



Viral Resistance

An Information Literacy Game

The Role of Technology in 21st Century Education

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Viral Resistance: Final Report

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Viral Resistance: A Game-Based Approach to Critically Evaluate News Content on Social Media

Project Overview

Digital media are an inescapable part of our everyday lives, impacting how we conduct ourselves as citizens in a democratic society. Mihailidis & Thevenin (2013) note that “On a large scale, the evolution of ‘networked social movements’ (Castells, 2012), organized largely around digital tools and social media, is reshaping civic engagement not only in the case of large-scale civic and political uprisings, but also in the context of daily engagement with personal and public matters.”

If Americans interact with social media so regularly, are they prepared to engage with a plethora of news content- some which is intended to be misleading?

A recent study by the Stanford History Education Group suggests not. Researchers found that students displayed a “dismaying inability... to reason about information they see on the internet.” Specifically, students were unable to distinguish advertisements from article content, identify inappropriate evidence, and evaluate the legitimacy of sources in social media claims (Stanford History Education Group, 2017). There are many potential problems at the root of this issue, including sophisticated propaganda techniques, psychological factors, and decreased emphasis on civics in formal education.

Accurate and inaccurate information can be shared more easily, by more people, today than ever before. We are increasingly seeing the effects of this discourse on society; national debates about everything from healthcare to education to politics suffer from the influence and spread of dubious content. In 2016, popular phony headlines included, “Pope Francis shocks world, endorses Donald Trump for president,” “Donald Trump sent his own plane to transport 200 stranded marines,” and “Warren Endorses Sanders, Breaking With Colleagues.” The eagerness of the mainstream media and the polarization of social groups presents a challenge for consumers.

Viral Resistance aims to help learners develop conscious, critical thinking skills that combat the spread of inaccurate, misleading, and blatantly false news on social media. We will focus on dispositions that help learners care about factual information and understand biases, as well as hard skills, such as using efficient techniques to tell if a news story is reliable. Our game will target casual learners, both inside and outside formal education spaces, and our initial learner pool is composed of English-speaking social media users in the United States, ages 18 - 50, who frequently share news related posts on Facebook. We are defining our user group by behaviors that would make them targeted for “fake news” articles and influential in the spread of news.

Background

In a Pew Research poll, 65% of Americans indicated that they thought fake news was causing a great deal of confusion (Barthel, 2016), and it has become a contentious issue in present-day discourse. Because this issue was in the spotlight during the 2016 election season, it's easy to think of fake news as a partisan issue. However, anyone is capable of falling for a phony news story if it meets certain criteria for the reader. This is an issue rooted in human behavior, with a with real-world impact on politics, health, and society.

Modern propaganda techniques have become more sophisticated, adding a repertoire of online techniques to exploit well-established psychological biases and heuristics in order to create the impression of trustworthiness where none really exists. Paul & Matthews (2016) describe an approach employed by the Russian government in the 2014 Crimean conflict as a “firehose of falsehoods” utilizing “high volume” and “multichannel” messaging without any “commitment to objective reality” or “consistency” to overwhelm and pre-empt counter-messaging by traditional means such as fact-checking. The propagandists simultaneously created fake news sites, mocked up to resemble real news sites, in order to propagate the same false messages.

Of course, propaganda itself is nothing new, and education has been seen as a remedy for its ill effects. Labaree (1997) frames one of the historical goals of American public education as promoting “democratic equality”, in support of the right and capability of all citizens to participate productively in a democratic society. This framing seems to place the relevant skills squarely within the purview of civics and information literacy. Unfortunately, civics education is not in particularly great shape in the United States today.

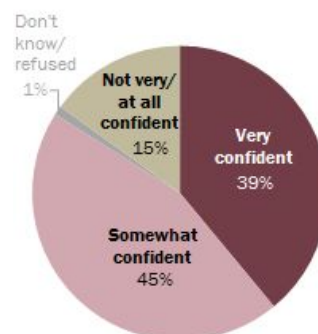
Therefore, some responsibility lies in the educational policies of the past few decades. In some sense, the reduction in civics-related education in favor of standardized math and reading is part of a long-running tension that Labaree (1997) frames as a tension between goals of “democratic equality”, “social efficiency”, and “social mobility”. This tension has reduced focus on long-term vigilance for citizens, who are constantly encountering new information.

There are both educational and social drivers for the recent proliferation of fake news, but perhaps the most compelling reason it remains a problem is that fighting fake news requires us to confront our own psychological tendencies. For instance, confirmation bias makes us seek information that affirms our initial choices (Jonas, Schulz-Hardt, Frey, & Thelen, 2001). This in turn means that whichever message we are exposed to first tends to stick with us, biasing our choices about further information in favor of messages that agree with the original one.

