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Weaving Skill Ropes:

Using Metaphor to Enhance Understanding of Skills and Learning

A FRAMEWORKS RESEARCH REPORT

Michael Erard • March 2013

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TABLE OF CONTENTS

INTRODUCTION 4

EXECUTIVE SUMMARY 7

WHAT IS AN EXPLANATORY METAPHOR? 10

WHY SKILLS AND LEARNING NEED AN EXPLANATORY METAPHOR 11

WHY WE TEST EXPLANATORY METAPHORS 12

HOW EXPLANATORY METAPHORS ARE IDENTIFIED AND TESTED 13

- Phase 1: Mapping the Gaps 13
- Phase 2: Designing Explanatory Metaphors 13
- Phase 3: Testing Explanatory Metaphors 14

THE WINNER: AN EFFECTIVE EXPLANATORY METAPHOR FOR SKILLS AND LEARNING 14

- What Weaving Skill Ropes Contributes to the Public Understanding 14
  - I. General Effects 16
  - II. Evidence from On-the-Street Interviews 17
  - III. Evidence from the Quantitative Experiment 18
  - IV. Evidence from Persistence Trials 19

USING WEAVING SKILL ROPES 25

- Applications of the Metaphor 26

APPENDIX: THE METHODOLOGICAL APPROACH TO IDENTIFYING AND TESTING EXPLANATORY METAPHORS 29

INTRODUCTION

The research presented here was conducted by the FrameWorks Institute with funding from the Ford Foundation, William and Flora Hewlett Foundation, Charles Stewart Mott Foundation, Nellie Mae Education Foundation, NoVo Foundation, Raikes Foundation, and the W.K. Kellogg Foundation. This effort to develop and test metaphors as tools to effectively communicate about skills and learning is one part of a larger project — called the Core Story of Education Project — that seeks to apply frame elements, such as values and metaphors, to communicate about education and learning. The goal of this multi-year, multi-method project is to design a message platform with empirically demonstrated effectiveness in creating public support for progressive education policies.

Explanatory metaphors are frame elements that fundamentally restructure the ways that people talk and reason about issues. As such, these metaphorical communications tools are useful in efforts to shift the interpretational frameworks that people access and employ in processing information. By fortifying understandings of abstract phenomena (such as the links between social contexts and learning outcomes), explanatory metaphors can strengthen Americans' support for policies that improve learning, both as a process and as an outcome.

Following FrameWorks' multi-disciplinary and iterative approach to communications research (Strategic Frame Analysis™ [1]), we have unpacked and distilled people's understandings of what skills are, how learners learn skills, and how skills are related to one another. We have focused on how Americans' understandings of learning are shaped by a shared set of assumptions and understandings — what anthropologists call "cultural models."[2] These shared assumptions are what allow individuals to navigate their social worlds and make sense of the experiences and information they encounter. As part of their functional role in meaning-making, cultural models can sometimes work to constrict available interpretations and make some messages "harder to think."[3]

Americans think of skills in a pragmatic way. They see skills as important because of their practical value — we need them in order to be able to do the things that we need to do. Furthermore, learning skills that we will not use in the real world is seen as pointless. From a communications perspective, the fact that people see skills as important and practical is a good thing — it means that we can activate this pattern of understanding and tap into a rich vein of culture. However, our research (outlined in a previous report[4]) has also turned up

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additional ways of thinking about skills and learning which are less productive in considering progressive education reforms:

- *How do skills develop?* While experts are attuned to ways that skill development is *contingent* on opportunities and supports, the public assumes that most skills develop *automatically as a natural feature* of growth and aging. *Implication: We need to focus on skills as the result of active interventions that happen in a developmental context.* The metaphor discussed here facilitates this perspective.

- *How does learning happen?* Experts have a complex model of learning that includes a focus on fluency, application, rehearsal, intrinsic motivation and feedback. In contrast, public thinking is structured by people's experiences with the traditional instructional system — in short, a one-way and passive model of learning. *Implication: We need to inoculate against passive conceptions of the brain as a container and learning as a conduit of knowledge from teachers' to students' brains. These ways of thinking about skills stand in the way of innovations in curriculum design, classroom design, scheduling and other areas, and undergird outdated factory-industrial models of education.* The skills metaphor inoculates against these conceptions.

- *What is skill transfer?* Experts consider the capacity to transfer skills across multiple domains and contexts to be a key meta-skill for children to develop. They also advocate for including skill transfer instruction in teacher training, curriculum design and assessment. The public, however, does not have a strong model of transferability. *Implication: We need to structure the realization that skill transfer is itself an important skill, and one that does not develop as a matter of course.* The skills metaphor communicates this concept.

- *How are skills related?* Experts argue that schools should provide classroom instruction that integrates children's cognitive, social and emotional skill development. Their view is that these skills are interdependent, and that "you can't develop any one of these skills without the others." By contrast, the public has difficulty seeing a place for social and emotional skill instruction in the classroom, which they see as a sphere that should be devoted to cognitive skill

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development and knowledge acquisition. *Implication: We need to communicate the importance of these skill areas and the idea that they develop, and are used along with, cognitive skills. We also need to communicate that no single one of these three areas can be seen as more fundamental or basic than the others.* The skills metaphor communicates this concept.

At the outset of this project, FrameWorks conceived of two discrete sets of communication needs, each of which would be met by its own metaphor. This premise governed our research process. One metaphor would be developed to help define skills and communicate about skill acquisition, aimed at the questions "What is a skill?" "What is learning?" and "What is skill transfer?" A second metaphor would make concrete the relationships among social, cognitive and emotional skills, aimed at the question, "How are skills related?"

Following our prescribed process, we assembled and tested two separate sets of candidate metaphors. However, as the research progressed, it became evident that the most highly productive conversations in the two areas of questions drew from the same domain: the domain of ropes, braiding, fabric and weaving. This domain proved highly effective in structuring people's talking and thinking on all of the target questions about skills and learning, so we combined the tasks into a single inquiry designed to see how much of the overlapping goals of skill identification, skill acquisition processes and inter-relationships among skills could be generated from this powerful metaphor category. This report describes the research process that produced the skills metaphor and provides a guide on how to use this communications tool.

We note that even the best explanatory metaphors cannot accomplish everything that needs to be done in reframing a complex issue like skill development. Other frame elements (Values, Messengers, Visuals, Tone, Explanatory Chains, Social Math and additional Explanatory Metaphors[5]) need to be tasked with addressing other routine misdirections in public thinking. Toward that end, this report is another in a series of explorations designed to identify effective elements of an overarching Core Story of Education.

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EXECUTIVE SUMMARY

FrameWorks' explanatory metaphor research process demonstrated that the domain of weaving ropes offers a powerful resource for productively channeling how Americans talk and think about skills and effective learning.

