

# Game Design for Promoting Counterfactual Thinking

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## ABSTRACT

We describe the first iteration of an Alternate Reality Game (ARG) designed to lead players into a newly enfranchised relationship with history and engage them in scientific thinking and information literacy practices. We found that the points at which the game's mythology blurred the lines between fact and fiction prompted middle school students to move beyond rote memorization of content. Instead, they began to question, analyze, and make hypotheses about the data presented. However, striking a meaningful balance between "true" history and imagined events poses new design challenges. We present a formative typology of counterfactual design patterns that can help designers, educators, and players locate interesting fault lines in reality that facilitate the expansion of ARG mythologies.

## Author Keywords

Alternate Reality Games; counterfactual thinking; children.

## ACM Classification Keywords

K.3 [Computers and Education]: General;

## General Terms

Design, Human Factors, Theory.

## INTRODUCTION

*In the spring of 2011, a group of middle school students from a public school in America witnessed a curious quantum event. At midnight one April night, time folded back onto itself, creating a path in 4-dimensional space-time that enabled the transmission of a message from 2011 to 1853. The contents of the message, which guaranteed the preservation of U.S. history as we know it, had been encrypted, scattered, and hidden for over a century. Thanks to the collective efforts of the students to authenticate documents, decipher clues, and decode maps, the message was successfully reassembled and sent, at just the right time and place.*

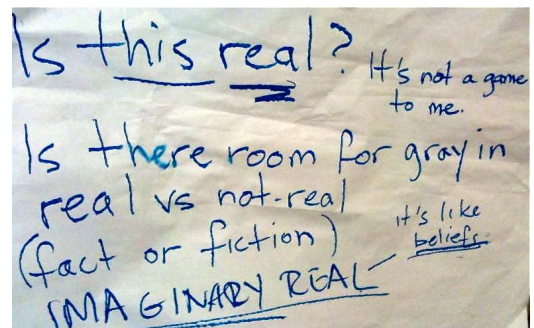
The account above really happened, according to the group of middle school students (13-15 year olds) who

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participated in the first season of the Arcane Gallery of Gadgetry (*AGOG*), an Alternate Reality Game (ARG) designed to expose them to the interpretive process behind history and the mathematical roots of cryptography and cartography. Not long before the quantum entanglement that enabled their special message to be sent, the students had been recruited by university researchers to help investigate a set of historical artifacts that had allegedly been discovered by staff members from the Smithsonian American Art Museum. After receiving background on an actual but secret philanthropic society founded by one of America's founding fathers (Ben Franklin), they accepted responsibilities as archivists, cryptographers, surveyors, and inventors and embarked on training missions to acquire skills specific to their chosen specialties. For the next two weeks, the students, along with the research team, gathered historic evidence, decoded data embedded within historic maps, and tinkered with technology in an effort to piece together the relevance and purpose of these artifacts.



**Figure 1: Student-players' questions and comments, as recorded in brainstorming sessions during the ARG.**

By blurring the lines between fiction and reality, the game encouraged the student-players to interpret the information presented in their classes in entirely new ways. Whenever information in extant historical records was missing or suspect, such as several factual but unexplained fires in the building that once housed the US Patent Office, they were encouraged to play with the available data and consider reasonable extrapolations. Key, pre-scripted story bits were meted out when related puzzle challenges were solved; however, the players often interacted dynamically with the narrative content and characters. While the game's fictitious elements may seem contrived, the collaborative inquiry process the students followed to connect disparate data into

a coherent narrative was an authentic representation of the methods used by professional scientists and humanists.

In this paper, we describe the design challenges we encountered and the strategies we employed to integrate an interactive narrative with game challenges in order to engage students in inquiry-based, counterfactual thinking. We found that a few students expressed frustration at being asked to move beyond regurgitating answers from textbooks they had previously been taught never to question. However, many students expressed newfound awareness of historical thinking as an investigative process, involving “detective” work and interpretation. We highlight student reactions and offer insights for designers of ARGs and similar immersive learning experiences.

### ARGS AS DESIGNED LEARNING EXPERIENCES

An ARG is a form of transmedia storytelling [5], with narrative elements that are distributed across multiple communication platforms, such as mobile devices, networked computers, and books. Just as the ARG’s narrative components are distributed across “real-world” platforms, players use “real-world” technologies such as blogs, chat, and telephony to make sense of the unfolding story. During *AGOG*, in-game characters delivered narrative clues via podcasts, video and blog posts; likewise, players shared information that they uncovered about the narrative using Facebook-like status updates, blog posts, and a community wiki.

Collaboration is a primary design goal for most ARG developers, who strive “to create puzzles and challenges that no single person could solve on their own” [10]. ARGs also immerse their players in hands-on experiences. Players have a central role in assembling the story world, by collecting, connecting, and sharing the distributed story bits that comprise the game’s narrative. As explained by Sean Stewart, lead writer for *The Beast*: “Instead of telling a story, we would present the evidence of that story, and let the players tell it to themselves” [10].

