Information is the Main Ingredient

Using Metaphor to Enhance Understanding of Digital Media and Learning

A FRAMEWORKS RESEARCH REPORT

Michael Erard ◆ May 2012

About FrameWorks Institute:

The FrameWorks Institute is an independent nonprofit organization founded in 1999 to advance science-based communications research and practice. The Institute conducts original, multi-method research to identify the communications strategies that will advance public understanding of social problems and improve public support for remedial policies.

The Institute's work also includes teaching the nonprofit sector how to apply these science-based communications strategies in their work for social change. The Institute publishes its research and recommendations, as well as toolkits and other products for the nonprofit sector, at www.frameworksinstitute.org.

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INTRODUCTION

The research presented here was conducted by the FrameWorks Institute for the John D. and Catherine T. MacArthur Foundation. This effort to develop and test metaphors as communications devices was part of a larger effort to communicate about learning in America, and specifically the connections between digital media and learning. Also, this metaphor research is part of a larger project that seeks to apply this and other frame elements, such as values, to communicate about how to improve learning by creating and sustaining better environments, policies and institutions for learners.

Developing and testing *simplifying models* is one part of a framing strategy designed to do this. *Simplifying models are metaphor-based frame cues* that fundamentally restructure the ways that people talk and reason about issues. As such, these metaphorical communications tools are useful ingredients in efforts to shift the interpretational frameworks that people access and employ in processing information. By fortifying understandings of abstract or culturally innovative phenomena (such as the links between social contexts and learning outcomes), simplifying models can strengthen Americans' support for policies that improve learning by creating collaborative learner-centered environments and practices.

Following FrameWorks' multi-disciplinary and iterative approach to communications research (Strategic Frame Analysis™ [1]), we have unpacked and distilled people's understandings of digital technology, learner agency and learning outcomes. We have focused on how Americans' understandings of learning and the role of technology 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" than others.[3]

There might be said to be two broad solutions to improving policy support for digital technology in learning environments. The first is to inject new understandings of learner agency and the affordances provided by digital interactivity into public discourse, providing resources that advocates can use to channel current thinking away from unproductive, dominant cultural models. The other, more passive approach is to wait out demographic changes until "digital natives" come of age and take positions of authority. To be clear, no one actively advocates this solution, but the notion that digital natives may be more receptive to arguments about digital media and learner agency is a commonplace. There are several reasons for the unviability of this approach. One is that these digital natives may be as susceptible as other Americans to thinking of the mutual incompatibility of play and productive activity (which FrameWorks research found to be a dominant view on this issue),

and so need to be ushered past certain aspects of the culture. A second is that demographic shifts will unfold over decades, during which educational gaps and economic challenges may be exacerbated and opportunities for progress lost.

In opting for the first alternative, FrameWorks' research explored what it would take to communicate about "highly mentored, well-designed problem solving spaces that may be enabled by digital media," to use the formulation of James Gee.[4] This involved exploring and documenting Americans' understandings of learning as a process, of effective learners and of technology (including devices, social media, the Internet and other components of the digital realm). It also involved iterating and testing simplifying models that would make new forms of learner agency and the potential digital media as a learning tool "easier to think."

A critical insight came from FrameWorks' Peer Discourse Sessions. To participants in these sessions, finding answers (e.g., the location of a state capital) on the Web did not count as a skill, particularly in a school context; rather, the purpose of school was to devote time to putting such answers in one's brain, then retrieving that information when tested. Not only was it difficult for people to think about higher-order skills; they were unable to conceive of ways in which having answers was the first step in a longer process of invention, creativity and learner-directed achievement. It was as if answers were only prepackaged meals, not ingredients that served a variety of productive processes. It goes without saying that participants defaulted to talking about school settings and formal education nearly immediately. They had not, as John Seely Brown and Douglas Thomas write, acquired a sense of the "where" and the "how" of information.[5] To them, using Wikipedia to find out that Lincoln is the capital of Nebraska obviated most of the educational enterprise in its traditional form. What needed to be communicated was not, we concluded, solely about the agency of learners (both in and out of formal settings) but about a new relationship to information as a raw material that learners – at all stages – needed practice finding, evaluating and manipulating.

This was the direction that the simplifying model design and testing process took: structuring an understanding about information in the hands of empowered learners, who use it as a raw material and do things with it that suits their needs and interests. These forms of working with raw materials draw from perspectives on skills that are already present in people's thinking but are considered perhaps marginal or peripheral. The task, then, was to find these productive ways of thinking about skills and learning and move them into the center of people's thinking about scholastic learning. For reasons that were clear from the earliest research,[6] we also knew we could not explicitly mention "digital media." Also, the word "technology" needed to be deployed with considerable care. Thus, the task was to open a space for thinking about digital media and technology as a learning tool without making the simplifying model use those particular linguistic cues.

We note that even the best simplifying models cannot accomplish everything that needs to be done in reframing a complex issue like digital and media learning. Other frame elements (Values, Messengers, Visuals, Tone, Causal Chains, Social Math and additional simplifying models[7]) 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 educational narrative.

EXECUTIVE SUMMARY

FrameWorks' simplifying model research process demonstrated that one simplifying model, *Cooking with Information,* offers a powerful resource for changing how Americans talk and think about effective learning and the power of digital media as an effective learning tool. The metaphor channeled people away from less productive modes of reasoning and enabled participants to talk articulately and think productively about the importance of learner-centered, experiential, and mentored learning; and about a role for digital media in this expanded perspective. The simplifying model also met another set of important criteria, as it proved highly communicable and durable. Below we provide the core elements of the metaphor – components that are required for the tool to perform its communicative function – as well as a set of more peripheral ideas that can be combined with core components in crafting specific messages about learning and the role of digital media in this process.

Cooking with Information

Core
–The core comparison is between learning in or out of school and cooking (or learning to cook)
–Learning means working with information as an ingredient – selecting, mixing, evaluating the things that become part of a dish or meal
–It also means becoming skilled with tools
–There's a goal with cooking – learners try to make the food they want to eat or share
–To learn how to do this, they have to get their hands on tools and ingredients
–They have to get their hands dirty, to experiment and play
–They can't do it by themselves – learners may be the ones doing the cooking, but they need help from someone more experienced
Periphery
–Digital media is a new ingredient for the kitchen
–Digital media is a new tool for the kitchen
–Learning is messy
–Like cooking, learning is engaging and fun
–It's important to be able to cook what you like
–An important part of cooking is sharing what you've cooked and how you've cooked it with other people

More specifically, FrameWorks simplifying model research found the following.

• With the right cues, Americans are amenable to hands-on, experiential activity as well as mentorship as keys to effective learning. With the right cognitive tools, their preexisting understandings of the importance of these types of learning can be activated and then pulled into thinking about scholastic learning. Simultaneously, this pushes away more dominant and (in this case) less productive assumptions and understandings. Research suggested that *Cooking with Information* was effective in shifting the cognition of people who used it.

