

DRIVING THE BUS: DESIGNING EDUCATIONAL ALTERNATE REALITY GAMES FOR REUSABILITY

Designing Educational Alternate Reality Games for Reusability

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Abstract

Because alternate reality games (ARGs) are so time- and cost-intensive to produce, educational ARGs must be designed for reusability. We present a design framework for reusability centered on the objectives of adaptability, extensibility, and replayability. We then illustrate the use of this design framework with a case study of our ARG *The Tessera*, a ghost story designed to teach teenagers computational thinking skills and dispositions. By including an online multiplayer leveled structure and in-game communication for adaptability, an extensible participatory narrative, and the ability to replay levels to collaborate with and coach peers, *The Tessera* enables players to “drive the bus” of their own learning.

Introduction

Alternate reality games (ARGs) are “immersive, interactive experiences where players collaboratively hunt for clues, make sense of disparate information, contribute content, and solve puzzles to advance a narrative that is woven into the fabric of the real world” (Bonsignore, Hansen, Kraus, & Ruppel, 2012, p.25). While games are increasingly incorporated into education, the use of alternate reality games has not kept pace. Because most ARGs are designed as one-time experiences and require a great deal of money, time, and labor to design, they are a challenge for educators to incorporate into their curriculum. An effective educational ARG design must address reusability so educators can use these games with multiple classes year after year.

Few researchers have addressed the issue of reusability in alternate reality games (Martin, Thompson, & Chatfield, 2006). In his chapter “Games beyond the ARG,” Jeff Watson critiques the way the emphasis on “top-down” transmedia storytelling limits accessibility, replayability, and sustainability of ARGs. He proposes that “For media companies, educators, and activists alike, one way around this problem of expense is to develop replayable games that engage participants in repeatable practices rather than the consumption of additional layers of curated narrative” (Watson, 2017, p. 206).

In our experience designing educational alternate reality games, we have encountered several challenges relating to reusability: namely, how to better support independent learning for players joining the game at different times, as well as mitigating the learning curve for educators facilitating

the game. This paper illustrates how we applied our previously published design framework for reusability (Hansen, Bonsignore, Ruppel, Visconti, & Kraus, 2013) to the architecture and mechanics of our ARG *The Tessera* to address those specific challenges. Through a case study of *The Tessera*'s structure and analysis of its successes and challenges we further the design literature for future educational ARGs to make them more accessible, cost-effective, and engaging.

Overview of Design Framework for Reusability

The design framework for reusability of ARGs focuses on the core design objectives of adaptability, extensibility, and replayability (Hansen et al., 2013).

Adaptability reflects the potential for the game to be modified to meet the needs of a specific player, group, or context, such as location or time. For example, the party game *Apples to Apples* often ends up with "house rules" that disregard the competitive play point system and privilege opportunities to play for fun, or to lobby for the card you submitted. In educational games, adaptability draws on the pedagogical concept of scaffolding: providing guidance in the right way and at the right time (Vygotsky & Cole, 1981; Wood D., Bruner J.S., & Ross G., 1976). There are multiple methods of scaffolding learning in games, such as using the interface to prompt players, moving from a guided instruction or tutorial into an open-ended project or challenge, or collaborating with other players or gamerunners who provide learning resources (Pellicone et al., 2017, p. 87).

Extensibility refers to the ability to add to the game in an authentic way while transforming it to do something else. Even if a game is not entirely reusable, aspects of it, such as characters, mythology, content, or mechanics, might be extensible to new contexts. For example, sandbox games like *Minecraft* allow players to become developers and add their own content to the existing game engine (Duncan, 2011). Writers often extend the narratives of existing games through creating their own fan fiction around the existing characters or writing new characters into the existing game world. For educational games, the ability to extend the game towards a player's individual interests can create intrinsic motivation for learning (Wouters, van Nimwegen, van Oostendorp, & van der Spek, 2013). Indeed, the participatory narrative aspect of alternate reality games invites players to extend elements of the interactive storylines and to take responsibility for collaborative sense-making around the game challenges.

Replayability allows a player to experience the game multiple times, or the game to be reused for a new group of players. When replaying a video game like *MarioKart*, even though the mechanics and narrative of the game are the same, the social interaction among players is different, which motivates them to replay (Montola, Stenros, & Waern, 2009). For educational purposes, games can be replayed to cement concepts, refine skills, and allow players to experience multiple ways of solving the same problem, as in the math game *24*. Because ARGs are so time- and resource-intensive to create, it is vital for educational ARGs to be replayable by multiple classes, year after year.

Case Study of *The Tessera* ARG

Brigham Young University, the University of Maryland, and Tinder Transmedia have collaborated with the Computer History Museum to design *The Tessera*, an educational ARG for teaching teenagers computational thinking skills and dispositions. The Tessera is co-designed with teenagers and funded by the National Science Foundation. Instead of being a "learn to code" exercise, its goal is to introduce

teens to foundational computing concepts like problem decomposition, pattern recognition, and abstraction as they explore an interactive ghost story.

The Tessera's story revolves around a mysterious collective of historically significant innovators, known as “The Tessera,” hunted by the inscrutable, sinister “S.” Players navigate real-world and online computational thinking puzzles with the help of the ghosts of these famous men and women who are trying to save everything their think-tank stands for from S’s destructive tendencies. *The Tessera's* structure contains several transmedia components: an online game called *The Tessera: Light in the Dark*; a live experience at the Computer History Museum, called *The Tessera: Ghostly Tracks*; a pair of Twitter accounts for our main characters, Ada Lovelace and the nemesis called S; an external wiki, where players could post biographies of Tessera members, fan art, memes, and sightings of S; and 2 card games—a competitive game and a party game—that can be played from a single deck.

