

How to Learn About Homeland Security

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Abstract

The article describes how one can begin to learn about homeland security. Starting with institutionally approved, rather than objectively-tested and validated, foundational knowledge may provide academic order, but the order is achieved at the cost of constraining prematurely what homeland security could become. The method presented in this essay starts with the subjective interests of a learner, and relies on the usefulness of intellectual conflict to transform the learner's ideas. The article outlines several frameworks learners can use to structure their homeland security inquiry. The author argues claims about what constitutes foundational knowledge in homeland security frequently are based on socially-constructed agreement that masks the subjectivity needed to arrive at consensus. Rather than avoiding subjectivity in determining the roots and bounds of homeland security, we can encourage reflective practitioners to construct and share insights derived from their experience-based, research-informed understanding of homeland security.

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What This Article is About

"Education is not the filling of a pail, but the lighting of a fire." ¹

The core question addressed in this essay is how to begin learning about homeland security. The primary audience is master's degree participants at the Naval Postgraduate School's Center for Homeland Defense and Security (CHDS).² The students are public-sector practitioners from federal, state, local, and other government agencies.

The approach I advocate in this essay embraces subjectivity and the requirement to present and defend subjective observations to other people. For experienced practitioners a foundational approach³ to learning homeland security "fills a pail." Starting from where you are, learning what you need to learn, and exposing your ideas to your colleagues can be a pathway to "lighting a fire."

I support my argument by reviewing the factors involved in deciding what constitutes valid foundational knowledge about homeland security. Those factors make it difficult to achieve objective, evidence-based agreement about what counts as foundational knowledge. But the difficulty provides opportunities for learners to create, assert and defend their own ideas about what counts as homeland security knowledge.

After describing and linking subjectivity, andragogy (adult education), and questions and learning, I discuss the phenomenological context within which homeland security learning can occur. I describe the Cynefin framework and illustrate how it can be used to structure questions and inquiry about homeland security.

The final part of the essay outlines a matrix offering alternative ways to conduct homeland security inquiry. The matrix is constructed from three types of truth (correspondence, coherence, and pragmatic) and seven inquiring systems (induction, deduction, multiview, dialectic, unbounded, abduction, and detour and access).

The method described in this essay is based on my experiences teaching over 65 *Introduction to Homeland Security* graduate seminars since 2003. It is one answer to the question of how best to learn about homeland security.

Creating Homeland Security Knowledge

Figure 1 contains topics one is unlikely to find presented in a homeland security textbook (yet).

1. *Examining Female Genital Mutilation as an Act of Terrorism*
2. *21st Century Crime: How Malicious Artificial Intelligence Will Impact Homeland Security*
3. *The Implications Of Nanotechnology For The Fire Service: Avoiding The Mistakes Of The Past*
4. *Cyber Federalism: Defining Cyber's Jurisdictional Boundaries*
5. *Pyro-Terrorism in High-Rise Buildings*
6. *The Arctic: A Wait and See Approach to Defending the Homeland*
7. *The Intergenerational Transfer of Trauma and Implications for Syrian and Iraqi Refugees*
8. *Crowdsourcing Threat Analysis; Applying a "Superforecasting" Methodology to Detection of Homegrown Violence*
9. *Big Brother or Trusted Allies? How the Police Can Earn Community Support for Using Unmanned Aircraft*
10. *Fake News, Conspiracy Theories, and Lies: An Information Laundering Model for Homeland Security*
11. *Asserting Collective State Sovereignty to Strengthen the National Network of Fusion Centers*
12. *Obsessive Compulsive Homeland Security: Insights from the Neurobiological Security Motivation System*
13. *Measuring State Resilience: What Actually Makes A Difference?*
14. *It Takes a Village: Integrating Firehouse Hubs to Encourage Cooperation among Police, Fire, and the Public*
15. *Implementation of Active Cyber Defense Measures by Private Entities: The Need for an International Accord to Address Disputes*
16. *Homeland Security from a Tribal Context*
17. *Tusks, Traffickers and Terrorists: Is Wildlife Trafficking a Homeland Security Concern?*
18. *The Maple Leaf and the Olive Branch: A Comparative Analysis of Refugee Policies in Canada and the United States and the Potential for Blended Reform*
19. *Puerto Rico's Homeland Security Readiness: Redesigning the Island's Power Grid to Improve Its Resiliency and Efficiency*
20. *Military Doctrine Relating to Homeland Security Does Not Adequately Guide Domestic Use of the National Guard*
21. *Disaster Housing for High-Density Urban Environments*
22. *Diversity in Homeland Security: Analyzing Environment, Not Numbers*
23. *Social Media Screening of Homeland Security Job Applicants and the Implications on Free Speech Rights*
24. *Disruptive Emergence in Disaster Response Systems*

25. *Effectiveness of Blockchain Technology in the Customs Environment*
26. *What the Homeland Security Enterprise Can Learn from The Stock Market*
27. *Creating A Secure Border by First Agreeing What Secure Border Means*
28. *Reacting to School Shootings by Engaging the Lost Time Interval*
29. *Black American Social Status and Post 9/11 Unity*
30. *Hi Tech, Low Tech, And No Tech Communication Strategies When the Power Goes Out*
31. *Applying the National Infrastructure Protection Plan to State and Local Infrastructure Priorities*
32. *The ESTA Program and Northern Border Security Loopholes*
33. *The Role of Social, Personal and Perceived Isolation in the Radicalization Process*
34. *Preventing Police Murders by Identifying Early Warning Indicators*
35. *Information Sharing Within the Critical Infrastructure Community*
36. *Creating A “State to Grass Roots” Strategic Communication Model for ESF 8*
37. *Evaluating Adherence to The Intelligence Cycle Within the Homeland Security Intelligence Environment*
38. *Modifying the Risk Formula for Homeland Security Grant Allocations By Incorporating Indirect And Spillover Consequences*
39. *Establishing a 4th Phase Air Cargo Screening Strategy*
40. *A Strategy for Preventing the Theft of Public Safety Vehicles*
41. *Re-Visioning Border Security as A Complex Adaptive System*
42. *Punching Above Their Weight: The Homeland Security Contributions of the U.S. Pacific Territories*

Figure 1: Selected CHDS Thesis Topics

Figure 1 contains titles of research conducted in the last four years by cohorts at the Center for Homeland Defense and Security. The authors are reflective homeland security practitioners.⁴ They, like the alumni who preceded them, did not learn homeland security by relying on foundational ideas about homeland security. They learned by starting with the experiences, knowledge, and interests they brought to CHDS; by sharing those experiences with their colleagues; and by modifying and growing what they know about homeland security through interactions with courses, lectures, assignments, readings and challenges to their ideas. The knowledge they are creating helps to advance homeland security as both a practice and an academic discipline.

Three Approaches to Learning Homeland Security

In this section I describe three (not mutually exclusive) ways to begin learning about homeland security: 1) a foundations approach: start with the fundamental concepts of homeland security; 2) an objective approach: start with concepts whose validity can be objectively determined; and 3) a subjective approach: start with the ideas, questions and knowledge each learner brings to the educational activity.

If the homeland security discipline were firmly established, one could learn about homeland security by building on the discipline’s conceptual foundations.⁵ Textbooks are one place to find candidates for a foundational approach to homeland security.⁶ They codify homeland security

into a series of categories, frequently a large number of categories.⁷ Textbooks are constructed by experts who assert – based on experience and research -- what one needs to know about homeland security.⁸ Students who rely primarily on textbooks, according to Kuhn, tend to “accept theories on the authority of teacher and text, not because of evidence.”⁹

Eighteen years after September 11 2001, homeland security is still not a discipline.¹⁰ There is no national agreement about what homeland security is.¹¹ There is no broad consensus about what the core homeland security problems are. They seem to keep changing. Different language communities have settled – more or less – on working definitions of homeland security.¹² Where there is agreement within those communities, homeland security foundations look similar to ideas from other fields of study - like law enforcement, emergency management, and public administration.¹³ The claims I have seen about homeland security foundations are supported largely by socially-constructed agreements about what constitutes foundational knowledge.¹⁴ I consider those agreements to be based on a consensus that masks subjectivity.¹⁵

I do not see a practicable way to avoid subjectivity. Consequently I think of subjectivity more as ground truth to be acknowledged rather than a problem to be solved. I believe socially-constructed agreements about foundations can be useful. In fact, my argument encourages socially-constructed foundations. However, I want to expand who gets to decide what the foundations are, and to encourage reflective practitioners to construct and share their own foundations. This essay describes how that can be accomplished.

In addition to a traditional foundational approach,¹⁶ there are at least two other ways to learn homeland security. One way is to remove, as much as possible, the subjective element in deciding what a foundation is, and to replace subjectivity with objective referents. This would follow the practice of physical and material sciences (like physics, biology, chemistry, and engineering), and would base foundations on empirical knowledge — by which I mean knowledge that is repeatable, and whose validity is falsifiable and independent of the observer’s mental state.¹⁷ As I will argue later in the discussion of the Cynefin framework, an objective approach to homeland security might help learning simple and complicated issues.¹⁸ It is less helpful in learning about the complex issues that – in my opinion -- constitute the bulk of the dynamic concerns facing homeland security practitioners.

Another strategy — the one advanced in this essay — is to approach learning about homeland security from the perspective of radical subjectivity.¹⁹ This strategy adopts, makes explicit, and extends the subjectivity inherent in contemporary models of how to learn about homeland security.²⁰

Instead of subjectivity being an opaque tool reserved to those who possess institutional authority (such as people who publish textbooks or who develop homeland security curricula), I want to make subjectivity transparent, legitimize it for homeland security scholarship, and make it available to anyone who wants to learn about homeland security.²¹

Subjectivity in this context does not mean considering as true whatever one wants to be true (e.g., that Obama is a Muslim or that the 9/11 attacks were an inside job). I use subjectivity to

refer to a process that begins with individual interpretations and reflections of sense data²² and extends through a transformational process of presenting and defending one's observations about homeland security to other people. I use the term "radical" in a dictionary — not a political — sense, to mean "root." I am looking for homeland security inquiry to start with the baseline of what each participant brings to the CHDS program.