• *Cooking with Information* works as a simplifying model because cooking is seen as a practice that must follow certain traditions, rules and procedures and simultaneously, as something that is strongly associated with creativity and experimentation. FrameWorks' research shows that people see learning how to cook as being essentially contingent upon structured hands-on experience and supported trial and error – some of the very understandings that digital media and learning advocates want curricula infused with. When these implicit understandings are activated, people are able to see them as necessary features of *all* learning. In an online survey, respondents (n=200) were asked to write what came to mind after reading the simple statement, "children are like cooks." They replied with phrases like "like to create," "like to experiment," "experimental," "improve skills," "make stuff out of ingredients," "make messes," "open to new experiences," and so forth. Negatively-valenced responses to this prompt were nearly nonexistent. These positive associations increase the likelihood that advocates will adopt this simplifying model and that the metaphor will be productive and useful in providing members of the public with new ways of thinking about digital media and learning.

• The simplifying model is effective also because it places raw materials and the tools for transforming them *outside* of the learner. The model frames these things as being in the environment or workspace, which provides them to learners, who bring skills and who will acquire other skills in transforming those materials. Thus, the model proposes a way to rethink the fundamental notion that knowledge amounts solely to having content in one's head, and further, that one must possess such content before acquiring skills. In fact, one way the metaphor proves effective is in channeling people's thinking toward the realization that, from both pedagogical and outcomes perspectives, content and skills are functionally and essentially intertwined.

• One key challenge in this work was to intertwine content and skills as simultaneously necessary for *young children*. FrameWorks' research has found again and again that learner agency tends to be age-graded. That is, the people who naturally support experiential learning approaches tend to reserve them both for very young learners and for older

learners; meanwhile, the middle group of learners (probably starting at the very beginning of elementary school) is seen as needing a basic stock of content *before* they can move on to honing skills through application. In part, this follows from the notion that learning is hard work, not play; we found that many people hold the notion that in order for school contexts to be successful, they must be characterized by seat work and focused discipline. *Cooking with Information* countered these tendencies by establishing a set of fundamental requirements for *all* effective learning, regardless of age or location – the idea that in order for *any* learning to be effective it must be learner-centered, experiential, and mentored.

• FrameWorks' metaphor research revealed another simplifying model with significant promise as a communications device – *Information Drivers*. We recommend this metaphor with reservations, as it was not as productive as *Cooking with Information*. However, our analysis did reveal certain specific strengths associated with the *Information Drivers* metaphor, and we discuss these strengths toward the end of this report in order to provide advocates with greater flexibility in meeting specific communications needs and challenges.

WHAT IS A SIMPLIFYING MODEL?

A simplifying model can be thought of as a bridge between expert and public understandings – a simplifying model that presents a concept in a way that the public can readily deploy to make sense of new information, channeling the way they think and talk about a particular topic. More specifically, FrameWorks defines a simplifying model 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).[8] A simplifying model renders a complex and/or abstract problem as a 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 simplifying model 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 simplifying model looks like and how it behaves.[9] An effective simplifying model:

(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);

(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 simplifying model can redeploy it in its original form, where it is able once again to clarify key aspects of the issue.

WHY DIGITAL MEDIA AND LEARNING NEEDS A SIMPLIFYING MODEL

When designing and testing simplifying models, FrameWorks' researchers employ the results of earlier qualitative research, cultural models theory and an understanding of the communications challenges presented by the particular topic. We conceived of the following ways that a simplifying model must work on the specific issue of digital media and learning.

• The simplifying model should recruit useful aspects of what Americans understand as effective learning, in order to promote a view that for learning to be effective it must be hands-on and experiential, experimental, and mentored.
• It must focus attention both on the process and outcomes of learning.
• It should enable people to place learners at the center of the learning process, while simultaneously making room to think about the importance of mentoring by more experienced people (who may also be age peers).
• It should re-situate learning as an activity which occurs both inside and outside classrooms and schools.
• It should communicate the idea that multiple skills can be and are learned simultaneously.
• It should move people's thinking away from conceptual metaphors that characterize brains as containers to be filled with content/knowledge.

• Crucially, the simplifying model should create a cognitive opening for people to think about the contributions of digital media to learning without ever having to use the phrase "digital media and learning."

• Even as it opens up thinking about new *digital* information environments, the simplifying model should not disqualify learner agency from analog environments, either; in other words, building, sustaining, and leveraging the agency of a learner is platform-agnostic.

• It should also reflect our culture's new relationship with information, not only with regard to access and "connection," but also how digital technologies open new spaces for mixing, making, creating, and sharing.

Below we briefly discuss the process by which FrameWorks' researchers identified, developed and empirically tested the power of the *Cooking with Information* simplifying model in broadening public understanding of effective learning and digital technology. We then present the findings from this research and conclude with specific recommendations about how best to deploy this communications device in messaging about digital media and learning. We provide Appendix A for more about the specifics of the research methods employed.

WHY WE TEST SIMPLIFYING MODELS

Most people can easily identify and even generate metaphors to explain, teach or argue points and ideas. Yet metaphors are integral to human thought at much deeper levels that evade conscious detection and reflection.[10] 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 each other. These consequences may also interact with culture-specific interpretations and default cognitive preferences, endangering the very communications goal that we want a metaphor to serve.

Because of this potential for metaphors to have unintended negative effects in relation to communications goals, FrameWorks tests its simplifying models in order to observe and measure the *actual* directions that metaphors take in social interaction and discourse. These tests allow us to "see around the first bend" – 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 metaphor "popularity contests" and 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, the best alternative is to compress this evolutionary schedule to produce a metaphor with immediate cognitive and social fit. Our methods of testing simplifying models are designed with these considerations in mind.

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

Phase 2: Designing Simplifying Models
FrameWorks' 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., "Tools," "Journeys") and multiple candidate simplifying models in each category (e.g., "Information Drivers" and "Cooking with Information"). The initial simplifying models generated from this phase are listed in Appendix A.

Phase 3: Testing Simplifying Models
FrameWorks tests the candidate simplifying models in multiple research formats, beginning with On-the-Street Interviews with around four dozen individuals. These are followed by experimental surveys given to a sample of 2,000 participants; these surveys test the candidate models on measures of issue understanding and metaphor application. Finally, we take the most effective simplifying model candidates into a final phase of qualitative testing, Persistence Trials, that mimics the game of telephone, with six individuals per trial. With

these we can see how well the simplifying models hold up in social interaction as they are used and shared. At each stage, we use our findings to winnow our selections as well as refine the simplifying models that remain. What results is a detailed data about which simplifying model works and why.

THE WINNER: AN EFFECTIVE SIMPLIFYING MODEL FOR DIGITAL MEDIA AND LEARNING: *COOKING WITH INFORMATION*

Employing the research process outlined above, FrameWorks' research team identified, refined and empirically tested four broad simplifying model categories and a total of eight iterations across those categories. One of these simplifying models, *Cooking with Information,* emerged as a highly effective tool for replacing dominant patterns of thinking around effective learning (what it is, how it happens and the role of technology in this process) with more productive ways of understanding this issue. The research process also yielded important insights about the effectiveness of another simplifying model –*Information Drivers* – in relation to a more narrow but still important set of communications functions. We present the findings from the second simplifying model toward the end of the report.