Because ARGs recruit devoted player populations adept at solving complex problems collaboratively, they have garnered increasing attention in formal education contexts as a potentially transformative vehicle for information literacy learning and collaborative sense-making [7,8]. A handful of ARGs have already been developed with educational goals in mind, such as *World Without Oil (WWO)*, which asked players to imagine their world in the midst of a global oil crisis, and *Humans Vs. Zombies*, which engaged undergraduates at a university in the U.S. in information literacy practices [7]. Feedback from both players and designers suggests that ARGs also create meaningful learning experiences and support knowledge transfer across domains [11]. Players not only begin to see themselves as “real-world” problem solvers, they *are* real-world problem-solvers. The Institute for the Future (ITF) used the collective forecast created by players of the ARG,

*Superstruct* (2008), as the basis for an annual report to Fortune 500 clients, and the World Bank’s *EVOKE*-inspired ventures (2010) include a farming program run by high school players in South Africa [11].

ARGs ask players to engage with a past, present, or future *alternate* world that they can influence. Imagining and “living in” an alternate world requires them to look at the world around them critically, constantly asking “what if” questions. **Counterfactual thinking** can be described as imagining what might have been, or the consideration of “what-if” alternatives to specific events [1]. It can be a powerful learning tool that fosters investigative reasoning across multiple disciplines, including science, history, and business [2,3,12].

The ARG’s porous boundary between a fictional game world and the “real world” does present challenges. By embedding game play and story seamlessly into existing technologies, ARG designers often strive to “deny and disguise the fact that it is even a game” [14]. Known as the “This is Not a Game” (TINAG) ethos by ARG designers and players, it can be the game’s primary apparatus for prompting critical, counterfactual thinking and information literacy practices, because players are responsible for distinguishing “truth” from fiction. Still, striking a meaningful balance between fact and fiction using the TINAG mantra poses an ethical dilemma for designers [15]. How do designers responsibly and meaningfully depart from the historical record in the context of libraries, schools, museums, and archives—cultural institutions that place a high value on trustworthiness and accuracy of information?

### COUNTERFACTUAL DESIGN CONSIDERATIONS

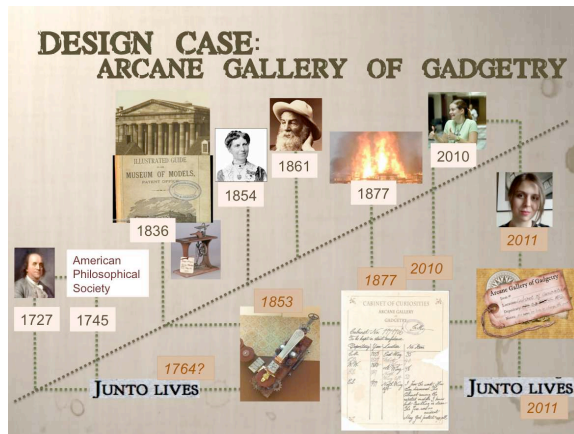
Throughout the design process of *AGOG*, we applied the notion of creating *designed experiences*, rather than content delivery vehicles [13]. Our goal was to have players view historical events and artifacts as possibility spaces that needed to be actively interpreted and reconstructed, not inevitabilities that could simply be memorized and retold.

#### Locating opportunities for counterfactual intervention

First, we needed to establish a process that we could follow to discover fault lines and joints in reality (i.e., available historical records), in order to create both an original, historically grounded mythology and subsequent extensions of it.

*AGOG* is set in the Civil War era and grounded in the history of the US Patent Office. We followed a simple, but surprisingly fertile process of collecting related historical data into our design documents and diaries, then looking for gaps through which we might lay some counterfactual paths. We used these gaps to focus students’ attention on unanswered questions, or questions open to interpretation (e.g., What might have caused the Patent Office fire? How do you track and restore lost records?). In this way we

sought to subtly foster players' engagement with the *National Center for History's Historical Thinking Skills* [9], such as “challenging arguments of historical inevitability” and “differentiating between historical facts and historical interpretations.” A visual representation of this design approach is shown in Figure 2. The timeline and narrative elements above the diagonal represent people, places, and events that are part of our established historical record. Counterfactual paths, extending from fault lines in this record, connect the historical elements with fictional artifacts, personas, and events shown below the diagonal).



**Figure 2: Chronological and conceptual relationships among factual/counterfactual narrative elements in *AGOG*. A video illustrating the development of this design document is available at: [arcanegalleryofgadgetry.org/season-1/](http://arcanegalleryofgadgetry.org/season-1/).**

**Table 1** details the formal typology that we developed throughout our design process. For example, one design pattern is *genealogical*: the secret society that our players join is "JENIUS" (Junto of Enlightened Naturalists and Inventors for a United Society), a fictional society that derives from Ben Franklin's factual Junto club. Another pattern is *causal*: in the absence of a definitive known cause for the historical 1877 fire at the U.S. Patent Office, a fictional cause was invented as part of the *AGOG* storyline.