"Start from where you are" is the phrase I use to describe the subjective approach to learning homeland security. I use "transformational dialectic" to describe a cyclical process of presenting and defending one's observations to other people, and refining one's ideas based on that process.²³

My belief — maybe stated more accurately as my hope — is that starting from where you are, and using the transformational dialectic will serve two purposes (in addition to keeping students motivated to learn).

1) It will enable individuals to learn about homeland security in a way that keeps homeland security knowledge alive and continuously evolving. This contrasts with a learning model based on collecting and remembering a series of facts and interpretations about homeland security.²⁴ My view is that a foundational approach to learning homeland security (as illustrated by text books) emphasizes learning at the lower levels of Bloom's Taxonomy.²⁵ Starting from where you are encourages learning at all six levels.²⁶

2) It will help to expand, sustain, and grow understanding of homeland security as a social enterprise. For example, the research topics described in figure 1 – and research developed by subsequent cohorts at CHDS (and elsewhere) -- will be added to the store of homeland-security knowledge. Many of those ideas may have a short life. Other ones may help to shape the future of homeland security.

A relevant aphorism is "Let a hundred flowers bloom. Let a hundred schools of thought contend."²⁷ In my opinion, it is too early in the development of homeland security as a field of study to declare victory and say we know what it is. I recognize there are institutional, efficiency, and resource issues encouraging us to say what homeland security is, and then move on to whatever comes after that.²⁸ Foreclosing homeland security too quickly risks substituting a false sense of certainty for a missed opportunity to learn – and to influence -- what homeland security could and should be.

Each of the participants at CHDS has the opportunity to make and defend claims about homeland security that can help shape the field. Because CHDS selects experienced practitioners with the demonstrated ability to do graduate-level work, I believe we would do a disservice to program participants if we first insisted they agree on the foundations of homeland security before they were allowed to develop their own perceptions about the discipline. My approach, instead, is to encourage them to start from where they are, share and defend those perceptions, and use a variety of tools (research, classwork, reading – even textbooks) to refine what they know and what they are learning.

Start from Where You Are by Asking Questions about Homeland Security

Starting from where you are means identifying what you want to learn about homeland security. If you don't know what you want to learn, you can always start by asking, "what is homeland security?" That will lead you down a -- thus far -- endless path that touches international and domestic terrorism, emergency management, public health, critical infrastructure, privacy, cyber security, climate change, elections, human trafficking, artificial intelligence, child pornography, immigration, border security, the national debt, obesity, education, mass casualty events, biotechnology, and who knows what else.²⁹

People who come to CHDS have questions about homeland security. These questions emerge from professional and personal interests. Instead of discounting those experiences in favor of a "foundations of homeland security" approach, experience becomes an integral part of an andragogical learning process.

Andragogy - an adult learning philosophy - is based on five assumptions about the characteristics of mature learners:³⁰

1. **Self Directed** — mature learners move from being dependent to being self-directed, from depending on others to determine what should be learned, to deciding for themselves what they learn, why they learn it, and how they learn it.
2. **Experience** — Adults bring significant experiences to the learning enterprise, and use those experiences as learning resources.
3. **Readiness** — Adults are ready to learn something when they perceive the need to learn it.
4. **Learning Orientation** — Their learning focus is on solving problems or taking advantage of opportunities to advance the issues they care about.
5. **Motivation** — Adults are motivated to learn more for internal than external reasons.

Starting with a question engages learners in each of the andragogical assumptions.³¹

So what?

If you want to learn about homeland security ask yourself why. Also ask what specifically you want to know about homeland security — not because your class assignment is to ask a question, but rather because you really want to know the answer. Pick something you care about.

A Working Definition of Learning³²

I recognize there are many definitions of learning.³³ For the purposes of this essay, I will define learning as transforming experience into knowledge.³⁴ I am using "knowledge" here to mean information that can be used to serve a purpose.³⁵

Elinor Ostrom suggests how frameworks can aid learning:³⁶

The purpose of a framework is to “identify the elements (and the relationships among these elements)..., to consider for analysis..., organize diagnostic and prescriptive inquiry..., [and] provide the most general set of variables that should be used to analyze all types of settings relevant for the framework.

There are two frameworks I find especially useful in analyzing how I learn something: one is Kolb’s learning cycle.³⁷ The other is Bloom’s Taxonomy of educational objectives in the cognitive domain.³⁸

Kolb’s cycle, shown below,³⁹ illustrates how learning can occur. The model is drawn as a cycle, but one can enter at any point. The learning model consists of 1) having an experience, 2) reflecting on that experience, 3) generalizing from a set of similar or related experiences, and 4) using the generalization to structure (either through behavior or interpretation) a new experience.

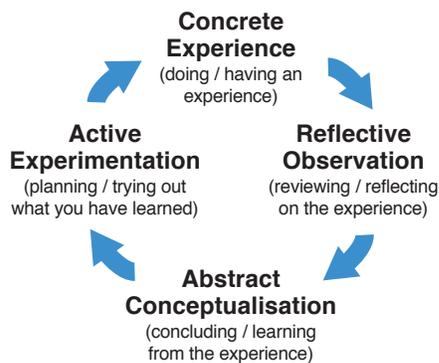


Figure 2: Kolb’s Learning Cycle

If one maps the learning cycle against Bloom’s Taxonomy, illustrated below⁴⁰, one can see how the learning cycle moves through several taxonomic dimensions. I will illustrate that claim with a cyber-security example, first by identifying questions derived from each level of Bloom’s Taxonomy.

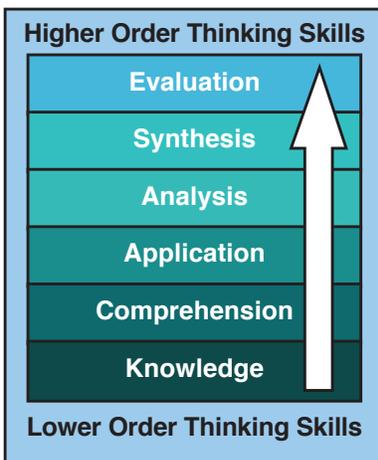


Figure 3: Bloom’s Taxonomy

*Learning can focus on **knowledge** gained by gathering facts -- for example, what were the dollar costs of cyber intrusion in 2018?*

*Learning can focus on demonstrating **comprehension** – e.g., where is a particular agency vulnerable to cyber intrusion?*

*Learning can focus on **applying** what one knows – e.g., what steps can an agency take to reduce its vulnerabilities to a cyber intrusion?*

*Learning can focus on **analysis** – for instance, how are the costs of intrusion calculated; how are vulnerabilities identified; what are the reasons leading one to believe steps taken to reduce vulnerabilities will be effective?*

*Learning can focus on **synthesizing** knowledge – e.g., what can we learn about mitigating cyber vulnerabilities by exploring how other security vulnerabilities – in human and non-human environments⁴¹ -- have been reduced?*

*Learning can focus on **evaluating** knowledge – for example, what are the advantages and disadvantages of an offensive cyber-security strategy as opposed to a defensive strategy?*

For a reflective practitioner, one's learning about homeland security evolves at each level of Bloom's Taxonomy through having experiences (in the world of practice, research, readings, seminars, informal discussions etc.), reflecting on and generalizing from those experiences, and transforming those experiences into a different way of thinking, feeling or acting.

So what?

Ask yourself what you mean by learning, and what indicators you use to confirm that you have learned something.

Homeland Security Exists in More than One Phenomenological Space⁴²

I find the Cynefin framework⁴³ useful in organizing and understanding homeland security "realities."⁴⁴ It segments reality into ordered and unordered systems, and it describes the characteristics of four systems in a way that allows for description, analysis, and prescription.⁴⁵

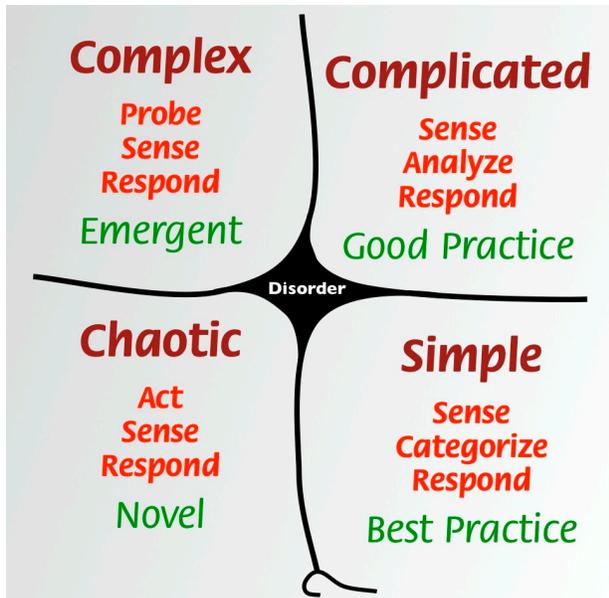


Figure 4: Cynefin Framework

Applied to homeland security, Cynefin assumes 1) a homeland security issue can be framed according to cause-effect relationships embedded in the issue, and 2) the way the issue is framed affects how one approaches learning about it.⁴⁶

Some issues are simple⁴⁷, meaning (in Cynefin terms) cause-effect relationships are clear and widely understood (for example, get caught trying to bring a weapon onto a plane and you will likely not fly that day). Other issues are complicated, meaning cause-effect links are presently unknown, but with some research they can become known (for example, how to improve an organization's cyber-security practices to reduce the likelihood of a successful intrusion). Both simple and complicated issues can be positioned in what Cynefin terms the ordered space. Learning in these domains consists, prototypically, of memorization (for simple issues) and conducting research (for complicated issues).

