Using Frames to Increase Understanding and Support for the Social and Behavioral Sciences

A FrameWorks Strategic Messaging Report

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I. Introduction

While social and behavioral scientists are trained and professionally socialized to engage in public debate about the nuances of their theories and methods with *other scientists and experts*, they are less practiced at explaining the general value and practical importance of their research to members of the public and policymakers. There are a number of questions around how best to communicate with these public audiences about the value of social and behavioral science (SBS) research. Answering these questions demands an understanding of how non-scientists think about the value of social science, and how different ways of communicating social science research affect these views.

The good news is that creating a communications strategy that engages the public and policymakers in considering the value of the social and behavioral sciences does not need to be a guessing game. Communications questions are empirical questions. As such, social and behavioral scientists have a powerful tool to help them craft effective communications — social and behavioral science. Theories of culture and cognition can inform the *design* of communications strategies. Experimental surveys and various qualitative methods can be used to empirically *test* these strategies for their effects on public thinking. To that end, this report summarizes research the FrameWorks Institute has conducted for the National Academy of Sciences (NAS). In pursuing these questions, the FrameWorks Institute conducted a series of studies that: 1) document the conceptual challenges in the public's understanding of SBS, and 2) test communications strategies to determine their ability to increase public understanding of SBS and create more favorable perceptions of the value of this research.

The research presented here indicates that there are productive ways of inviting the public, policymakers, and even those skeptical of the value of SBS research to engage in deeper discussions about its role in society. Most generally, FrameWorks' research demonstrates that members of the public lack familiarity with the social and behavioral sciences — what they are, how they produce knowledge and how they benefit society. Effective engagement, therefore, requires giving audiences a new story composed of specific framing tools that: (1) explain what the social and behavioral sciences are and what they do, (2) provide concrete examples of innovative social and behavioral scientific research, and (3) explicitly communicate the value of the social and behavioral sciences for American society.

The research base that informs this report includes:

1. Cultural models interviews[1] conducted in March and April 2014 with 20 Americans in Philadelphia, Penn., Frederick, Md., Jacksonville, Fla., Portland, Ore., and Providence, R.I.;

2. Two experimental surveys conducted in September and November 2015 involving more than 6,500 American respondents to demonstrate the impact of exposure to a variety of narrative elements on public knowledge about the social and behavioral sciences, and their support for allocating public funds to support them;

3. A series of On-the-Street Interviews conducted with 58 Americans in June 2014. FrameWorks researchers used these interviews to test the effectiveness of candidate exemplars and Explanatory Metaphors in generating understanding of the function and importance of SBS.

This strategic report is organized as follows.

- We first **Outline The Narrative** that communicators can use to effectively engage members of the public and policymakers in a deeper conversation about SBS, and encourage an appreciation of the importance of this type of research.

- We **Chart The Landscape** of public thinking by describing the dominant ways that Americans reason about SBS.

- We **Detail the Empirical Evidence** that supports the recommended reframing strategy, and that demonstrates how it successfully navigates the existing landscape of public understanding.

- We end with a cautionary tale of the **Traps in Public Thinking** that must be avoided if reframing is to succeed.

II. A New Narrative to Reframe Social and Behavioral Sciences

Through a multi-method and iterative research process, FrameWorks' researchers identified three general narratives that effectively explain the logic of social scientific inquiry to non-scientists, and illustrate the value of the social and behavioral sciences. Narratives are powerful framing tools because of the deep and durable ways in which they organize information and events, and make information cognitively "sticky."[2] Messages that incorporate narrative help people remember, retrieve and interpret information when they make decisions and communicate with others.[3]

The following section provides an outline of the most effective narrative structure that emerged from the research process. It is important to note that the power of this strategy derives from the *combination* of each of the three narrative elements we enumerate below. Each of these elements accomplishes a specific, and somewhat discrete, function in reframing SBS. Therefore, communicators should employ the entire narrative wherever possible. More detailed recommendations about how and when to use this narrative can be found throughout the remainder of the report.

1. The Explanatory Metaphors *Puzzle Solving*, *Mapmaking* and *Powering Society* organize the narrative.

Metaphors are familiar to us all as poetic devices, but FrameWorks' research, and many other studies in the social sciences, show that they can also be uniquely powerful devices for improving understanding and focusing thinking.[4] FrameWorks uses the term *Explanatory Metaphor* to denote the specific use of metaphor as a communication and translation tool. An Explanatory Metaphor is a concrete, easily understandable and memorable comparison that quickly and effectively explains an abstract or complex topic. Explanatory Metaphors are effective because they leverage similarities between a source (the familiar object or process) and target (the thing being explained) to help achieve specific communications goals. In other words, A is like B in ways that help better understand B.

As organizing principles in a new narrative about SBS, the Explanatory Metaphors *Puzzle Solving*, *Mapmaking* and *Powering Society* help non-SBS scientists:

- *Understand <u>how</u> SBS research is conducted and <u>who</u> performs it.* The metaphors give people conceptual resources to explain some of the basic contours of SBS, and understand what SBS research is and how it works.

- *Realize that SBS <u>benefits society</u>.* The metaphors lead people to the conclusion that SBS research has practical benefits that affect everyone's well-being.

In short, the Explanatory Metaphors provide conceptual channels that allow people to arrive at a

general understanding of the social and behavioral sciences. Below are examples of these metaphors.

> ***Puzzle Solving:*** *Social science is about putting together pieces of knowledge to reveal a fuller picture of how the world works. Just as you need to figure out how pieces fit together to solve a jigsaw puzzle, social scientists figure out how new pieces of knowledge fit into the picture that other scientists have been putting together. Over time, scientists find new pieces of the puzzle that fit together with existing knowledge. By showing us a fuller picture of how things work, social and behavioral scientists help us move forward as a country.*

> ***Mapmaking:*** *Social science is about exploring and mapping new areas of knowledge. Just as pioneers search for new places and map their journeys so others can follow, social scientists journey into new territories of understanding and discovery. By using information gathered from previous journeys and taking new steps of their own, social scientists chart a course of progress for our country.*

> ***Powering Society:*** *Social science generates knowledge that powers our society. Just as we rely on electricity to power our lives and progress, knowledge from social science improves how we live and keeps us moving forward. Over time, scientists generate knowledge that powers new accomplishments.*

While these three metaphors are highly effective at channeling productive thinking about SBS, they require other elements and strategies in order to deepen understanding of, and increase support for, SBS.

2. The organizing metaphors synergize with the values of *Progress*, *Ingenuity* and *Innovation*.

The values of *Progress*, *Ingenuity* and *Innovation* communicate the importance of the social and behavioral sciences to members of the public and policymakers. Values, or broad ideals about what's desirable and good, act as powerful directives: guiding attitudes, focusing reasoning and shaping decisions.[5] Values orient people's thinking on a topic, making it more likely that they will engage productively with the information that follows. As elements in the overarching story, the values of *Progress*, *Ingenuity* and *Innovation* work in powerful ways to help people answer the question of why SBS matters. The following is an example of how to include values in messaging about SBS:

> *Our country's forward progress has always relied on our ingenuity and innovative spirit. Finding new ways to solve problems means that we have to think creatively, and carefully study all options. Our society's progress depends on building and testing new programs and policies that will help us meet our challenges. Social science research is a key part of this work because it produces knowledge that we need to move society forward.*

3. The right exemplars point to the benefits of SBS research.

Exemplars are particular cases that illustrate some facet of an issue and motivate deeper engagement.[6] For this project, exemplars are particular research studies that exemplify what social science research is and how it works. Exemplars also explain the social significance and practical benefits of this research. Exemplars offer specific content that enables members of the public and policymakers to better understand SBS research. It is important to note that finding effective exemplars is an empirical pursuit and that not all SBS studies are effective exemplars. A critical attribute of an effective exemplar is that it helps the target audience understand general concepts about SBS research — what it is, how it is done, what it produces, and why it is important. As a result, studies that a scientist views as most important for understanding a concept may or may not be the best exemplars for helping a broader audience appreciate science. In short, it is important to recognize that the ability of a given exemplar to serve as a tool for effectively communicating about SBS is an *empirical question*, and that scientists need not rely on their intuition to make these important communications decisions.