### Signaling the divide between fact and fiction

Having established a process for unearthing counterfactuals that we could graft onto “actual” history to create an *AGOG* mythology, we began to embed these counterfactual elements throughout the game space: within the wiki and in-game character blog posts, video posts or podcasts. The challenge that emerged, however, was this: how might we signal the difference between factual and fictional elements to impressionable middle school players who are just learning to distinguish between them? Our counterfactual design goal was to maintain an immersive experience with subtle signals while supporting student efforts to separate fact from fiction. We made deliberate efforts to mediate between the two poles: we did not make fact and fiction indistinguishable from each other—but neither did we do all the work for the students. Given their young age, we scaffolded the play context to support their efforts to make

sense of the fact/fiction divide, but made sure the cognitive labor was put in their court.

The approach we took includes the use of subtle visual markers to label fictional material, such as a change in fonts (e.g., regular to *italic*). The majority of historical fact-fiction overlap appeared on the *AGOG* community wiki, which was initially seeded with content by the design team, but received player additions as they uncovered data during the game. When historical information on our player community site was purely fact, it was hyperlinked to credible web sources. For story elements that were questionable, such as the fire, or duplicitous, such as a shady rival society, in-game characters would post notes such as “Cause: unknown...?” or “CLASSIFIED.” Students were encouraged to research these sketchy entries and augment them with evidence-based claims. For one clearly contrived artifact, the *Kairograph*, students inferred: “Kairo means ‘special time’. Another word to describe time is ‘chronos,’ or ‘normal time.’ ‘Graph’ means to write or inscribe or generally communicate. Put those words together, you get communicating across time”. When a player read about an actual historical event for which we invented fictional causes—or about a real historical personage with a fictional secret identity—we divided the data into two sections of the page: what we know about the “public” (i.e. true) and “private” (i.e. fictional) aspects of these entities. This layout separated historical fact from the game's imaginings, subtly marking the reliable as different from the questionable, and prompted additional investigation by the students.

In response to a survey given post-game, 20% of the middle school players ( $n=51$ ) commented that they were surprised at “how real” the game felt. One student explained that “treating it like it was real” was the best aspect for her. During the game, discussions about TINAG dominated interactions between the design team and the players, highlighting the responsibility that educators have to balance the drama of uncovering new nuggets of history with the academic imperative to remain trustworthy models. These TINAG talks also gave players an opportunity to debate and share insights with their peers. One player related *AGOG*'s mechanics to the interlocking layers of fiction and reality in the film *Inception*. Another explained to her classmates that the narrative was an “imaginary real.”

Our endgame was not to assess the skills acquired by the students using traditional techniques, such as standardized tests post-game. We aim to explore designs that embed assessment mechanisms authentically – in-game, and engage students in 21<sup>st</sup> century literacy practices, such as critical thinking and collaborative problem-solving [6-9]. The students' successful completion of the final mission was our assessment tool. It required that they had internalized our learning outcomes. The students' TINAG debates exemplify [6]'s contention that such questions “lead to productive explorations on why and how certain

AGOG Counterfactual Design Pattern	Example
<b>Categorical</b>	An imaginary collection of inventions (The Arcane Gallery of Gadgetry) was added to the pre-existing category of "lost/incinerated patent models" (category expansion)
<b>Causal</b>	In the absence of a definitive known cause for the historical 1877 fire at the Patent Office, a fictional cause was invented as part of the <i>AGOG</i> storyline
<b>Correlational</b>	Walt Whitman and Clara Barton were integrated into the <i>AGOG</i> narrative because of their historical association with the US Patent Office, where they both worked for a time
<b>Documentary</b>	Documentary "evidence" for the Cabinet of Curiosities is designed to conform visually and generically to authentic institutional records
<b>Genealogical</b>	The secret society that <i>AGOG</i> players join is "JENIUS," a fictional society that ostensibly derives from Ben Franklin's Junto club.

**Table 1: Typology of Counterfactual Design Patterns. Complete table posted at [arcanegalleryofgadgetry.org/season-1](http://arcanegalleryofgadgetry.org/season-1).**

events occurred.... They emphasize creative thinking rather than memorization" (p.17). We believe the students' TINAG comments can be mapped to [4]'s design goal to let players describe ambiguity and reflect on experiences "instead of just listening to someone lecture them" (p.2043). Survey responses like "I was surprised at how intricate it was" and "it was a strategizing game that keeps you thinking" also support [4]'s recommendations to embed "deep content" within the game narrative.

**CONCLUSIONS AND FUTURE DESIGNS**

Our foray into ARG designs for learning was motivated by current views in education and HCI communities that more design-based examples are needed to further develop and establish effective models for game-based learning [4,13]. Our typology of counterfactual design patterns can help designers, educators, and players to locate interesting fault lines in reality and facilitate the expansion of ARG mythologies (**Table 1**). The basic process of counterfactual mutation could also apply to future-oriented ARGs, such as *WWO*. *AGOG* is part of a larger research study on the design and use of ARGs for learning, whether in formal or informal education contexts. We will evaluate and expand design patterns that promote counterfactual thinking, as well as investigate other methods for codifying ARG design, as we prepare for *AGOG*'s next iteration (2012).

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