision-making?
 - c. How can “information” have unintended or unforeseen consequences for strategic decision-making?
 - d. **Post-Test Only:** Has student wargame AA83 improved your understanding of the information environment? How?

¹⁶¹ All questions are both pre- and post-test unless indicated otherwise.

Student Wargame ABLE ARCHER '83
Student Observation Checklist

<u>Preparatory</u>	<u>USA</u>	<u>Frequency</u>	<u>USSR</u>	<u>Frequency</u>
<ul style="list-style-type: none"> • Player reads / understands rules and learning objectives 				
<ul style="list-style-type: none"> • Player chooses action/actor cards to support chosen NSS 				
<u>Player Turns</u>				
<ul style="list-style-type: none"> • Player allocates resources to enable actions/actors 				
<ul style="list-style-type: none"> • Player identifies preconditions necessary for certain actions/actors 				
<ul style="list-style-type: none"> • Player identifies unanticipated changes to DEFCON condition 				
<u>Player Response to Opponent Turns</u>				
<ul style="list-style-type: none"> • Player identifies unanticipated effects on Opponent 				
<ul style="list-style-type: none"> • Player identifies conflict/complementary nature of NSS with that of Opponent 				
<ul style="list-style-type: none"> • Player acknowledges need to adjust gameplay based on Opponent actions 				
<ul style="list-style-type: none"> • Player adjusts gameplay based upon Opponent actions 				
<u>Player Response to Game Injects / Events</u>				
<ul style="list-style-type: none"> • Player identifies changes to conditions/strategy from game injects 				
<ul style="list-style-type: none"> • Player adjusts gameplay based upon game injects 				

<ul style="list-style-type: none"> • Player identifies possible changes to Opponent's gameplay based upon game injects 				
Subsequent (or later) Gameplay				
<ul style="list-style-type: none"> • Player makes faster card selection during "deck building" 				
<ul style="list-style-type: none"> • Player chooses cards that support chosen NSS 				
<ul style="list-style-type: none"> • Player identifies need to "hedge" in the event of changed win conditions 				
<ul style="list-style-type: none"> • Player anticipates changes to win conditions/NSS from Opponent's turns 				
<ul style="list-style-type: none"> • Player anticipates changes to win conditions/NSS from game injects 				
<ul style="list-style-type: none"> • Player identifies how own actions will impact Opponent 				

Wargame ABLE ARCHER 1983

Likert Scale Average Scores

Learning Objective Focused

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
The activity had clear learning outcomes (9 Respondents; 35 "points")			3.9		
The activity supported learning outcome achievement (9 Respondents; 37 "points")				4.1	
Preparatory materials supported gameplay and learning (9 Respondents; 41 "points")				4.6	
Game products (e.g., briefs) reinforced the learning outcomes (9 Respondents; 38 "points")				4.2	
The game context and scenario contributed to the learning objectives (9 Respondents; 38 "points")				4.2	

Activity / Game-Play Focused

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
The amount of time spent learning the rules was appropriate. (9 Respondents; 33 "points")			3.7		
Game complexity was sufficient to challenge my decision-making. (9 Respondents; 38 "points")				4.2	
The game was sufficiently intuitive or playable, so as not to get "bogged down." (9 Respondents; 32 "points")			3.6		
Game play was intuitive once I was familiar with the rules. (9 Respondents; 36 "points")				4	

Game inputs encouraged me to adapt my strategy or style of play to achieve my goals. (9 Respondents; 38 "points")				4.2	
Game inputs encouraged me to adapt my strategy or style of play to prevent my opponent from achieving his/her goals. (9 Respondents; 37 "points")				4.1	

After Action / Group Discussion Focused

	Strongly Disagree (1)	Disagree (2)	Neither Agree nor Disagree (3)	Agree (4)	Strongly Agree (5)
The group discussion/AAR contributed to a greater understanding of the learning objectives. (6 Respondents; 28 "points")				4.7	
The group discussion/AAR provided greater context to player moves and game events. (6 Respondents; 29 "points")				4.8	

Student Observation Checklist - Totals

Total Game Count: 5 Games observed (9 Players)

<u>Preparatory</u>	<u>USA Games</u>	<u>USA Freq.</u>	<u>USSR Games</u>	<u>USSR Freq.</u>	<u># Games</u>	<u>Total Obs.</u>
<ul style="list-style-type: none"> • Player reads / understands rules and learning objectives 	5	5	5	5	10	10
<ul style="list-style-type: none"> • Player chooses action/actor cards to support chosen NSS 	4	4	4	4	8	8
<u>Player Turns</u>						
<ul style="list-style-type: none"> • Player allocates resources to enable actions/actors 	4	7	3	4	7	11
<ul style="list-style-type: none"> • Player identifies preconditions necessary for certain actions/actors 	5	9	3	4	8	13
<ul style="list-style-type: none"> • Player identifies unanticipated changes to DEFCON condition 	1	1			1	1
<u>Player Response to Opponent Turns</u>						
<ul style="list-style-type: none"> • Player identifies unanticipated effects on Opponent 	1	1	1	1	2	2
<ul style="list-style-type: none"> • Player identifies conflict/complementary nature of NSS with that of Opponent 	2	2	1	1	3	3
<ul style="list-style-type: none"> • Player acknowledges need to adjust gameplay based on Opponent actions 	2	2	3	3	5	5
<ul style="list-style-type: none"> • Player adjusts gameplay based upon Opponent actions 	2	2	3	4	5	6
<u>Player Response to Game Injects / Events</u>						