Complex and chaotic issues reside in the unordered space. In the complex domain, cause and effect relationships are known after the fact, not before⁴⁸ (for example, the impact of Kirstjen Nielsen's tenure as DHS Secretary on border security policy), and generally neither the causes nor the effects are repeatable in precisely the same way. In the chaotic domain, cause and effect have no discernible relationships (for example, the first 102 minutes after the 9/11/01 attack in New York).⁴⁹ Things just happen.⁵⁰

So what?

Do you believe what happens in homeland security has a cause that can be known before the effect appears? If so, where does that belief come from, and what evidence can you cite to support that belief? What if you entertained the hypothesis that some causes can only be known after the fact? How would that change your approach to learning homeland security?

Each Phenomenological Space Has Different Rules About Cause and Effect, and Understanding Cause-Effect Relationships is Important if One Wants to Improve Homeland Security

To illustrate in more detail how the Cynefin framework can be applied to homeland security, consider this subject: “*how to measure the effectiveness of homeland security program expenditures.*” To make the topic more specific, I’ll say the *program* is intended to improve the capability of a jurisdiction to respond effectively to a Vehicle Borne Improvised Explosive Device (VBIED). Stated as a “cause-effect” relationship, the desired *effect* is “being prepared to respond to a VBIED;” having the required capabilities is the *cause*.

Approached as a *simple* issue,⁵¹ measuring effectiveness means identifying the goals of the program (the desired elements of the capability, as outlined - for example – in grant documents), and then measuring whether the goals were achieved.

Treated as a *complicated* issue, it is not apparent what capabilities a jurisdiction needs to prepare for a VBIED response.⁵² There may be some general recommendations from the Department of Homeland Security or the Bureau of Alcohol, Tobacco, Firearms and Explosives, but the recommendations must be tailored to the jurisdiction’s context. Adapting the recommendations to a local jurisdiction requires answers to additional questions — e.g., what happens if the device is detonated in a particular location (such as a high school), what are the elements of an appropriate response, and so on. Research can provide answers to those questions, and in the process establish jurisdiction-specific performance metrics.

In summary: simple and complicated issues reside in the ordered domains of homeland security. Cause-effect relationships are known or can be known. Learning can occur before a device explodes.

From a *complexity* perspective, the jurisdiction will not know with certainty how prepared they are until they experience a VBIED. They may approximate knowing through a plan or an exercise, but the empirical truth about the relationship between grant expenditures and preparedness cannot be known until the jurisdiction experiences a detonation. Even then, the truth, revealed through after-action analyses, may be shaped by a social process that is as much concerned with political and legal concerns as it is with preparedness.⁵³

A detonation creates *chaos*. As happened with the 2013 Boston Marathon bombing, prepositioned capabilities will be combined with improvised capabilities in ways not considered by security planners.⁵⁴ When preparedness is viewed from within the chaos space, it is difficult to separate unexpected response assets from the part preparedness-grant expenditures played in response. They are all combined. In principle, from this view, measuring the effectiveness of homeland security program expenditures can at best be approximated, and probably only in general terms.

In summary: complex and chaotic issues reside in the unordered homeland security domain. Any order that does emerge is after the fact. Cause-effect relationships are known retrospectively, not prospectively, and they will not be repeated. Learning can only happen after experience.⁵⁵

So what?

For the issues you care about, for the questions you want answers to, for the parts of the homeland security enterprise you want to change, what assumptions are you making about cause-effect relationships, about why and how things happen the way they do? Does changing those assumptions offer alternative ways of thinking about your topics of interest?

How to Find Answers to Homeland Security Questions

Simple questions (in the Cynefin sense) are characterized by known and repeatable cause and effect relationships. For example, “how can a vacationing American citizen take her 12 year old son from the United States to Canada if the child does not have a passport?” Answering a simple question involves collecting data, placing the data in the appropriate category, and providing an answer based on the way the question has been asked and answered previously. There is an answer and a procedure to be followed for the vacationer’s simple question (simple for Customs and Border Protection, if not so for the parent.⁵⁶)

Complicated questions come from systems whose constituent elements can be described completely.⁵⁷ The system may be characterized by unknown, but knowable cause-effect relationships. For example, “how is the electric grid vulnerable to an E2 electromagnetic pulse?”⁵⁸ or “what impact will new screening technology have on passenger flow rates at large primary hub airports?” Answering complicated questions requires conducting research: gathering data, analyzing data, and reaching conclusions that can be supported by the analysis.

Complex questions emerge from socio-technical systems whose constituent elements can neither be prospectively described nor understood by analyzing its components.⁵⁹ The questions are characterized by unrepeatable cause-effect relationships knowable only in retrospect. Examples of complex questions are “how can the public be engaged so they remain interested in homeland security?” or “how can the Department of Homeland Security’s organizational culture be changed?” One way to answer complex questions is to try a comparatively minor solution (i.e., probe) and, through continuous feedback (i.e., gather data), see if you are learning anything useful. If you are, do more; if you are not, try something else (i.e., respond to what the data say).⁶⁰

A *chaotic* question is not a single question.⁶¹ It refers instead to a set of questions about an issue whose dimensions span the simple, complicated and complex domains. There is no agreement on what is a correct or useful question. Consider, for example, questions about

immigration. Why is immigration a homeland security issue? How can the U.S. stop the unrestricted flow of illegal immigrants or refugees across the border? What are the ethical implications of removing young children from their parents, or returning families to countries where they may be killed? How can the families of American-born children of undocumented immigrants be preserved? Why do employers persist in hiring illegal aliens? What jobs do undocumented immigrants take away from citizens? How much money do illegal immigrants contribute to and take from the U.S. economy? What civil rights do undocumented immigrants have? Answering questions within a chaotic policy space like immigration involves taking action — start somewhere, anywhere. Just pick one question to answer and see where it goes (i.e., gather data about whether the inquiry is productive or not). Inquiry leads to other, more refined questions, and so on. Your goal -- as a learner -- is to move from the chaotic space to the complex, complicated or simple space. You get there by taking action and paying attention to where that takes you.

So what?

The phenomenological space where you situate your homeland security questions will influence the approaches you use to answer those questions. What does your question look like if it is reframed within a different phenomenological space?

The Story So Far

Here I will summarize what I've argued up to this point and why. I will then describe where the argument is going next.

The core question addressed in this essay is how CHDS students can begin to learn about homeland security. I suggested there are at least three ways: a foundational approach, an objective approach, and a subjective approach. Learning about homeland security by starting with foundations may provide academic order, but the order is achieved at the risk of constraining too quickly what homeland security could become. I also believe what I called an objective approach to learning homeland security would ignore the dynamic strategic, policy and operational reality faced by many CHDS participants. The approach I advocate embraces subjectivity (start from where you are) and combines it with the requirement to present and defend subjective observations to others (the transformational dialectic), modifying ideas as needed.

A foundational or an objective approach to learning about homeland security may become appropriate as the field matures.⁶² But I believe it is too soon to consider restricting the conversation about what constitutes homeland security. I suggest one way to “start from where you are” is to identify what you want to learn, what questions you have about homeland security. I connect that approach to the assumptions embedded in andragogy, an adult learning philosophy. I then describe how I use “learning” in this essay, and show the connection between asking questions about homeland security, Kolb’s learning cycle, and Bloom’s Taxonomy.

After linking subjectivity, andragogy, and questions and learning, I shift to discussing the phenomenological context within which learning will occur. I describe the Cynefin framework and illustrate how it can be used to frame questions and inquiry about homeland security.

The next part of the essay describes alternatives available for conducting inquiry into homeland security issues. The discussion is aimed at general inquiry frameworks (also known as inquiring systems), not at specific methods of inquiry, such as case studies, policy analysis, surveys, focus groups, experiments, and so on.

Using Inquiring Systems to Learn

C. West Churchman defined an inquiring system as *“a system of inter-related components for producing knowledge.”*⁶³ Each inquiring system consists of inputs (how inquiry starts; the building blocks of knowledge within that system), an operator (the process used to transform inputs into outputs), outputs (knowledge produced by a particular mode of inquiry) and the guarantor (the criteria to be met to demonstrate the inputs and operator are correct, so a valid output will be produced).

For example, observations (i.e., data) provide the inputs for an **inductive** inquiry system. The operator (i.e., a process for handling data) examines the data to identify any hypotheses, patterns, or theories in the data. If any are discovered, they become the knowledge produced by the inquiring system. The guarantor in this case is the ability to use the hypotheses, patterns or theories to predict future outcomes. **The inductive system focuses on data.**⁶⁴

Here is a homeland security example of an inductive inquiring system. Assume video information is collected from a drug-interdiction operation showing individuals training inside an abandoned school. Based on papers, cell phone records, internet surveillance, and other data, analysts conclude the people are likely planning to attack a middle school in a Midwest American state. Part of the briefing to decision makers about the findings includes analysts describing how they reached their conclusions.

The system collected data, generated a hypothesis, reached a conclusion, and demonstrated the logic they used to reach that conclusion. That is how an inductive inquiring system operates.⁶⁵

In addition to the inductive system, there are at least six other inquiring systems that can be used by someone who wants to learn about homeland security: a deductive inquiry system, a multiview system, a dialectic system, an unbounded system, an abductive system, and an inquiring system based on detour and access.