The following exemplars proved most effective across multiple research methods in building public knowledge and positive attitudes about SBS:[7]

> ***Addressing Economic Inequality:*** *Here's one example of how social science has discovered knowledge that has improved our lives. Social scientists saw that children who grew up in poverty had worse prospects in life than other children. So they asked, "How can we improve the lives of children living in poverty?" This is a question social scientists can answer because it involves how people behave and interact. Based on their knowledge of how children develop, social scientists came up with the idea that richer experiences and greater stimulation would improve outcomes for children living in poverty. To test this idea, they carefully collected evidence and compared results for two groups of children living in poverty — one group received stimulating, high-quality daycare; the other did not receive this special care. The study showed that by age 30, the children given the high-quality childcare were four times as likely to have graduated from college, and were far healthier, than those who did not receive this special care. Social science research showed that investing in early childhood improves lives and benefits society as a whole.*

> ***Improving Health:*** *Here's one example of how social science has discovered knowledge that has improved our lives. Social scientists know that each year, a very small percentage of the people who actually need kidney transplants receive them. So an important question was, "How can we get compatible donor kidneys to the patients who need them?" This is a question social scientists can address because it involves how people think and behave. Social scientists employed something called economic matching theory to develop a kidney exchange clearinghouse. The system — based on college dormitory housing assignments — matches incompatible donor-patient pairs with other pairs. The scientists carefully collected evidence and did comparisons to test this way of matching kidney donors to recipients to see if it worked. They found that this simple matching procedure led*

to more successful exchanges between compatible pairs of donors and recipients. Computer models suggested that an additional 2,000 to 4,000 transplants could be achieved each year if there were a nationwide pool of all eligible donors and recipients. Social science research showed how to support more kidney transplants and saved thousands of lives.

__Increasing Safety:__ Here's one example of how social science has discovered knowledge that improved our lives. Social scientists saw that several million rear-end collisions were occurring every year. So they asked, "How can we increase safety and reduce the number of accidents?" This is a question social scientists can answer because it involves how people behave and interact. Based on their knowledge of what a driver looks at while driving, social scientists came up with the hypothesis that moving the brake light up and centering it in places where other drivers can more easily see it could prevent a lot of rear-end collisions. To test this idea, they carefully collected evidence and did comparisons of different brake light designs. They showed that the higher-up, centered brake lights reduced rear-end collisions by 4 percent, which translated into 100,000 fewer crashes, 60,000 fewer injuries, and a savings of over $600 million per year. Social science research showed that understanding drivers' behaviors can help save lives and money.

In sum, the effectiveness of these narratives is contingent on the combination of an organizing Explanatory Metaphor, an appeal to the importance of the value *Progress/Ingenuity/Innovation* and a concrete exemplar. All of these elements must be present to create the optimal framing effect. The following is an example of a complete narrative about the social and behavioral sciences.

The social sciences help our country harness our ingenuity and apply our innovative spirit to meet new challenges and solve new problems. Just as you need to figure out how pieces fit together to solve a jigsaw puzzle, social scientists figure out how new pieces of knowledge fit into the picture that other scientists have been putting together. For example, a few years ago social scientists saw that several million rear-end collisions were occurring every year. So they asked, "How can we increase safety and reduce the number of accidents?" Based on their knowledge of what a driver looks at while driving, social scientists thought that centering the brake light could prevent a lot of rear-end collisions. To test this idea, they carefully collected evidence and compared different brake light designs. They showed that higher and centered brake lights reduced rear-end collisions by 4 percent, which translated into 100,000 fewer crashes, 60,000 fewer injuries, and a savings of over $600 million per year. Solving this puzzle required that social scientists better understand drivers' behaviors, which ultimately helped save lives and money.

From this narrative set-up, communicators can proceed to explain the myriad examples of the benefits of SBS to society. This particular narrative has been tested to ensure that all component parts are working to advance understanding and address specific challenges in public thinking about SBS, which we describe in the next section.

III. The Public's Understanding of the Social and Behavioral Sciences

In crafting a new narrative about the social and behavioral sciences, communicators must remember that members of the public and policymakers are not empty vessels waiting to be filled with information.[8] Our interviews with non-scientists suggest that people are generally unfamiliar with the social and behavioral sciences, and thus employ a set of "cultural models"[9] — or shared, but implicit, understandings and assumptions — to reason about this topic. These models become active when people are asked to reason about what the social and behavioral sciences are, how they work, and why they are important. In general, our research shows that cultural models that people employ to make sense of new and unfamiliar information about SBS often run counter to the communications goals of social and behavioral scientists. Strategic communicators must therefore become familiar with people's default patterns of understanding in order to anticipate obstacles and better engage people in thinking about the value of SBS.

Below, we lay out the dominant features of the set of the public's cultural models of the social and behavioral sciences. These models are organized around four essential questions:

1. What are the social and behavioral sciences?
2. Who does social and behavioral science?
3. How do the social and behavioral sciences work?
4. What is the value of the social and behavioral sciences?

1. What are the social and behavioral sciences?

A cognitive hole: Perhaps the most important thing for communicators to understand is that many people have no idea what the social and behavioral sciences are. A large portion of the public is unfamiliar with the terms "social science" or "behavioral science" and, when asked to define or explain these terms, most people are simply stumped. When people are pushed to fill in this cognitive hole, they fall back on specific patterns of understanding that then constitute the foundation for subsequent thinking about SBS.

Social science is about people: Though members of the public do not have a clear understanding of social science, they fill in their "cognitive hole" by picking up on the "social" lexical cue and assume that social science is about people and how they socialize. In many respects, they are not incorrect — indeed, social science is about how people interact. However, this understanding does not include any concept of research or science. The "social" aspect of social science is much more salient than the "science" aspect. For example, people tend to talk about the social sciences in terms of how people cooperate with one another, and downplay the role of scientific processes in these endeavors.

Behavioral science is about behavior problems: Members of the public overwhelmingly, and not surprisingly, think of behavioral science as dealing with behavior. However, there is a strong tendency to assume that behavioral science is about the study of behavior *problems*. As a result, behavioral scientists are limited to psychiatrists, and the behavioral sciences are only understood as studying mental health problems such as schizophrenia, attention deficit and hyperactivity disorder (ADHD), and depression.

These definitional understandings (or lack thereof) have implications for SBS communicators. The public's cognitive hole about SBS, its productive but thin association between the social and behavioral sciences and "people," and the limitation of the behavioral sciences' links to psychopathology means that communicators must provide people with specific, concrete and memorable explanations of SBS. In the narrative strategy outlined above, this is accomplished through the use of easily accessible metaphors and "sticky" exemplars. Specifically, well-chosen and diverse exemplars will help people recognize the range of phenomena that SBS examines, and the myriad benefits that result from this research.

2. Who does social and behavioral science?

In addition to difficulty in defining SBS, people do not recognize social and behavioral scientists *as* scientists, which impedes their ability to productively engage in thinking about how SBS works, and the benefits of this research.

Scientists wear lab coats and work with numbers: Members of the public think about science as an activity that is systematic, rigorous and quantifiable. It is best conducted in labs where the setting is controlled and careful measurements can take place. The public therefore has difficulty imagining how such activity can be applied to something as variable and uncontrollable as human behaviors and society. In short, people's productive understanding of science is *not* applied to thinking about SBS.

Practitioners, not scientists: People generally think that the value of the social and behavioral sciences is in helping people, not necessarily in research. The "social sciences" are regularly equated with social services, social work, or other professions in which the primary mission is to help people experiencing difficult life circumstances. "Behavioral science" is generally limited to clinical practice rather than research or scientific inquiry.

Scientific inquiry is not a feature of either of the public's models of who does SBS, which is a key dimension of the way that people think about this issue. Communicators therefore need to connect people's understanding of "science" to SBS. Metaphors are particularly well suited to clarifying the research process, while exemplars provide concrete information about how social scientists conduct research.

3. How do the social and behavioral sciences work?

While people have only vague notions of what social science is, and narrow understandings of who does it, they have strong ideas about how to study social life.

Look it up: People consider the social and behavioral sciences as gathering information about something that is already "out there" in the world, and research is the process of *finding* this information. Thus, "research" can be done by anyone by simply reading books, looking at smartphones or Googling various subjects.

Anyone can observe: Members of the public often describe the social and behavioral sciences as "soft," and cite observation as the most commonly employed research method. Similar to the *Look It Up* model, they reason that since anyone can make observations, anyone can engage in social and behavioral science irrespective of training or background. According to this model, every person is different and "sees" things in unique ways; generalizations are meaningless and SBS is inexact in its conclusions. In fact, one participant in FrameWorks' qualitative research described SBS as "not intellectual."

These models discount the status of social and behavioral scientists as professionals who require specialized skills and knowledge to do their work, and consequently undermine people's ability to appreciate the practical benefits and social contributions of SBS. Because these models are operative when the public thinks about SBS, it is critical that communicators establish more robust understandings of what and who is involved in SBS through Explanatory Metaphors and exemplars.

4. What is the value of the social and behavioral sciences?

In general, members of the public are highly skeptical about the value of social and behavioral scientific research, and employ the following models to think about the benefits of this kind of research.