We suspect that individuals may have an inaccurate assessment of their own ability to judge suspicious news. In a December 2016 Pew Research survey, 39% of people were “very confident” they could identify fake news (Barthel, 2016), and yet, some research claims that fake news outperformed real news during the last election cycle (Silverman, 2016).

Majority are confident in their ability to recognize fake news

% of U.S. adults who are ___ in their ability to recognize made-up news



Source: Survey conducted Dec. 1-4, 2016. "Many Americans Believe Fake News Is Sowing Confusion"

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Contrasting the confidence from adults, the National Assessment of Educational Progress, commonly called the Nation's Report Card, shows only 23% of American eighth graders scoring "proficient" or higher in civics, with overall scores remain largely unchanged: overall scores have increased only 4 points (on a 300-point scale) since testing began in 1998.

Access to civics and media literacy education in K-12 varies, and there is a dropoff in opportunities for adults after high school. Those who opt out of college don't have easy access to education, and many university programs lack information literacy requirements. The burden for any information literacy education after this point falls on the learner to engage. Essentially, as soon as Americans are legally fit to engage civic duties at age 18, information literacy education stalls.

There are at least a few problems at the root of the information literacy issue, including sophisticated propaganda techniques, implicit biases, and decreased emphasis on information literacy in formal education. Our best chance at affecting change is to target these learners who are underserved by education; those outside the classroom who have missed out on (or graduated out of) information literacy learning opportunities.

Learner Profile

Our initial learning profile is composed of active Facebook users ages 18-50 who use the platform regularly. Social media users aren't always aware of the bigger picture in which they participate. In fact, the experience is so customized that it's practically designed to obscure the reality that there are actually millions of other people in our social networks.

Our desired users are seldom served by formal education and aren't likely to seek out information literacy education in adulthood. They would rather spend free time with family or friends, and aren't particularly likely to visit a library for an educational experience.

We aim to address habits of users who engage with content often, and power users with wide networks that will make a broad impact with the skills we intend to teach. However, we suspect a variety of social media users should benefit from this solution. Because news-based viral content is particularly relevant in American media, we will focus on English speakers living in America.

Characteristics

Facebook user: We are targeting Facebook, which is by the most popular social media platform, with relatively even distribution between political affiliation, race, and gender (Perrin, 2015). Since 70% of Facebook users report daily use (Duggan, 2016), we should be likely to find and test our solution with this group.

Age range: Research indicates that younger users express more concern about fake news, with 66% of people ages 18-29 saying they thought fake news causes a great deal of confusion. Concern decreases with older social media users, and drops significantly with users over 50 (Barthel, 2016). We're designing for ages 18-50, understanding that users on the older end of the spectrum will be less likely to voluntarily engage an experience like this.

Growth-focused disposition: Our learners should be curious truth-seekers and problem-solvers. They may have a high need for Cognition Scale (Bost, 2007), which means they intrinsically enjoy learning, or they may have increased interest because of the recent focus on fake news in public discourse.

Motivations: We acknowledge that an individual's motivation plays heavily into social media behavior. According to the uses and gratifications theory (Katz, 1974), people engage media to satisfy a variety of needs (i.e. cognitive, affective, social, personal, escapism). We will find ways to address those motivations in our design and narrative.

Prior Knowledge

Media Awareness: Learners should be interested in news and information, and may have some experience with fake news content. This is a large demographic; Pew Research reports that 64% of Americans, regardless of political persuasion, believe that fake news is causing a "great deal" of confusion about current events, while 24% believe there is "some confusion." (Barthel, 2016).

Moderately Tech Savvy: Learners should have some experience with web browsing on a tablet to be interested in the narrative and learn applicable skills. They should have a basic grasp of social media features, e.g. liking, sharing, reporting.

Political Experience: Because of the sensitive implications surrounding fake news content, we want to make this learning experience bi-partisan. Both Democrats and Republicans report encountering fabricated or inaccurate news online, and 53% of Facebook users report a social network composed of mix views (Duggan, 2016).

Behaviorally, our users are not predisposed to evaluate the credibility of content, and sometimes lack the skills to do so. This could be due to a lack of education in general, or a lack of current education that considers the rapid evolution of media and information distribution. To complicate things, confronting issues of misinformation head-on is confronted with pushback for psychological reasons.

We want to teach skills with a lengthy shelf-life: those that help identify problematic information while accounting for pushback around learners' existing beliefs. Since our real-world experiences will include agents who actively seek to propagate disinformation, we must also set as a dispositional outcome, that learners will be more inclined to verify the information they consume.