What *Cooking with Information* Contributes to the Public Understanding

Cooking with Information makes broad-ranging contributions to public discussions about digital meaning and learning by 1) recruiting productive aspects of how people are able to think about learning and bringing them into the domain of "education" and 2) building public understandings of the specific importance of learner-centered learning and the ways that digital technology can enable this type of learning.

The strengths of *Cooking with Information* come mainly from deeply modeled associations with "cooking," namely the following.

• Cooking is an everyday activity in which both rules and creativity are required, and cooks – both professional and amateur – are understood as people who can follow recipes *and* who have the skills to go off-script to create and experiment.
• Cooking is a hands-on activity that one can learn only by doing – by making things, tasting them, learning about, and altering the process and trying again.
• Cooking is an activity that can be done at various levels of sophistication, which means both children and adults can do it (i.e., it is not the exclusive domain of a certain maturity level).
• The activity is both process- and outcome-oriented – cooking is equally about the act and the resulting product.

• The domain of cooking involves multiple process inputs and determinants – there are skills, tools, ingredients, and recipes – and takes place in a range of settings.
• People associate cooks and cooking with experimentation, creativity, and risk-taking.
• Cooks and cooking enjoy a highly visible and familiar status in popular culture.
• People generally share a positive emotional regard for talking about cooks, cooking, and food.

Below we review the development of this simplifying model 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 communications on digital media and learning. Finally, we describe some of the finer points of using this simplifying model that will be helpful to its potential users, concluding with specific directions for applying both it and *Information Drivers*, a secondary but useful simplifying model.

I. General Effects
Each stage of research confirmed the salience of the *Cooking with Information* simplifying model. Salient parts of the metaphor include:

• The student is the cook.
• Cooks need to learn to use tools and ingredients.
• Information mainly plays the role of ingredient, though it can also be a tool.
• Manipulating and transforming information is a vital skill that children must learn.
• Learning and using that skill increases one's fluency with a host of connected skills, just as cooks learn many additional skills along with learning to use their tools and ingredients.
• Learning to cook requires both direct hands-on experiences *and* mentorship in these experiences.
• Cooking is simultaneously creative and rule-driven; you can't have one without the other.

FrameWorks' previous research uncovered several dominant cultural models that Americans use to talk about learners and learning. *Cooking with Information* was highly effective in moving people's talking and reasoning away from these unproductive patterns of thinking by structuring different ways to talk and think about effective learning: how it happens, when and where it happens, and what its results are.

II. Evidence from On-the-Street Interviews
In On-the-Street Interviews conducted with 48 people in Boston, Massachusetts and Baltimore, Maryland, FrameWorks researchers tested the ability of eight candidate simplifying models to enable more articulate and scientifically consonant discussion[11] about the process and results of effective learning. Informants were first asked a set of questions

about effective learners and were then presented with a simplifying model. After the model 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 simplifying models changed thinking and talking about learning. The analysis also focused on isolating the reasons *why* each of the models tested were having their respective effects. The results of this analysis were used to winnow and refine the set of candidate models before the next research phase.

In the On-the-Street sessions, *Cooking with Information* proved to be easy to use and led to articulate discussions about the importance of creativity, hands-on learning, learner-centered learning, and mentoring. After the presentation of the model, informants also talked about the application of skills as a key part of effective learning and as evidence of a successful learning process. An additional asset of the simplifying model was the way that it helped informants talk about corollary skills and how it is important to have a range of skills, not just the basics. Most importantly, several informants of their own accord talked about the power of digital media to improve learning, suggesting that the simplifying model had created a way of looking at learning in which there was space for a productive role for digital media and technology.

The *Information Drivers* simplifying model also performed well in these interviews. Analysis showed that this simplifying model was effective in getting people to focus on the connection between direct experience (getting your hands on the wheel) and effective learning. Analysis also revealed that the model generated uncued statements about the importance of a set of important corollary skills (reading maps, navigation, etc.) that informants were able to map onto primary skills that are important for children to learn. The simplifying model also focused attention on the importance of learner empowerment and guided mentoring and brought with it sticky and productive language, such as "diversity of path," "destinations," "navigation," and "risk-taking."

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 six refined candidates. This test, a head-to-head comparison using random assignment techniques, enables FrameWorks' researchers to chart the effectiveness of each simplifying model in achieving the instrumental goals described above.

Results were analyzed by measuring the variance between high and low scores on each of the experiment's outcome questions. The questions with the most variation between high and low scores were selected as primary outcome measures, as they provided the clearest

discrimination in judging the performance of the simplifying models. In other words, those outcome measures in which the performance of the models was relatively indistinguishable were excluded from the analysis that was used to select the winning models. The scores of the six simplifying models on these high-variance measures were compiled into an effectiveness score, which was used to select the top three simplifying models. These top three models were brought forward into Persistence Trials, which is the final qualitative method in the simplifying models testing process.

Effectiveness Rankings:
(1) *Craftsman*
(2) *Drivers*
(3) *Cooks*
(4) *Wildlife Expert*
(5) *Trailblazers*
(6) *Guide*

IV. Evidence from Persistence Trials
FrameWorks held Persistence Trials in Portland, Oregon; Boston, Massachusetts; and Philadelphia, Pennsylvania for a total of eight sessions with 48 participants. These sessions were used to gather data on *Craftsman*, *Drivers* and *Cooks*. In the intense social interaction of the Persistence Trials method, the simplifying model with the most productive results was *Cooks,* which, based on the results of the Trials, was renamed *Cooking with Information.* The *Drivers* metaphor, renamed *Information Drivers*, also showed promising results as discussed in the conclusion of this document.

Persistence Trials give participants a way to interact with and use the simplifying model in actual social discourse, and therefore produce rich data about a given simplifying model's properties and effects. In a Persistence Trial, an initial pair of participants is presented the simplifying model, first as text and then conversationally by the researcher. The participants then discuss the simplifying model 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 simplifying model to a third pair. Finally, the first pair returns to hear the transmitted model from the third pair. This last step allows us to see whether the model has persisted over the session and to enlist participants in explaining any changes that may have occurred to the model. 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 simplifying model; whether and how the model inoculates against unproductive cultural models; whether and how the model is able to self-correct; and the degree to which it

is communicable. The design of these sessions also affords the opportunity to observe several types of interactions (researcher/pair, between individual participants, between groups of participants), which provides valuable insight into how the simplifying model is articulated, as well as its thinkability. In these terms, the specific advantages of the *Cooking with Information* simplifying model are as follows.

1. Application. Persistence Trials showed that participants applied the *Cooking with Information* model in the following ways.

Effective learning is learner-centered. In Persistence Trials, participants talked about curiosity, engagement and fun, and focused on motivation on the part of both learner and cook. As one participant put it, "Some part of the cook needs to find its way into the food for it to be good." This notion was successfully mapped onto students, where effective learning was understood to be learner-centered and driven by learners' interests.