Many ARGs struggle to be adaptable to different groups in different locations or at different times, because they are one-time events and some people may come “late” to the party. Late arrivals may miss essential narrative information and the opportunity to solve the earlier puzzles. The online multiplayer leveled structure of *The Tessera: Light in the Dark* lets players join at any time. When they enter, players only get access to the beginning of the story, so they don’t see spoilers or join the party after everything has been solved. This also helps players “have to” play through it all—unlike many ARGs where only a handful of players may solve a puzzle and the entire player community moves on to the next puzzle. This means, for example, that different school classes could play *The Tessera* at different times and not “mess up” each others’ play.

An added advantage of using an online multiplayer leveled structure similar to a video game was making it easier for players to understand the ARG as a new genre by reducing the learning curve (Bonsignore, Hansen, Kraus, Visconti, & Fraistat, 2016; Pellicone et al., 2017). Familiar game structures such as a scavenger hunt and escape-the-room experience can be adapted for new narratives tailored to educational goals (Nicholson, 2016). By blending traditional ARG elements with escape-the-room elements in both our location-specific and online parts of *The Tessera*, and video game elements in the online *Tessera* game, we enable players to jump into participation more easily, without questions about “how do I play this?” or “where’s the game?”

We also designed scaffolding in *The Tessera* to reduce player dependency on a facilitator. The ghost of Ada Lovelace serves as the player guide through the online game, issuing calls to action. We narratively integrated more detailed instruction for solving the puzzles through a red “caretaker’s log” visibly placed in each of the levels. Players quickly realized they learned as much from reading the instructions as from doing the puzzles; many pointed to the binary number system as a concept they learned from *The Tessera*, and one even compared it to “speaking a different language.” Finally, we created architecture for gamerunners and players to assist each other through synchronous chats and an asynchronous forum. By including multiple layers of assistance, we allow players to “drive the bus” of their learning by selecting what level of help they need to progress; some may be able to solve the puzzles just with the caretaker’s log, while others may need the links to walkthrough videos posted in the forum to complete the challenges.

To address extensibility, we presented two separate narratives within the same *Tessera* universe. Offering a live experience called *The Tessera: Ghostly Tracks* at the Computer History Museum, we used

the resources of our knowledge partner to create a physically immersive experience that also served as an entry point into the online *Tessera* game. In *Ghostly Tracks*, teens get clues from ghosts of *Tessera* members through the Actionbound app on an iPad. They then go on a scavenger hunt to find artifacts of significance for the ghosts in the museum exhibits, and solve computational thinking puzzles using the exhibits, digital clues, and physical props to ultimately reveal the identity of their ghost.

Another extensible feature of ARGs is the participatory narrative. An external wiki allowed players to add their personal story to the game universe, describing the ways in which S has interfered with their daily activities (Kaczmarek Frew, 2017). Players also interacted with in-game characters through social media to reinforce the sense that the gameworld has spilled out into the “real world.” The mystery narrative provided one of the most prominent motivations for playing, with one player remarking in a post-game review, “My favorite aspect was the meaning of *Tessera* how you trace S. You really don’t know who S is but it cool how you can see some parts like clues and other things about S.” Gathering information about S from these different media and making sense of it are just some of the 21st century literacies that ARGs facilitate, along with the creation of original content (Bonsignore, Hansen, Kraus, & Ruppel, 2012). For example, another player described “getting to work with my classmates and learn new things about the game and different conspiracies that we all had about the game...was also one of my favorite things,” showing the joy of this extensible collaborative storytelling.

Replayability is an essential element of educational ARGs that makes efficient use of resources when designing for learning. *The Tessera: Light in the Dark* online game emphasized the collaborative nature of problem-solving by adding the ability for current players to repeat previous levels and help newer players (Steinkuehler, 2004). This structure minimizes the role of a facilitator so players can “drive the bus” of their own learning and serve as mentors to others. One player commented in a post-game review that when she collaborated with a peer to replay a puzzle requiring translation between Arabic, Roman, and binary number systems that was familiar to her but new to him, “I could more easily explain to him how things worked, and he could very easily offer suggestions to solve things I hadn’t yet.” This coaching not only deepened her own understanding of number systems through her explanation but also allowed her to benefit from exposure to her peer’s unique perspective on the problem.

The Tessera ARG also includes several tasks that can be replayed for fun, such as the final design challenge we called Sketchventor (Pellicone, Kaczmarek Frew, Bonsignore, Hansen, Hoffman, & Kraus, 2018). In this challenge, players select a verb such as “shrink,” “futurize,” or “vilify.” They also are randomly assigned a landmark invention, such as the airplane, vaccinations, or the computer mouse. Players must then apply the verb to the invention to create their entirely new innovation, which they sketch out and describe. After finishing their own innovation, players can view and like other players’ inventions, as well as create more inventions if they wish. This Sketchventor game is also extensible as it can be played with the physical card deck as well as online.

By using adaptability, extensibility, and replayability as core design principles for *The Tessera*, we were able to create an alternate reality game that educators could reuse over time with multiple students, as well as facilitating self-motivated and collaborative learning.

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