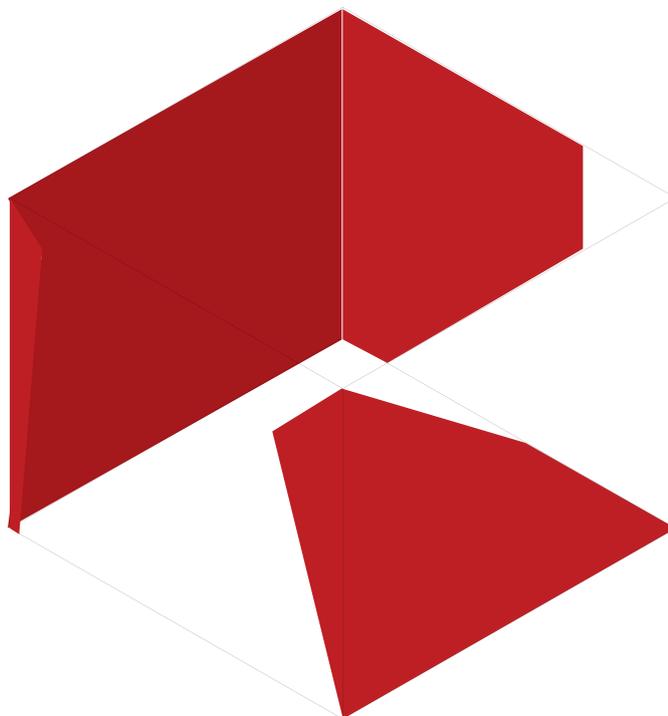


# Studies in Material Thinking



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Faculty of Design and  
Creative Technologies  
Auckland University of Technology  
Auckland 1142, New Zealand

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Eml [info@materialthinking.org](mailto:info@materialthinking.org)  
Web [www.materialthinking.org](http://www.materialthinking.org)

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## Volume 11 Re / materialising Design Education Futures

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### Teaching the design of narrative visualization: behavioral economics and financial literacy.

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**Aaron Fry, Jennifer Wilson & Carol Overby**

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*Abstract: A 2012 course at Parsons The New School for Design immersed students in a design-based exploration and explication of financial concepts and behaviors. Students collaborated with a class of community financial counseling trainees to develop financial-literacy materials for underserved populations. These narrative visualizations depict financial information and behaviors, using a technique that draws upon research in financial literacy, decision-making and behavioral economics to engage with the interconnectedness of behavioral and analytical decision processes. Members of the Visualizing Finance Lab at Parsons developed an assessment tool, the infoEmotion matrix, to analyze the student work by identifying the visual and content elements that present the most-prevalent aspects of financial decision-making.*

*Key Words: Narrative visualization, financial literacy, behavioral economics, heuristics, design education, collaboration, decision processes, infoEmotion matrix*

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**Author**

**Aaron Fry /**

The New School /  
Parsons  
The New School for Design /  
frya@newschool.edu

**Jennifer Wilson /**

The New School /  
Eugene Lang College The New  
School for Liberal Arts /  
wilsonj@newschool.edu

**Carol Overby /**

The New School /  
Parsons The  
New School for Design /  
overbyc@newschool.edu

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**Financial Literacy**

The complexity of financial concepts and practices, as well as increasing personal responsibility for retirement planning, has heightened the need for personal financial literacy worldwide. There is a growing body of research on financial literacy and its economic importance (summarized in Lusardi & Mitchell, 2013), and studies have consistently found low levels of global financial literacy (c.f. Lusardi & Mitchell, 2011). Worldwide, government agencies, NGOs and other entities have launched a range of financial education programs, many at the community level, but recent studies (Schmeiser & Seligman, 2013; Fernandes, Lynch & Netemeyer, 2014) indicate that an apparent increase in an individual's financial knowledge does not correlate with improved financial behaviors or improved financial wellbeing.

Measurement of these programs' effectiveness is still in the formative stage (Holzmann, Mulaj & Perotti, 2013); however, there is evidence that intuition-based tools such as rules of thumb can be more effective than financial education in improving some financial behaviors (Drexler, Fischer & Schoar, 2010). This is consistent with findings in behavioral economics and in behavioral finance, which suggest that individuals tend to make financial decisions through intuitive rather than analytical means (see discussion below in Behavioral Economics and Financial Literacy).