Weaving Skill Ropes

- Learning is the brain weaving skills into ropes.
- Each skill rope is made of smaller strands.
- A strong skill rope needs strong strands, but it also needs these strands to be woven tightly together.
- Each strand needs all the others — no single strand can do all the work of the rope.
- Learners need chances to develop all the strands, to learn how to weave and reweave them together, and to use the resulting ropes.

The metaphor can be extended to structure a more specific discussion of how social, cognitive and emotional skills are related to one another, as in the following way:

- To construct a skill rope, the brain needs to weave together three different strands.
- All skill ropes are made of cognitive, emotional and social strands.
- A strong rope needs each of the strands to be strong, but it also needs them to be woven tightly together so that they support one another and add strength to the skill rope.
- Each strand needs all the others — no single strand can do all the work of the rope.

Strengths of the metaphor

Weaving Skill Ropes is a highly communicable, usable metaphor that showed significant strengths in structuring how participants talked about learning, the contexts of learning, and the acquisition and use of skills. The metaphor enabled people to see that skills are dynamic, that learning is lifelong, and that the best way to create positive learning outcomes involves weaving social and emotional skill development into cognitive skill development. The

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domain of weaving ropes was productive across a range of research venues and methods, and with a wide range of Americans.

Relevance to Americans

One might assume that weaving, braiding and rope-making are activities that are meaningless to most contemporary Americans, but, in fact, they proved to be solidly understood by all our informants at each stage of research. It is notable that the noun "rope" and the verb "weave" are fairly frequent words in both spoken and written American English. The rope, as a concrete and practically useful item, tapped into Americans' sense that skills are inherently practical and useful. In addition, a rope is perhaps one of the few items that qualifies as a tool whose construction people can imagine, see and perhaps even do. In other words, weaving ropes combines functional (what something does), structural (what something is made of) and processual (how something is made) entailments.

Who weaves?

Weaving is a deliberate and active process which does not simply occur by itself; because ropes cannot weave themselves, our participants reasoned that skill ropes do not create themselves. This makes the metaphor particularly useful for prescribing learning as a deliberate activity that occurs best in certain ways and contexts. At the same time, our participants apparently felt no need to invoke a human "weaver," "ropemaker" or other agent. This is another asset of this metaphor, because conversations did not hang up on the question of who the weaver was: whether a teacher, a parent, some other authority figure or learners themselves.

What is woven?

Another asset of the metaphor is that specific skills can be named as ropes — for instance, one could name "the reading rope" or "the writing rope" in order to open a discussion about the multiple strands that make up those skills, and the right contexts and practices through which those strands can be most tightly woven together.

Rope as a way to think about individual differences

In the metaphor, a skill is a rope, but, in discussions, people were often described in terms of ropes as well. Participants found it easy to describe a range of individual characteristics using language about ropes and weaving. For instance, autism spectrum disorders came up

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frequently as an example of people who "only had two strands" or who "weren't well-woven." Also, people easily incorporated the notion of variegated strands. One informant cheerfully described the model well-rounded person as "plaid."

Produces gestures

Using the ropes/weaving domain in discourse was commonly accompanied by weaving/braiding gestures and visual representations by informants. The use of gesture, in particular suggests a high degree of "thinkability" of the metaphor, because people can illustrate it with their hands.

The failure of *"Skill as a Muscle"*

Because the metaphor of a *Skill as a Muscle* is prominently used in education communications, we decided to test it along with other candidates in this research. We observed that it problematically activates people's thinking about individual decision-making and willpower, probably because "building muscle" and "exercising" are seen as individual health behaviors. In other FrameWorks research, we have found that health and related topics are strongly associated with individual responsibility.[6] Such an association endangers policy support by taking the focus away from contexts of learning and placing responsibility for outcomes narrowly on the shoulders of learners and their effort and discipline. *Skill as a Muscle* also did not capture other crucial aspects of the expert view of skills — for instance, that skill components can transfer to other skills. For these reasons, we removed the metaphor from further examination and do not recommend that advocates interested in building public support for learning reforms use the *Muscle* metaphor.

WHAT IS AN EXPLANATORY METAPHOR?

An explanatory metaphor can be thought of as a bridge between expert and public understandings. Presenting a concept in a way that the public can readily deploy to make sense of new information, channels the way people think and talk about a particular topic. More specifically, FrameWorks defines an explanatory metaphor as a research-driven, empirically tested metaphor that captures and distills a concept by using an explanatory framework that fits in with the public's existing patterns of assumptions and understandings (cultural models).[7] An explanatory metaphor renders a complex and/or abstract problem as a

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simpler analogy or metaphor. By pulling out salient features of the problem and mapping onto them the features of concrete, immediate, everyday objects, events or processes, the explanatory metaphor helps people organize information into a clear picture in their heads. This has the potential to make people better critical thinkers and more careful media consumers who are ultimately better situated to think about how policy affects social issues like education reform, school readiness and learning outcomes.

On the basis of this theoretical perspective, FrameWorks has built a robust, reliable protocol for determining what an effective explanatory metaphor looks like and how it behaves.[8] An effective explanatory metaphor:

1. improves understanding of how a given phenomenon *works*;
2. creates more robust, detailed and coherent discussions of a given target concept (e.g., education reform, learner agency, skill development);
3. is able to be applied to thinking about how to *solve* or *improve* a situation;
4. inoculates against existing dominant, but unproductive, default patterns of thinking that people normally apply to understand the issue;
5. is highly communicable, moving and spreading easily among individuals without major breakdowns or mutations;
6. is a linguistic resource for social interaction (e.g., people can incorporate it into their stories and conversations); and finally,
7. is self-correcting. When a breakdown in thinking does occur, people using the explanatory metaphor can re-deploy it in its original form, where it is able once again to clarify key aspects of the issue.

WHY SKILLS AND LEARNING NEED AN EXPLANATORY METAPHOR

When designing and testing explanatory metaphors, FrameWorks' researchers employ the results of earlier qualitative research, cultural models and metaphor theory, and an understanding of the communications challenges presented by the particular topic. We conceived of the ways that an explanatory metaphor must work on the specific issue of skills and learning as the following:

1. The metaphor has to be understandable and usable for a range of learners, contexts and skill domains.

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2. The metaphor has to elicit or convey expert understandings of skill acquisition as a function of fluency, application, rehearsal, motivation and feedback. It also has to elicit an understanding of skills as componential, dynamic and constructed (as well as constructable), as opposed to sequential, static and pre-existing.
3. The metaphor needs to make the relatedness of social, emotional and cognitive skills more thinkable.
4. The metaphor needs to inoculate against conceptions of students/learners as passive, the brain as a container, and learning as a one-way conduit from teacher to student.
5. The metaphor has to inoculate against the age-grading of people's thinking about skills and learning, such that they recognize a common set of features for positive learning outcomes for learners.
6. The metaphor has to create openings for thinking about innovations in learning and education, and neutralize idealized notions related to the factory-industrial model of education.