> *I may not necessarily be interested initially in cooking...until you teach it to me in an interesting way, and then I'm like, "Yes, I am interested in cooking!"*
> ---
> *The more you know the more you want know, and the more you know the more you realize what you don't know. And I think education needs to be that sort of process. Children really need to learn on their own, rather than have something given to them constantly and just giving it back.*

Learning and creativity go hand-in-hand. Participants talked readily about how all cooks need to know basic techniques, but that knowledge of basic techniques is *not* what makes someone a great cook. Instead, mastery requires learning to creatively mix those techniques and styles together to make something unique. Additionally, people said it was important for a cook to know different ways to make the same dish, and also that both cooking and learning had to incorporate opportunities for trial and error and experimentation, where failure was a permissible outcome. Thus, people saw that creativity is integral to the learning process and that the desirable outcome of learning is being creative.

> *One thing I learned when it comes to teaching children is that you could teach them your method and they could learn it, but sooner or later there is going to be another method – things are going to change...they need to add little changes in there that they do on their own. So everybody needs different techniques for the same thing.*
> ---
> *The first thing is intellectual curiosity – be curious to look at something and not just accept it for what it is but ask where did that come from, how does it work, what's behind it, what was there before, what could be there in the future, and I think*

currently school kind of squelches that. I think curiosity needs to be supported and nurtured and I don't think that's always happening.

Sure, experience is the best teacher. And he is right about trial and error – you can make up your own stuff later. Like the other day I was making bread for my friend and her husband. And I'm like, well gee, I don't want to use white flour, I want to use whole wheat flour – I can do that, I can break the rules if I want, what am I going to get – arrested? Plus, oh, it doesn't call for cloves? I'm sticking that in there too, I can do that! You can make stuff up too, you can add your own ingredients – you can make up your own recipe, too!

Effective learning involves synthesis. Participants also talked about how becoming or being a good cook involves mixing ingredients and combining skills. They explained that these synthesized abilities were skills in and of themselves; also, that the ability to synthesize depends on constituent skills and knowledge such as understanding the qualities of the ingredients, having experience using the available tools and prioritizing the desired outcomes. Drawing on the importance that they accorded to synthesis in cooking, participants explained that a child learning how to use information as a raw material must learn how to evaluate, mix, integrate, and synthesize.

Effective learning involves information sniffing. The link between ingredients and information proved powerful and sticky over the course of the Persistence Trials. Informants discussed how becoming a cook requires extensive practice in understanding the qualities of ingredients. Participants were facile in mapping this understanding back onto student learning, explaining that students also needed to have experience working with information in order to develop the important skill in assessing its quality, value, and utility. This need for an expanded repertoire of skills moves people beyond the simple notion that learning involves putting an answer into a person's brain.

The importance of self-assessment for effective learning. Participants also noted the importance of continual self-assessment for a cook to improve their skills and abilities. Cooking, tasting, adjusting, remaking, and then tasting again all are understood as essential elements in learning how to cook. This understanding was brought to bear in thinking about student learning, where participants explained that for students to master skills they must be able to make things, evaluate the product and then, based on their evaluation, go back and make it better.

We've all made cakes...too much rum, whatever. Too much of something, not enough of something else, and it didn't come out the way it was desired to come out, so...back to the drawing board, where did we go wrong? So now you have a discussion group

about the outcome and you think about where you went wrong during the process and you try to correct it. And then you check the results of that. And if the results are different, then you succeed. If they're the same, you're failing somewhere and that's when you need a second person to point out, after you've already tried a second time, where you went wrong, and set you in the right direction. But hands-on first is really important....

Digital media and learning. In several instances, thinking and talking about *Cooking with Information* led people to discussions that focused specifically on digital media as a tool for effective learning. This becomes even more interesting and noteworthy when coupled with the fact that the iteration of the simplifying model that was presented to participants made no explicit reference to "digital media" and contains only one short mention of "new information technologies."

2. Inoculation. *Cooking with Information* also showed an ability to inoculate against several powerful default cultural models that lead people in unproductive directions when thinking and talking about learning and digital media. By "inoculation," we mean that after people were exposed to the simplifying model and engaged with it, instances in which unproductive dominant cultural models could be seen shaping discussions were either nonexistent or highly infrequent.

Against basics first – "Suck it up and learn." Earlier FrameWorks' research uncovered a persistent tendency for participants to insist that effective learning required learners to accumulate basic content *before* such content could be applied to develop skills. In a way, the default perspective on content and skills is that experimentation is something that learners have to earn. As evidenced in the quotes below, *Cooking with Information* was highly successful in replacing this understanding with one predicated on the early and constant importance of hands-on experience for effective learning.

> *I think that the book learning and the teacher learning is helpful but also the hands-on learning goes a lot further than when you're sitting in the classroom and watching people show you how to do something....You can go a lot further when you're not just sitting in classroom with a book.*
> ---
> *Participant 1: Everybody learns differently, [in] different ways. Just like somebody might cook, this one might use this ingredient, this one might use that one to make their fantastic recipe, somebody might learn hands-on, somebody might learn with books, everybody learns in a different way.*

Participant 2: I just believe traditionally we've taken one avenue to teach people, and it's been that way forever. And I feel like with all of the new technology and different ways to learn, we're finding out so many different things about brain patterns.

Against compartmentalized learning "silos." The simplifying model encouraged people to talk about the need for integrating content and skills. In the following quote, a participant warns about how difficult it would be to retool schools around an integrated hands-on model of learning. In so doing, he also displays his understanding of the importance of integrated learning.

I think there's going to be difficulties in that transition because the teachers aren't prepared to teach in the manner that a chef does. The chef has the freedom. He can go from ingredient to ingredient, [to] this pot and make this sauce, and the participants' learning is hands-on. And the students – just by the way the curriculum is set up, it isn't set up to be hands-on. The majority of the concepts – the math, the history, English – they're not hands-on, it's reading, it's a dictation....

Against "effective learning inevitably results from effective teaching." In other research, FrameWorks has uncovered the default cultural model of an effective teacher as one who cares.[12] In this way, people reason that in order to improve educational outcomes, it is necessary to help – or force – teachers to care more. These types of discussions were totally absent from Persistence Trials where participants were primed using the *Cooking with Information* model. Instead, participants in these sessions focused on teacher training, creativity, knowledge, and mentoring.

3. Self-correction. Self-correction refers to a simplifying model'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. For instance, participants may lose track of the fact that a person who is learning to cook also learns additional corollary skills, or that hands-on experimentation in the process is important. An important measure of a simplifying model's strength, self-correction occurs when these features fall out of conversation and then reassert themselves in subsequent discourse *without being re-cued by the moderator*. When communicated in the public sphere, simplifying models 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 simplifying model.

We observed how elements of *Cooking with Information* could easily resurface after being dropped. In one instance, the notion of mentored hands-on learning in the classroom returned

after having been wiped away by a presentation of the simplifying model in terms of a celebrity cooking competition. In another instance, "information as ingredients" reasserted itself. The first pair of participants presented tools and creativity but left out "information as ingredients," but the second pair immediately began talking about these ingredients and even jumped to digital media itself as an important ingredient for making learning more relevant and interesting. Later, they used this is as the basis for talking about student-centered learning, in which students personalize their own ingredients for the way that they learn best.