Since 2009 the Visualizing Finance Research Lab at The New School has been investigating the potential role of designers for improving financial literacy and financial behaviors, and inquiring whether visual communications that incorporate cultural and emotional cues (which we term narrative visualizations) might help to improve these behaviors. In 2012 the Lab piloted a course—Design 4: Visualizing Finance—in which students worked with a class of community-based financial counselors to create narrative visualizations.

This design course is part of the Bachelor of Business Administration degree program in Strategic Design and Management at Parsons The New School for Design. The program combines classes in social sciences, business, communication and design to apply design principles to business contexts. Students take a required four-course design sequence, each course comprised of 15 three-hour sessions. The purpose of Design 4, the final course in the sequence, is to introduce students to information design broadly conceived.

In spring of 2012 the Visualizing Finance Lab adapted a section of Design 4 to teach the design of narrative visualization to support financial literacy. This was realized through a partnership with the City University of New York's (CUNY) professional development evening school for working adults. Our partner CUNY class 'Personal and Consumer Finance' trains community leaders to act as financial counselors. The class was developed and is taught by Joyce Moy, who is a community organizer as well as Professor of Small Business Management and Entrepreneurship at CUNY and Executive Director of CUNY's Asian/Asian American Research Institute.

Ms. Moy brings extensive experience to developing financial counseling programs that support immigrants, women and minority individuals and business owners in Greater New York City. She attributes the success of these programs to the degree to which they integrate personal narrative, financial concept and empathetic interpersonal communication. Ms. Moy enumerates key contributors to the success of her training class and the resultant counseling:

01. Starting with one's own story—this personalizes the instructor and gives her credibility.



02. Focusing on common financial traps (students with large educational loans, etc.).
03. Placing one's emphasis on helping the client (everything from presentation and facilitating to counseling skills) and imparting very practical, specific skills.

The counselors enrolled in Ms. Moy's class are typically affiliated with neighborhood community centers and have not received previous training in financial advising. Through the class, the trainee financial counselors gain literacy and empowerment themselves. They model the counseling sessions as their clients will experience them by alternately assuming the role of counselor or client in counseling role-plays, informing through interpersonal dialog and negotiation. The instructor and class subsequently analyze and critique the students' performance for their quality of financial information and advice, as well as modes and styles of communication. Ms. Moy's students, for example, learn to shift the language of decision-making from 'sacrifice' to 'choice,' and to encourage clients to reflect on the relationship between delayed gratification and future success (J. Moy, personal communication, April 13, 2012).

While Ms. Moy designed her class to familiarize students with important financial information and concepts, she is also training them to recognize and engage with the non-analytical aspects of financial decision-making. As we will see, her role-plays simulate real-world financial dilemmas that combine decisions stemming from a flawed rational-choice basis (e.g., choosing a high interest rate credit card debt over a lower interest rate bank loan) with decisions that have an emotional and/or cultural basis (e.g., choosing to assume debt to help a family member). Ms. Moy's emphasis on the behavioral dimensions of financial decision-making are supported by findings in behavioral theory.

### **Behavioral Economics and Financial Literacy**

'[E]conomics is at its core a psychological science, [however it has been based on] naïve psychology that has not always stood up to empirical scrutiny' (Amir, O. et al., 2005, p. 444). A key aspect of this 'naïve psychology,' described in rational choice theory by proponents of neoclassical economics, is the assumption that rational individuals, operating with correct information, will always plan and work toward the optimization of their own economic interest. Neoclassical economics assumes that individuals are making independent decisions in an environment of complete information; however, Herbert Simon asserts that human rationality is bounded, and the decision-making capacity of individuals is limited by the information available, their cognitive capacity, and the amount of time available to make a decision. In the absence of ideal conditions, people may employ heuristics, or rules of thumb, to make decisions (Simon, 1972). Heuristics and other intuitive decision-making methods are used far more often than rational choice methods when individuals make financial decisions, as Kahneman (2011) found.