Below, we briefly discuss the process by which FrameWorks' researchers identified, developed and empirically tested the power of the *Weaving Skill Ropes* explanatory metaphor in broadening public understanding of skills and learning. We then present the findings from this research and conclude with specific recommendations about how best to deploy this communications device in messaging about skills and learning. The Appendix provides more specifics about the research methods employed.

WHY WE TEST EXPLANATORY METAPHORS

Most people can easily identify and even generate metaphors in order to explain, teach or argue points and ideas. Yet, metaphors are integral to human thought at levels that evade conscious detection and reflection.[9] Each metaphor proposes a re-categorization of a concept in mind. Because concepts already exist in an internalized web of other meanings, these re-categorizations implicate and activate other concepts, how they are categorized and their relationships to one another. These consequences may also interact with culture-specific interpretations and default cognitive preferences, endangering the very communications goal that the metaphor is intended to serve.

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Because of this potential for metaphors to have unintended, negative effects in relation to communications goals, FrameWorks tests its explanatory metaphors in order to observe and measure the *actual* directions that metaphors take in social interaction and discourse. These tests allow us to look at the "cognitive downstream" — to observe what happens to metaphors as they live and breathe in complex cultural, political and linguistic ecologies. Testing metaphors further enables us to avoid subjective responses to metaphors and inoculate against arguments about a metaphor's effectiveness based on from-the-hip assessments of "what most people think" or "what most people know." That is, testing metaphors allows us to see their actual effects on cognition and meaning-making, and to avoid potentially disastrous armchair predictions.

A final reason for testing is that many of the most persistent metaphors that we use in our daily language have evolved over long periods to fit their cultural circumstances and be usable by human brains. We use such metaphors because they are present in our language and our culture, and they are present in our language and culture because they have outlasted or proven themselves to be more cognitively fit than other related attempts. Because issue advocates do not have the luxury of long periods to see what might emerge naturally, we compress this evolutionary schedule to produce a metaphor with immediate cognitive and social fit. Our methods of testing explanatory metaphors are designed with these considerations in mind.

HOW EXPLANATORY METAPHORS ARE IDENTIFIED AND TESTED

Phase 1: Mapping the Gaps

FrameWorks' research team first conducts two types of interviews: Cultural Models Interviews and Expert Interviews. Cultural Models Interviews are conducted with members of the general public and are designed to gather data that, through qualitative analysis, reveal the underlying patterns of assumptions — or cultural models — that members of the public apply in processing information on a given topic. Expert Interviews are conducted with researchers, advocates and practitioners who possess an expert or technical understanding of the given phenomenon. These interviews are designed to elicit the expert understanding of the issue. Comparing the data gathered from these two types of interviews reveals the gaps

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that exist between how experts and average Americans understand and approach issues.

Phase 2: Designing Explanatory Metaphors

FrameWorks' interdisciplinary research team then analyzes transcripts of the interviews conducted in Phase 1 to generate a list of metaphor categories that capture salient elements of the expert understanding in metaphors accessible to the general public, using approaches to metaphor from cognitive linguistics and psycholinguistics. The result of the design process is a list of metaphor categories (e.g., *Tool*, *Raw Material*) and multiple candidate explanatory metaphors in each category (e.g., *Skill Structure*, *Skill Stacking*). The initial explanatory metaphors generated from this phase are listed in the Appendix.

Phase 3: Testing Explanatory Metaphors

FrameWorks tests the candidate explanatory metaphors in multiple research formats. The process begins with a "smell testing" by professionals in the relevant field. In informal conversations with researchers, the professionals are asked whether or not they could imagine themselves using the candidate metaphors in their daily work. Next, we hold On-the-Street Interviews with around four dozen individuals recruited randomly in several locations. These are followed by experimental surveys given to a scientific sample of 2,000 participants; these surveys test the candidate metaphors on measures of issue understanding and metaphor application. Next, we take the most effective explanatory metaphor candidates into a final phase of qualitative testing, Persistence Trials, that mimics the game of telephone, with six individuals in each trial and three to four trials per candidate metaphor. With these, we can see how well the explanatory metaphors hold up in social interaction as they are used and shared. At each stage, we use our findings to winnow our selections and refine the explanatory metaphors that remain. What results is detailed data about which explanatory metaphor works and why.

THE WINNER: AN EFFECTIVE EXPLANATORY METAPHOR FOR SKILLS AND LEARNING

Employing the research process outlined above, FrameWorks' research team identified, refined and empirically tested four broad explanatory metaphor categories and a total of 16

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iterations across those categories. One of these explanatory metaphors, *Weaving Skill Ropes*, emerged as a highly effective tool for aligning public and expert thinking around what skills are, how they develop and how they are used.

What Weaving Skill Ropes Contributes to the Public Understanding

Weaving Skill Ropes makes broad-ranging contributions to public discussions about 1) what skills are and how they develop, and 2) how social, emotional and cognitive skills are related to one another and used.

The strengths of the metaphor on each of these topics stem from the following features of the metaphor domain:

- Skills are ropes made out of smaller strands.
- The strength of each strand lends to the overall strength of the rope, but the strength of the weave is also essential.
- Weaving ropes is a deliberate activity; it does not occur naturally or passively.
- Each of the strands may be unremarkable on its own, but they come together to produce a useful whole, which is stronger than any individual strand.
- The noun "rope" and the verb "weave" are frequent words in spoken and written American English. Also, it is worth noting that "rope" is used to label the category of "rope" but can also be extended to talk about specific types of ropes, as we discuss below.
- Weaving, braiding and rope-making proved to be solidly understood by all of our participants at each stage of research.
- Having both a noun ("rope") and verb ("weave") highlights how "weaving ropes" is an ongoing and changing process. In other words, it is a metaphor that helps people think about *how* skills develop *over time.*
- Ropes are practical tools. A rope is a unique item in that it qualifies as a tool whose construction people can imagine, see, and perhaps even do.
- The weaving of a rope as a continual process also lends itself to discussions of lifelong learning, and is therefore usable in a range of learning contexts outside of formal school settings.
- The combining of strands involved in making a rope forestalls the view that social, cognitive and emotional skills are acquired in sequence. In our qualitative research, participants talked about these skill sets being "used together" and developed together.
- Skill transfer is communicated via the "weaving and reweaving" of skill ropes, as people take elements from one learned skill and "splice" and apply it in another context, domain or need.

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Below, we review the development of this explanatory metaphor through the iterative research process. We discuss its general effects, summarize the empirical evidence that demonstrates its explanatory power, and describe the specific strategic advantages it confers when employed in communicating about skills and learning. Finally, we describe some of the finer points of using this explanatory metaphor with specific directions for its application.