Competitor Analysis

Considering the recent popularity of "fake" news and viral content, we were prepared to encounter a variety of short- and long-term solutions to this issue. We had considered a number of approaches to our game, and throughout this process were able to narrow down and eliminate some gameplay options. We thought a lot about whether players should create or consume news in the game, and debated the merits of including real-time news or a fictional narrative. Single- and multi-player designs had pros and cons, as we thought about whether the gameplay should be collaborative or competitive.

We discussed questions like -

- Could players learn from creating fake news that agrees with their point of view on real-world issues?
- Would people be willing to fake out their friends in a party game?
- What about a multiplayer mode extension to a single-player story-driven game?

We used our research to learn about the ecosystem for fake news games, as well as to stress test our own preliminary ideas.

Addressing Learning Challenges

Fake News is a difficult problem to solve because it stems from a trifecta of information literacy problems: (1) consumers are not **predisposed** to evaluate the credibility of content, (2) they largely lack the **skills** to do so, and (3) attempts to address this problem head-on are met with **pushback** for a number of deeply-rooted psychological reasons.

Existing efforts to tackle the problem of fake news generally address one of the problems, but not all three.

Informational resources such as those being offered by libraries and news sites around the internet address only the *skills* portion of the issue, and likely with a low level of efficacy (informational flyers are essentially a form of direct instruction). Like textbooks sitting on a shelf, however, these passive resources have little impact on the *dispositions* of consumers to apply these skills at the appropriate times. Since the psychological biases underlying selective application of these skills is not addressed, these resources may in fact make the problem worse, as consumers are more able to justify their skepticism *only* of content they already disagreed with.

Workshops are being held in local libraries, in cities like [Pittsburgh](#) and [Seattle](#), to help citizens become more aware of their media consumption. Seattle's [Ask A Librarian](#) service allows users to chat with librarians 24 hours a day.

YouTube now offers the [Internet Citizens](#) program in the U.K., a free video workshop for teens.

In April of 2017, Facebook, in partnership with The News Literacy Project, Arizona State University, and The State University of New York, shared "[Tips to Stop False News](#)". In contrast to Google's plans, this solution puts the burden on the user to find and report skeptical items.

Media literacy organizations are offering tips for consumers as well. [How to Spot Fake News \(and Teach Kids to Be Media-Savvy\)](#) includes simple bulleted lists of tips for identifying fake news.

Other groups have focused a bit more on the content, in order to demonstrate the concepts. [Trump Has Called Dozens Of Things Fake News. None Of Them Are](#) demonstrates how fake news propagates using real case studies

Alert systems created by some news aggregators address the *predispositional* aspect by forcibly elevating the issue of content credibility, but continue to rely on the consumer's own information literacy skills to evaluate the accompanying content. A consumer who lacks these skills cannot make effective judgments

about the credibility of the article even when consciously considering it. There is also little reason to believe that being made aware of "expert" claims about the validity of a story will overcome consumers' psychological propensity to believe the messages in spite of the formal concerns surrounding them.

Alert systems have gained in popularity since news aggregators and social networks emerged as hubs in the perception of fake news around 2016. Mainly concerned with mitigating the spread of fake news, these companies issued guidelines to users to help them identify and report suspicious news as it became a problem. In April 2017, [Google announced they would begin flagging fake news stories](#). Approved sources would be promoted first, based on a vetting process.

Subversive experiences, including games, can induce powerful emotional responses in players, including disgust at the ease with which Fake News can be manufactured and distributed, or the idea that it could be regarded as an industry. Game-based experiences may also succeed in penetrating the psychological *pushback* layers against addressing Fake News as a topic, by providing fictional content, giving players fictional roles, and posing issues as hypothetical. However, the experiences we have examined within this category did not systematically work to build player skills in assessing the credibility of a piece of content -- that is, they strongly highlighted the fact that credibility could be lacking, but did not work to build the skills that consumers would need in order to make that judgment about articles themselves.

[Fake It to Make It](#) was designed around the production of fake news, inspired by Macedonian teens who profited from fake news during the 2016 Presidential election. [Criticism of this game](#) is focused on its tediousness and the fact that it is "real" enough that it feels like work.

BrainPop is an online catalog that [recommends media literacy games](#) for kids, including titles like "[After the Storm: Day One](#)," a point-and-click news adventure game.

Our ideal game experience is a strategic combination of solutions that can successfully address all three necessary aspects of the problem - teaching skills and disposition, while addressing psychological pushback.

Viral Resistance is designed to address these challenges simultaneously. We will implement effective instructional design that builds information literacy skills with a faded scaffolding model to guide the player before giving them autonomy for more complex tasks. Our game will present learning content using embedded design to help persuade players to learn without being obvious and disengaging them. We have also deliberately relied on aspects of play to avoid psychological pushback from players. To aid dispositional growth, we decided to create a fictional narrative in which learning tasks can be distanced from the distractions of players' psychological responses.