A more comprehensive treatment of the inductive, deductive, dialectic, multiview, and unbounded systems can be found in works of Churchman,⁶⁶ Mitroff and Linstone,⁶⁷ and Mitroff and Pondy.⁶⁸ Information about the abduction and detour and access systems can be found in the works of Peirce, Fann, Josephson, Ramo, and Jullien.⁶⁹ I will sketch core elements of each approach.⁷⁰

Deduction – A Focus On Theory: Where the inductive inquiring system starts with data and produces a theory, the deductive approach to inquiry begins with a “theory”⁷¹ and uses the elements of the theory to determine what constitutes data. For example, I know one researcher who used complexity theory to model border security. She shaped her perception of the border through the lens constructed from the conceptual categories of complex adaptive system theory.⁷² Based on that deductive frame, the inquiring system defined what counts as data suitable to collect and analyze (for example, data about agents, rules, links, feedback, nodes), and excluded other data as noise (e.g., organizations, policies, people, and so on). The same inquiry process is employed with other deductive frameworks used within homeland security, such as the national incident management system, social identity theory, positioning theory, design theory, catastrophe theory, intelligence cycles, phases of emergency management, the DHS risk formula, the national preparedness framework, socio-techno theory, and comparative theory. Frameworks define what counts as data and what can be ignored.

Multiview – Focus On Stakeholders: Multiview inquiring systems start with the premise there is a distinction between experiencing reality (e.g., applying for and receiving a homeland security grant) and describing that experience. Each stakeholder concerned with a homeland security issue perceives the issue through a lens shaped by multiple experiences and processes.⁷³ For example, congressional districts, DHS, state and local homeland security agencies, budget officials, private sector organizations, vendors, and many other groups stand to gain or lose depending how grant resources are allocated. The perspectives of those stakeholders are important data for anyone who wants to learn how to improve, for instance, the risk formula used to justify awards. A multiview inquiring system incorporates elements of inductive and deductive systems; it differs from those systems by adding more than one stakeholder perspective to the inquiry.

Dialectic – Focus On Conflict: Conflict is the primary metaphor for the dialectic inquiring system. The “marketplace of ideas” is another descriptive image. The purpose of dialectic inquiry may not be to settle issues, but instead to illuminate differences in assumptions, interpretation of data, and conclusions between two or more positions about an issue. While the parties to the issue may not change their positions, dialectic inquiry benefits a third, neutral party⁷⁴ who believes truth rarely resides in one perspective, and who seeks to find a synthesis among positions. The homeland security enterprise is filled with conflict.⁷⁵ Elsewhere I argue homeland security evolves through conflict.⁷⁶ Mapping conflicts can be a useful way to learn comprehensively about homeland security.

Unbounded – Focus On Anything And Everything: The open system is the primary metaphor for the unbounded inquiry system.⁷⁷ It begins with the assumption that no discipline is superior to any other discipline. All inquiring systems are inter and mutually dependent on one another. Every inquiring system presupposes every other inquiring system.⁷⁸

Unbounded inquiry asserts that everything is connected to everything else, so it sets its sight on the big picture. It focuses on a problem “if and only if [the problem] is a member of the set of all other problems.”⁷⁹ Unbounded inquiry focuses on the “*system of interacting problems*, none of which can be formulated independently, let alone solved, independently of all other problems on

which it impacts and which impact on it.”⁸⁰ Illustrative issues include leading in the homeland security enterprise, information sharing, homeland security resource allocation, measuring return on homeland security investments, climate change, immigration, and cyber security.

The unbounded inquiring system is claimed by its advocates to be an appropriate way to explore *wicked problems*,⁸¹ because of its focus on the technological, environmental, and human dimensions of problems. The output from this perspective is thinking that is not constrained by the existing conceptual structures of disciplines and professions. The output is an active search for information that contradicts accepted beliefs.⁸² Unbounded inquiry seeks answers to questions and solutions to problems “that [minimize] the costs of failure rather than [minimize] its likelihood; [and seeks] ... a solution that sacrifices efficiency for resilience; ... that trades avoidance of failure for the ability to survive and recover from failure.”⁸³

Abduction – Focus On Intuition: Abduction means guessing.⁸⁴ It is not a pull-something-out-of-your-rear guess, but rather an educated assessment based on experience and knowledge. Abduction is a type of intuition. Less is understood about the abductive inquiring system than the previous systems because only recently have intuitive perceptions and judgments been at least quasi-legitimized.⁸⁵

There are problems with abduction, as with all inquiring systems.⁸⁶ The line is fragile between accurate intuition and wishful thinking. In 2007, DHS Secretary Chertoff was criticized for telling the Chicago Tribune he had a gut feeling al Qaeda was going to attack the U.S. that summer:

*Chertoff based his assessment on a personal hunch, admitting that there was not enough evidence of a pending attack to raise the nation’s threat level. Rather, Chertoff had studied terrorist patterns and some undisclosed intel to come up with his determination.*⁸⁷

Behavioral economists, neuro-psychologists, decision theorists and others point out the cognitive barriers to thinking objectively and accurately.⁸⁸ Abduction is difficult.

But sometimes intuition and gut feelings work effectively as a mode of inquiry. In August 2001, something bothered Customs official Jose Melendez-Perez when Mohammed al-Kahtani tried to come into the country through Florida. Melendez-Perez did not allow the person assumed now to have been the 20th hijacker to enter.⁸⁹

On December 14, 1999, U.S. Customs inspector Diana Dean thought Ahmed Ressam was acting “hinky” as he tried to enter the U.S. from Canada. Responding to that hunch helped prevent the “Millennium Bomber” from attacking the Los Angeles Airport.⁹⁰

Experienced practitioners often rely on their “inner tuition.”⁹¹ Abductive talent can be adapted to learn about homeland security. Go with your gut, but have it be an educated gut, a best guess; make it clear what your guess is; expose your ideas to others and look for confirming and opposing evidence.

Detour And Access – Beating Around The Bush: *“One should not be too straightforward. Go and see the forest. The straight trees are cut down, the crooked ones are left standing.”*
Chanakya – Fourth Century, B.C.

The previous inquiring systems searched directly for actionable knowledge, for truth. Conceptually, they are rooted in western traditions of argumentation that emphasize “getting to the point.” The detour and access inquiring system aims to approach knowledge and truth indirectly. The system emerged from studies of how art, poetry, and philosophy were used in China to access and influence power.⁹²

I will not pretend to know as much about this inquiring system as I would like to know. For the purposes of this introduction, I’ll paraphrase material from a Francois Jullien text.⁹³

Detour and access focuses on both (not either/or) field and ground, object and context. It seeks oblique, indirect, and suggestive meaning to explore how shape-shifting techniques of detour provide access to subtler knowledge and meanings than can be obtained through the direct approaches that characterize most Western inquiry. Jullien argues indirect speech “yields a complex mode of indication, open to multiple perspectives and variations, infinitely adaptable to particular situations and contexts.” It is a mode of inquiry that has advantages and disadvantages in contexts where “absolute truth is absent.”

The strategy underlying the 2013 National Preparedness Report may be an illustrative example⁹⁴ of the detour and access inquiring system. Congress insists DHS document the “progress the Nation has made in building, sustaining, and delivering the 31 core capabilities outlined in the National Preparedness Goal across all five mission areas identified in Presidential Policy Directive 8 (PPD-8): Prevention, Protection, Mitigation, Response, and Recovery.”⁹⁵ The way I read the Preparedness report, the authors are telling Congress there is no single way to measure national or state progress.⁹⁶ I think the 2013 report can be further read to suggest, indirectly and obliquely, the authors believe it may never be possible to measure accurately national preparedness. The authors of the 2013 Report do not, and probably cannot, come out and say that directly. They must detour around that conclusion if they are to retain access to policymakers.⁹⁷

So what?

This section argued there are at least seven approaches to structuring inquiry. Each approach is a tool that can be used by people who want to learn about homeland security.

Induction: *what data do you want to know?*

Deduction: *what theories can you use?*

Multiview: *what are the data and theories employed by stakeholders with an interest in an issue?*

Dialectic: *for any particular homeland security issue you care about, what are the arguments, and the pros and cons for the various positions?*

Unbounded: *what are the meta-issues and problems (with their attendant data, theories, stakeholders and arguments) that transcend and overlap specific homeland security topics and questions?*

Abduction: *what does your experience and intuition tell you about what you are trying to learn?*

Detour and access: *how can you approach learning about a homeland security issue by attending both to the object of your inquiry and to its surrounding context?*

And Then There is Truth

How will you know when you have learned what you want to know about homeland security? Once you have applied the various inquiring systems to the homeland security questions you care about, how will you know when you have learned the truth?

In the example I used earlier about VBIED preparedness, is one view about VBIED preparedness more correct than another? What is the *true* perspective?

Arguments can be constructed to support -- more or less convincingly -- each of the four claims⁹⁸ about how to measure VBIED preparedness. The “truth” of those claims can be assessed against different criteria.

Asked in a more general way, what is the truth about homeland security (pick your specific issue), and how can we know it?

I have written elsewhere about the role of truth in homeland security.⁹⁹ I described three kinds of truth: correspondence, coherence and pragmatic.

Correspondence truth means there is a one-to-one relationship between the phenomenon being investigated and the language used to describe that phenomenon. Truth corresponds to the thing being described. If I want to learn how to create an interoperable radio system for first responders, there are comparatively easy ways to know the truth about whether I’ve accomplished that goal or not. For this example, the reality of radio communication will correspond to the language used to describe whether I have succeeded: e.g., I can either talk with someone from another agency or

I cannot. Correspondence truth seems to work best (within limits) in the world of material reality. It is a truth that cannot easily be talked around or wished away.

Coherence truth is a dominant mode of social truth. It refers to agreements about the world (knowledge) that are internally consistent, within a particular community.¹⁰⁰ For example, beliefs about what disciplines should be represented in a fusion center are guided by this mode of truth. Richard Rorty offers an aphorism that illustrates coherence truth, and captures its socially-constructed nature: “*Truth is what your colleagues let you get away with.*”¹⁰¹

Pragmatic truth is about getting the job done. What the “job” is depends on the situation. For learning, pragmatic truth is when you know enough about your initial question to build on this new knowledge.¹⁰²

Here is an example using all three types of truth.