4. Communicability. Communicability refers to how faithful the transmission of the simplifying model is among participants. Analyzing video of Persistence Trials, FrameWorks researchers look for the repetition of exact language and key ideas and the stability of the central metaphor as it is passed between individuals. In this way, communicability and self-correction are somewhat antithetical concepts – where a model is perfectly communicable, it would not devolve and require self-correction. But a 100% communicable model is an unrealistic expectation, as attested by our research, knowledge of communications practice and underpinning theories of cognition. Still, communicability varies significantly among the simplifying models that we test, making it an important metric in gauging a simplifying model's effectiveness.

The *Cooking with Information* simplifying model was highly communicable between participants; the central concept (of a person learning to prepare food) was sticky and was cued with very little effort. Furthermore, important dimensions and applications of the model (discussed above in the applications section) also persisted as the model was passed between participants – e.g., notions of ingredients, skills and tools, as well as creativity. For example, here is a participant from one of the first generations "passing" the simplifying model to the second group:

> *A good way to think about learning is to think about what chefs do. They learn in school and they learn in the restaurant hands-on. They learn to use different tools, different ingredients, and the ability to put things together; to take different pieces of information and ingredients, and make something. [They learn to think] about it, and make an output that's tasty and beautiful. That's how we're thinking about what learning should be.*

ANOTHER PROMISING MODEL: *INFORMATION DRIVERS*

In the process of designing and testing candidates, another simplifying model, *Information Drivers*, emerged as promising. This model performed well in On-the-Street Interviews, the quantitative experiment and Persistence Trials. Though we do not recommend this device

over *Cooking with Information* because it was not as successful in as many ways, research did suggest that *Information Drivers* possesses overlapping and distinct contributions to thinking and talking that make its assets and shortcomings worth mentioning. The core elements of the model are as follows.

Core
– The core comparison is between learning in or out of school and learning to drive a car
– Learners are going on an information journey
– They're going to operate and navigate a vehicle in order to go wherever they want to go
– To learn to do this, they have to get their hands on the wheel and be in the driver's seat
– They have to be able to get lost sometimes
– They can't do it by themselves – learners need to get their hands on the wheel but they need to have help from someone more experienced as they do this

I. Assets

The core elements of *Information Drivers* had structured discussions about digital media and learning in some very productive ways.

Technology is an important learning tool and also an important tool to learn how to use. The most obvious asset of *Information Drivers* is that technology and technology use, as both process and outcome, are built into the model from the very beginning. In this way, the simplifying model becomes a way to talk about how to learn to use technology, how to learn with technology, and how to do a range of things that are enabled via technology. The research process showed that this was a persistent and predictable way in which the model affected thinking and talking about digital media and learning.

Hands-on experience is vital for effective learning. When participants mapped *Information Drivers* onto skills development, the first and most predictable conclusion they drew was that:

> *You can't learn how to drive without getting your hands on the wheel and actually driving. If you're saying that academic learning is like learning to drive, then of course kids need to get their hands on things and have direct experiences – that's the only way you can ever learn how to drive.*

A related notion was that people need considerable practice and access to opportunities for practice. They can't always be sitting in the passenger seat.

Mentoring plays a critical role. Another powerful application of *Information Drivers* was the way in which it established the notion of an optimal balance between learner freedom and guided mentoring. The driver, especially one at the beginning of the learning process, needs to be free to make mistakes and learn on his or her own, but also needs to have parameters of support built around this freedom. Participants were frequently and easily able to map this entailment back to thinking about students, education, teaching, and learning.

Adaptability, flexibility, problem-solving are key skills. Another notion that was conveyed by the simplifying model was the importance of knowing what to do when one "gets lost." Participants acknowledged that children need to know how to problem-solve and recognized that the best way to develop this skill is to have opportunities to "get lost and have to find their way back." In this way, participants were able to see that the goal of learning is getting to a destination regardless of how one does it and that the more ways one knows to do it, the better.

II. Weaknesses

Despite the considerable strengths of this simplifying model, research also revealed several weaknesses associated with *Information Drivers* which make it less recommendable than *Cooking with Information.* The problems that seemed to derive directly from certain words in the iteration have been addressed above. Other, less surface problems include the following.

Unsticky. In Persistence Trials, we found the metaphor did not pass as reliably between generations as did *Cooking with Information*.

Driving as an individual activity. Research suggested that driving is not modeled as a collaborative activity. Using this simplifying model has the potential to focus people's thinking on individual activity, making communicating about group and collaborative learning more difficult.

Driving as rule-based best practice. In On-the-Street Interviews, informants talked about driving as a practice with a relatively confined domain. Even if the destinations were potentially infinite and determined by the needs and desires of the driver, the way one undertakes those trips invariably follows a narrowly prescribed set of practices. In some cases this suggested that there are only a few ways to learn, which does not resonate very well with people's understandings that everyone learns in their own way. It also does not accord with the "learning as creativity" and "learning producing creativity" ideas of *Cooking with Information.*

Negative associations. In a way, testing simplifying models is the search for the smallest text or visual cue that can produce the largest cognitive effect. In the quantitative experiment,

FrameWorks piloted an open-ended question that provided a minimal presentation of the simplifying model ("children use information like navigators.") Participants were asked to write their immediate associations with this phrase; about 200 participants replied. Their answers were overwhelmingly negatively valenced: "don't follow directions," "do stupid things," "foolish," "impulsive," "aggressive," "impatient." This suggests that while people are able to compute comparisons between navigators and learners, many of their immediate and most basic associations are unproductive in relation to the goals that we had for the simplifying model – to productively channel thinking toward the importance of learner-centered, direct, mentored, experiential forms learning. These results, therefore, were interpreted as problematic characteristics of the *Information Drivers* model.

In this same experiment *Cooking with Information,* which was also placed into the same open-ended format, generated answers that were overwhelmingly positively valenced. As discussed earlier, people associated learners with cooks through an understanding of their creative, experimental, hands-on practices, as well as through their use of a set of skills and tools to produce a certain outcome.

USING *COOKING WITH INFORMATION*

Our research shows that the *Cooking with Information* simplifying model represents a significant communications device in creating support for the models and principles of digital media and learning. The core metaphor proved to be highly understandable, applicable, communicable, and effective in inoculating against dominant cultural models that limit or misdirect public understanding on this issue, and peripheral elements are ones that issue advocates and laypeople themselves innovated in naturalistic settings. For these reasons, FrameWorks confidently offers this new strategic frame element to aid in reframing the public conversation about digital media and learning.

We add several notes of caution, however, in the application of simplifying models in general and of the two models offered here specifically. First, the simplifying models suggested here were tested both for their 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 these two models are invited to apply to their creative adaptation of these communications tools.

We conclude with a set of notes that advocates should keep in mind when they set out to use the *Cooking with Information* model. First we offer a representation of the core and peripheral elements of the model and then provide two examples of how the model can be instantiated in text.