Science is fickle and has a hidden agenda: The public often assumes that science is subject to manipulation, and motivated by unscrupulous intentions (e.g., profit, reputation, promoting a specific ideology). Members of the public are highly skeptical of the soundness and validity of new scientific "findings," and they often describe the cycles of research as fickle and untrustworthy. This skepticism is structured by the public's latent understanding of science as being "just another opinion." In our interviews, study participants often described how "statistics can say anything" and "studies can show anything," and these ideas were especially salient when participants considered health research. For example, study participants cited examples of research that asserted that coffee was unhealthy one day and extremely beneficial the next, or that vitamins are necessary health supplements according to one study and snake oil in the next. These ways of thinking lead people to conclude that one should not put much stock or value in research findings, and explain low support for SBS research without a reframing strategy.

In sum, the existing public narrative about the social and behavioral sciences is vague and ill-
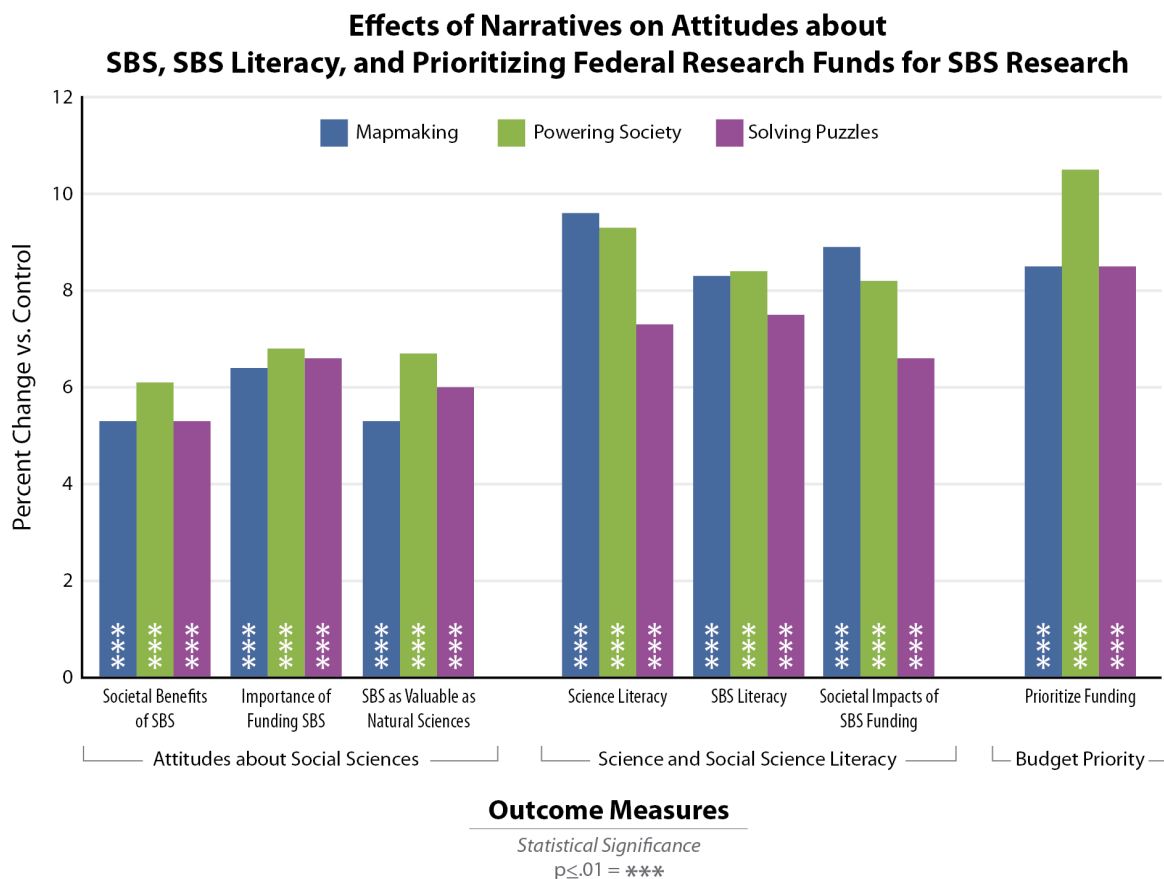
defined. When pushed to reason and think about SBS, members of the public often rely on cultural models that have the potential to devalue the social and behavioral sciences, or, at best, shape a narrow conceptualization of what SBS is, who does it, how it is done and what benefits it produces. Below, we detail the evidence base that demonstrates how a reframing strategy based in narrative can broaden the public's understanding of SBS.

IV. Evidence Base: Employing Social Science to Develop an Effective Communications Strategy

FrameWorks researchers deployed two methods in an iterative process to test the efficacy of various framing tools and strategies. An initial survey experiment tested the effectiveness of a large number of candidate exemplars. On-the-Street Interviews employed a pre-post set-up to explore the effects of specific exemplars and metaphors on public thinking about the social and behavioral sciences. These interviews also generated hypotheses about framing that were subsequently tested in two waves of experimental surveys. Appendix A includes more detailed discussion of each method, and Appendix B provides a discussion of the limitations of the research described here. Below, we focus on the results and implications of this research.

1. Stories stick: Use narrative to increase public understanding of, and support for, SBS research.

Figure 1

**Effects of Narratives on Attitudes about
SBS, SBS Literacy, and Prioritizing Federal Research Funds for SBS Research**

Outcome Measures

Statistical Significance
p≤.01 = ✳✳✳

The main focus of the survey experiment was to test the overall effect of complete narratives across a range of outcome measures (see Figure 1). The narrative structure and components that were tested here resulted from previous phases of research (see Items 2-5, below).

The outcome scales included: (1) an attitudinal scale that assessed participants' conceptions of SBS's practical and societal benefits, their support for funding SBS, and their assessment of the value of SBS as compared to the natural sciences; (2) a knowledge scale measured through multiple-choice questions which included general scientific literacy questions, social science literacy questions, and knowledge about the impacts of funding (or failing to fund) SBS; (3) a scale that measured public support for making SBS a priority in the federal budget. Research showed that three narratives — which included either the *Mapmaking*, *Powering Society* or *Solving Puzzles* orienting metaphors, referenced the *Progress/Ingenuity/Innovation* value, and concluded with the *Addressing Economic Inequality* exemplar[10] — produced large, substantively and statistically significant gains across all the outcome measures relative to the control group.[11,12]
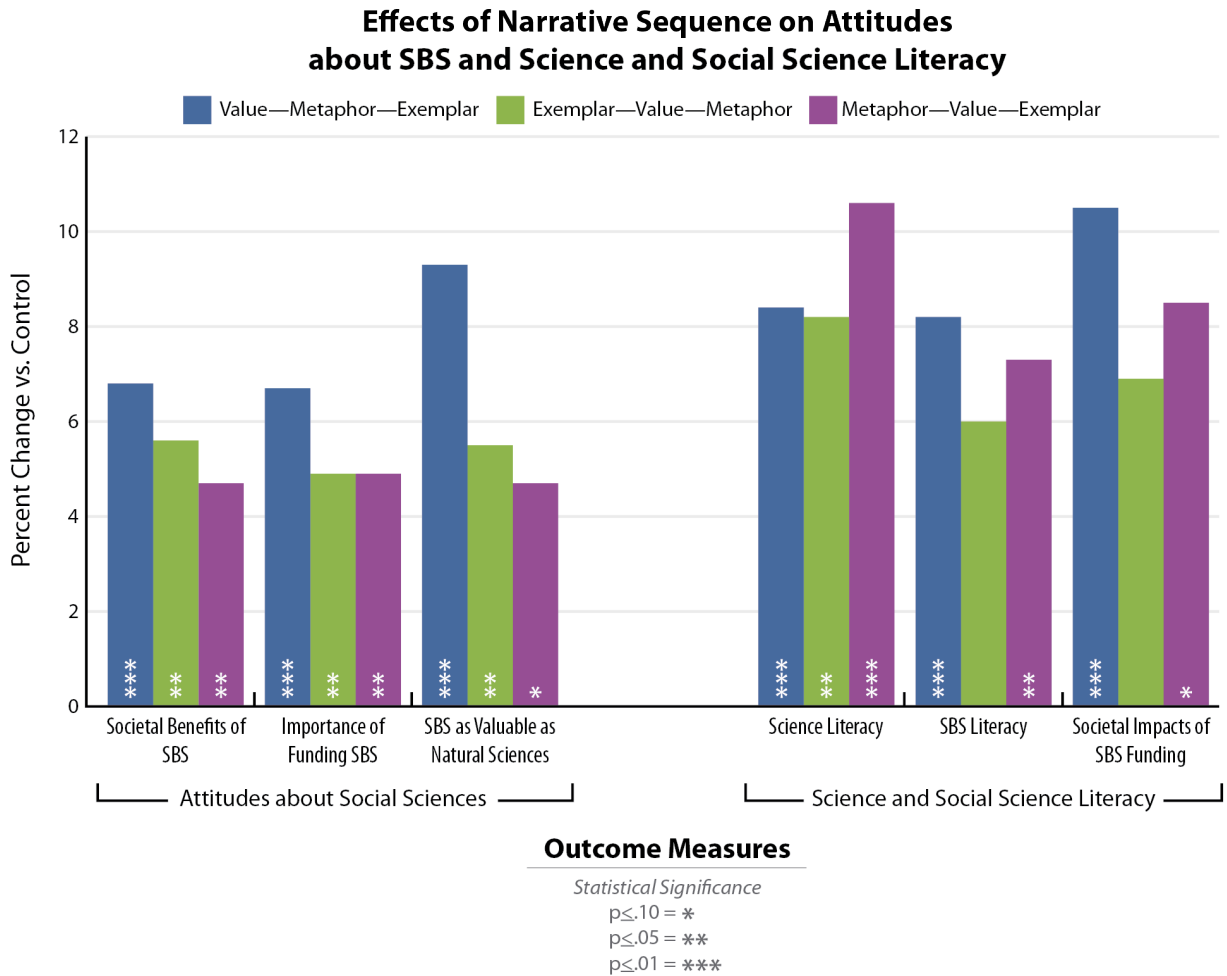
More specifically, results showed that exposure to these variations of the narrative had strong effects on attitudes about, and knowledge of, SBS:

- The variations of the narrative increase public understanding of the benefits of the social and behavioral sciences — causing **a 5 to 7 percent increase across all attitude measures** when compared to the control condition (statistically significant at the $p < 0.01$ level). For example, exposure to the narrative that included the *Powering Society* metaphor generated an increase in support for the *importance of funding social and behavioral science research* of approximately 7 percent.

- Exposure to the narrative variations resulted in **substantial gains (between 6 and 10 percent increases compared to the control condition) in respondents' knowledge about the social and behavioral sciences**. The largest gain stemmed from exposure to the narrative that included the *Mapmaking* metaphor, where participants correctly answered roughly 10 percent more of the multiple-choice questions designed to measure participant knowledge about the social sciences than did the control group.

- Finally, roughly **8 to 10 percent more** participants who were exposed to a version of the narrative **endorsed increased federal funding** for SBS research.

In short, our research shows that these variations on the Value+Metaphor+Exemplar narrative are highly effective in encouraging public understanding and support for SBS. This narrative represents the meta-strategy in reframing SBS.

2. Order matters: Begin the narrative with the values *Progress/ Ingenuity/Innovation* to help people understand why SBS matters.

Figure 2

Effects of Narrative Sequence on Attitudes about SBS and Science and Social Science Literacy

Outcome Measures

Statistical Significance
$p \leq .10$ = *
$p \leq .05$ = **
$p \leq .01$ = ***

The survey design allowed FrameWorks' researchers to test which ways of ordering the component parts of the narrative might be better than others. Figure 2 details the effects of three alternative ways of sequencing the narrative elements. This is a simple comparison of order that addresses whether the value, the metaphor or the exemplar should come first in narrative presentation. While all three the variations produced strong positive effects compared to the control group across all outcomes, leading with the value produced larger increases on all the attitudinal measures and two of three knowledge measures. Leading with the value produced differences ranging from 2 to 4 percent compared to the other narrative orders tested.[13]

On-the-Street Interviews and responses to open-ended questions on experimental surveys further demonstrated the importance of opening the narrative with an explicit value statement. Both sets of data showed that *Progress/Ingenuity/Innovation* orient people toward the societal benefits of the

social and behavioral sciences. On-the-Street Interviews revealed that these values are cognitively linked with the metaphors of *Puzzle Solving*, *Mapmaking* and *Powering Society*, and that a narrative that evokes *Progress/Ingenuity/Innovation* proved *highly effective* in generating recognition of the importance of the social and behavioral sciences for society. In open-ended surveys, respondents who asserted that *SBS is important* added that there is much still to learn about how humans behave — what we do and why — and pointed out that humanity is constantly evolving and will continue to do so. Thus, it is important to use *Progress/Ingenuity/Innovation* to orient thinking along these productive themes of forward advancement and new ideas, and away from unproductive themes, such as the belief that we already know enough about how humans behave, and that humanity, in fact, does not change.

3. Metaphors explain: Incorporate *Solving Puzzles*, *Mapmaking* or *Powering Society* Explanatory Metaphors to explain what SBS does and how it works.

FrameWorks' On-the-Street Interviews revealed the specific strengths of each metaphor.

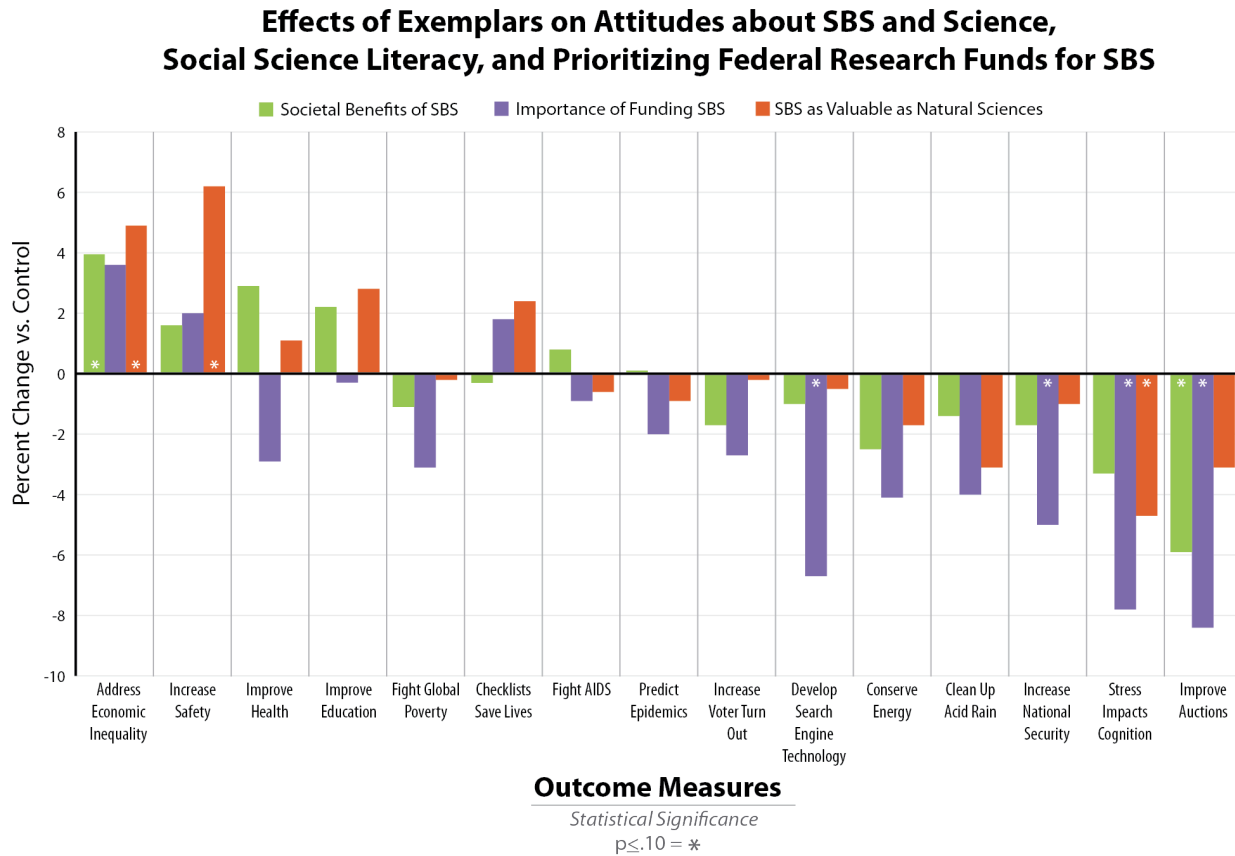***Powering Society communicates the instrumental value of the social and behavioral sciences.*** Study participants understood that, just as electricity is used *to do* things, SBS generates knowledge that is used to do things that improve society. The language of efficiency, pulled from the domain of energy, is sticky, and helps people recognize that social science makes society work more smoothly and effectively in a way that "powers" forward progress.

Mapmaking explains the role of the social and behavioral sciences in producing innovative knowledge. The *Mapmaking* narrative helps people see how SBS contributes to social progress by generating *new knowledge*. The idea of exploration helps people understand that SBS investigates new issues and ideas, and is at the forefront of social progress. In addition, the notion of mapmaking helps people understand SBS as a careful, systematic form of inquiry that produces new, useful ways of seeing and understanding the world.

Solving Puzzles demonstrates how the social and behavioral sciences build off of other findings and complements the natural sciences. This particular version of the narrative helps people understand SBS as part of a broader endeavor to understand the world and generate knowledge. It highlights the collaborative, iterative nature of SBS work. The idea of putting together a puzzle helps people see how specific pieces of research fit together to form a broader picture of how the world works. This feature of the narrative makes it well suited to explaining how SBS complements the natural sciences.