What is homeland security? From the perspective of *correspondence* truth, the answer would depend on the relationship between what people say they are doing when they are doing homeland security work (language) and how they behave (reality). From a *coherence* view, the answer depends on what language community one is in. The answers can be (and almost always are) different if one is talking, for example, to emergency managers, firefighters, DHS leaders, professors, travelers going through an airport, counterterrorism officials, or children who fear they will be deported. From a *pragmatic* truth perspective, homeland security is whatever it has to be for me to obtain the resources I need to prevent, respond, recover from and mitigate the threats faced by my community of interest.

So what?

The definition of learning used in this paper is “transforming experience into knowledge.” How do you know when you have approached the truth of what you learned? This section offers three checks: does what you know correspond to reality as you understand it? Does what you know cohere with what other people you respect believe they know? Does what you know help you accomplish your homeland security mission?

The Homeland Security Inquiry Matrix

The advantage of a foundational approach is that it is a comparatively easy way to impose conceptual order on the study of homeland security. As a student, you read and remember the claims of others, and look to find a link between what you’ve learned and the practical responsibilities and interests you have in the homeland security enterprise.

The much more messy and ambiguous start-from-where-you-are approach is filled with uncertainty and — if you enjoy learning — adventure.

The tools for the adventure include subjectivity, andragogy, questions, trial and error learning, a phenomenological approach to homeland security represented by the Cynefin framework,

multiple inquiring systems, and several ways to determine the truth of what you have learned. To those tools, add the experiences you had before you started your academic study of homeland security, the ideas you are exposed to in classes, in readings, in exercises, in writing assignments, and in discussions.

These tools lead me to postulate a homeland security inquiry matrix (illustrated below). The rows describe the inquiring systems: inductive, deductive, multiview, dialectic, unbounded, abduction, detour and access. The columns hold the types of truth: correspondence, coherence, and pragmatic.

| Inquiry System ↓ Truth → | Correspondence | Coherence | Pragmatic |
|--------------------------------|----------------|-----------|-----------|
| Induction | | | |
| Deduction | | | |
| Multiview | | | |
| Dialectic | | | |
| Unbound | | | |
| Abduction | | | |
| Detour & Access | | | |

Homeland Security Inquiry Matrix

Figure 5: Homeland Security Matrix

Now consider what you want to learn about homeland security, the questions you have. Conceptually, each cell in the matrix could stimulate ideas about how to learn what you want to learn, and how to know when you've learned it.

Conclusion

The core question addressed in this essay is how CHDS students - and maybe other interested people - can begin to learn about homeland security. Learning about homeland security by starting with institutionally approved, rather than objectively tested and validated, foundations may provide academic order, but the order is achieved at the risk of constraining too quickly what homeland security could become. An alternative approach embraces subjectivity (start from where you are) and combines it with the requirement to present and defend subjective observations to others (the transformational dialectic).

I do not believe we can yet eliminate or avoid subjectivity in determining the roots and bounds of homeland security. I want to expand who gets to decide what the foundations of homeland security are, and to encourage reflective practitioners to construct and share insights derived from their own foundations.

A version of the uncertainty principle asserts one cannot measure both the position and the movement of a physical system.¹⁰³ Metaphorically, I believe the same is true when it comes to learning about homeland security. People learning about homeland security can emphasize where our proto-discipline used to be and is today, or they can focus more on the opposing pole to help create where it could go. The approach outlined in this essay points to a method of keeping homeland-security knowledge alive and continuously evolving. It is one answer to the question of how best to learn about homeland security.

So what?

“Education is not the filling of a pail, but the lighting of a fire.” In my view, for experienced practitioners a foundation approach to homeland security “fills a pail.” That may be enough for some educational purposes.

Starting from where you are, learning what you need to learn, and exposing your ideas to your colleagues might light a fire that could help shape the future of homeland security.

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Notes

- 1 The proverb is frequently attributed to Yeats. I have not found any evidence Yeats actually wrote those words. According to <http://quoteinvestigator.com/2013/03/28/mind-fire/>, Plutarch is more likely the originator: “For the mind does not require filling like a bottle, but rather, like wood, it only requires kindling to create in it an impulse to think independently and an ardent desire for the truth.”
- 2 One reviewer suggested I broaden my audience to include other graduate and maybe undergraduate programs. I have no evidence the approach I’m suggesting would work anywhere but CHDS. However, I believe the approach could be useful to other people who are looking for a way to start learning about homeland security.
- 3 I use “foundational approach” to mean assertions about what constitutes the basic concepts and ideas in homeland security. I discuss this term more fully later in the essay.
- 4 Donald A. Schon, *The Reflective Practitioner: How Professionals Think In Action*, 1st ed. (New York: Basic Books, 1984).
- 5 For an analysis of what is required for a discipline to be “firmly established,” see the disciplinary matrix discussion in Thomas S. Kuhn and Ian Hacking, *The Structure of Scientific Revolutions*, 4th ed. (Chicago; London: The University of Chicago Press, 2012), 181-186.
- 6 Kuhn, in *The Structure of Scientific Revolutions* (p 143), claims that having textbooks is one of the indicators a field of study is becoming a discipline.
- 7 For representative examples, see CW Productions LTD, *Homeland Security: Safeguarding the U.S. from Domestic Catastrophic Destruction*, eds. Richard White, Tina Bynum, and Stan Supinski (BookBaby, 2016); Clarence Augustus Martin, *Understanding Homeland Security*, 1st edition (Los Angeles: SAGE Publications, Inc, 2014); Willard M. Oliver, Nancy E. Marion, and Joshua B. Hill, *Introduction To Homeland Security: Policy, Organization, and Administration*, (Sudbury: Jones & Bartlett Learning, 2014); Jane A Bullock, George D Haddow, and Damon P Coppola, *Introduction to Homeland Security* (Boston, MA: Butterworth-Heinemann, 2012); Charles P Nemeth, *Homeland Security: An Introduction to Principles and Practice* (Boca Raton, FL: CRC Press, 2013); Larry K Gaines and Victor E Kappeler, *Homeland Security* (Boston: Prentice Hall, 2012); Mark Sauter and James Jay Carafano, *Homeland Security: A Complete Guide* (New York: McGraw-Hill, 2012); Jane Bullock, George Haddow, and Damon P. Coppola, *Homeland Security: The Essentials*, 1st edition (Oxford: Butterworth-Heinemann, 2012).
- 8 One aspect of this approach is illustrated in a 2018 paper by Ramsey and Renda-Tenali. They describe 8 “knowledge domains [for undergraduate degree programs in homeland security] ... that collectively define the intellectual scope of the discipline” (p 7 & 8). The domains – according to the consensus judgment of nine subject matter experts -- are intelligence, emergency management, law and policy, critical infrastructure, strategic planning and decision making, terrorism, human and environmental security, [and] risk analysis and [risk] management. James D. Ramsay and Irmak Renda-Tanali, “Development of Competency-Based Education Standards for Homeland Security Academic Programs,” *Journal of Homeland Security and Emergency Management* 15, no. 3 (September 8, 2018), <https://doi.org/10.1515/jhsem-2018-0016>. In 2006 a colleague and I made a preliminary, but not as comprehensive, effort to construct homeland security knowledge domains: Christopher Bellavita and Ellen Gordon, “Changing Homeland Security: Teaching the Core,” *Homeland Security Affairs* 2, Article 1 (April 2006), <https://www.hsaj.org/articles/172>.
- 9 Kuhn, *Structure of Scientific Revolutions*, 80.
- 10 An academic discipline minimally requires: a set of problems to work on; a body of knowledge to apply to those problems; scientifically legitimate research about the problems; textbooks that aggregate the core knowledge of the discipline; and programs to educate students at the undergraduate and graduate levels, including developing PhD programs to advance knowledge in the field. See Christopher Bellavita, “Changing Homeland Security: In 2010, Was Homeland Security Useful?” *Homeland Security Affairs* 7, Article 1 (February 2011), <https://www.hsaj.org/articles/52>. For an argument that homeland security is becoming a discipline, see Michael D. Falkow, “Does Homeland Security Constitute An Emerging Academic Discipline?” 2013, <http://calhoun.nps.edu/public/handle/10945/32817>. For another perspective, see William V. Pelfrey and William D. Kelley, “Homeland Security Education: A Way Forward,” *Homeland Security Affairs* 9, Article 3 (February 2013), <http://www.hsaj.org/?article=9.1.3>.