I. General Effects

Each stage of research confirmed the effectiveness of the *Weaving Skill Ropes* explanatory metaphor. Useful parts of the metaphor include:

1. A skill is a rope.
2. Learning is a process of weaving that skill rope.
3. A rope is made of many smaller skill components.
4. The number or size of these components is not fixed; they vary among ropes.
5. A rope does not come into existence naturally — it is something that must be constructed.
6. Ropes are practical objects — we use them to do things.
7. Each disparate thread or strand of a rope may be unremarkable on its own, but in combination with others it makes a substantial contribution.
8. A rope is flexible as well as strong.
9. Ropes are not static — they can be woven continuously and they can be unwoven and rewoven, or spliced with other ropes.
10. Ropes differ in size, structure and function.

Weaving Skill Ropes was highly effective in harnessing Americans' practical views of skills and moving people's talking and reasoning away from other, unproductive patterns of thinking. The rope/weaving metaphor domain structured different ways to talk and think about effective learning: how it happens, when and where it happens, and what results.

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II. Evidence from On-the-Street Interviews

FrameWorks' researchers conducted On-the-Street Interviews with 72 people in Portland, Maine, Annapolis, Md., and Frederick, Md. These interviews tested the ability of 12 candidate metaphors (six metaphors in two sets) to enable more articulate and scientifically consonant discussion about the process and results of effective learning. The first set of metaphors was designed to structure thinking about what skills are and how they develop. The second set sought to address thinking about the relationship between social, emotional and cognitive skills, and how these skills are used.

Informants were first asked a set of questions about effective learners and were then presented with an explanatory metaphor. After the metaphor was presented, they were asked the earlier questions but in a rephrased form. Two researchers independently analyzed the resulting video data, looking for patterned ways in which each of the eight tested explanatory metaphors changed thinking and talking about learning. The analysis also focused on isolating the reasons *why* each of the metaphors tested were having their respective effects.

Here, we observed that the metaphor of *Braiding Ropes* was particularly generative in regards to the multiple components of skills, the transferability of those components among skills, and the need for strong individual strands. Though the word "braiding" was not "sticky" in discourse (perhaps not surprisingly, since it is not frequent in American English), "strands" appeared multiple times. This metaphor also produced a rich set of entailments regarding the flexibility of the rope and its ever-changing nature.

These results were used to winnow and refine the set of candidate metaphors for the next research phase.

III. Evidence from the Quantitative Experiment

Using the results from On-the-Street Interviews to winnow the set of candidate metaphors and refine existing iterations, FrameWorks designed a large-scale experimental survey to quantitatively assess the efficacy of the refined set of metaphor candidates. This test, a head-to-head comparison using random assignment techniques, enables FrameWorks' researchers to chart how well each explanatory metaphor achieves the goals that we described above. Eight metaphors (in two sets of four metaphors apiece) and one control condition were tested

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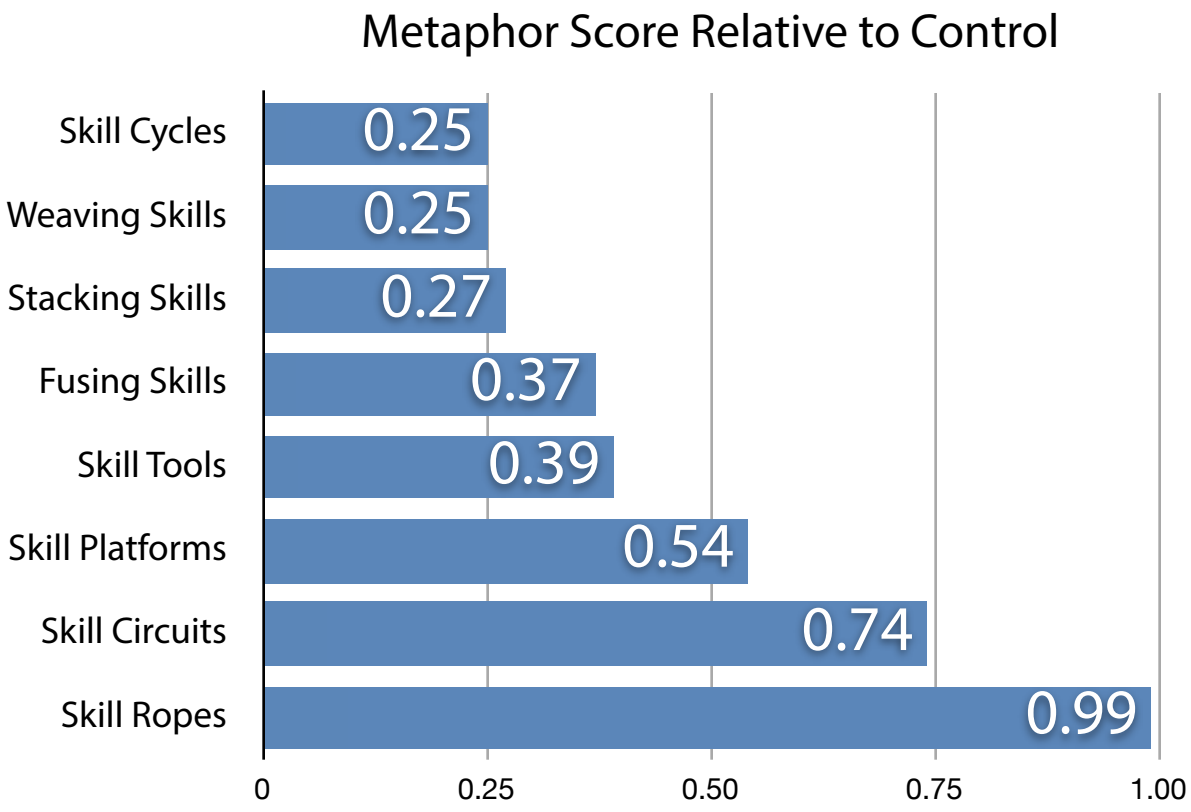
using the same set of questions. (Examples of these questions are provided in the Appendix.) Figure 1 provides the performance of each metaphor relative to a control. The difference in scores of *Skill Ropes* and *Skill Circuits* relative to the control were statistically significant.



Based on these results, FrameWorks' researchers took the top two performing metaphors — *Skill Circuits* and *Skill Ropes* — forward into the final stage of the research — Persistence Trials.

IV. Evidence from Persistence Trials

FrameWorks held Persistence Trials in Philadelphia, Pa. and Austin, Texas, for a total of five sessions with 30 participants. These sessions were used to gather data on two candidate metaphors: *Weaving Skill Ropes* and *Building Skill Circuits*. In the intense social interaction of the Persistence Trials method, *Weaving Skill Ropes* emerged as the explanatory metaphor with the most productive results.

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Persistence Trials give participants a way to interact with, and use, the explanatory metaphor in actual social discourse. They therefore produce rich data about a given explanatory metaphor's properties and effects. In a Persistence Trial, an initial pair of participants is presented the explanatory metaphor, first as text and then conversationally by the researcher. The participants then discuss the explanatory metaphor with the moderator before teaching it to a subsequent pair of participants after being given a few minutes alone to plan a presentation. Following the transfer, the second pair explains the explanatory metaphor to a third pair. Finally, the first pair returns to hear the transmitted metaphor from the third pair. This last step allows us to see whether the metaphor has persisted over the session and to enlist participants in explaining any changes that may have occurred to the metaphor. With written consent from all participants, Persistence Trials are video-recorded from start to finish.