Solution Strategy

Our solution concept assumes that we will not be able to meet our learning objectives around the core skills and dispositions of information literacy through traditional approaches. In particular, cognitive biases such as confirmation bias and the use of social heuristics (Paul & Matthews, 2016) mean that a direct skill-training approach using real-world controversial content will likely fail, because potential learners will

be strongly predisposed against such lessons. Our broad solution concept therefore revolves around a game-based approach to circumvent those biases, at least in the early stages of learner engagement.

Case for the Solution

The game Viral Resistance is designed to build learners' skills in information literacy through the use of embedded design, scaffolding, and information design strategies that support effective instructional design. These strategies influence the narrative and sequence of learning experiences.

Instructional design strategies: Circumventing pushback

Due to the inherent biases that surface when discussing “fake news”, we looked to the work of Geoff Kaufman to learn about effective game design strategies. Kaufman, Flanagan, & Seidman (2016) have designed several successful game-based interventions using Embedded Design, addressing issues such as implicit gender bias in STEM (Kaufman & Flanagan, 2015) and social biases in the workplace (Kaufman & Flanagan, 2016A). Kaufman and colleagues describe their Embedded Design framework, as mitigating psychological reactance (Brehm, 1966), which can be described as the aversive reaction people experience to overt attempts at persuasion. Their design framework relies on a “stealthy” embedding of content in games, such that it does not immediately trigger adverse user reactions to the controversial topics it has been used to address.

Our game design leverages two of the Embedded Design strategies: Intermixing, which is the “ideal ratio” of topical content to off-topic content in the game, and Distancing, which uses hypothetical and/or fictional scenarios to distance players from real world issues.

The following images show the in-game dialogue that would lead up to a learning experience. The dialogue is used to build the outer loop of the game, develop characters, and strategically intermix on- and off-topic content.

Viral Resistance uses a narrative that contains fictional characters and events to distance the player from inherent biases they may have towards real people and events. The narrative also provides the opportunity to strategically fade in story arches that may metaphorically relate to our current events. However, we need to make sure our learners are prepared to questions their own biases before presenting them with challenging material.

Instructional design strategies: Building skills effectively

We apply scaffolding techniques in Viral Resistance to help learners focus on completing learning tasks within their “range of competence”, Wood, Bruner, and Ross (1976). The game has three overarching learning objectives that all rely on the previous one:

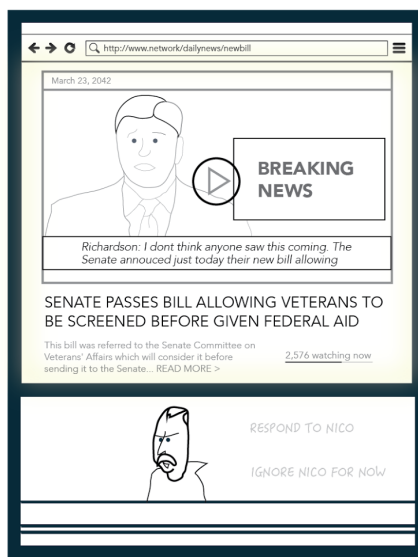
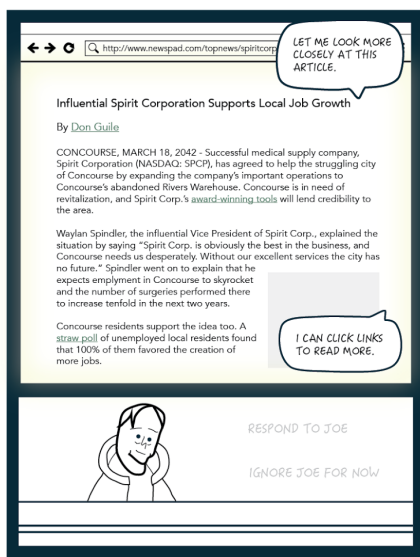
1. Think critically about news [When to investigate]
2. Identify key elements of a news story [Where to investigate]
3. Conclude the reliability of a news story [How to investigate]
4. Value the truth [Why to investigate]

Early in the game, learners are walked through a “worked example” showing the process of (1) identifying when to investigate a news story (2) identifying the location of important elements of the news story to

investigate (3) identifying if a news article is reliable or not, and (4) learning the consequences of revealing the truth or not. Through the practice of this process, learners will need less and less guidance.

For the first learning objective, the player will learn to think critically about news. They will learn to critically evaluate information unless the news is satirical in nature or not claiming to be interpreted as fact. Through early game play, learners will have to investigate news, regardless of the content of the article, which will encourage learners to develop the disposition that all news should be questioned when represented as fact. This goes against players' natural tendencies to only criticize news that goes against their biases (disconfirmation bias). The images below show early game (full scaffolding) and late game (all scaffolding faded) scenes when the player is presented with an article. With the first example, the player is prompted to open the article to investigate. In the second, the player can choose to engage with the article or not.