Clinical experiments by Tversky and Kahneman have demonstrated that heuristic decision-making is prone to various cognitive biases or errors of calculation, which lead individuals to different decisions than those predicted by rational choice theory (Tversky & Kahneman, 1974). In the bias known as 'loss aversion' Tversky and Kahneman show that individuals' attitudes toward monetary risk do not reflect standard utility models; rather, individuals tend to be risk-averse when decisions involve monetary gains, but risk-seeking when decisions involve monetary losses (Tversky & Kahneman, 1991). According to Ariely and Norton (2008), 'A central aspect of utility for economics is hedonic utility, the units of pleasure and pain that the brain assigns to each and every event in the world' (p.13). Rational-choice theory assumes a 1:1 relationship: the pain of one dollar lost is equal (in utility) to the pleasure of one dollar gained. In behavioral economics, however, the math of hedonic utility is different. Thaler and Benartzi (2004) suggest that '[e]stimates of loss aversion are typically close to 2.0: losses hurt roughly twice as much as gains yield pleasure' (p.169).



Thaler and Shefrin (1981) examine several heuristics used by individuals to counter a lack of self-control; these heuristics, they argue, lead individuals to make biased rather than rational decisions. As example, Thaler and Shefrin cite 'a prohibition on dissaving combined with limits on borrowing. Using this rule of thumb, a person might borrow and lend simultaneously in spite of a substantial difference in the interest rates, as in the case of the passbook loan' (p. 397). Explaining further, 'these loans allow an individual with \$5000 in a savings account earning 5 percent to borrow at 9 percent using the balance as collateral, instead of at 10% with no collateral' (p. 392). In this case, the motivation to enter into such a (seemingly disadvantageous) transaction is that the self-imposed limits of the arrangement have a value for some consumers that is worth more than the four-point monetary differential. 'The loan allow[s] him to transfer consumption across time periods while it provides a regimented repayment scheme' (p. 397). This enables the borrower to keep the savings of \$5000 intact while budgeting for the loan repayments at 9%. Similarly, Xiao, Sorhaindo and Garman (2006) have found heuristic-type behavior in financial counseling clientele: '...consumers in credit counseling may follow a hierarchical pattern in their financial behaviors, paying off debts and adjusting spending before considering saving' (p. 108).

The behavioral factors that influence individuals' financial decisions are complicated by larger social and cultural influences. A heuristic common to many cultures is based on what Thaler and Shefrin (1981) term the debt ethic:

... a rule, which seems common is to prohibit borrowing except for specific purchases, like houses and automobiles. [Rules] such as the debt ethic are learned from parents or other models, which suggests that there will be differences depending on social class, education and age (p. 379).

Thus, to affect financial behavior, it is not enough simply to present the facts. The design of financial literacy must be informed by an understanding of how various behavioral and cultural factors interact. This understanding can be reflected and conveyed with subtle metaphorical and compositional design elements, a visual language that is particularly suited to the depiction of behavioral and cultural aspects. The following section provides some examples of these visual strategies, which we call narrative visualizations.

### **Heuristics and Behavioral Factors in Narrative Visualization**

Behavioral and emotionally-inflected aspects of financial ideas are often the driving force for editorial illustrations in the financial press, as demonstrated in Figure 1 (Michael Morgenstern, *The Economist*, Dec. 4, 2008). This illustration accompanied the article 'Where have all your savings gone' which commented on the shrunken savings of individuals in Europe and the U.S. early in the latest economic recession. Morgenstern vividly depicts a man kneeling beside a deep hole in the ground, staring into the financial—and literal—abyss into which coins continue to roll. A flower waving bravely in the distance reminds viewers (at least those culturally attuned to Pete Seeger) of the implicit reference in the article's title, and suggests a kinder past when life—and a planned retirement—was carefree. That juxtaposition and the relative sizes of the images both contribute to a highly personalized sense of desolation.

... the black hole resonates on many compositional and symbolic levels, including the baby down the well... His attitude is one of despair and submission: a person who is not in control, like a 19th century Dickens character. The emotional resonance is very profound (Asnes, cited in *Visualizing Finance Lab*, 2012, p. 13).





Figure 1

Morgenstern's illustration is typical of what we define as narrative visualizations: those illustrations, animations, storyboards, and graphic novels that engage the viewer with metaphor and storytelling. Also, narrative visualizations are especially effective at framing that story. While the article in *The Economist* describes the implications of aggregate spending and saving, the visualization strongly conveys the emotional impact on the individual, and thus reframes these concepts in terms of personalized loss.

Because of their reliance on story, narrative visualizations are excellent vehicles for conveying financial information that is nuanced by insights from behavioral economics. By depicting specific situations, characters and contexts, narrative visualizations can highlight the kinds of heuristics and biases that affect individuals' financial behavior. The visualizations also draw on cultural and social references appropriate to their intended audience. Narrative visualizations thus seem to offer an effective format for financial literacy materials.