- 11** Shawn Reese, April 3, 2012, “Defining Homeland Security: Analysis and Congressional Considerations (R42462),” Congressional Research Service. One can also note the national homeland security agenda in 2001 differed significantly from the 2018 focus on catastrophic climate events, immigration, cybersecurity, and biotechnology, among other topics. For a comprehensive, although conventional, outline of contemporary homeland security issues, see William Painter, “Selected Homeland Security Issues in the 115th Congress,” Congressional Research Service, May 11, 2017.
- 12** Christopher Bellavita, “Changing Homeland Security: What is Homeland Security?” *Homeland Security Affairs* 4, Article 1 (June 2008), <http://www.hsaj.org/?article=4.2.1>.
- 13** This is a preliminary conclusion. I am still testing the claim by examining widely-adopted homeland security textbooks and reading lists.
- 14** For an exemplar of this approach, see the thoughtful work by Robert McCreight, “A Pathway Forward in Homeland Security Education: An Option Worth Considering and the Challenge Ahead,” *Journal of Homeland Security and Emergency Management* 11, no. 1 (January 21, 2014), doi:10.1515/jhsem-2013-0099. For others, see the textbooks identified in note #7, and the recent contribution by Ramsay and Irmak Renda-Tanali, “Development of Competency-Based Education Standards for Homeland Security Academic Programs.”
- 15** Christopher Bellavita, “Waiting For Homeland Security Theory,” *Homeland Security Affairs* 8, Article 15 (August 2012) <http://www.hsaj.org/?article=8.1.15> 7-8.
- 16** For an extended discussion of a discipline’s foundations, see the disciplinary matrix section in Thomas S. Kuhn and Ian Hacking, *The Structure of Scientific Revolutions*, 4th ed., 181-186.
- 17** Here are some textbook examples of foundational knowledge in physics and engineering. They illustrate how foundational homeland security knowledge might (one day) be packaged: Saeed Moaveni, *Engineering Fundamentals: An Introduction to Engineering*, 5th edition, (Boston: Cengage Learning, 2015); David Halliday, Robert Resnick, and Jearl Walker, *Fundamentals of Physics Extended*, 9th edition, (Hoboken, NJ: Wiley, 2010); and the more contemporary *Foundations of Physics: An International Journal Devoted to the Conceptual Bases and Fundamental Theories of Modern Physics*, <https://link.springer.com/journal/volumesAndIssues/10701>.
- 18** As discussed later, the Cynefin framework uses “simple” and “complicated” to mean phenomena characterized by known or prospectively knowable cause-effect relationships.
- 19** See Habermas’ postmodernist critique: <http://plato.stanford.edu/entries/postmodernism/>: “Habermas seeks to rehabilitate modern reason as a system of procedural rules for achieving consensus and agreement among communicating subjects.” Offering “procedural rules” is what I’m trying to do with both the emphasis on subjectivity and the transformational dialectic.
- 20** One reviewer of a previous draft suggested I might never be convinced textbooks could be superior to the approach I advocate. I think textbooks can be useful in certain educational contexts. I do not object to using textbooks as a part of one’s learning tools. I am arguing against CHDS students and other experienced practitioners using textbooks to begin their learning. I would welcome an experiment testing the scope, depth and utility of alternative ways to learn homeland security in a classroom – graduate or undergraduate.
- 21** One reviewer recommended I “briefly address [the] stigma associated with subjectivity.” I believe consciously embracing subjectivity enables the collective learning described in this essay. I recognize, however, other people hold the position that subjectivity in inquiry is to be avoided. Someone interested in this topic might start with Subjectivism, Sage Encyclopedia of Qualitative Research Methods, (Thousand Oaks: Sage, 2008) available at <http://www.sonic.net/~cr2/subjectivism.htm>; the discussion of subjectivity in Steinar Kvale, “Ten Standard Objections to Qualitative Research Interviews,” *Journal of Phenomenological Psychology* 25, no. 2 (January 1, 1994): 147–173, doi:10.1163/156916294X00016; or Paul Diesing, “Subjectivity and Objectivity in The Social Sciences,” *Philosophy of the Social Sciences* 2 (1):147-165 (1972). The citations in note 22 discuss aspects of subjectivity related to “stigma.”
- 22** Jonathan Haidt, *The Righteous Mind: Why Good People Are Divided by Politics and Religion* (New York: Pantheon, 2012), 55, 97-99; See also, Daniel Kahneman, *Thinking, Fast and Slow*, 1st ed. (New York: Farrar, Straus and Giroux, 2011); Peter L. Berger and Thomas Luckmann, *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (New York: Anchor, 1967); Carl Ratner, “Subjectivity and Objectivity in Qualitative Methodology,” *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research* 3, no. 3 (September 30, 2002), <http://www.qualitative-research.net/index.php/fqs/article/view/829>. See <http://www.qualitative-research.net/index.php/fqs/article/view/822/1784> for a summary review of the topic.

- 23** Orion F. White, Jr. and Cynthia J. McSwain, “Transformational Theory and Organizational Analysis,” In *Beyond Method: Strategies for Social Research*, ed. Gareth Morgan, 292–305. (Thousand Oaks: Sage Publications, Inc, 1983). The process, as I interpret it, is cyclical in the sense used by Graff and his colleagues in describing the continuous conversation of scholarship (in Gerald Graff, Cathy Birkenstein, and Russel Durst, *They Say / I Say: The Moves That Matter in Academic Writing*, 3rd ed. (New York: W.W. Norton & Co., 2014): 3-4.) White and McSwain use transformational largely from a psychological perspective. That idea goes beyond what I want to do in this paper. On the utility of continuing the transformation process, see also Aumann’s agreement theorem: “A ... 1976 theorem of Aumann asserts that honest, rational Bayesian agents with common priors will never agree to disagree” on their opinions about any topic. Scott Aaronson, (2005), “[The Complexity of Agreement](#),” Proceedings of ACM STOC: 634–643, doi:10.1145/1060590.1060686. ISBN 1-58113-960-8. Retrieved 2010-08-09.
- 24** I have heard it argued that “starting from where you are” risks missing something important. In my experience (and neglecting for now how “important” is determined), if the information missed is important, the student will eventually learn it.
- 25** Bloom’s taxonomy is discussed later in this essay. Benjamin Samuel Bloom, *Taxonomy of Educational Objectives: The Classification of Educational Goals Handbook I, Handbook I*, (New York; New York; London: McKay ; Longman, 1956). Two of the text books I reviewed to support the claim about levels (Jane A Bullock, George D Haddow, and Damon P Coppola, *Introduction to Homeland Security* and Mark Sauter and James Jay Carafano, *Homeland Security: A Complete Guide*) started each chapter with the lower-level Bloom’s Taxonomy description of “what you will learn.” Compare this approach to learning to that espoused in William V. Pelfrey and William D. Kelley, “Homeland Security Education: A Way Forward.” *Homeland Security Affairs* 9, Article 3 (February 2013) <http://www.hsaj.org/?article=9.1.3> .
- 26** Knowing what the four failures were that led to the 9/11/01 attack is a different kind of learning than understanding, for example, what the Commission meant by failure of imagination, or whether the Commission got it its critique correct. National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report: Final Report of the National Commission on Terrorist Attacks Upon the United States*, 1st ed (New York: Norton, 2004). Philip Shenon, *The Commission: The Uncensored History of the 9/11 Investigation* (New York: Twelve, 2009). I suspect how professors use textbooks can encourage learning at all six levels. I would welcome seeing evidence about how and with what results this is done.
- 27** “Letting a hundred flowers blossom and a hundred schools of thought contend is the policy for promoting progress in the ... sciences.... [I]t is harmful to the growth of ... science if administrative measures are used to impose one particular ... school of thought and to ban another. Questions of right and wrong in ... science should be settled through free discussion in ... scientific circles and through practical work in these fields. They should not be settled in an over-simple manner.” Mao Tse-tung, “On the Correct Handling of Contradictions among the People,” in *The Selected Works of Mao Tse-tung*, Vol. V (Peking, China: Foreign Language Press, 1957), http://www.marxists.org/reference/archive/mao/selected-works/volume-5/mswv5_58.htm. Mao was talking about handling contradictions in a socialist society, but his point has relevance for homeland security — unlike Mao’s suggestion in the same commentary about what to do with people who disagree with mainstream ideas: “What should our policy be towards non-Marxist ideas?” he asked. “As far as unmistakable counter-revolutionaries and saboteurs of the socialist cause are concerned, the matter is easy, we simply deprive them of their freedom of speech.” [This citation taken from Christopher Bellavita and Ellen Gordon. “Changing Homeland Security: Teaching the Core.” <https://www.hsaj.org/articles/172>.] A colleague pointed out Mao’s “deprivation rule” can be used when the good guys are doing the depriving: “Twitter shuts down 125,000 Isis-linked accounts,” <http://www.independent.co.uk/life-style/gadgets-and-tech/news/125000-isis-linked-accounts-suspended-by-twitter-a6857371.html> .
- 28** I am using the word “us” to mean people who care about homeland security education.
- 29** Barry Buzan, Ole Wver, and Jaap De Wilde, *Security: A New Framework for Analysis*,(Boulder, Colo: Lynne Rienner, 1997) describes a related definitional debate in the broader security studies field. The “narrow” view of security studies gives primacy to “the military element and the state in the conceptualization of security.” The “wide” view aims “to extend security ... thinking into the non-traditional sectors (economic, societal, environmental).” The comparative framework they offer can be applied, with modifications, to homeland security. The narrow view of homeland security emphasizes terrorism and catastrophes. A wider view expands thinking into other domains that affect the nation’s safety and security. For an example of a wider view of homeland security see Wayne Porter and Mark Mykleby, *A National Strategic Narrative* (Woodrow Wilson International Center for Scholars, August 2011).