The game also uses scaffolding to help learners initially identify key elements of a news story that help you identify if a news article is fake or not. Through game play, players will learn to identify certain parts of media (articles, videos, etc.) that are essential to identifying if they are reliable or not. As it stands, this game addresses four separate categories of elements in a news story: **source**, **author**, **claim**, and **evidence**. Each category involves separate (though related) knowledge -- knowing how to identify if an author is biased is different from identifying a claim is made with no evidence, even if they both lead to the correct conclusion that an article is not reliable. The game intends for a player to correctly identify each knowledge component at least 3 times before moving them onto the next level (next scaffolding stage). The images below show early game (full scaffolding) and late game (all scaffolding faded) scenes when the player is looking at the media source. With the first example, the player is prompted to look at the links. In the second, the player must choose to engage the correct parts of the article.



Players also learn to build arguments and support their conclusions about source reliability. Game mechanics are designed to walk players through the creation of an argument about different elements of the news sources. Below is an example of game play where a learner constructs an argument about the author of a news article:



Currently we have not designed how argument construction may be scaffolded differently in later levels of the game. Argument construction may be compressed or arguments may become more complex later in the game.

Lastly, players learn to value the truth and understand the consequences of relying on and believing information that is falsely presented to the public. This is learned most evidently in the last part of the game where a player learns if they correctly identified the reliability of a source and they see how that affects players and events in the game. The images below show the results of a player's argument construction in the game, and the consequences for the player in this story, Joe.



Instructional Design Challenges

As Embedded Design research has produced changes only in behavioral and self-report measures of beliefs, this design approach has largely not been applied to contexts like ours, in which the learning objectives include specific skills relevant to the practice of evaluating the validity of news media content. It will therefore be a novel challenge moving forward to resolve likely tensions between the "stealth" design of an intervention and the need for face-valid assessment, as well as questions of transfer if the learning context appears too dissimilar to the real world.

As the game stands, we do not have mechanics in place to vary the challenge of the game for different learners (i.e. adaptive difficulty). This means we do not have a strategy for verifying if learners are within their zone of proximal development. We acknowledge that gathering feedback about user performance can help create appropriately scaffolded learning environments, and this issue will be explored through further game development.

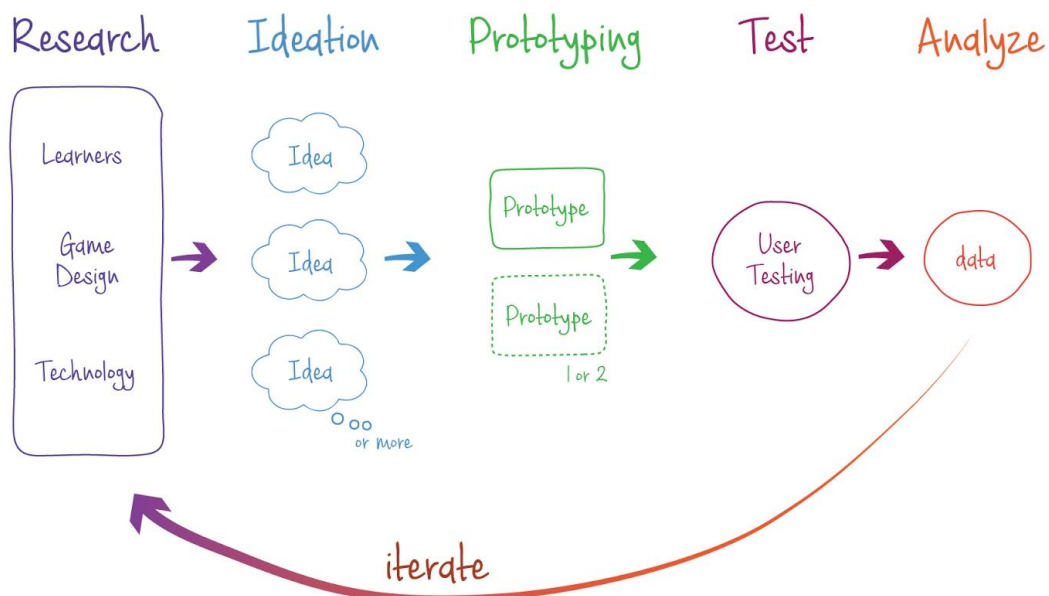
Summary

The game Viral Resistance is designed to build learners' skills in information literacy through the use of embedded design, scaffolding, and information design strategies that support effective instructional design. These strategies influence the narrative and sequence of learning experiences.