4. Include *Addressing Economic Inequality*, *Increasing Safety* or *Improving Health* to make SBS research more concrete.

Figure 3

**Effects of Exemplars on Attitudes about SBS and Science,
Social Science Literacy, and Prioritizing Federal Research Funds for SBS**

FrameWorks began the inquiry into effective exemplars by testing 15 examples of social scientific research.[14] As demonstrated in Figure 3, *Addressing Economic Inequality*, *Increasing Safety* and *Improving Health* generally produced positive outcomes. Exemplars are critical components in the narrative, but not just any exemplar helps people understand the social value and practical benefits of SBS. Our On-the-Street Interviews revealed more direct information about how to best present specific exemplars:

Exemplars work when methods are described clearly. Very simple references to methods — researchers compared group A to group B — enhance understanding of what SBS research looks like and, in turn, reinforce understanding of it *as scientific*. Exemplars that are amenable to simple description of methods are preferable to exemplars in which methods are too complex and obscure to allow this.

Exemplars need a straightforward and clearly stated benefit to society. Exemplars that involve direct benefits to individuals and society help people recognize the importance of the social and behavioral sciences.

Communicators should explicitly state the general lesson to be gathered from the exemplar.
Analysis of On-the-Street Interviews revealed that people struggle to derive a general lesson from exemplars. Unless the message is explicit about, and emphasizes, the lesson, people are likely to focus on the subject matter of the exemplar (e.g., kidney donation) rather than recognizing that the exemplary study helps illustrate how social and behavioral science works in general. As we discuss throughout this report, using a narrative to frame the exemplars should help people understand the relevance of the exemplars and derive general lessons from them, but being explicit about these lessons is important to reinforcing their general relevance.

5. The whole is greater than its parts: Use a complete narrative rather than isolated elements.

Figure 4

Effects of Complete Narrative Versus Individual Exemplars on Attitudes about SBS

Statistical Significance
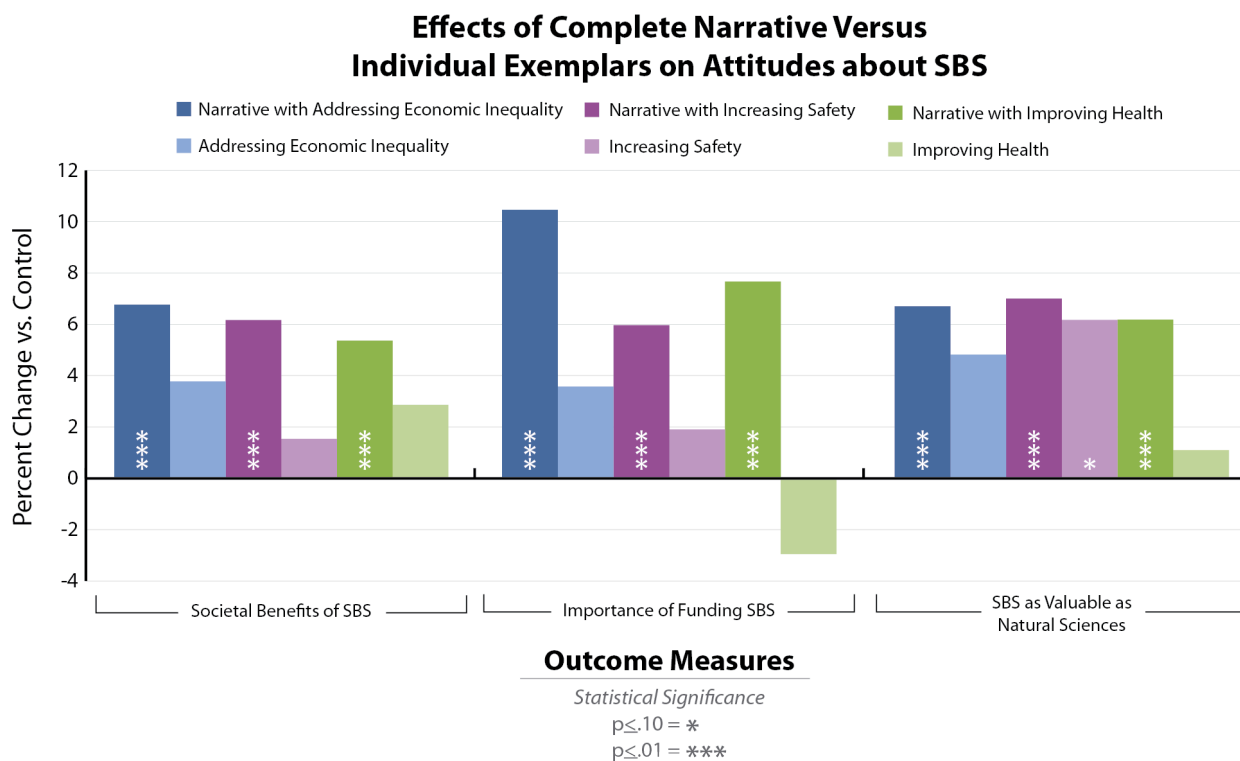p≤.10 = ✱
p≤.01 = ✱✱✱

Figure 4 details the effects of presenting a full narrative as opposed to just an exemplar.

Compared to the exemplar on its own, the complete narrative generates more positive evaluations of the societal benefits of SBS, more support for funding, and higher assessments of the value of SBS relative to the natural sciences. Contextualizing exemplars with narrative results

in a 2 to 7 percent gain in support across these key attitudinal outcomes, as compared to exemplars alone; most notably a 6.9 percent increase in support for SBS funding in the *Addressing Economic Inequality* exemplar — an increase that is statistically significant at the $p < 0.01$ level.

As further evidence of the effectiveness of the complete narrative as compared to that of exemplars on their own, researchers tested an exemplar that was *counterproductive* in the initial exemplar test — the *Acid Rain* exemplar (which in the initial experiment was found to drive outcome scales *down* by, on average, 3.6 percent relative to the control condition — that is, make people less supportive of the value of SBS) — and found that when presented as part of the full narrative, the exemplar's effectiveness rose by 5 percent, 9.9 percent and 5.3 percent in the Societal Benefits of SBS, Importance of Funding SBS and SBS as Valuable as Natural Sciences outcome measures, respectively. In this case, the narrative was able to convert an unproductive exemplar into a productive one on all three of these measures. This suggests that the narrative has sufficient power to take an exemplar that is unproductive on its own and leverage it to more productive communications ends. Furthermore, this suggests the potential for using a wider range of exemplars with the narrative, but remembering to take into consideration the guidance from the qualitative research about what aspects of an exemplar are most useful (Section 4, above). This represents a key finding from the research.

FrameWorks' qualitative research sheds additional light on this finding. When the exemplars were presented on their own during On-the-Street Interviews, none was consistently effective in generating understanding of SBS research and its societal benefits. These interviews suggested that, in isolation, the exemplars do not provide people with the tools to reason generally about how SBS works. Participants tended to focus on the specific subject matter (kidneys, for example), rather than drawing more general lessons about what SBS does and how it works.

Importantly, the On-the-Street Interviews also showed that metaphors on their own have compromised effectiveness in reframing SBS. While the metaphors increased understanding of the social and behavioral sciences, participants' knowledge remained vague and highly abstract. Placing the metaphors within a broader narrative that includes an explicit, orienting value to clarify the lessons to be drawn, and an exemplar to improve understanding of SBS, is therefore crucial to fully leveraging the metaphors' explanatory power.

6. The story stands up: Deploying the narratives is effective in reframing countering statements that argue against the value of SBS research.

The survey experiment was also designed to allow researchers to measure the effectiveness of narratives in a competitive messaging environment — specifically, when arguments against the value of SBS research were also introduced. Figure 5 details the effects of such competition.