• Player identifies changes to conditions/strategy from game injects	1	1	2	2	3	3
• Player adjusts gameplay based upon game injects	2	2	2	2	4	4
• Player identifies possible changes to Opponent's gameplay based upon game injects	1	1	1	1	1	2
Subsequent (or later) Gameplay	One total iteration of players playing a second / subsequent time.					
• Player makes faster card selection during "deck building"						
• Player chooses cards that support chosen NSS	1	1			1	1
• Player identifies need to "hedge" in the event of changed win conditions			1	1	1	1
• Player anticipates changes to win conditions/NSS from Opponent's turns						
• Player anticipates changes to win conditions/NSS from game injects						
• Player identifies how own actions will impact Opponent	1	1	1	1	2	2

Student Comments / Other Observations

1. Comment: "Fun little game"
2. Comment: "The intent is to teach the DIME? You've done it..."
3. Observation: Players generally accepting negative consequences of Action cards over playing Offset / Concession.
4. Observation: Some players appeared to not have read the rules

5. Comment: Students recommended a starting hand with more Event / Actor cards (non-probability based)
6. Comment: Need more play throughs to get the full benefit of balancing priorities / risks; so many moving parts.
7. Comment: Players stated that they believe they would have to 2-3 times to get adequate strategic play
8. Comment: Turn sequence slider was no factor after a couple of turns.
9. Comment: Players believed that there should have been more event cards than action cards in the game especially to start the game (The players possibly drew more action cards at the start of the game before they actually understood their NSS strategy) As a result two was the highest they could roll during the game to get a successful roll and due to this they never really accumulated any points.
10. Observation: DEFCON slider was rarely a factor during gameplay.
11. Observation: Junior personnel took significantly longer to build decks than observer's peers
12. Comment(s): 3 of 4 players commented upon the need for more information
13. Comment(s): 2 players indicated difficulty in moving off of zero / digging out of the "hole"
14. Comment: potentially good for Los Alamos National Lab (?)
15. Comment: "It's in the ballpark of intelligence / information, which is cool."

Educational Wargaming: EX ABLE ARCHER '83 Textual Analysis
Guided Discussion & Pre/Post-Test Assessment Tools

Themes:

1. ABLE ARCHER '83 / Strategic Context
 - a. Recognition that individual events occur within a larger strategic environment.
 1. May need to meet certain prerequisites to take certain actions.
 2. Actions may be precluded by conditions.
 3. Actions may impact environment in unforeseen/unpredictable ways.
 4. Accumulation of seemingly small events
 - b. Difficulty in understanding / assessing motivations and perceptions of opponent.
 1. Opponent strategy frustrates your own.
 2. Opponent strategy bolsters your own.
 3. Opponent responds in unforeseen/unpredictable ways.
2. 2018 National Defense Strategy
 - a. Complex & volatile security environment.
 1. Game unfolding required a change to initial strategy.
 2. Opponent acted unpredictably.
 3. Environment / context had unpredictable/unforeseen reactions.
 - b. Integration of all instruments of national power.
 1. Must balance resources to achieve NSS goals.
 2. Competing NSS goals complicated card building.
 3. Competing/changing NSS goals complicated game play.
 4. Had to change / adjust strategy based upon game inputs.
 5. Had to change / adjust strategy based upon player inputs.
3. Warfighting Function - Information
 - a. Deterrence requires an understanding of opponent's perceptions / motivations
 1. Danger of mirror-imaging.
 2. Changed approach upon gaining understanding of opponent's goals
 3. Changed approach upon gaining an understanding of opponent's reactions
 4. Disconnect between message sent / message received
 - b. Imperfect information (Environmental)
 1. Players wish they'd known/seen XXX
 2. Lack of information on XXX impacted gameplay
 3. Ambiguity in opponent response or motivation
 4. Revelation of XXX resulted in YYY

Analysis Matrix - Applied to:

1. Recorded comments during play (9 players, 5 games)
2. Group Discussion / AAR (6 players)
3. Pre/Post Test (2 Players thus far)

Theme / Subtheme	Frequency of Occurrence
1.a.: Role of larger strategic environment.	1
1.a.1: Required prerequisites for actions.	5
1.a.2: Actions precluded.	4
1.a.3: Unforeseen / unpredictable game input.	
1.a.4: Accumulation of small events.	1
1.b.: Difficulty in assessing perceptions and motivations of opponent.	
1.b.1: Opponent strategy frustrates your own.	4
1.b.2: Opponent strategy bolsters your own.	1
1.b.3: Opponent responds in unforeseen / unpredictable ways.	
2.a: Complex & volatile security environment.	
2.a.1: Game inputs required strategy change.	2
2.a.2: Opponent acted unpredictably.	
2.a.3: Unforeseen / unpredictable game inputs.	
2.b: Integrate all instruments of DIME	6
2.b.1: Balance resources to achieve NSS goals.	5
2.b.2: Role of competing NSS goals in deck building.	7
2.b.3: Role of competing/changing NSS goals in game play.	4
2.b.4: Adjust strategy based upon game inputs.	2
2.b.5: Adjust strategy based upon opponent turns.	2

3.a: Need to understand opponent's perceptions / motivations.	4
3.a.1: Danger of mirror-imaging.	2
3.a.2: Changed approach upon understanding opponent goals.	
3.a.3: Changed approach upon understanding opponent's reactions.	4
3.a.4: Disconnect between "message" sent/received	2
3.b: Imperfect Information	2
3.b.1: Players wish they'd known/seen XXX	3
3.b.2: Lack of information on XXX impacted gameplay.	2
3.b.3: Ambiguity in opponent response / goals.	2
3.b.4: Revelation of XXX resulted in YYY	