Design

Rapid Prototyping

Our development [process](#) included a commitment to not making decisions prematurely, especially in the absence of real-world testing. Our timeline outlines an iterative design methodology (see diagram below), using human-centered design and rapid prototyping processes.



Prototype Reports

Our project created and user tested three prototypes over the course of the semester, each focusing on a different aspect of the development.

Prototype 0: Basic Premise (2/14/17)

Based on our background research and initial design goals/constraints, we generated the paper prototype shown at right. The prototype is presented as a potential "Fake News" article in which the author (a bird) complains about birdwatching as an invasion of privacy. The "player" is asked to evaluate the article and decide whether to share it, ignore it, or report it. The skills (and outcome actions) used are intended to be the same as in real life fake news detection, while the setting is intended to be "distanced" (per Embedded Design).

Test:

We recruited a convenience sample of n=10 volunteers and used a think-aloud protocol to evaluate:

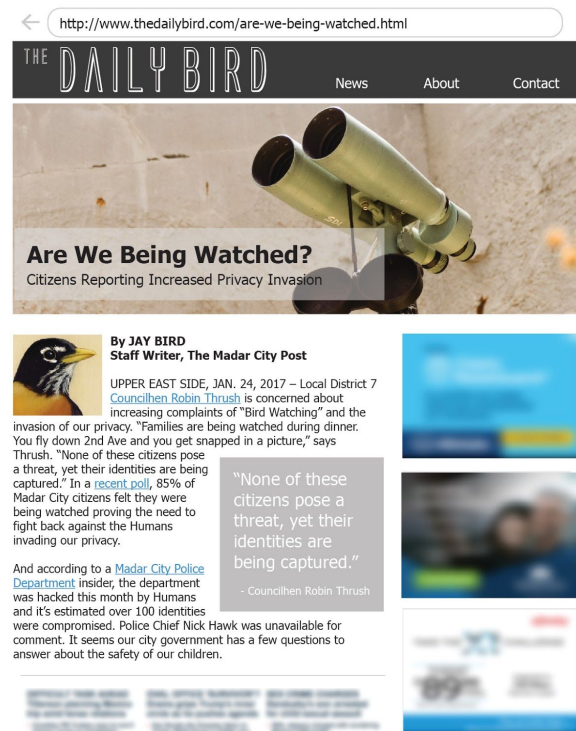
1. What information-seeking behaviors novices and experts used to determine whether the article was trustworthy
2. Whether people found this task premise interesting or boring
3. Whether people found the setting fun, interesting, boring, or confusing

We recorded participants' actions during the think-aloud, and had them fill out a short survey about their social media sharing behaviors and thoughts on the game (plus basic demographics).

Outcomes:

Participants' actions during the think-aloud were coded and categorized by the development team member who recruited them. Information-seeking behaviors (e.g. checking for a fake URL) were compiled into a list of potential interactions and content areas that could be problematized in-game. This included information-seeking behaviors that respondents mentioned which were not applicable to the paper prototype, such as asking knowledgeable friends, or only responding to articles that they have seen forwarded multiple times. Respondents mentioned a fuller range of potential "final decision" actions than we had planned for as well, including private message conversations with the sender, and never even opening the article based on its title. Respondents also mentioned that they judged articles differently according to their apparent genre, e.g. clickbait, editorial, satire, fluff, etc.