Figure 5

Effects of Narrative versus Counter Messages on Attitudes about SBS and Science and SBS Literacy
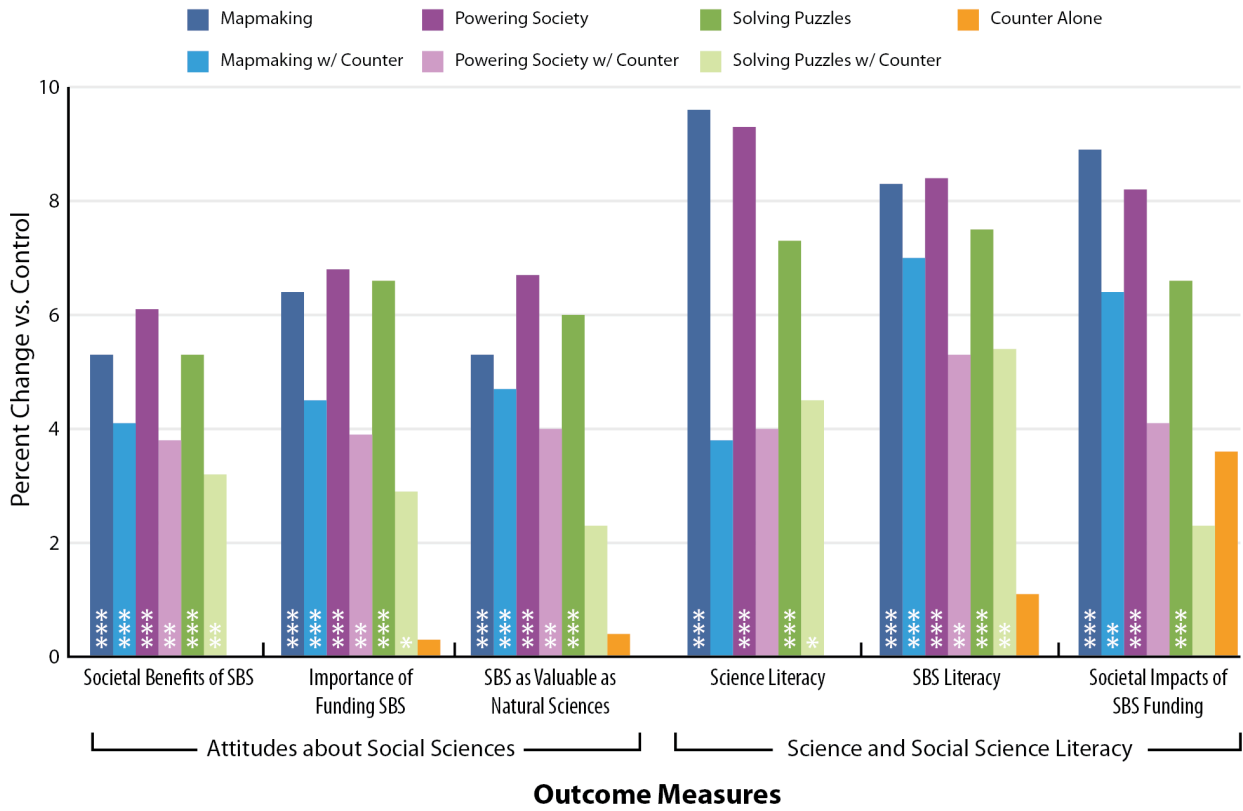
The following counter message was included in the experiment to test the ability of the SBS narratives to hold up to arguments against SBS research:

> *Some people say that we should not waste our resources on social science research because, at the end of the day, this kind of research doesn't produce knowledge that increases our economic prosperity, or improves our health and welfare, and does not makes our country more secure.*

> *We are better off moving our resources into the hard sciences, which produce more useful knowledge. Our country is losing its lead in fields like supercomputing and particle physics. If we don't redirect resources soon, the medical sciences, aerospace engineering and nanotechnology could be next.*

In the design, each of the three versions of the *Progress/Ingenuity + [Power Society* OR *Mapmaking* OR *Solving Puzzles] + Addressing Economic Inequality* narrative was presented to a randomly assigned group. Each version of the narrative was also presented along with the counter messages

to six other groups, with the counter message appearing either before or after the narrative. Analysis indicated no order effect (i.e., no difference in whether the anti-SBS message appeared before or after the narrative). Therefore, Figure 5 combines the results of the counter message conditions.

Figure 5 shows that, while the presence of a counter message reduces the impact of the narrative, it does not eliminate its effect. In fact, the effects of the narrative on attitudes about SBS and SBS literacy remain statistically significant in almost all cases.[15] For example, the counter messages have the least influence in the *Mapmaking* narrative on the *SBS vs. Natural Sciences* attitudinal scale, reducing the effect from 5.3 to 4.7 percent. *The research shows that all three narratives, but especially the Mapmaking narrative, significantly reduce the effect of arguments against SBS.*

V. Traps: What to Avoid in Public Communications

In the following section, we identify communication "traps" that lead listeners to view SBS in ways that are different than many SBS scientists intend. Traps are plausible ways of framing an issue that, upon investigation, turn out to do more harm than good in their effects on people's understanding of an issue. Communicators need to be aware of the following traps as they describe SBS research.

The Unproductive Metaphor Trap. In FrameWorks' research, the *Surprising Payoffs* metaphor proved generally ineffective in increasing public support for the social sciences. First, the metaphor fails to anchor thinking to the social and behavioral sciences, and people talk instead about the unintended benefits of all sorts of things. Second, the language of "surprise" carries with it a sense of risk — things might go well, but they also might go badly, which can inadvertently activate the *Science Is Fickle* cultural model. Finally, our research shows that members of the public at times understand the metaphor in literal terms (payoffs), which prompts them to think about financial markets and investments. For these reasons, we do not recommend this metaphor as an organizing principle for a general communications strategy.

The Unframed Exemplars Trap. Unframed presentations of exemplars are ineffective because, absent a narrative frame, people do not know what lessons to draw. When people are presented with exemplars on their own, they interpret them as information about a particular subject (e.g., kidney donation or education) rather than as illustrative of SBS research. Without a narrative frame, people struggle to draw lessons *about the social and behavioral sciences* from exemplars*.*

The Theory Trap. Focusing communications on SBS theory has unpredictable, and often negative, effects. For example, in FrameWorks' On-the-Street Interviews to test exemplars, most respondents did not understand the exemplar that was concerned with game theory, and they could not see its value or role. The terminology itself was difficult to grasp. For example, respondents who referred to game theory said things like, "Scientists use games to …" or are trying to "game something." SBS communicators should not assume that common theoretical paradigms are familiar, or that their importance is immediately obvious to members of the public.

The Overly Familiar Concepts Trap. Topics that are too familiar can also have counterproductive effects. When people have existing judgments about a topic, they tend to discount research findings. For example, when we tested an exemplar that showed the impact of class sizes on student outcomes, participants talked about their personal experience of education and class size, rather than considering what the exemplary study found.

The Government Trap. FrameWorks research has consistently shown that the public has two dominant ways to think about the role of government. On the one hand, government is thought of as fundamentally inefficient and incapable of addressing social problems. At the same time, members of the public view the government as an all-powerful and often nefarious force.[16] Communicators need to carefully frame the role of government in their examples of SBS research. When exposed to

research examples that involved government, such as ways to impact voter turnout, or the federal government's role in search engine technology, people become suspicious of government manipulation as it relates to research, practice and policy.

VI. Conclusion

The reframed narrative presented in this report was designed to help people understand what SBS is, how SBS research is conducted, and why it is important. This narrative draws its power from an orienting metaphor, carefully selected values, and empirically-tested exemplars. This evidence-based approach to storytelling provides the rough draft of a new plot, complete with sub-chapters:

1. **Craft a narrative to increase public understanding of, and support for, SBS research.**

2. **Begin the narrative with the values *Progress/Ingenuity/Innovation* to help people understand why SBS matters.**

3. **Incorporate *Solving Puzzles*, *Mapmaking* or *Powering Society* Explanatory Metaphors to explain what SBS does and how it works.**

4. **Include *Addressing Economic Inequality*, *Increasing Safety* or *Improving Health* exemplars to concretize SBS research.**

5. **Tell a complete narrative rather than isolated frame elements.**

6. **Deploy the narrative to counter opposing messages.**

This narrative structure is not meant to constrain the creativity of communicators, but rather to focus their energies on those narrative elements that hold the most promise in opening up public discourse to the power and import of the social and behavioral sciences.

Appendix A: More on Methods

Cultural Models Interviews

Respondents were selected to represent variation in ethnicity, gender, age, residential location (urban, suburban, rural), educational background and political ideology (all as self-reported during the screening process). Recruiting a wide range of people from different geographical locations, and looking at common, implicit patterns of reasoning across the sample, is an attempt to ensure that the cultural models identified represent shared, or "cultural," patterns of thinking rather than specific regional or other demographic variations. Past work with cultural consensus modeling has demonstrated that groups that share broad cultural similarities, to a large degree, share many of the same basic implicit cultural models, even when diverse along more specific criteria.[17] The current study relies on the results of this research, and culture and social theory more broadly,[18] in assuming that, as members of a culture, individuals share deep and implicit ways of understanding.

Constructing cultural models from linguistic data relies on the ability to see patterns of thinking — the expression of models in mind — through talk.[19] It was therefore important to recruit respondents whom the researchers had reason to believe actually do talk about social issues. Therefore, in an attempt to ensure that participants were likely to have ready opinions about these issues without having to be overly primed by asking them directly about the target issue, respondents were selected who reported being attentive to the news and current events, and who were involved in their communities. In addition, individuals who were employed in some field or profession related to social science were excluded from the sample to avoid biases that would impede the ability to gather data about how the general public, as non-experts, reasons about target concepts.