- 30** M.S. Knowles, et al., *Andragogy in Action*, (San Francisco: Jossey-Bass, 1984); See also M.K. Smith, (2002) “Malcolm Knowles, Informal Adult Education, Self-direction and Andragogy,” *The Encyclopedia Of Informal Education*, www.infed.org/thinkers/et-knowl.htm; <http://infed.org/mobi/malcolm-knowles-informal-adult-education-self-direction-and-andragogy/>. “Mature learners” typically is interpreted to mean adults. I do not know why this approach could not also be extended into other age groups. Colleagues who teach elsewhere tell me it would likely not work with undergraduates.
- 31** To illustrate this claim, consider the questions that could be generated from an andragogical perspective about a cyber-security threat to critical infrastructure: 1) what do you want to learn, why, and how? 2) what do you already know about the topic?, 3) what need do you have to learn about it?, 4) what problems are addressed through the questions you ask about it? and 5) is there something personal that drives you to want to know?
- 32** A reviewer of an earlier draft asked about the purpose of the text box insets. Lyndon Johnson was once briefed about the Middle East by several professors. After the briefing he is alleged to have said “Therefore, what?” (<https://goo.gl/qwSA4Y>) This essay is written primarily for graduate students (although it may also be useful to some undergraduates). In my experience with practitioners, they can take just so much conceptualizing before they want to know “so what?” What I aim to do with the text insets is to break the stream of theoretical language, and operationalize the ideas in the prior section(s) by suggesting to the readers how they can use the information.
- 33** For examples, see <http://www.learning-theories.com/> and http://en.wikibooks.org/wiki/Learning_Theories/Adult_Learning_Theories.
- 34** David A Kolb, *Experiential Learning: Experience as the Source of Learning and Development*, 2nd Edition (Pearson Education, New Jersey, 2015), 49. Kolb’s phrase is “Learning is the process whereby knowledge is created through the transformation of experience.”
- 35** In Bloom’s taxonomy (*Taxonomy of Educational Objectives: The Classification of Educational Goals*), “knowledge” is demonstrated by recalling facts. I am using “knowledge” to mean beliefs that bear an appropriate connection (whether causal, coherent, or practical) to the subject of inquiry, a connection that depends on the “mode of truth” (discussed later in the essay). See Ted Honderich, *The Oxford Companion to Philosophy* (Oxford; New York: Oxford University Press, 2005), 285 (facts), 478-479 (knowledge), 873 (social construction), 874 (social facts).
- 36** Elinor Ostrom, “A General Framework for Analyzing the Sustainability of Social–ecological Systems,” *Science* 325, no. 5939 (2009): 420. See the discussion of the deductive inquiry system, below, for more on frameworks.
- 37** Kolb, *Experiential Learning*, 51.
- 38** Benjamin Samuel Bloom, *Taxonomy of Educational Objectives*.
- 39** Graphic from http://aahlearning.blogspot.com/2013_10_01_archive.html (accessed August 2019).
- 40** Graphic from https://serc.carleton.edu/NAGTWorkshops/time/learning_goals.html (accessed August 2019). The revised version of Bloom’s Taxonomy moves evaluation to the penultimate position at the top of the pyramid, and moves synthesis to the top, rebranding it as creativity.
- 41** Raphael D Sagarin and Terence Taylor, eds., *Natural Security: A Darwinian Approach to a Dangerous World* (Berkeley: University of California Press, 2008).
- 42** For the purposes of this paper, I’m using phenomenology to mean “making sense of a situation in a way that allows one to be effective in achieving a desired goal” (suggested by David Snowden). A more precise discussion of the term can be found in Dermot Moran, *Introduction to Phenomenology* (London; New York: Routledge, 2000): 37-41: “Explanations are not to be imposed before the phenomena have been understood from within.”
- 43** D Snowden and M Boone, “A Leader’s Framework for Decision Making,” *Harvard Business Review*, November 2007; C Kurtz and D Snowden, “The New Dynamics of Strategy: Sense-making in a Complex and Complicated World,” *IBM Systems Journal* 42, no. 3 (2003).

- 44** I put “realities” in quotes to suggest, while skipping over it in this paper, it would be useful to discuss material and socially-constructed reality in homeland security.
- 45** Snowden and Boone provide an example of using the framework in a public safety context in “A Leader’s Framework for Decision Making,” 1,8.
- 46** The graphic comes from [https://en.wikipedia.org/wiki/Cynefin_framework#/media/File:Cynefin_framework,_February_2011_\(2\).jpeg](https://en.wikipedia.org/wiki/Cynefin_framework#/media/File:Cynefin_framework,_February_2011_(2).jpeg). There are numerous graphical variations of the Cynefin framework. The history of the model’s development can be found here: <http://old.cognitive-edge.com/wp-content/uploads/2010/08/The-Origins-of-Cynefin-Cognitive-Edge.pdf>.
- 47** Since 2014, David Snowden, the developer of Cynefin, changed the word “simple” to “obvious” in the model. In this essay I use simple.
- 48** Weick calls this retrospective sensemaking (see, for example, Karl E Weick, *Making Sense of the Organization* (Malden, Mass. Blackwell, 2009). For a very readable introduction to the complexity literature see (the first half of) Melanie Mitchell, *Complexity: A Guided Tour* (Oxford University Press, USA, 2009); and John H. Miller and Scott E. Page, *Complex Adaptive Systems: An Introduction to Computational Models of Social Life* (Princeton University Press, 2007); For a pragmatically philosophical introduction, see Paul Cilliers, *Complexity and Postmodernism: Understanding Complex Systems*, 1st ed. (Routledge, 1998).
- 49** <https://dotsub.com/view/22a4f971-77cd-4863-8aa3-c2170f93db01> (accessed August 10, 2019). Jim Dwyer and Kevin Flynn, *102 Minutes: The Untold Story of the Fight to Survive Inside the Twin Towers* (New York: Times Books, 2006).
- 50** Gedeon Naudet, James Hanlon, and Jules Naudet, 2010. 9/11. Paramount. One specific example of chaos as described in the text can be viewed (starting at the 46 minute mark, through 51) at <https://www.youtube.com/watch?v=YXYCdfoz0wQ> (accessed August 10, 2019). A reviewer suggested another useful illustration of the chaotic frame in Terri M. Adams, and Larry D. Stewart, “Chaos Theory and Organizational Crisis: A Theoretical Analysis of the Challenges Faced by the New Orleans Police Department During Hurricane Katrina,” *Public Organization Review* 15, no. 3 (September 2015): 415–31. <https://doi.org/10.1007/s11115-014-0284-9>.
- 51** Simple in Cynefin terms.
- 52** Although there are many ideas; see for example, Prepare for a Vehicle-Borne Improvised Explosive Device (VBIED)/Suicide Vehicle Borne IED (SVIED)/Person-Borne IED (PBIED) (05-2-3092), p 2-324 – 2-325, <https://rdl.train.army.mil/catalog/go/100.ATSC/9AE04EFF-0143-4FEF-AE38-5BA288A54EE1-1304110136444>.
- 53** Jeffrey Kaliner, “When Will We Ever Learn? The After Action Review, Lessons Learned and the Next Steps in Training and Educating the Homeland Security Enterprise for the 21st Century,” 2013, <http://calhoun.nps.edu/public/handle/10945/34683>.
- 54** See, for example, STATEMENT OF RICHARD SERINO, DEPUTY ADMINISTRATOR, FEDERAL EMERGENCY MANAGEMENT AGENCY, U.S. DEPARTMENT OF HOMELAND SECURITY, BEFORE THE COMMITTEE ON HOMELAND SECURITY AND GOVERNMENTAL AFFAIRS, U.S. SENATE WASHINGTON, D.C., “LESSONS LEARNED FROM THE BOSTON MARATHON BOMBINGS: PREPARING FOR AND RESPONDING TO THE ATTACK” [sic for the caps]. Submitted By Federal Emergency Management Agency, 500 C Street, S.W. Washington, D.C. 20472 JULY 10, 2013. 2 (viz “They weren’t the only responders.”) http://www.fema.gov/media-library-data/20130726-1923-25045-1176/lessons_learned_from_the_boston_marathon_bombings_preparing_for_and_responding_to_the_attack.pdf.
- 55** This reflects an idea frequently attributed to Lao Tzu, “If you tell me, I will listen. If you show me, I will see. But if you let me experience, I will learn.”
- 56** <https://web.archive.org/web/20131127015315/http://www.hlswatch.com/2013/08/13/crossing-over-into-canada/> (accessed August 10, 2019).
- 57** Cilliers, *Complexity and Postmodernism*, viii.

- 58** “Report of the Commission to Assess the Threat to the United States from Electromagnetic Pulse (EMP) Attack,” Volume 1: Executive Report, 2004, 6; Also, https://www.ferc.gov/industries/electric/indus-act/reliability/cybersecurity/ferc_executive_summary.pdf .
- 59** Cilliers, *Complexity and Postmodernism*, viii-ix; http://en.wikipedia.org/wiki/Sociotechnical_system .
- 60** This is Tim Harford’s theme in *Adapt: Why Success Always Starts with Failure* (New York: Farrar, Straus and Giroux, 2011). A TED talk of the book’s core idea can be seen at http://www.ted.com/talks/tim_harford.html. Note that the distinction between complicated and complex is not easily apparent. In my view, these are the two domains that stimulate homeland security evolution. Complicated and complex are primarily the domains of wicked problems (see note #81). Action in the chaotic domain can trigger punctuated evolution (equilibrium) in a system.
- 61** For the purposes of this presentation, the chaotic inquiry frame is equivalent to the disordered space in the Cynefin framework, the space of not knowing what quadrant you are in.
- 62** Elsewhere I suggested three tests for determining when the field has matured enough to justify a foundational approach: does a “homeland security perspective” help solve any of the field’s enduring problems? Are the ideas derived from that perspective superior to the approaches championed by other disciplines in the homeland security enterprise? What are the notable achievements – either practical or conceptual – derived from a “homeland security perspective?” Christopher Bellavita, “Changing Homeland Security: In 2010, Was Homeland Security Useful?”
- 63** Ian I Mitroff, *The Unbounded Mind: Breaking the Chains of Traditional Business Thinking* (New York: Oxford University Press, 1993) 29, citing C. West Churchman, *The Design of Inquiring Systems: Basic Concepts of Systems and Organization* (New York: Basic Books, 1971).
- 64** For an extended discussion of the role of induction in social science, see Barney G. Glaser and Anselm L Strauss, *The Discovery of Grounded Theory; Strategies for Qualitative Research, Observations* (Chicago: Aldine Pub. Co, 1967). For an excellent example of the inductive inquiry system applied to a homeland security system, see the Naval Postgraduate School/Center for Homeland Defense and Security *K-12 School Shooting Database* at <https://www.chds.us/ssdb/>.
- 65** Ian I Mitroff, *The Unbounded Mind: Breaking the Chains of Traditional Business Thinking*, 31. Induction is also the primary way I learned this method of teaching homeland security.
- 66** C. West Churchman, *The Design of Inquiring Systems*.
- 67** Ian I Mitroff, *The Unbounded Mind*.
- 68** Ian I. Mitroff and Louis R. Pondy, “On the Organization of Inquiry: A Comparison of Some Radically Different Approaches to Policy Analysis,” *Public Administration Review* 34, no. 5 (September 1, 1974): 471–479, doi:10.2307/975094.
- 69** Charles S. Peirce, *Collected Papers of Charles Sanders Peirce* (Cambridge: Harvard University Press, 1931): 136-143; K. T. Fann, *Peirce’s Theory of Abduction* (Dordrecht: Springer Netherlands, 1970); John R Josephson and Susan G Josephson, *Abductive Inference: Computation, Philosophy, Technology* (Cambridge; New York: Cambridge University Press, 1996); Joshua Cooper Ramo, *The Age of the Unthinkable: Why the New Global Order Constantly Surprises Us and What to Do About It*, 1st ed. (New York: Little, Brown and Company, 2009); Francois Jullien, *Detour and Access: Strategies of Meaning in China and Greece*, trans. Sophie Hawkes (MIT Press, 2004); François Jullien, *The Book of Beginnings*, Translated by Jody Gladding, Translation edition, (New Haven: Yale University Press, 2016) .
- 70** A thorough presentation of these inquiring systems should include comparisons among the seven, and a description of the problems associated with each one.
- 71** For a brief discussion about the many uses of the word “theory,” see citation number 9 in Christopher Bellavita, “Waiting For Homeland Security Theory.” In the current essay, I am using theory to refer to a generalization, hypothesis, pattern or any framework that helps discriminate between signal and noise.
- 72** I do not believe there is a “single” theory of complex adaptive systems. I’m using the single construction in the example for illustration purposes.