#### **Design 4: Visualizing Finance**

Using narrative visualizations for financial literacy gives design students a context within which they can explore strategies to depict complex relationships and culturally inflected situations. The final project in the Design 4: Visualizing Finance course focused on narrative visualization as a tool for depicting both informationally-based and culturally-situated scenarios and decisions. Parsons students collaborated with the CUNY class (discussed above) and were tasked with creating a time-based visualization of the counseling role-play they had observed.

In creating these narrative visualizations, students learned to

- communicate financial concepts
- understand the emotional/cultural drivers of decisions
- design communication for underserved populations
- create materials for a social purpose

The collaboration also immersed students in a 'participatory design process.' This is one of the key factors identified by Chick (2012) in developing a process of design for social innovation. In working with Ms. Moy's students, the design students spent 'time with users/citizens in their own environments, rather than working on a project abstractly in another space' (Manzini, Thackara, Pillonton, cited in Chick 2012), recognizing the expertise of those most affected by the problem.



Development of the project proceeded through the following steps:

01. An initial student visit to the CUNY classroom to familiarize themselves with the target populations, the real-life scenarios the future financial counselors were likely to encounter, and the cultural and emotional factors that might affect their clients' decisions;
02. a return visit to observe and videotape a simulated counseling session, and
03. an instructor-led session in the design studio to review the financial concepts and social context behind the counseling session, and to discuss the components of good narrative visualization.

The Design 4 students were then given the video file and a script of the scenario, and divided into teams. Each team was tasked with creating a time-based visualization of the role-play as a financial literacy tool. Teams were instructed to include discussion of the financial concepts, as well as character, setting and other cultural factors. (For more information, see Fry, Wilson & Overby, 2014.)

**Analysis and the infoEmotion matrix**

The student projects were assessed using a general rubric; however, Lab members later looked at the students' work in the context of professional narrative visualizations (e.g., Figure 1 above). Based on this analysis, we developed a more-formal framework for evaluating how specific design elements contribute (or could contribute) to financial and behavioral messages conveyed by narrative visualizations. The results are summarized in the infoEmotion matrix (Table 1).

Content Element	Graphs/maps	Text	Dialog	Object	Setting	Character	Body language	Facial expression	Tone of voice
Financial: data	●	●		●					
Financial: information	●	●	●	●					
Financial: concepts	●	●	●	●	●	●			
Behavioral: consequences	●	●	●	●	●	●	●	●	●
Behavioral: decision processes	●	●	●	●	●	●	●	●	●
Behavioral: negotiation	●	●	●	●	●	●	●	●	●
Behavioral: ethics	●	●	●	●	●	●	●	●	●
Behavioral: culture	●	●	●	●	●	●	●	●	●
Behavioral: emotion	●	●	●	●	●	●	●	●	●

Table 1

The infoEmotion matrix organizes visualization elements and content elements into a grid. The content elements are subdivided into financial and behavioral elements, and are arranged in descending order from those that are more rational/analytical to those that are more intuitive/emotional/cultural. Visualization elements are similarly ordered, from left to right. In Table 1, the presence and intensity of the design elements is visually represented with circles, ranging from a blank space (indicating absence of an element) to pale-gray filled circle (presence) to dark-gray filled circle (high intensity). The circles are placed at locations in the matrix to indicate effective pairings of content and visualization elements. For instance, characters more easily convey emotional or cultural factors, while charts more easily convey factual information. The matrix is not meant to be exhaustive. Rather, it is intended as a tool to consider how different aspects of a narrative visualization can convey financial concepts and information, as well as more cultural and behavioral factors.



## Student Projects

The role-play depicted in the students' projects concerned a young couple planning to marry. The couple consults a financial counselor because the man's father had accumulated credit card debts in the son's name; the son's credit score had been badly compromised, complicating the couple's decision to marry. In this section we analyze student work, consider the social and cultural factors (as well as heuristics) and apply the behavioral elements of the infoEmotion matrix.

### Project 1

'Tom and Jen: A Credit Story' by Brianna Morris and Elizabeth Shupe (Figure 2) is a 3:12 minute key-frame partially animated narrative with sound and voiceover ([vimeo.com/105232861](https://vimeo.com/105232861)). The visual style uses simple vector-based graphics (similar to those in the television animation South Park) against photographic montage backgrounds.