A professional marketing firm was employed to locate participants. This company drew from existing databases used to field other studies, and by using standard random digit dial methods to "cold call" individuals in the research areas.[20] Individuals were called and asked a series of questions to determine whether they met the inclusion criteria, and to gather data necessary to create variation in the demographic variables mentioned above. Individuals who met the criteria were called back and given a general overview of the interview, as well as information about time and location. All respondents received additional information about the project at the time of the interview, both verbally and in writing, and provided written consent.

The sample included nine men and 11 women. Nine of the 20 respondents self-identified as African American, eight as Caucasian, two as either Hispanic or Latino and one as Native American. Five participants self-identified as liberal, five as conservative and the remaining 10 as "middle of the road." The mean age of the sample was 40 years old, with an age range from 24 to 68. Two respondents had high school degrees, five had some post-secondary education, 10 had a college degree and the remaining three had post-graduate degrees. Five respondents had children under the age of 16, and the remaining 15 had no children.

It must be noted here that, although the sample was constructed to include as much variation as possible in order to distill common cultural models shared by individuals of varying demographics, the sample was not, nor was it meant to be, nationally representative in a statistical way. Issues of demographic variability and representativeness were taken up in a subsequent quantitative phase of the study (see below). The sampling techniques employed are also in line with the broader literature on theory construction and model building.[21]

As the goal of these interviews was to examine the cultural models Americans use to make sense of and understand issues of social and behavioral sciences, a key to this methodology was to give respondents the freedom to follow topics in directions they deemed relevant, and not in directions the interviewer believed most germane. Therefore, the interviewers approached each interview with a set of topics to be covered and questions to ask, but left the interview sufficiently open to thoroughly follow each respondent's train of thought.

Respondents were first asked to respond to a general issue ("What do you think about X?") and were then asked follow-up questions, or "probes," designed to elicit explanation of their responses ("You said X, why do you think X is this way?"; "You said X, tell me a little bit more about what you meant when you said X"; "You were just talking about X, but before you were talking about Y; do you think X is connected to Y? How?"). This pattern of probing leads to long conversations that stray (as is the intention) from the original question. The purpose is to see where the respondent draws connections from the original topic, and from which ones. Respondents were then asked about various valences or instantiations of the issue at hand, and were probed for explanations of these differences ("You said that X is different than Y in this way, why do you think this is?"). Thus, the pattern of questioning begins very generally, and moves gradually to differentiations and more-specific topics.

Respondents were first asked a series of open-ended questions about research in general. These provided them the opportunity to speak to whatever associations came to mind about the different kinds of research, the goals of that research, and the way that research is (and should) be conducted. A subsequent line of questioning then asked about science in general: what science is, what it does, how it does that, and how it could be done better. Respondents were then asked detailed questions about associations with the specific terms "social science" and "behavioral science."

On-The-Street Interviews

As the initial opportunity to test candidate Explanatory Metaphors and exemplars, On-the-Street Interviews present an ideal opportunity to gather empirical data on the effectiveness of these tools: Which specific elements of the tools are functioning well, and which aspects are less successful in clarifying concepts and shifting perspectives.

The metaphors and exemplars are written up as "iterations," in paragraph-long presentations. Iterations of five metaphors were tested at this stage: *Exploring/Mapmaking*, *Designing A Blueprint*, *Knowledge Generation* (*Powering Society*), *Puzzles* and *Surprising Payoffs*. Iterations of four

exemplars were tested: *Increasing Safety*, *Improving Education*, *Addressing Economic Equality and Improving Health*.[22]

In June 2014, FrameWorks tested these metaphors and exemplars in Baltimore, Md., and Milwaukee, Wis. A FrameWorks researcher approached individuals on the street and asked if they would be willing to participate in a short interview as part of a research project on "issues in the news." The recruiting researcher paid particular attention to capturing variation in gender, ethnicity and age. Data on each respondent's age and party affiliation, as self-identified, were collected after each interview. Efforts were made to recruit a broad range of respondents.

The Interview
Each candidate Explanatory Metaphor and exemplar was presented orally, in separate interviews. In all, 58 interviews were conducted. All respondents signed written consent and release forms, and interviews were video- and audio-recorded by a professional videographer. Data from the interviews were used to select metaphors and exemplars to bring forward in research, as well as to refine the ways in which these tools were presented.

Interviews were designed to gather data that could be analyzed to answer the following questions.

- Did the respondents *understand* the Explanatory Metaphor or exemplar?

- Did they *apply* the Explanatory Metaphor or exemplar to talk about the social and behavioral sciences in productive ways?

- Did the Explanatory Metaphor or exemplar *shift* discussions away from the dominant thought patterns that characterized the initial responses they gave prior to hearing the Metaphor or exemplar?

- Did exposure to the Explanatory Metaphor or exemplar *lead to more articulate answers and robust, fully developed conversations* of issues that respondents had problems discussing prior to being exposed to the framing tool (the Explanatory Metaphor or exemplar)?

Experimental Surveys

The quantitative experiment was designed by FrameWorks researchers and fielded by Survey Sampling International (SSI).[23] The design followed an experimental protocol based around random assignment with a control. In the control, participants answered questions absent any message. Additional conditions were included to concentrate on specific hypotheses. The pool of respondents was sampled from a large panel of adult registered voters (more than 3 million individuals) and matched to the national population, resulting in the following characteristics: Gender: Male 43 percent; Age: 18-49 54 percent, 50-64 30 percent, 65+ 17 percent; Education: Less than High School 2 percent, High School 62 percent, Bachelor's 24 percent, Higher 12.5 percent; Party: Democrat 34 percent, Independent/Other 40 percent, Republican 26 percent; Ethnicity: Caucasian 81 percent, African American 10 percent, Other 9 percent. Eight percent of the sample identified as Hispanic.

The survey experiments proceeded in three waves. Each wave focused on a specific aspect of narrative, steadily building knowledge from the first wave to the last. The exemplars were the focus in the first wave; metaphors were the focus in the second wave; and the third wave focused on message ordering and the role of message components (i.e., how important was it to have the whole narrative vs. just the exemplar), the resilience of the narrative to counter messages, and the ability of the full narrative to improve the effectiveness of exemplars that, on their own, were unproductive. The first wave fielded from June 3 to 17 with 957 participants, the second from September 17 to 26 with 2,100 participants, and the third from November 5 to 20 — all in 2014 with 3,700 participants. In all, the quantitative results stem from analyses of 6,757 respondents.

Following the needs of the project, the scales described below — each consisting of four to six questions — were included as outcome measures. As the study progressed, scales were added to address additional effects. The base set of scales charted participants' attitudes and beliefs on a seven-point, "strongly disagree" to "strongly agree" continuum. A second set included multiple-choice questions to assess respondents' knowledge. Each scale was created from the constituent items using principle components analysis to produce a singular zero to 100 measure, where 100 corresponds to complete support in terms of public opinion or in terms of a perfect score on a knowledge test. Participants were also given a set of open-ended prompts, detailed below, and asked to respond in their own words.

The **attitudinal** scales tapped: *Benefits of the Social and Behavioral Sciences*, which assessed beliefs in the worth of the endeavor with items like "We should use the results of social science in making all of our policy decisions"; *Support for SBS funding*, which charted respondents' willingness to support spending public resources in this pursuit — for example, "Our government should spend more money supporting social science research"; and *SBS versus natural science* that asked respondents to compare the two research domains, with questions like "Social researchers (for example, psychologists and economists) are scientists, just like physicists and biologists." The order of these questions was randomized.

The **multiple-choice question** scales measured participants' knowledge in three areas: *General SBS and Natural Science*, for example, "Which of the following best describes the relationship between the social sciences and the natural sciences? (a) The social sciences and the natural sciences both provide evidence about the world, but they study different topics (b) The social sciences and the natural sciences both provide evidence about the world, but the natural sciences are more important (c) The natural sciences provide solid evidence, while the social sciences rely on feelings and intuitions"; *Specific SBS Knowledge*, such as "To the best of your knowledge, how does social science research affect our national economy? (a) Social science research identifies ways to improve the economy (b) Social science research wastes resources and is a drain on the economy (c) Social science research has little effect on our economy"; and *SBS Funding*, such as "What would happen if we eliminated funding for social science research? (a) We would be less equipped to make decisions about important social issues (b) We would be able to allocate more funds to more important issues and priorities (c) We would not see any major changes." The order of questions and of multiple-choice answers within questions was randomized.

The three **open-ended prompts** included: "Is studying human behavior important — why or why not?" "How would you explain what social science research is to your best friend?" And, "What is the best way to understand how humans behave?"

In the last wave, the budget question — "Right now, roughly 97 percent of the federal money spent on scientific research goes to natural science and 3 percent goes to social and behavioral science. Do you think the percentage going to social and behavioral science should increase, remain the same, or decrease?" — was added to gain additional information on the effect of narratives on participants' attitudes toward funding social and behavioral science research.