Data from Persistence Trials are analyzed along several lines: if and how participants can *apply* the explanatory metaphor; whether and how the metaphor *inoculates* against unproductive cultural models; whether and how the metaphor is able to *self-correct*; and the degree to which it is *communicable*. In these terms, the specific advantages of the *Weaving Skill Ropes* explanatory metaphor are as follows:

1. Application. Persistence Trials showed that participants applied the *Weaving Skill Ropes* metaphor in the following ways:

Increased Learner Agency

Participants used *Weaving Skill Ropes* to describe learning as an active process, not a dumping of content into passive brains via direct teacher instruction. Some talked about finding and creating motivation to learn; others talked about certain types of learning and evaluation scenarios.

> **Participant 1:** I'm looking at the rope as a skill that you need for life, job, whatever. My thought would be there are many ways to teach it. Some things you have to teach yourself. Am I learning something that someone needs to teach me, or am I learning something that I need to learn myself …

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Skills are Dynamic and Transferable

People frequently and easily used *Weaving Skill Ropes* to discuss skills in the same ways that experts do. That is, skills are transferable, they are dynamic, and they are made up of multiple skill components. These descriptions of skills are significantly more sophisticated than default notions of skills. For instance, people easily discussed skills as componential.

> **Participant 1:** My whole thing is, the rope for me is a skill. The ultimate skill. I think that's how I'm looking at it. The rope, it's something you need — am I good at math? To me, that's a rope. But I need analytical skills, I need this, I need three different things [to make up that rope] … and how good I am at that rope or that thing depends on how strongly [sic] my strands are.

Along with componentiality came the notion that skill creation is dynamic:

> **Participant 1:** A skill is not something you just pick up. You have to work on it, it's ongoing.
>
> —
>
> **Participant 1:** Do you think skills are finished things? Could you have a rope that wasn't finished?
>
> **Participant 2:** I would say yes. You can have a rope that can still have more strands and can have more coming into it, and you can have a rope that's going to connect to other skills. So you have something that's bigger than what it is on its own terms.

The dynamic nature of skill-building also made it easier for people to think about skill transfer, which the metaphor conceives of as "unweaving" and "reweaving" skill strands:

> **Participant 1:** The hardest thing is to teach yourself something different and to unlearn it. You've got this rope, and you think you're good at it, but maybe you're not as good at it as you should be, and you need to strengthen one of your strands. You need to relearn and make that strand stronger.

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Multiple, Intertwined Skills

Just as important as talking about the componentiality of skills were the strands and the relationships between the strands that participants identified as being part of skill ropes. Thinking about skill ropes, participants saw room for emotional and social strands even in skills that are ostensibly intellectual or cognitive. In short, the rope idea was successful in getting people to recognize the importance of social and emotional skills and to see how these skills are fundamentally intertwined with cognitive components.

> **Participant 1:** We think that those are traits that you can use for building up any kind of skills — all kinds of skills are related, in that we think that it takes a certain amount of each of those things to become good at a skill. We picked motivation as a starting point — you have to know what you want to do in order to learn the skill. Repetition. Again, it can be practicing as well as thinking positive thoughts. Imagination — that goes along with your motivation at the beginning. You have to think of a way you can get better or think of new things to learn.

Another strength of *Weaving Skill Ropes* is the way it calls attention to the existence of more aspects to skills than meet the eye — that there are parts of a rope which are essential to its function and strength but are not immediately visible on the surface. This entailment is useful in discussions of what students are actually learning, as well as attempts to evaluate how well they are learning and provide supports that make learning more effective.

> **Participant 1:** In learning, a lot of times it can come down to test scores [which is] treated as measures of the whole learning experience. Clearly that's not the case. It's more about the process of climbing the rope and building it together — it's usually not just about one type of performance. So that's how I see the rope metaphor working in my mind — learning isn't stretching out one type of skill, but it's creating the circumstances so that other skills can come together so that you have a rope when you're all said and done.

2. Inoculation. *Weaving Skill Ropes* also showed an ability to inoculate against several powerful default cultural models that lead people in unproductive directions when thinking and talking about skills and skill development.

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Against hyper-individualization

Americans will often assert that each person has a unique learning style and learning needs. When thinking in this way, people tend to think and behave like consumers who expect a certain item or service for a particular cost and who think of all human relations as transactions. This is problematic in that it makes notions of basic principles and universal best practices that are essential components of public policy across populations difficult to consider. When using *Weaving Skills Ropes*, however, people mentioned learning style differences infrequently. The metaphor provided a model of a brain-based process for learning that is fundamental and uniform across learners, domains, settings and life stages. It can also be part of a shared vocabulary for what learners in a range of settings and life stages need — and, therefore, what institutions and policies can provide for them.

Against separating cognitive skills from other skills

Another challenge is to get Americans to see how emotional, social and cognitive skills are connected to each other. People readily agree that these skills are related, but have difficulty in describing how; moreover, they tend to put specific skills in specific places — for example, seeing school as the domain for developing cognitive skills and out-of-school time as the context in which social skills are developed. Also, they fail to see how cognitive skills are *supported* by social and emotional skills. *Weaving Skill Ropes* ameliorated these problems by making it easier for people to see how the different strands of the rope (if they are cognitive, social or emotional) support each other, and how the development of social and emotional skills supports cognitive skill development and vice-a-versa.

> **Participant 1:** You have to ask teachers to keep track of the things that go into learning. If the kid is having a problem, it could be because they need to work on their people skills, or they're having emotional problems — it's not just their thinking [skills].

This was accompanied by a sense that the strength of any one strand supported the whole rope.

> **Participant 1:** If you don't have strong strands to learn the skill, you don't have the skill. That's why this strong rope needs strong strands.

One participant talked about the reality that other skills might be submerged or invisible, and that talking in terms of weaving ropes made the existence of many strands more apparent.

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> **Participant 1:** I think [the metaphor] would be a good way to start a conversation about — whether or you're trying to reach students or other people — that on the surface it might seem like it's just one thing, one means to an end. But, say, if you're thinking of a mental exercise or a practice or a sport, you might think of it as purely physical. But of course it's winning or losing with grace that's your emotional skill. It's how to be a leader in terms of the team, so that's about social skills. So it's clearly more than just physical, but sometimes on paper, if you're saying, "I'm a basketball player," you might be thought of as someone with just physical attributes.