- 73** For another statement of this system, see the discussion of motivated reasoning in Jonathan Haidt, *The Righteous Mind: Why Good People Are Divided by Politics and Religion* (New York: Pantheon, 2012), 98.
- 74** For example, a person who wants to learn about homeland security.
- 75** As of August 2019, homeland security policy conflicts can be seen within the following topic areas: refugee policy, border security, Immigration and Customs (ICE) detention and removal procedures, election security, cyber attacks, wildfires, drought, flooding, climate change, child immigrants, visa overstays, social media abuses, pandemic threats, encryption, white nationalism, biotechnology, radicalization, mass casualty criminal events, loss of confidence in government institutions, foreign threats, automation, health care spending, the national debt, domestic political divisions, trust between police and communities, and domestic use of drones.
- 76** I make this argument in Christopher Bellavita, “Homeland Security in the United States: Lessons from the American Experience,” in *Homeland Security Organization in Defence Against Terrorism*, ed. J Charvat (Amsterdam: IOS Press, 2012), 36.
- 77** For an introductory discussion about open systems and national defense and security, see Wayne Porter and Mark Mykleby, *A National Strategic Narrative* (Woodrow Wilson International Center for Scholars, August 2011). A comprehensive review of the evolution of systems theory ideas can be found at Alex J. Ryan, “What Is a Systems Approach?” arXiv Preprint arXiv:0809.1698 (2008), <http://arxiv.org/abs/0809.1698>.
- 78** Mitroff, *The Unbounded Mind*: 91-92.
- 79** Mitroff, citing Churchman, 109.
- 80** Ibid., 139, citing Russell Ackoff, *Redesigning the Future*, (New York, John Wiley, 1974).
- 81** H Rittel and M Webber, “Dilemmas in a General Theory of Planning,” *Policy Sciences* 4 (1973): 155–169.
- 82** Mitroff, *The Unbounded Mind*, 127.
- 83** Ibid., 116.
- 84** Robert Burch, “Charles Sanders Peirce,” *The Stanford Encyclopedia of Philosophy* (Summer 2013 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/sum2013/entries/peirce/> .
- 85** For discussions to support this legitimization claim, see Timothy D. Wilson, *Strangers to Ourselves: Discovering the Adaptive Unconscious*, New Ed. (Belknap Press, 2004); Gary Klein, *Sources of Power: How People Make Decisions*, Reprint (The MIT Press, 1999); Malcolm Gladwell, *Blink: The Power of Thinking Without Thinking* (New York, N.Y.: Back Bay Books, 2007).
- 86** A discussion of problems goes beyond what I want to do with this essay. That analysis can be found in C. West Churchman, *The Design of Inquiring Systems*, and Ian I Mitroff, *The Unbounded Mind*. For one illustrative example of the analysis, see John Vickers, “The Problem of Induction”, *The Stanford Encyclopedia of Philosophy* (Spring 2013 Edition), Edward N. Zalta (ed.), URL = <http://plato.stanford.edu/archives/spr2013/entries/induction-problem/> .
- 87** “Chertoff’s Gut: Al-Qaeda Could Strike This Summer,” *Wired.com*, *Threat Level*, accessed October 28, 2013, <http://www.wired.com/threatlevel/2007/07/chertoffs-gut-a>.
- 88** Daniel Kahneman, *Thinking, Fast and Slow*, 1st ed. ; John S. Hammond, Ralph L. Keeney, and Howard Raiffa, “The Hidden Traps in Decision Making,” *Harvard Business Review* 76, no. 5 (1998): 47–58; Jonathan Haidt, *The Righteous Mind: Why Good People Are Divided by Politics and Religion*, (New York:Pantheon, 2012).
- 89** Stewart A. Baker, *Skating on Stilts: Why We Aren’t Stopping Tomorrow’s Terrorism*, 1st ed. (Hoover Institution Press, 2010), Relevant excerpts at <http://www.newsmax.com/RonaldKessler/hijacker911terrorismObama/2010/09/27/id/371659> .
- 90** Hal Bernton et al., “The Terrorist Within, Chapter 12: The Crossing,” *The Seattle Times*, July 2, 2002, available at <http://community.seattletimes.nwsourc.com/archive/?date=20020702&slug=12ressam02>. The article also illustrates what can happen when someone ignores her intuition.

- 91** Kline, *Sources of Power*, describes how experienced public safety professionals use intuition.
- 92** Francois Jullien, *Detour and Access: Strategies of Meaning in China and Greece*, trans. Sophie Hawkes (MIT Press, 2004). This system continues to be used in China: “Chinese Communist party authorities, fearing a threat to their legitimacy, forbid open discussion of the so-called “June 4th incident” [Tiananmen Square Anniversary] in the country’s media and on its internet. Yet internet users have reacted by using ever-more oblique references to commemorate the tragedy, treating censors to an elaborate game of cat-and-mouse,” (<http://www.theguardian.com/world/2013/jun/04/tiananmen-square-online-search-censored> . For additional information on problems with “detour and access” as an inquiry method, see the discussion in Ralph Weber, (2014). “What about The Billeter-Jullien Debate? And What Was It About?” *Philosophy East and West*, 64(1):228-237.
- 93** Ibid. The direct quotations, according to my notes, are from Chapters 1 and 2 in *Detour and Access*. Since I no longer have access to the book, I have been unable to locate the page numbers.
- 94** U.S. Department of Homeland Security, National Preparedness Report, March 30, 2013, <http://www.fema.gov/media-library/assets/documents/32509?id=7465>; a similar argument can be made for the 2014 and subsequent National Preparedness Reports, <https://www.fema.gov/media-library/assets/documents/97590>, (2015) <https://www.fema.gov/media-library/assets/documents/106292>, (2016) <https://www.fema.gov/media-library/collections/523>, and (2017) <https://www.fema.gov/media-library/assets/documents/134253> .
- 95** http://www.fema.gov/media-library-data/20130726-1916-25045-2140/2013_npr_fact_sheet.pdf.
- 96** For examples, see the data discussion on page ii, and the description of the methodology on pages 2-3: “The NPR reflects approximately 1,400 sources and 3,200 measures and metrics that contribute to analysis of the core capabilities and related targets identified in the Goal.” (2); “These trends in national preparedness will be increasingly evident in future reports, as the NPR development process continues to mature and incorporates additional input from across the whole community.” (ii).
- 97** The conclusion in this sentence is based on my reading of the report; there is nothing in the report that makes this assertion. DHS has been trying for close to two decades to measure preparedness. Perhaps it is the quest, not the people on the quest, that is the barrier. See also the discussion of measurement in the April 12, 2016 congressional testimony “FEMA: Assessing Progress, Performance, and Preparedness” at <http://www.hsgac.senate.gov/hearings/fema-assessing-progress-performance-and-preparedness> .
- 98** The claims were framed earlier in this paper as simple, complicated, complex and chaotic.
- 99** Christopher Bellavita, “Changing Homeland Security: What Is Homeland Security?”.
- 100** This theme is developed in Peter L. Berger and Thomas Luckmann, *The Social Construction of Reality*; See also Paul Thagard, *Coherence in Thought and Action, Life and Mind* (Cambridge, Mass: MIT Press, 2000).
- 101** Rorty is quoted in W. Desmond, *Art, Origins, Otherness: Between Philosophy and Art* (Albany, NY: State University of New York Press, 2003), 280.
- 102** “Build” could be learning something more, or helping to improve homeland security.
- 103** Jan Hilgevoord and Jos Uffink, “The Uncertainty Principle,” in *The Stanford Encyclopedia of Philosophy*, edited by Edward N. Zalta, Winter 2016, Metaphysics Research Lab, Stanford University, 2016, <https://plato.stanford.edu/archives/win2016/entries/qt-uncertainty/>; Robert P. Crease and Alfred Scharff Goldhaber, *The Quantum Moment: How Planck, Bohr, Einstein, and Heisenberg Taught Us to Love Uncertainty*, 1st edition, (New York: W. W. Norton & Company, 2014), 23-26.

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