> **Core**
>
> – The core comparison is between learning in or out of school and cooking (or learning to cook)
> – Learning means working with information as an ingredient – selecting, mixing, evaluating the things that become part of a dish or meal
> – It also means becoming skilled with tools
> – There's a goal with cooking – learners try to make the food they want to eat or share
> – To learn how to do this, they have to get their hands on tools and ingredients
> – They have to get their hands dirty, to experiment and play
> – They can't do it by themselves – learners may be the ones doing the cooking, but they need help from someone more experienced
>
> **Periphery**
>
> – Digital media is a new ingredient for the kitchen
> – Digital media is a new tool for the kitchen
> – Learning is messy
> – Like cooking, learning is engaging and fun
> – It's important to be able to cook what you like
> – An important part of cooking is getting to eat what you cooked
> – Also important is sharing what you've cooked with other people (who might also want to hear how you cooked it)

1. Sample text instantiation (long)

In restricting student access to digital media during the school day, school districts might be depriving students of powerful tools they need to work with information ingredients. These students are like cooks who need to get experience experimenting with combining ingredients and problem solving. Digital media is an important tool is this process. Students need to learn how to pick good ingredients and mix them together, and then need practice using tools to transform those ingredients into something interesting. Digital media is the newest sort of tool that these student cooks have, and it's one they can use to share what they make with others and to get feedback from teachers, peers, or even broader audiences in the community. Of course, students need guidance from teachers and peers as they learn how to use these tools, just as beginning cooks don't get free range of the kitchen.

2. Sample text instantiation (short)

We might think about students as cooks, and their classrooms as their kitchens. In order to produce dishes that they want to eat or share, they need to be able to put their hands on the

information ingredients and learn how to choose, evaluate, and mix them together. Giving them access to digital media is an effective way to do this – allowing them to produce digital dishes, to share them, and to learn how to make them better. It's also a good way for them to get feedback and direction from people who are better information cooks than they are.

The following are specific recommendations for how to most effectively deploy the model in communicating about digital media and learning.

• **Use all the core elements; add peripheral elements when necessary.** The core elements of the simplifying model should always be present in some fashion when it is used; additionally, peripheral elements can be added or removed. This might depend on the length of presentation, the genre, or the particular content that communicators are attempting to convey.

• **Make use of all the productive ways in which cooking is like learning and cooks are like learners.** The cooking/kitchen/food domain is very powerful and broad. Users of the model should take advantage of this wiggle room as they decide which elements of cooking and learning to cook to match with learning, skills, knowledge, and students. The ability of this metaphor to hold and facilitate many different messages about digital media and learning is one of its major strengths.

• **Stay away from consumerism in talking about** *Cooking with Information.* We recommend that users stay away from a discussion of shopping for or buying ingredients. Though we did not test this element specifically, past research suggests that doing this will active powerful consumerist models of behavior that Americans overextend to all domains of private and public life.

• **Take advantage of the fact that the model allows for messaging about learners at all skill and mastery levels.** Note that this simplifying model compares learners and cooks at all skill levels, *not* solely beginning cooks or learners. Useful avenues of thinking are opened up when one compares a learner – even a child – with an expert cook. The model's ability to message about the importance of processes for all levels of learners is another major communicative strength that experts and advocates can take advantage of.

• **Make use of the way that "learners are like cooks" and "learners are like student cooks."** This simplifying model offers some useful latitude in this regard.

• **Take advantage of the concept of building lifelong habits.** When it comes to children and eating, people seem to be particularly sensitive to the ways in which early experiences build later habits, which can be true in the informational realm, as well.

• **Don't expose hungry people to the simplifying model.** That may seem like a joke, but it bears remembering because the cooking domain is so powerful. In one Persistence Trial held in the morning, a discussion become so overwhelmed by the topics of food and cooking that participants needed reminding that they were supposed to be thinking about learning and learners, and that the simplifying model was to help them do that.

• **Talk about ingredients, tools, skills and the way that cooks learn and deploy them toward specific ends.** Similarly, "ingredients," "tools," and "skills" were immediately available as fundamental dimensions of this simplifying model. We suggest exploiting this availability by discussing relationships among these elements. For example, one might talk about how trial-by-error processes are important for learners to understand the properties of information ingredients they are mixing together. One might also talk about how assessing the quality of information ingredients is itself an important corollary skill.

• **Compare information to both an ingredient and a tool.** One potentially useful comparison between cooks and learners in a digitally-enhanced learning space is that the work of cooks does not depend on the cook's personal possession of ingredients or tools; those things can be part of a workspace or an experience and are *outside* of the cook. What are *inside* the cook are skills and abilities. Comparing information to both an ingredient and a tool makes it external to the learner/cook and diminishes the requirement that learning involves putting content into a learner.

• **Focus on the necessity of both established recipes/techniques and creative fusion.** Another area of richness is the way that cooks can alternate between executing food according to algorithms (recipes) and heuristics (culinary traditions, creative goals), and that performing as a good cook is rooted in both sets of practices. In other words, avoid a judgment that suggests that cooking with recipes is *always* bad. After all, sometimes in our daily lives we simply reheat leftovers rather than cook a five-course meal from scratch.

• **Keep cooking in people's everyday action scenario.** There exists the possibility that people will see cooks as professionals and cooking more as a professional practice than an everyday one, so reasserting the ways that preparing food is something everyone knows how to do, to some degree, is a good thing.

• **Discuss cooking as a collaborative process** – both in terms of making a meal and in sharing it with others. This notion of cooking can be employed to make points about the importance of collaborative learning, collaboration as a skill to learn and of the role of peer-to-peer mentorship in learning processes.

• **Talk about the importance of "taste-testing"** as a way to make points about the iterative process of learning and producing, and of the importance of experimentation, assessment, and trial and error in effective learning.

USING *INFORMATION DRIVERS*

Below are both core and peripheral elements of the *Information Drivers* simplifying model.

Core – The core comparison is between learning in or out of school and learning to drive a car – Learners are going on an information journey – They're going to operate and navigate a vehicle in order to go wherever they want to go – To learn to do this, they have to get their hands on the wheel and be in the driver's seat – They have to be able to get lost sometimes – They can't do it by themselves – learners need to get their hands on the wheel but they need to have help from someone more experienced as they do this
Periphery – Learners are heading for the open road and they need to have navigation skills to get where they're going – There are different information terrains that they need to be able to move through – A driver's license is like a digital badge – A license to drive is respected in many places – There are procedures for proper driving that drivers need to learn and use just as there are procedures for using information – It can be fun to drive with no particular destination – Driving a car is like using a device to use information – The device can also be the mentor – No one's an automotive native, no matter how immediately they take to driving

• **Use all the core elements; add peripheral elements when necessary.** The core elements of the simplifying model should always be present in some fashion when it is used; additionally, peripheral elements can be added or removed. This might depend on the length

of presentation, the genre, or the particular content that communicators are attempting to convey.

• **Use phrases such as "you need to get behind the wheel" and "getting your hands on the wheel"** to emphasize the importance of direct experiences in effective learning.

• **Describe the importance of being prepared to traverse various terrains (sometimes winding, mountainous, etc.)** to illustrate how students can apply what they have learned in one context to various other contexts (i.e., the idea of learning for transfer).

• **Emphasize the process of "navigation" as a key skill that is developed in and required for driving**. Navigation implies higher-order thinking skills such as problem-solving and critical thinking and can be helpful in communicating the importance of these skills.

• **Use the fact that you don't learn to drive on your own** to emphasize the importance of mentorship in learning in general and more specifically, in the use of digital media as a learning tool.

• **Discuss the car as a tool to use to get somewhere** to frame the importance of digital media as a tool to acquire key skills.