Figure 2

## Visualization Elements

### Setting

In the third through fifth frames (00:15–00:33) the religious/cultural traditions of the couple are depicted by the church background of the wedding, along with Jen's white dress. Later (01:00–01:14) Jen appears against the background of a blue sky suggesting heaven (virtue), an allusion reinforced by the halo around her head.

### Character

The first frame gives indications that the couple are of Latin American origin (Jen's skin color, dress, earrings and make-up and the hairstyles of both). The character of the African-American financial counselor provides additional culturally-specific cues (01:15–01:30 and 02:13–02:20). Occasional details detract from the specificity of other cues; for example the apartment interior (02:29–02:38) may not be typical for an income-appropriate apartment within the boroughs of New York City. Body Language Tom's hunched shoulders throughout the visualization convey a guarded or helpless stance, while Tom-as-vampire (00:31–00:33, 00:57–00:58, 01:31–01:41, 01:56–02:13) has a menacing stance with squared shoulders. The body of Tom's father as mosquito bloats out as he drains Tom's credit score (00:46–00:54).

### Facial Expression

Facial expression plays an important role in this visualization, beginning with the opening frame (00:00–00:05) in which Tom is looking anxiously at Jen while Jen stares anxiously at the viewer. In the second frame (00:06–00:15) the couple wear optimistic smiles. Jen maintains this expression at the altar until 00:31, but it changes to one of dread as Tom bares his vampire fangs (00:32/33). Her happy/serene expression returns in the 'blue sky' scene



(01:00–01:08), but changes to one of consternation with knitted eyebrows (01:09–01:14) as she considers how marriage to Tom will adversely affect her credit score. Smiles appear in three frames that depict productive actions: the meeting with the financial counselor (01:15–01:31), Tom’s negotiation with his parents, and sharing the new apartment (02:21–02:37). However, anxious expressions return to both as they face their next decision (03:01–03:07).

**Text/Dialog**

Throughout text is provided by voiceovers, and brief dialog words or phrases appear as speech bubbles or exclamations.

**Graphs/Maps**

Graphs/maps are not used.

**Content Elements**

**Financial data, Financial information, Financial concepts**

These are imparted by the financial counselor and presented as voiceover and text.

**Behavioral: consequences**

The voiceover explains, “When Tom was young, his father had taken out many credit cards in his name, only to not pay them off and inevitably to [sic] have a huge impact on Tom’s credit.” (00:44–00:53). “She knows that if her [sic] and Tom were to marry—his poor credit would affect her greatly—something she is not too happy about” (01:06–01:14).

**Behavioral: decision processes**

The counselor “explain[s] all of the options the couple have in their situation... Tom and Jen are now faced with the hard decision of [sic] what their next step will be” (02:14–03:06).

**Behavioral: negotiation**

Tom asks his parents to help him with his rent in order to pay down his debt faster (02:19–02:27).

**Behavioral: ethics/culture**

The couple consider whether they should try to prove that Tom’s father forged his signature on applications for credit cards (02:38–2:49). Cultural values are implied in considering this decision.

**Behavioral: emotion**

See ‘Facial Expression’ above.

Visualization Element	Graphs/maps	Text	Dialog	Setting	Character	Body language	Facial expression	Tone of voice
Financial: data	●	●						
Financial: information	●	●	●					
Financial: concepts	●	●	●	●	●			
Behavioral: consequences	●	●	●	●	●	●	●	●
Behavioral: decision processes	●	●	●	●	●	●	●	●
Behavioral: negotiation	●	●	●	●	●	●	●	●
Behavioral: ethics		●	●	●	●	●	●	●
Behavioral: culture			●	●	●	●	●	●
Behavioral: emotion			●	●	●	●	●	●

Table 2



In Table 2, we summarize this analysis using the infoEmotion matrix. As described above, the setting depicts details of culture while the elements of character, facial expression and tone of voice are used throughout to convey emotional cues and suggest aspects of the decision making process. Little information is presented through graphs or text; instead, the project uses visual and content elements from the more intuitive/emotional end of the infoEmotion matrix. This creates an engaging story with cultural and emotional richness, reflecting the complex realities of intuitive decision-making.

We compare Project 1 with a second visualization from the same course assignment, utilizing the same role-play and script. Project 2 is visually sophisticated but mostly uses elements at the rational/analytical end of each scale, depicting more analytical decision processes. In addition, Project 2 uses the visual style of instructional films of the 1940s and 50s, leading the viewer to expect clear answers through the heavily-didactic mode in which this visualization presents its information.