3. Self-correction. Self-correction refers to an explanatory metaphor's ability to "snap back" to its initial form following a deterioration or mutation of the concept in discussion. At times, one structural feature of the metaphor may be forgotten, drop out of conversation, or devolve into an alternative formulation. An important measure of an explanatory metaphor's strength, self-correction occurs when these features fall out of conversation and then re-assert themselves in subsequent discourse *without being re-cued by the moderator*. When communicated in the public sphere, explanatory metaphors are likely to break down. Therefore, it is important that a concept have sufficient internal coherence to recover from devolutions — to encourage people to arrive at key entailments despite partial or inaccurate communication of the explanatory metaphor.

Given how highly communicable this metaphor was, there were limited opportunities for researchers to observe its self-correctional attributes. In other words, observing self-correction requires a degree of metaphor breakdown that *Weaving Skill Ropes* happily did not experience.

4. Communicability. Communicability refers to the faithfulness of the transmission of the explanatory metaphor among participants. Analyzing video of Persistence Trials, FrameWorks researchers look for the repetition of exact language and key ideas, as well as the stability of the central metaphor as it is passed between individuals. Communicability varies significantly between the explanatory metaphors that we test, making it an important metric in gauging the effectiveness of any one explanatory metaphor.

From the earliest stages of the research process, we observed people using aspects of the weaving domain with great facility. Words like "strands," "strong strands," "weaving,"

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"melding," "combining," "splicing" and others were frequent in the conversations. The notion of *Weaving Skill* was highly communicable between participants; the central concept of strands and ropes was highly sticky.

In one instance, *Weaving Skill Ropes* was presented along with another metaphor that a participant introduced, giving us an opportunity to watch a run-off between two metaphors. In the conversation, the other metaphor, that of a skills tree, was introduced by a Generation 2 participant and presented next to *Weaving Skill Ropes* to Generation 3 participants, who said that they preferred *Weaving Skill Ropes* as a way to talk about skills. What seems to have been key was the flexibility, functionality and process entailments of the rope and the sense that weaving the rope is never completed.

Another characteristic of a metaphor with a high degree of communicability is that, when participants talk about it, they make gestures with their hands and fingers.[10] In the case of *Weaving Skill Ropes*, we observed participants in both On-the-Streets Interviews and Persistence Trials intertwining their fingers when talking about learning, weaving and the combining of strands. They made more gestures than when talking about other metaphors, and they gestured more with *Weaving Skill Ropes* in productive conversations. When such gestures accompany a particular metaphor, they indicate that the metaphor has been powerfully incorporated into deep parts of cognition and meaning-making — in short, from a cognitive perspective, such gestures indicate that the metaphor has a high degree of "thinkability."

USING *WEAVING SKILL ROPES*

For the reasons described above, FrameWorks confidently offers *Weaving Skill Ropes* as a new strategic frame element to aid in reframing the public conversation about skills and skill development, and education reform more generally.

We add a note of caution, however, in the application of explanatory metaphors in general and of the metaphor offered here more specifically. The explanatory metaphor suggested here was tested both for its underlying concept and with respect to the highly targeted linguistic execution of the core set of concepts. We have thus provided some guidelines that users of this metaphor are invited to apply to their creative adaptation of this communications tool.

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The following are a set of notes that advocates should keep in mind when they set out to use *Weaving Skill Ropes*. Here is the basic metaphor:

Weaving Skill Ropes

- Learning is the brain weaving skills into ropes.
- Each skill rope is made of smaller strands.
- A strong skill rope needs strong strands, but it also needs these strands to be woven tightly together.
- Each strand needs all the others — no single strand can do all the work of the rope.
- Learners need chances to develop all the strands, to learn how to weave and reweave them together, and to use the resulting ropes.

The metaphor can be extended to structure a more specific discussion of how social, cognitive and emotional skills are related to one another, as in the following way:

- To construct a skill rope, the brain needs to weave together three different strands.
- All skill ropes are made of cognitive, emotional and social strands.
- A strong rope needs each of the strands to be strong, but it also needs them to be woven tightly together so that they support each other and add strength to the skill rope.
- Each strand needs all the others — no single strand can do all the work of the rope.

Applications of the Metaphor

We offer the following hypothetical constructions, executed in the form of editorials, as examples of specific ways in which *Weaving Skill Ropes* could be applied in communications.

Reading Rope

PITTSBURGH – A Virginia Cove father tells a familiar story. His son is smart (he can talk endlessly about insects) but cannot read.

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The boy's principal promises that the child is getting "plenty of phonics." But homework seems to consist of memorizing sight-words. How can this impasse be avoided?

"The reading rope is woven out of many different strands," explained Xavier Jones, "and each of those strands has to be strong for the rope to function and do its job. A child's ability to read isn't held up by only one strand. Multiple strands have to be woven tightly together in order for the reading rope to be strong and useful in all the situations in which a child will need it."

Classroom Redesign

RALEIGH – It might seem a little far-fetched, but the days of the lecture classroom in higher education could soon go the way of 18th century single-room schoolhouses.

As this shift happens, architecture firms have learned to redesign their classroom models and give schools better places for educating students.

"There is a lot of research showing that most students don't learn very well from lectures," says Bill McNamara, a professor of physics at Western Carolina College who has consulted with several architectural firms on classroom design. "When students are learning, they're weaving skills together, and learning spaces should be designed to facilitate this weaving," McNamara says. They should be large enough and flexible enough for lots of different activities. They should encourage peer interaction, and they should be stimulating without making students feel anxious.

"We have to think about how classrooms support all the strands — whether they're social, or emotional or cognitive — that students need to learn how to weave together and use."

Weaving Empathy into Skills

BERLIN – Get ready for empathy class.

After recent tragedies, some educators have decided that American students could improve their ability to understand what others might be feeling.

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“Empathy is an important part of many skills that students have to learn,” said Mary Jones Smith, principal at Eastwood Junior High, “and it should be woven into those skills to make them stronger.” Literature and theater have traditionally been rich sources of human behavior which give students access to other people’s viewpoints.

Some critics say that empathy lessons don’t have a place in school.

But, says Smith, “Like other skills, empathy doesn’t get woven on its own — students need practice weaving it together with other skills. And school is a great place to practice this weaving. Empathy can be woven into many other skill-weaving activities that happen in schools and empathy is an essential strand in all the skill ropes that students need.

“When this weaving is done well, students understand on many levels, making them more fluent and flexible learners who can apply these skills to multiple situations.”

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APPENDIX: THE METHODOLOGICAL APPROACH TO IDENTIFYING AND TESTING EXPLANATORY METAPHORS

I. PHASE 1: MAPPING THE GAPS

In the first phase of this explanatory metaphors research process, FrameWorks employed an interview method called Cultural Models Interviewing. Using a detailed interview guide, interviewers asked questions aimed at getting at how average Americans understand what skills are and how they develop.

More generally, Cultural Models Interviews reveal the cognitive "terrain" on a given issue by focusing on the implicit patterns of assumptions — or cultural models — which individuals employ to process incoming information on an issue. These patterns are the "mental bins" into which people try to fit incoming information, and represent both potentially productive and damaging ways of making sense of information. To uncover the gaps in understanding on the target issue, the findings from Cultural Models Interviews were held up to data gathered from experts on skill acquisition. FrameWorks calls this process "mapping the gaps."