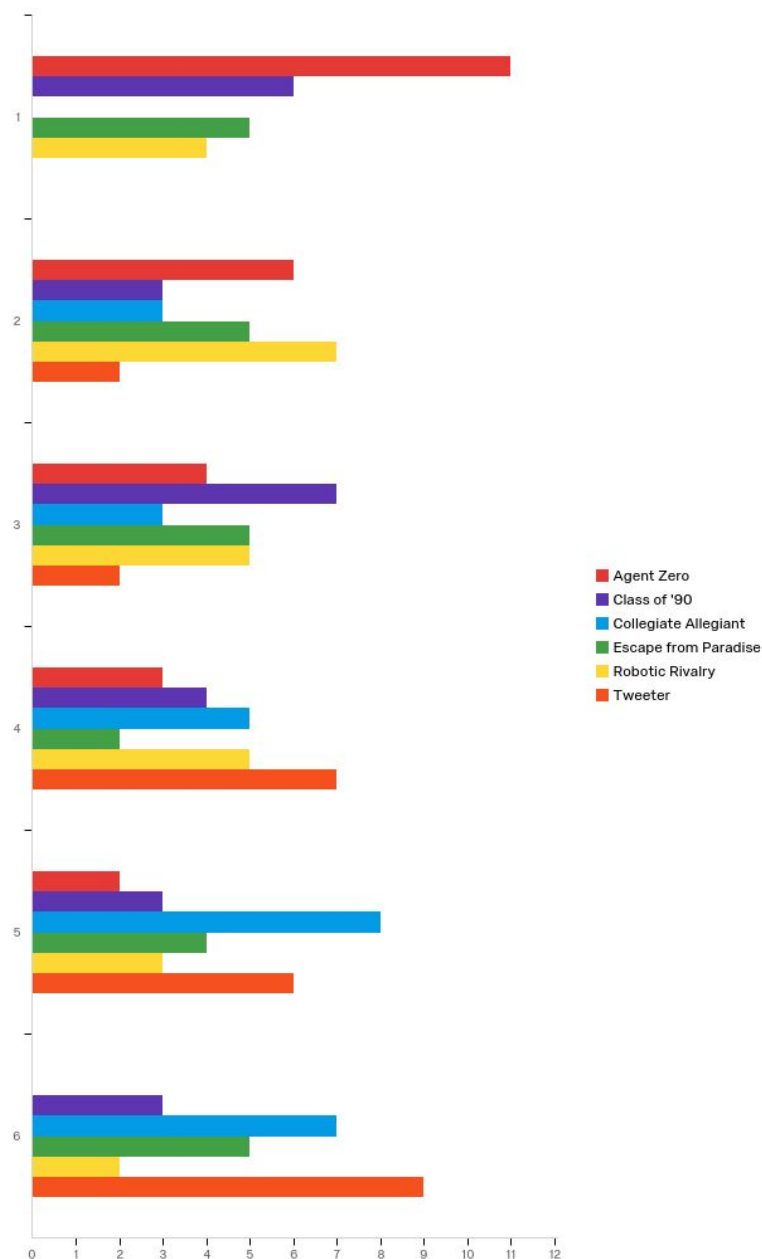
Participants generally reported finding the task interesting, and the objective of learning how to identify fake news as important. However, the setting and context of the article (i.e. our first attempt at "distancing") produced marked confusion. Players seemed to appreciate the levity and novelty of the bird



world (which suggested that "distancing" might be occurring), but were confused as to the overlap between the human world and the bird world -- for instance, did birds have rights, laws, and representative government?

Prototype 1: Gameplay Concepts (3/5/17)

Our second prototype was intended to establish the "outer loop" of gameplay, as well as adjust our theming in light of participants' mixed reactions to the "bird" theming in the previous prototype. To generate gameplay concepts, we conducted brainstorming, followed by a group card sort of ideas and themes. Each group member was then given a week to create one or more gameplay concept "pitches". The proposed solutions were substantially divergent in genre and content, ranging from a simulated social media feed to an adventure game featuring an intelligent laboratory ape. Rather than choosing based on internal deliberation alone, we collected and analyzed data from potential users to refine the design.



Test:

We collected survey data from a convenience sample of n=40 users in our target demographic to identify gameplay and setting motifs that would be attractive, understandable, and sufficiently "distanced" from the real world to achieve our design goals. Survey respondents were presented with a series of six "app store" blurbs in randomized order, each describing one of our gameplay concepts. Respondents were asked to rate each option, using a 5-point likert scale, on whether they thought (1) they understood the gameplay concept and (2) the game was something they would try. A third item, how well the respondent thought the description was written, was used to control for variation in writing quality, or themes that might be more amenable to the "app store" writing style. Respondents were also able to add a comment about what stood out to them about each concept, good or bad (nearly all respondents did so). Finally, at the end, respondents were asked to rank the six choices according to which ones they liked the most.

The six concepts contained deliberate clustering aligned to key gameplay mechanics we wished to evaluate. For instance, two of the concepts used on-screen

Above: Number of respondents (bar length) who picked each game concept (color) as their #th rank choice (cluster).

social media feeds as their primary player interface, while the others used an adventure game motif. Three options offered "dark" goals in which the player was able to choose to do evil things like blackmail others through social media. This clustering was intended to support statistical inference into which elements were most popular, but in practice, respondents noticed the clusters and commented directly on their preferences about them.

After collecting the data, we analyzed the preference rankings and user comments, and arrived at the following conclusions:

- Two concepts were near the bottom of almost every user's rank-ordering, and received no first-choice votes.
 - An inspection of the comments for one of the two (*Tweeter*) made clear that respondents found the idea of **"playing" a social media feed uninteresting**, because they had real social media and saw no point in doing so.
 - The comments for the other low-scoring concept (*Collegiate Allegiant*) suggested that many users were **taking offense at the idea of playing a game in which they did evil things**, and some users feared that it would have a negative social impact on players, particularly children.
- One concept (*Escape from Paradise*) received polarized feedback.
 - Many users found the **concept and content (animal conservation) desirable**.
 - However, several users found the **premise silly or confusing**.
- One concept (*Robotic Rivalry*) received feedback that **skewed heavily by gender** (men rated it highly, while women rated it low).
- One concept (*Agent Zero*) was the most-picked first choice by nearly a factor of 2, and received high ratings by almost all respondents.
 - Respondents praised the game's **premise** and seemed attracted to its **genre**.
 - Despite the opportunity to make "dark" choices in this concept, respondents did not seem to mind it in the context of a detective crime drama.