FrameWorks follows psychometric best practice to construct the scales used as outcome measures in quantitative studies.[24] The premise is that any self-reported measure will contain some measurement error, so multiple measures are deployed to triangulate on the underlying concept — here, a dimension of public opinion within respondents' thoughts about the issue. Then, the items' coherences are validated, a composite measure is formed and the composite is transformed into relatable units. Thus, for each dimension of opinion on a given topic:

1. FrameWorks creates a battery of four to seven statements surrounding the issue (with a seven-point "strongly agree" to "strongly disagree" response continuum).

2. Collects the data.

3. Performs a principle component (PC) analysis on the item responses to:

   a. Validate the items. We proceed only if the scale produces only one large Eigen value whose dimension vector accounts for a clear majority of the total item variation.

   b. Form a composite measure by calculating the weighted average of the item responses, where the weights equal the PC loadings.

4. The composite measure is a linearly transformed to create a 0 to 100 percent scale to simulate a public opinion poll.

Appendix B: Research Limitations

Understanding the limitations associated with this research will help communicators in using the recommendations made here, and serve to drive subsequent communications research about science translation. Below, we discuss some of the most important limitations of the research.

While qualitative research suggested the power of the *Progress/Ingenuity/Innovation* value, and quantitative experimental research showed the value to be productive, we did not systematically test other candidate values. It may, therefore, be the case that there is another, more productive value that exists as a way of orienting people to the value of SBS research. Systematically testing a large range of values would be a valuable topic for a future study.

While we tested a number of different ways of ordering the elements of the narrative, we did not test *all* possible order combinations. The choice to test value-metaphor-exemplar, exemplar-value-metaphor and metaphor-value-exemplar was driven by theoretical work on narrative, as well as past FrameWorks research.

It is important to note that, while we did test a number of different SBS exemplars, our research here was not exhaustive — there are certainly examples of SBS research that were not tested in our work. Testing additional exemplars may have revealed other examples of SBS work that could be used as parts of an effective SBS communication strategy. This same limitation holds for the metaphors that were tested — our research was not exhaustive and there may be other effective (or even more effective) metaphors that could be used in communications about the value of SBS. However, we would encourage communicators and researchers to treat other metaphors as *candidates* and *hypotheses*, and subject them to the same rigorous multi-method testing that was conducted here.

Our initial test of exemplars featured relatively small cell sizes (approximately n=60). While there were findings of significance at this stage of the research, we would have liked to have had more respondents in the 16 cells that comprised this experiment. Testing these (and other, see above) exemplars in an experimental survey with a larger sample would be of value.

Because of resource limitations and the need to investigate a wide range of research questions, we were not able to test multiple wording variations of each frame element tested. There may be more effective ways of iterating the messages that resulted from our research — as well as less effective ways of constructing the language of these messages. However, because of a tight control over the amount and content of variation between treatments (there was a high degree of parallel language and structure between treatments) we are confident that the differences observed in the experiments are a function of the independent variable being tested (for example, the difference between the exemplars observed in the dependent variable scales are due to the different exemplars that were tested rather than to some other confounding variable).

There is also an important limitation to note on the overall method used to construct the sample for the experimental research. We must note that our approach to the methods used was one that balanced pragmatism, applied value, and methodological rigor. We are candid about the tension between these interests, but believe that we achieved an appropriate balance between these methodological and applied concerns. In order to locate a communications frame that has demonstrated ability to change public perceptions, our experience has been that one must investigate a large number of potential frames and explore multiple hypotheses, as many ideas that experts and advocates hold do not prove to move public opinion.

In order to bring a sufficient number of options into the research process, we used the more cost-effective vehicle of opt-in panels. In the past, this method has provided us with a level of representativeness that we are comfortable with, and has allowed us to test the complicated and multiple hypotheses that are important in our applied work of helping communicators improve their practice. At the same time, we fully realize that random sampling produces higher degrees of representativeness — this is without question. Despite this, we believe that opt-in panel designs can be used to yield representative results and, because of their costs, are the cost-effective way of testing complicated strategies and multiple hypotheses. While we are comfortable with the decision to use an opt-in panel design, we recognize the reduced representativeness of this method, as compared to random-sampling procedures, as a limitation of the study.

In some ways, the relatively small number of respondents included in the qualitative cultural models research represents a limitation — results might have been slightly different with a larger sample. However, we do not believe that this is the case. The sample size employed here is in keeping with the work done by the progenitors and leaders in the field of cultural models research.[25] Research has found that cultural models can be accurately and robustly identified using relatively small, but diverse, samples. In addition, the inclusion of On-the-Street Interviews added data to our cultural models analysis, as did the open-ended component of the large-n quantitative experimental surveys. We therefore do not believe that the sample size of the cultural models interviews constitutes a significant limitation in the study or its findings. The inclusion of data drawn from On-the-Street Interviews and the quantitative survey are also a way of managing the geographical limitation of the cultural models data (i.e., that there are areas of the country that were not sampled in the cultural models interviews).

Finally, we acknowledge that our sample of respondents in On-the-Street Interviews was one based on convenience. While we attempted to construct a sample with variation along key demographic variables (age, race/ethnicity, gender), the On-the-Street Interview procedure did not allow for selection of a statistically representative sample. Again, our sampling procedure in the survey experiments was designed, in part, to address this limitation.

About the FrameWorks Institute
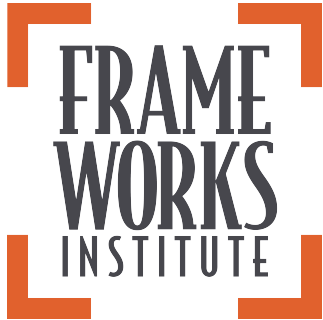
The FrameWorks Institute is a national nonprofit think-tank devoted to framing public issues to bridge the divide between public and expert understandings. Its work is based on Strategic Frame Analysis™, a multi-method, multi-disciplinary approach to empirical research. FrameWorks designs, commissions, publishes, explains and applies communications research to prepare nonprofit organizations to expand their constituency base, to build public will, and to further public understanding of specific social issues — the environment, government, race, children's issues and health care, among others. Its work is unique in its breadth — from qualitative, quantitative and experimental research to applied communications toolkits, eWorkshops, advertising campaigns, FrameChecks™ and Framing Study Circles. See www.frameworksinstitute.org

Endnotes

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[7] In early phases of the research, these exemplars were titled with different labels:
- *Addressing Economic Inequality* was originally called *Cycle Of Poverty*
- *Increasing Safety* was originally called *Brake Lights*
- *Improving Health* was originally called *Kidney Transplants*

Labels were changed through the course of the research to represent a key study finding — that labels were more effective when they drew attention to the general lesson learned rather than the specifics of the exemplar.

[8] Holland, D., & Quinn, N. (Eds.). (1987). *Cultural models in language and thought.* New York, NY: Cambridge University Press. Shore, B. (1996). *Culture in mind: Cognition, culture, and the problem of meaning.* New York, NY: Oxford University Press.

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[10] We included this exemplar in subsequent waves, as it was among the most effective exemplars of 15 tested in the first wave of the experimental survey.

[11] Parallel analyses indicate that these effects do not differ according to partisanship, that is, whether participants identified with a particularly political party.

[12] The three metaphors — *Mapmaking*, *Powering Society* and *Solving Puzzles* — were tested in a previous wave of the experiment in which all three were shown to be effective on the range of outcome measures. Also in this experiment, the three metaphors were crossed with two exemplars — *Brake Lights* and *Cycle Of Poverty* — to see if the effects of the metaphors would generalize across exemplars. Results indicated strongly that the metaphors' productive effects did generalize across the exemplars tested.

[13] The Science and Social Science Literacy scale reached statistical significance at the 0.05 level.

[14] These tests randomly assigned 957 respondents (selected to match demographic characteristics of U.S. census data) to one of the 15 exemplar treatments or a control condition (in which respondents received no stimulus). All respondents answered a set of questions that comprised the dependent variables in the experiment. The dependent variables were factor analyzed and grouped into three scales — Social Benefits of SBS, Importance of Funding SBS, SBS as Valuable as Natural Sciences. Analysis examined the effect of exposure to the treatment, as compared to the control condition, on respondent responses to the outcome questions.

[15] Results remain significant in 15 of the 18 possible outcomes (three narratives by six outcome scales).

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[22] Based on a finding that emerged over the course of the research, the exemplars were renamed as follows:
  • *Cycle Of Poverty* became *Addressing Economic Inequality*
  • *Brake Lights* became *Increasing Safety*
  • *Kidney Transplants* became *Improving Health*
  • *Class Size* became *Improving Education*

[23] http://www.surveysampling.com/

[24] Shadish, W.R., Cook, T.C., & Campbell, D.T. (2001). *Experimental and quasi-experimental designs for generalized causal inference.* London, England: Routledge.

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