II. PHASE 2: DESIGNING EXPLANATORY METAPHORS

After identifying the gaps in understanding, the second phase of the explanatory metaphors research process aimed to generate a set of candidate explanatory metaphors that were then empirically explored and tested in the third research phase. The result of the design process is a list of both metaphorical categories (e.g., *Structures*) and multiple iterations, or "executions," of each category (e.g., *Platforms*). FrameWorks' linguist analyzes all of the transcripts from the "mapping the gaps" phase of the research process, and then generates a list of metaphor categories that represent existing conceptual understandings that can be recruited, and metaphorical language and concepts that the experts and general public share. The linguist generates metaphor categories that capture the *process* element (how the thing works) of the expert understanding in metaphors that, given the data gathered from the general public, have the potential to be easily visualized and incorporated into thinking about the issue under consideration.

FrameWorks researchers who are specialized in cultural models and cognitive theory conduct a cognitive analysis of the explanatory metaphor categories, which examines the *expected*

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public response to the metaphors, based on cultural models theory and existing FrameWorks research on cultural models that Americans employ in understanding skills and skill acquisition. Researchers then use this analysis to review the metaphor categories, adding new possibilities and suggesting ones to be cut. At this stage, researchers also compare the candidate metaphors to the data from the initial Cultural Models Interviews. Metaphor categories that contain elements or aspects of metaphors found to be damaging or distracting in the public's thinking about the topic are eliminated from the candidate list. On the other hand, explanatory metaphor categories containing elements of more productive cultural models are highlighted as particularly promising.

During the process of designing candidate explanatory metaphors, FrameWorks also assesses the metaphors' abilities to be incorporated into practice by journalists and advocates/ practitioners. In some cases, this practical assessment has suggested that some candidate metaphors are too provocative or problematic to pass into the public discourse. These metaphors are removed from the working list. The refined list is then returned to the linguist, who begins to compose iterations or executions of the categories on the list. The list of categories and iterations is sent back to FrameWorks' researchers for additional revisions.

III. PHASE 3: TESTING EXPLANATORY METAPHORS — THREE TESTS OF MODEL EFFECTIVENESS

TEST I: ON-THE-STREET INTERVIEWS

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

The metaphors are written up as "iterations," paragraph-long presentations that cue the listener/reader to two domains of meaning, one that is typically referred to as the "source," the other as the "target." In the metaphorical statement "encyclopedias are goldmines of information," the source domain of meaning is "goldmine" and the target is "encyclopedias." In FrameWorks' terms, "encyclopedias" is the target because it is the object or process that the application of knowledge about goldmines is meant to illuminate.

Iterations on the following metaphors were brought to this stage: Set 1 (*Sharpening the*

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Brain's Tools, *Building Muscle*, *Skill Stacks*, *Building Skill Structures*, *Weaving Skills*, *Braiding Skills*) and Set 2 (*Skill Circuits*, *Skills Fabric*, *Skills Rope*, *Skills System*, *Skills Bundles*, *Skills Ladder*).

In 2012, FrameWorks tested a total of 12 candidate explanatory metaphors in Portland, Maine, Annapolis, Md., and Frederick, Md. Each candidate explanatory metaphor was presented orally, in separate interviews, to six informants in each location for a total of 6 interviews per metaphor, comprising a data set of 72 ten-minute interviews. All informants signed written consent and release forms, and interviews were video- and audio-recorded by a professional videographer. The 12 metaphors represented executions of six different candidate explanatory metaphor categories. Data from the interviews were used to winnow and refine categories, as well as to refine the individual executions of metaphors within categories.

Subjects

A total of 24 informants were recruited on site in the three locations. A FrameWorks researcher approached individuals on the street or walking through a mall and asked if they would be willing to participate in a short interview as a part 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 informant's age and party affiliation, as self-identified, were collected after the interview. Efforts were made to recruit a broad range of informants. However, the sample is not meant to be nationally representative. Although we are not concerned with the particular nuances in how individuals of different groups respond to, and work with, the explanatory metaphors tested in these interviews, we recognize the importance of between-group variation and take up this interest in quantitative testing of explanatory metaphors. There, the virtues of quantitative sampling techniques can effectively and appropriately address issues of representativeness and across-group variation.

The Interview

FrameWorks had the following goals in designing and conducting On-the-Street Interviews: (1) identify particularly promising explanatory metaphor categories; (2) refine those categories with more mixed results; and (3) eliminate highly problematic categories, in which

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the underlying *concept* created problems that could not be overcome by refining existing or designing new executions. FrameWorks' approach to this winnowing process is highly conservative, to assure that only the most unproductive categories — those that are beyond repair — are eliminated.

However, winnowing is a necessary feature of a process that intentionally produces a large set of possible iterations, but that culminates in the one most effective explanatory metaphor. More specifically, interviews were designed to gather data that could be analyzed to answer the following questions.

1. Did the informants *understand* the explanatory metaphor?
2. Did they *apply* the explanatory metaphor to talk about effective learning and what learners need in order to learn effectively?
3. Did the explanatory metaphor *shift* discussions away from the dominant thought patterns that characterized the initial responses?
4. How did informants respond to the questions about effective learning?
5. Did exposure to the explanatory metaphor *lead to more articulate answers and robust, fully developed conversations* of issues that informants had problems discussing prior to being exposed to the model?

TEST II: QUANTITATIVE EXPERIMENTAL RESEARCH

After analyzing On-the-Street Interview data, FrameWorks subjected the refined set of explanatory metaphors to an online quantitative experiment. The overarching goal of this experiment was to gather statistically meaningful data on the metaphors' effectiveness, which provided an empirical basis for selecting one or two metaphors that were most successful relative to a set of theoretically-driven outcome measures. In the end, experimental data were used to select and refine one explanatory metaphor that was then taken into the final stage of the empirical testing process. The metaphors that emerged as successful in On-the-Street Interviews were built out to include other iterations.

In September 2012, FrameWorks conducted the survey, which measured the performance of eight candidate explanatory metaphors in relation to a set of outcome measures. Approximately 2,000 survey participants were drawn from a national online panel, and data were weighted on the basis of gender, age, race, education and party identification to ensure that the sample was nationally representative.

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Experimental Design

Following exposure to one of eight "treatments" — paragraph-long iterations of candidate metaphors — participants answered a series of questions designed to measure a set of theoretically-based outcomes. Effects were compared both across and within categories, meaning that general categories were tested against other general categories, and specific iterations were tested against other iterations both within and across categories. Outcomes measured included *understanding* and *application.*

Treatments

In total, eight specific explanatory metaphor iterations were developed. Each treatment consisted of a paragraph that described the metaphor, as in the following example for *Weaving Skills*.