Based on the findings from this phase, we adopted the following elements for our design:

- The game would follow an adventure format rather than a social media feed format
- The game's setting and genre would be a near-future detective/crime drama
- The player protagonist would be a mostly good character, but a "dirty good" might be acceptable or even preferable

Prototype 2: Inner Loop (4/25/17)

The third prototype implemented a standalone portion of an early-game tutorial as an interactive wireframe to test the usability of our planned interface and continue data collection around our theming. We implemented a single article in myBalsamiq with three "hotspot" zones to check for article reliability, and used the player character's internal monologue to direct players to each area in "tutorial" style. Players were to judge, by clicking through a decision tree of reasonings, whether each area contained a flaw that constituted a credibility problem for the article, e.g. the author has a significant conflict of interest. Each choice included a "confirmation" screen with a paraphrase of the player's chosen critique (as protagonist internal monologue) before finalizing a decision. Players' final decisions in the three hotspots were reported as correct or incorrect on a "scorecard" screen at the end of the article, and short narrative

"stubs" at the beginning and end of the task give a sense of the outer loop and world surrounding the interactive gameplay segment.

Test:

The wireframe was tested with a convenience sample of n=6 users using a think-aloud protocol. Team members reviewed the notes for confusions around the task, interface, or content; as well as any comments made by participants about the task or interface.

Outcomes:

- We noted a number of problems around task flow, in which users wanted to review the article while making a decision, confirm that an option they had clicked was the one they actually intended, or back up and traverse the remaining decision options to see which "paraphrase" they liked best.
 - Based on these issues, we decided to **combine all the critique-construction steps into a single page interface**, so that all the choices (problem or not, nature of the problem, etc.) would be visible simultaneously
- The narrative voice shifted in sometimes unclear ways between internal monologue and dialog/input choices. Some users had trouble orienting themselves to what was being prompted as a hypothetical statement (i.e. click to confirm this is what you want to say) and what was being provided to the player as a prompt.
 - To solve this along with a few other issues and facilitate the consistency of the narrative moving forward, we changed the **visual genre of the piece to a multi-panel comic** (like a detective comic). This allows us to show the protagonist on-screen speaking to remove ambiguity about voice and context of a statement.
 - This also allows us to put the multiple steps of the critique decision on-screen at the same time (see above) by locating them within different panels on the same page.
- The "scorecard" interface created confusion because it used checkmarks to indicate issues that players had successfully identified. Players were unsure whether the green checkmark meant they had OK'ed something that was supposed to be marked as a problem.
 - We **redesigned the scorecard** to include the in-character paraphrase for each point in order to facilitate recall. We also added clarifying "You caught/did not catch" phrasing to the feedback statement.
- A number of individual changes were made to the text of the article and supporting documents (e.g. the web search), as well as the prompts and internal monologue text given to players

Final Product (5/10/17)

Our final product consists of (1) an HTML5 game containing introductory dialog, one complete inner loop, and concluding dialog, (2) code and a database to support the growth of the game to include many different outer loops and inner loops, and (3) an admin site that currently allows easy modifications, additions, and deletions to branching questions that users will be presented, and can be easily extended to support all database changes. The code for the game, as well as currently unused but potentially useful code for future iterations of the game, can be found here: github.com/saraxiang/viral-resistance, the code for the admin site can be found here: github.com/saraxiang/viral-resistance-admin-site, and additional implementation details can be found in the appendix.

For our final product we modified the UI presented when players select a link in an article. Players' questions and options are displayed concurrently on their screen using comic book style panels. We made this change because in user tests, players wanted to quickly toggle and view all possible options, and also displayed interest in the comic book art style. Additionally, comic book panels allow us to effectively group related content visually. We also highlighted relevant content throughout the game with yellow borders or backgrounds in order to direct players' attention to active game areas. Lastly we fleshed out our game art and outer loop story details.

[Viral Resistance Final Prototype](#)

Pitch Presentation

[Viral Resistance Pitch slides](#)

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Appendix

- Prototype 0: [News item](#)
- [Timeline](#)
- Prototype 1: [Scenario Pitches](#)
- [Decision Map](#)
- Prototype 2: [Balsamiq](#)
 - [Argument Formation](#)
- Prototype 3 - [Final](#)
- [Implementation Details](#)