¹ For more about SFA, 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.

³ See: Lévi-Strauss, C. (1963). *Totemism*. Translated by Rodney Needham. Boston, MA: Beacon Press; and Lévi-Strauss, C. (1966). *The savage mind*. Chicago, IL: University of Chicago Press.

⁴ Gee, J. Expert interview, July 13, 2010. Washington, DC: FrameWorks Institute.

⁵ Thomas, D. & Brown, J. S. (2011). *A new culture of learning*. Lexington, Kentucky: CreateSpace.

⁶ Kendall-Taylor, N., & Lindland, E. (2010). *"Faster and fancier books": Mapping the gaps between expert and public understandings of digital media and learning*. Washington, DC: FrameWorks Institute.

⁷ 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

⁸ Quinn, N. (2005). *Finding culture in talk: A collection of methods* (p. 3). New York, NY: Palgrave Macmillan.

⁹ Kendall-Taylor, N. (2010). *An empirical simplifying models research process: Theory and method*. Washington, DC: FrameWorks Institute.

¹⁰ Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.

¹¹ As distilled from a literature review, a set of expert interviews and a Field Frame Analysis that were conducted as earlier parts of the project. See www.frameworksinstitute.org/digitalmedia.html

¹² See Kendall-Taylor, N. (2010). *Understanding teachers' collective role in reform: Mapping the gaps between the expert and the public understandings of teachers' unions*. Washington, DC: FrameWorks Institute.

APPENDIX A: THE METHODOLOGICAL APPROACH TO IDENTIFYING AND TESTING SIMPLIFYING MODELS

I. PHASE 1: MAPPING THE GAPS

In the first phase of this simplifying models research process, FrameWorks employed an interview method called cultural models interviewing. Using a detailed interview guide, interviewers asked questions aimed at determining how average Americans understand digital media and learning.

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 digital media and learning experts. FrameWorks calls this process "mapping the gaps."

II. PHASE 2: DESIGNING SIMPLIFYING MODELS

After identifying the gaps in understanding, the second phase of the simplifying models research process aimed to generate a set of candidate simplifying models 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., "Tools") and multiple iterations or "executions" of each category (e.g., "Artist," "Craftsman," "Cooks," "Musician"). 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 simplifying model categories, which examines the *expected* public response to the metaphors, based on cultural models theory and existing FrameWorks research on cultural models, that Americans employ in understanding digital media and learning. 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 models found to be damaging or distracting in the public's thinking about the topic are eliminated from the candidate list. On the other hand, simplifying model categories containing elements of more productive cultural models are highlighted as particularly promising.

During the process of designing candidate simplifying models, FrameWorks also assesses the models' abilities to be incorporated into practice by journalists and advocates/practitioners. In some cases, this practical assessment has suggested that some candidate models are too provocative or problematic to pass into the public discourse. These models 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 SIMPLIFYING MODELS – THREE TESTS OF MODEL EFFECTIVENESS

TEST I: ON-THE-STREET INTERVIEWS
As the initial opportunity to test candidate simplifying models, On-the-Street Interviews present an ideal opportunity to gather empirical data on the effectiveness of candidate simplifying models: which specific elements of the models 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: Cooks, Craftsman, Trailblazers, Drivers, Guide, Fishing, Musician.

In 2011, FrameWorks tested a total of seven candidate simplifying models in Boston, Massachusetts and Baltimore, Maryland. Each candidate simplifying model was presented orally, in separate interviews, to 28 informants in each location for a total of eight interviews per model, comprising a data set of 56 ten-minute interviews. All informants signed written consent and release forms, and interviews were video- and audio-recorded by a professional videographer. The nine models represented executions of seven different candidate simplifying model 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 56 informants were recruited on site in the two 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 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 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 simplifying models tested in these interviews, we recognize the importance of between-group variation and take up this interest in quantitative testing of simplifying models. 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 simplifying model categories; (2) refine those categories with more mixed results; and (3) eliminate highly problematic categories, in which the underlying *concept* created problems that could not be overcome by refining existing executions or designing new ones. 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 simplifying model. More specifically, interviews were designed to gather data that could be analyzed to answer the following questions.

A. Did the informants *understand* the simplifying model and its underlying metaphor?

B. Did they *apply* the simplifying model to talk about effective learning and what learners need in order to learn effectively?

C. Did the simplifying model *shift* discussions away from the dominant thought patterns that characterized the initial responses?

D. How did informants respond to the questions about effective learning?

E. Did exposure to the simplifying model *lead to more articulate answers and robust, fully developed conversations* of issues that informants had problems discussing prior to being exposed to the model?

F. Did informants spontaneously raise digital media as one tool that effective learners need or could benefit from?

Normally, On-the-Street Interviews are canonical pre-post tests, but for this project we interwove questions in the simplifying model itself, as follows.

> **Driving information**
> As we think about how and where children learn, it's clear that we should prepare them to interact with information the same way that *Drivers* use cars and learn how to use them.
>
> *Check in about what that comparison means to them. What associations does that bring to mind?*
>
> We actively use cars to get where we want to go, wherever we want to go, and we learn how to drive by actually driving, and by getting help from those who have more experience than we do. Along the way they pick up many other skills.
>
> *Ask them: what sort of other skills do you think they'd pick up?*
>
> Some adults eventually use information like a car, but we need to make sure our children get early practice and mentoring so they can be truly knowledgeable.

Then the full set of post-model questions was asked.

TEST II: QUANTITATIVE EXPERIMENTAL RESEARCH
After analyzing On-the-Street Interview data, FrameWorks subjected the refined set of simplifying models to an online quantitative experiment. The overarching goal of this experiment was to gather statistically meaningful data on the models' effectiveness, which provided an empirical basis for selecting one or two models 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 simplifying model that was then taken into the final stage of the empirical testing process. The models that emerged as successful in On-the-Street Interviews were built out to include other iterations.

In June 2011, FrameWorks conducted the survey, which measured the performance of six candidate simplifying models in three metaphor categories 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.

Experimental Design

Following exposure to one of six "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 designing the survey instrument, multiple iterations were generated by a linguist as alternative representations of the larger metaphor categories. For example, the "Spatial" category included specific instantiations of "Navigators" and "In the Wild," while "Tools" contained "Cooks" and "Craftsman."[13]

In total, six specific simplifying model iterations were developed. Each treatment consisted of a paragraph that described the metaphor, as in the following example for "Navigators."

> **Navigators**
>
> A lot of people are thinking about how and where learning happens. Some of these people are saying that children use information like navigators. As navigators develop expertise, they learn how to move through an area at the ground level and know where the dangers and opportunities are. They learn how to do this by actually doing it, and by getting help from more skilled guides who have more experience. In learning how to navigate a terrain, they pick up a lot of related skills. That's one thing that makes really knowing how to navigate more valuable than just using a GPS to get from point A to point B. We need to make sure our children get practice and mentoring as early as possible so they can learn how to be truly skilled.

Among iterations, the only differences were the name of the simplifying model (e.g., "Cooks"), entailments, and structural features specific to that metaphor and appropriate lexical items or phrases. This balance of *variation* between models and *standardization* in construction and language is designed to ensure that any differences in effect were due to differences among the models themselves, and not to some unintended confounding variable.