What's going on when students are learning? Some people say that learning is about the brain weaving skills. Children weave skills based on what they know, what they learn from others, and their own direct experience. These skill fabrics can be woven and re-woven to become new, more complex skills, and children need to be able to weave skills fabric for many different purposes. Through practice, they can become good "skill weavers."

Among the two sets of metaphors, the only differences were the name of the explanatory metaphor (e.g., *Weaving Skills*), structural features specific to that metaphor, and appropriate lexical items or phrases. This balance of *variation* between metaphors and *standardization* in construction and language is designed to ensure that any differences in effect were due to differences among the metaphors themselves, and not to some unintended confounding variable.

Outcome Measures

After receiving the treatment paragraph, participants were asked 18 multiple-choice questions to test each metaphor's performance in relation to four areas: How did people define skills, how did they understand learning, could they apply the metaphor to thinking about skills, and could they apply the metaphor to understand improvements to education. The numerical outcomes of this experiment were provided in the main body of this report.

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Respondents were asked questions such as:

Which one of the following statements would you emphasize to explain how skills develop?

a. You develop skills with practice over time.
b. You must be given skills by other people.
c. You either naturally have certain skills or you don't.

Which one of the following statements about skills learned in school do you most agree with?

a. Skills learned in school have multiple uses.
b. Skills learned in school only have one specific use.
c. Skills learned in school are not useful out of school.

Which one of the following proposals do you think would be most effective in improving education?

a. More focus on students and their interests and needs.
b. More focus on making sure there are rules and that they are followed.
c. More focus on getting teachers who care into classrooms.

Open-Ended Pilot Questions

One goal of the explanatory metaphor testing process is to discover the minimally effective linguistic unit that produces the largest cognitive change, as measured in discourse. In this project, we endeavored both in On-the-Street Interviews and in a pilot study to check people's immediate reactions after they were given the most basic formulation of the metaphor (e.g., that "skills are like ropes"). In this pilot study, people were given open-ended opportunities to react to the explanatory metaphors.

Control

A control treatment was included in this study, in which participants were asked to "Take a few moments to think about skills and learning and answer the following questions." All of

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the candidate metaphors outperformed the control measure.

TEST III: PERSISTENCE TRIALS

After using quantitative data to select the most effective model, FrameWorks conducts Persistence Trials to answer two general research questions: (1) *can* and *do* participants transmit the explanatory metaphor to other participants with a reasonable degree of fidelity? and (2) *how* do participants transmit the explanatory metaphor? In other words, the method examines how well the explanatory metaphors hold up when being "passed" between individuals, and how participants use and incorporate the metaphors in explanation to other participants.

The Persistence Trial

A Persistence Trial begins with two participants. The researcher presents one of the candidate explanatory metaphors and asks the two participants a series of open-ended questions designed to gauge their understanding of the explanatory metaphor and their ability to apply the model in discussing the target domain (here, how effective learning might be improved). For example, the researcher asked how the participants understood the explanatory metaphor, then probed how well they could use it to explain what learning is and what learners need, and what sorts of tools learners might need in order to learn more effectively. Questions and analysis were also designed to locate any terms or ideas in the execution of the explanatory metaphor that participants had difficulty with or explicitly recognized as problematic.

After 15 to 20 minutes of discussion between the two initial (Generation 1) participants and the interviewer, Generation 1 was informed that they would be teaching the explanatory metaphor to another pair of participants (Generation 2). Generation 1 was given five minutes to design a way of presenting the explanatory metaphor, after which they had five minutes to present it to Generation 2. Generation 2 then had five to 10 minutes to ask Generation 1 questions about the presentation. During this time, the interviewer generally allowed dialogue to unfold naturally between the two groups but periodically probed for additional information on ideas that emerged.

Generation 1 then left the room and the interviewer asked Generation 2 an additional set of questions designed to elicit their understanding of the explanatory metaphor and their ability to apply the concept. This questioning lasted for approximately 10 minutes, at which point

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Generation 2 was informed that they would be "teaching" the idea to two new participants (Generation 3). Generation 2 had five minutes to plan their presentation, after which Generation 3 entered the room and the two groups went through the same steps and questions as described above.

A Persistence Trial ends when Generation 1 returns to the room. Generation 3 teaches the model to Generation 1 (without being told that Generation 1 is already familiar), and they are allowed to debrief with Generation 1 on the direction the metaphor has taken. The interviewer then reads the original paragraph-long iteration and asks questions about its transmissibility.

For the skills and learning research discussed here, FrameWorks tested two candidate explanatory metaphors: *Weaving Skill Ropes* and *Building Skill Circuits* in Austin, Texas and Philadelphia, Pa. There were three sessions on the former metaphor and two on the latter. All informants signed written consent and release forms prior to participating in the sessions, and interviews were video- and audio-recorded by professional videographers.

Subjects

A total of 30 informants participated in Persistence Trials. These individuals were recruited through a professional marketing firm, using a screening process developed by and employed in past FrameWorks research. Informants were selected to represent variation along the domains of ethnicity, gender, age, educational background and political ideology (as self-reported during the screening process).

Analysis

In analyzing data from Persistence Trials, FrameWorks sought to answer the following specific questions in relation to each explanatory metaphor.

1. Were participants able to *apply* the explanatory metaphor; and, more specifically, what were the ways in which they applied the model?
2. Was the explanatory metaphor *communicable?* Were Generation 1, 2 and 3's presentations of the explanatory metaphor faithful to the initial model presented by the interviewer? How did the groups' presentation of the model differ from the interviewer's presentation (i.e., did they use different language, use different ideas

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related to the metaphor, emphasize different entailments, etc.)?

3. Did the explanatory metaphor *inoculate* against dominant default cultural models? That is, did it prevent discussions from falling back to the dominant unproductive cultural models? Furthermore, if one of these cultural models did become active, could the explanatory metaphor prevent the discussion from veering narrowly in these perceptual directions?
4. Did the explanatory metaphor *self-correct*? That is, if one Generation's presentation was not faithful to the original explanatory metaphor or left out a key component, did the ensuing Generation's interpretation and/or presentation self-correct?
5. What specific *language* did the groups use in discussing the model? Was there language that participants used that was not included in the original execution of the explanatory metaphor?

As described in the main body of this document, *Weaving Skill Ropes* produced a number of beneficial effects on participants' talk about learning and skill development.

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ENDNOTES

1 For more about Strategic Frame Analysis™, see www.frameworksinstitute.org/sfa.html.

2 Quinn, N., & Holland, D. (1987). Culture and cognition. In D. Holland & N. Quinn (Eds.), Cultural models in language and thought (pp. 3-40). New York, NY: Cambridge University Press.

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5 For an overview, see www.frameworksinstitute.org/ezine8.html and www.frameworksinstitute.org/assets/files/PDF/framingpublicissuesfinal.pdf. For more on causal chains, see www.frameworksinstitute.org/ezine31.html. For more on tone, see www.frameworksinstitute.org/ezine17.html.

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