#### Project 2

'Debt Collecting and You' by Claudia Bernaldez and Jake Stein is a 3:16 minute key-frame partially animated narrative with sound and voice-over ([vimeo.com/105232862](https://vimeo.com/105232862)). The visual style also uses vector-based graphics and extensive on-screen typography.

#### Visualization Elements

##### Graphs/Maps

The couple's credit scores are presented as graphs: numerically and as a percentage of a whole (00:41–00:46). Their romantic connection is iconographically presented (00:16–00:20) as is their relationship dilemma (00:36–00:40).

##### Text/Dialog

Text is used extensively, both to pose questions and to answer the questions with facts. Unlike Project 1, the visualization concludes optimistically and unequivocally with text stating that 'now that they know the facts', the couple are already 'on their way to newly wedded bliss' (03:00–03:08).

##### Setting/Character/Body language/Facial expression/Tone of voice

Very few of the emotional/intuitive visualization elements are employed to indicate the cultural, emotional, and other complex factors that are involved in financial decisions. For example, facial expressions and body language are neutral throughout.

#### Content Elements

In contrast to the more emotionally-driven decision making of Project 1, Project 2 utilizes the rational/analytical end of the infoEmotion matrix almost exclusively:

##### Financial: data and Financial: concepts.

Specific instances of these include the costs of items the couple wish purchase (00:21–00:31), the couple's credit scores (00:41–00:46), and the explanation of summonses (01:18–01:32) and affirmative defenses (01:40–02:41).

##### Behavioral: decision process

This is only elaborated as a set of action steps that the fiancé, Dick, can take to address the problem (01:34–01:38). He appears as a 'rational actor,' making his decisions independently (without the assistance of a financial counselor) in order to achieve an ideal outcome.

##### Behavioral: negotiation

These elements are presented solely as part of a formal legal proceeding (01:00–01:16) and (01:32–01:44).



**Behavioral: consequences**

Consequences of decisions and actions are not explored.

Project 2 falls short on depiction of the complex cultural and emotional factors in financial decisions, and presents a rational decision process rather than the more-intuitive process by which financial decisions are most-often made. In contrast, Project 1 effectively uses design elements to depict emotions and cultural context. These cues engage the viewer with the characters' dilemma (unlike Project 2, which allows the viewer to remain less involved), highlighting behavioral aspects of decision-making while presenting financial information and concepts.

**Conclusion**

The Design 4: Visualizing Finance course integrated several important areas of scholarship, pedagogy, and social engagement which promise long-reaching benefits for students, consumers, and society. The students gained cultural and informational insights from their collaboration with the class of financial counselors, and they designed appropriate communications for underserved populations. The visualizations themselves reflect the emotional, cultural, heuristically-based and intuitive factors which dominate financial decision-making, suggesting potential for affecting behaviors.

In addition, this course led to development of the infoEmotion matrix, a useful tool for evaluating narrative visualizations. As the analysis of the student projects suggest, however, it is difficult to create effective visualizations that present financial situations in their full complexity, situated within specific cultural and social contexts. Given the urgent need for financial literacy, especially among marginalized populations, narrative visualization techniques offer a fruitful, yet challenging, possibility for social innovation through the creation of projects that require students to grapple with complex, multifaceted problems and engage with cultures other than their own.



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**Aaron Fry (lead author) /**  
The New School /  
Parsons The New School  
for Design /  
frya@newschool.edu

Aaron Fry (MFA) is an Associate Professor of Design Strategies in the School of Design Strategies at Parsons The New School for Design. Fry is co-director of the Visualizing Finance Lab at The New School.

**Carol Overby /**  
The New School /  
Parsons The New School  
for Design /  
overbyc@newschool.edu

Carol Overby (MBA) is an Assistant Professor of Design + Management at Parsons The New School for Design. Overby is co-director (with Aaron Fry) of the Visualizing Finance Lab at The New School.

**Jennifer Wilson /**  
The New School /  
Eugene Lang College The  
New School for Liberal Arts /  
wilsonj@newschool.edu

Jennifer Wilson (PhD) is an Associate Professor of Mathematics at Eugene Lang College The New School for Liberal Arts. Wilson is a member of the Visualizing Finance Lab at The New School.