Questions
The exact wording of the five questions was as follows.
1. *What statement from the following list seems most important for effective learning?*
    a. Effective learning requires an understanding of students' interests as well as their strengths and experiences.
    b. Effective learning requires making sure students have caring teachers.
    c. Effective learning requires focusing on basic subjects and traditional teaching methods.

2. *If you were going to explain effective learning, which statement from the following list would you emphasize?*
    a. Students learn best when they have experiences doing the things that they are learning.
    b. Students learn best when they have enough discipline to push through difficult material.
    c. Students learn best when teachers provide them with the right knowledge.

3. *Which statement best describes what you think about the relationship between technology and effective learning?*
    a. Computer games, Websites, and online activity have a place in the overall learning experience, because they are effective learning tools.
    b. Computer games, Websites, and online activity are distractions that don't belong in the classroom.
    c. Computer games, Websites, and online activity are dangerous and parents and teachers should keep them away from children.

4. *What is the best way to improve the way that children learn?*
    a. Recognize that learning happens everywhere and take advantage of this fact.
    b. Recognize that in-school and out-of-school learning are fundamentally different and should be kept separate.
    c. Recognize that the learning that happens outside of textbooks and lectures is important but doesn't have a place in the classroom.

5. *If you were going to improve the education system, which of the following do you think would be most effective?*
    a. Encourage kids by giving them mentored access to digital tools including Websites like Wikipedia and educational phone apps.
    b. Encourage most teachers by paying them more and making them more responsible.

    c.   Encourage parents to motivate their children to study, do homework and strive to perform better on tests.

Outcome Measures

After receiving the treatment paragraph, participants were asked a series of multiple choice questions to test each model's performance in relation to three outcome measures: understanding, application and aptness. The numerical outcomes of this experiment were provided in the main body of this report.

Open-ended Pilot Questions

One goal of the simplifying models testing process is to discover the smallest effective linguistic unit that can produce 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 "children use information like drivers"). In this pilot study, people were given open-ended opportunities to react to the simplifying models. There were two treatments.

Treatment 1: Participants were given the basic formulation of the metaphor, asked to answer the five questions, then provided with the rest of the model, after which they answered the questions again.

Treatment 2: Participants were given the basic formulation of the metaphor, asked some open-ended questions, and were then asked the five questions. The open-ended questions were:

> How much do you like or dislike this comparison between children and <navigators, cooks>?
> Please take some time to list the ways that you think children are like <navigators, cooks>.
> Now, please list any other thoughts that come to mind as you were thinking about the relationship between children and <navigators, cooks>.

Because this was a pilot experiment, it was run on only two models, Navigators and Cooks.

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 simplifying model to other participants with a reasonable degree of fidelity?; and (2) *how* do participants transmit the simplifying model? In other words, the method examines

how well the simplifying models hold up when being "passed" between individuals, and how participants use and incorporate the models in explanation to other participants.

The Persistence Trial

A Persistence Trial begins with two participants. The researcher presents one of the candidate simplifying models and asks the two participants a series of open-ended questions designed to gauge their understanding of the simplifying model 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 simplifying model; 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 simplifying model that participants had difficulty with or explicitly recognized as problematic.

After 15 to 20 minutes of discussion between the two initial participants (Generation 1) and the interviewer, Generation 1 was informed that they would be teaching the simplifying model to another pair of participants (Generation 2). Generation 1 was given 5 minutes to design a way of presenting the simplifying model, after which they had 5 minutes to present it to Generation 2. Generation 2 then had 5 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 simplifying model and their ability to apply the concept. This questioning lasted for approximately 10 minutes, at which point Generation 2 was informed that they would be "teaching" the idea to two new participants (Generation 3). Generation 2 had 5 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, where Generation 3 teaches the model to Generation 1 (without being told that Generation 1 is already familiar with it). They are then allowed to debrief with Generation 2 on the direction the metaphor has taken. The interviewer then reads the original paragraph-long iteration and asks questions about its transmissibility.

For the digital media and learning research discussed here, FrameWorks tested three candidate simplifying models: *Craftsman* and *Driving* in Portland, Oregon and Boston, Massachusetts (with three sessions apiece), and *Cooks* (with two sessions) in Boston. 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 48 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 simplifying model.

A. Were participants able to *apply* the simplifying model; and more specifically, what were the ways in which they applied the model?

B. Was the simplifying model *communicable?* Were the groups' presentations of the simplifying model faithful to that of the interviewer's initial model? How did the groups' presentations of the model differ from the interviewer's presentation (i.e., did they use different language, use different ideas related to the metaphor, emphasize different entailments, etc.)?

C. Did the simplifying model *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 simplifying model prevent the discussion from veering narrowly in these perceptual directions?

D. Did the simplifying model *self-correct*? That is, if one Generation's presentation was not faithful to the original simplifying model or left out a key component, did the ensuing Generation's interpretation and/or presentation self-correct?

E. 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 simplifying model?

As described in the main body of this document, both *Cooking with Information* and *Information Drivers* produced a number of beneficial effects on participants' talking about effective learning, how it happens, and the role that technology plays in enabling a learner-centered environment for learning.

APPENDIX B: USABILITY SESSIONS

For this project, FrameWorks extended its simplifying models design process in an important regard: It handed two candidate metaphors to issue advocates, observed them use the models in naturalistic settings with members of the general public, then debriefed with the advocates on the perceived strengths, weaknesses and affordances of the two metaphors. The results of two sessions (with two advocates, four laypeople and two models apiece) powerfully confirmed previous results as well as strongly demonstrated advocates' abilities to expand a given metaphor into other areas. In this brief Appendix, the process and some general observations are provided.

Process
The Usability Sessions occur in the usual marketing research facility. A moderator meets with two issue advocates who have been recruited and already briefed on FrameWorks work and practice. They discuss the first model, reading an iteration of it in text and hearing a summarized list of bullet points that represent the core part of the simplifying model. Then the moderator leaves the advocates alone to prepare their presentation and discuss any thoughts on the metaphors. Two members of the general public enter the room along with the moderator, and the advocates present the model to them and they discuss. The moderator shapes the discussion with very general questions but does not contribute intensively to it. After the two participants leave, the moderator discusses with the advocates how they found thinking about and talking with the metaphor. If there is another model to test, this process is repeated, with the same advocates but different members of the general public.

Implications for the Simplifying Models
From these usability sessions we were able to further refine the simplifying models themselves, confirming the usability of the core part of the model and extending the peripheral contents based on ways that the advocates and the lay participants invented or adapted linguistic expressions and entailments of the metaphors. The goal is to provide the ultimate end users with a recipe of essential and elective ingredients they can combine for different products, genres and media.

Implications for End Users
This method allows us to most closely proximate one type of real-world communication scenarios that our experts and advocates find themselves in. As such, we now have a far more accurate way to test the usability of our metaphors by the kinds of people who will actually be using them. This vetting produces significant insight into how these simplifying models will be used after they are used in the field and confirms their strengths as communications recommendations.

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[13] Titles of simplifying models go through many changes, though the paragraph-long iterations each title is attached to may not.