

DESIGNING AN AUGMENTED REALITY LEARNING EXPERIENCE FOR LIBRARY INSTRUCTION AS A TECHNOLOGY NOVICE

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This instructional design case describes the author's process for creating an augmented reality learning experience for library instruction at an academic library. With no budget, no team, and little experience with this type of technology, this design case describes the development of an instructional design utilizing emerging technologies. It also addresses the constraints of solo work, small or nonexistent budgets, little no experience using the technology, and interest but no support for learning and implementing an innovative solution to a design problem.

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INTRODUCTION

In the fall semester of 2018, I began designing an augmented reality (AR) learning experience to increase the scope of library instruction at Hodges Library at the University of Tennessee, Knoxville. Tasked with increasing our instructional reach with the constraints of limited staffing and classroom availability, I conducted a survey of aspirational peer institutions to see how other academic libraries were handling their instruction load. While the responses from the thirteen institutions varied, there was agreement that online tools would have to be implemented to create a sustainable alternative or supplement to in-person instruction.

According to survey respondents, tutorials and online worksheets were common solutions to in-person instruction overload. While these are attractive instructional tools for several reasons respondents cited—scalability and sustainability, simple production process, student familiarity with the format—I found these options lacking the motivational factors I look for in a learning design, chiefly a mix of relevance, authenticity, and fun. After working on the project for several weeks, an encounter with the AR tool Metaverse sparked an idea.

I went through several rounds with this project as technology changes threw me constant curveballs. By the time I conducted a pilot of the game with a group of students, it was early 2020; by the time I had actionable feedback, we were in a pandemic and working remotely. Bringing students into the library for an AR experience was the last thing we wanted to do. I have since taken a position at another institution, and do not foresee taking up this project anytime soon. In addition, ARIS is no longer a supported application as of 2021.

While this particular project never made it past the pilot, it taught me several valuable lessons as an instructional designer that might benefit others who find themselves in a similar context: with an exciting solution to a problem, but little or no experience, budget, or team to work with.

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DESIGN CONTEXT

Librarians at the University of Tennessee, Knoxville (UTK), faced a schedule jam-packed with instruction requests from first-year composition classes in the fall of 2018, with more arriving every day. The instruction load was heavy enough that questions of scalability and sustainability were already surfacing; with two instruction classrooms and limited staffing, ensuring coverage of all classes in a maintainable manner was a challenge.

Institutional Context

In the fall of 2018, UTK had 22,815 undergraduate students. For at least the last five years, each incoming freshman class has outnumbered the one preceding it. While many fulfill first-year composition requirements before reaching UTK, either by testing out or receiving the credits through dual enrollment, in the fall of 2018 UTK offered 192 courses meeting the first-year composition requirements, and 190 in the fall of 2019. These courses are unique, as at UTK, five different classes can fulfill the first-year writing or first-year composition requirement, making it an unusually robust program. Having five classes that students could be taking to fulfill that requirement made it almost impossible to implement a single instructional plan to support students.

One-shot sessions are a typical form of library instruction in higher education. A departmental faculty member teaching a course will request to bring their class to the library, where an instruction librarian will teach students how to utilize library resources and services to conduct research; at Hodges Library, these one-shots are required to be tied to an assignment to give the session relevance to students' work. Most sections attend only once, although some instructors do request two sessions in the semester, one for each major assignment.

Faculty members requesting instruction were required to do so two weeks before their requested date in order to give instruction librarians time to see who could fit the class in their schedule; requests that did not allow for a two-week time period were asked to provide a new date that met this requirement. An instruction deadline was implemented in the fall of 2019 instead to allow librarians conducting instruction to arrange their schedule for the entire semester to ensure coverage of these one-shots.

At Hodges Library, the main campus library, instruction librarians facilitated 88 one-shot sessions for first-year composition courses in the fall of 2018, and 71 in the fall of 2019. An unknown number were unable to be accommodated for reasons including restricted availability of classrooms or instructors, the request not being made two weeks prior to the requested date in fall 2018 prior to the implementation of the instruction deadline, and the teaching load already being at capacity for the requested dates.

Though each librarian who leads instruction is free to construct their own lesson plans, learning objectives for these sessions are consistent, with some flexibility to allow for composition instructor requests. After receiving library instruction, students will be familiar with:

- Where and how to get help from the Libraries
- Conducting a search in the library's online discovery tool using Boolean operators and appropriate search filters
- Accessing the relevant course research guide and locating their subject librarian
- Accessing a scholarly database
- Conducting a search in a scholarly database using Boolean operators
- Finding a book in the library's online discovery tool and using the mapping feature to locate the book.

At Hodges Library, there were two or three full-time librarians largely dedicated to teaching general education courses (first-year composition and first-year studies), with around nine others for whom teaching is a smaller percentage of their position; this included full-time faculty and staff, as well as part-time graduate students.

Design Team

I was the sole person working on this project, though I consulted with many others during the process. In 2017, I was hired as a graduate teaching assistant (GTA) at Hodges Library in the Teaching and Learning Programs Department. At the time of the project, I had received my Masters of Information Science from UTK in 2017 and was enrolled in the Masters of Science in Education program with a concentration in instructional technology.

Under Ingrid Ruffin, my first supervisor at Hodges Library and then-Student Success Librarian for First-Year Programs, I developed an interest in games and gaming for instruction. My first project as her GTA was to create an escape room for a first-year business administration course. She gave me the theme and template for the class, and I developed the storyline, filmed an introductory video, and selected the clues that would help students break out. This was my first introduction to what the job duties of an academic librarian looked like in practice, and I was immediately taken by the student-centered practices Ingrid implemented to create engaging, memorable learning experiences. This project, and Ingrid's commitment to meeting learning objectives in a way that was authentic and fun for learners, has been foundational in creating my professional identity and goals.

My interest in gamification and game-based learning pairs neatly with my interest in storytelling. I have an undergraduate degree in creative writing, and have incorporated storytelling into my work whenever possible. When tasked with creating the escape room for business students, for

instance, the first question I asked myself was why business students in particular needed to be involved in the story the game was telling. This instinct to situate players as protagonists in a story shapes the way I approach design.

Prior to this project's conception, Ingrid was promoted and moved to another department. Charissa Powell, Student Success Librarian for Information Literacy, became my new supervisor. She served as liaison to UTK's first-year composition program, and as such, was the person who tasked me with conducting the aspirational peer survey that began this project. She acted as advisor during the design process, collaborating on learning objectives, developing proposals for various stakeholders, and assisting with design decisions when needed.

Design Problem

The primary goal of this project was to create a sustainable, effective online learning experience that achieved the same learning objectives used for in-person lesson plans. After all, with a growing student body, the benchmark for reaching all composition courses moved with each incoming class of freshmen. Flexibility was important; the learning experience should enable composition instructors to assign it to their students at point-of-need, usually just as students are beginning to research their topic for an assignment. One reason instruction requests were often unable to be accommodated was because they tended to all fall into the same two or three weeks in a semester; for those popular weeks, this learning experience could be a valuable tool for classes not able to come to the library. The learning experience needed to be able to function without any supervision or facilitation and based on feedback from previous game efforts at Hodges, the disturbance to library faculty, staff, and visitors had to be minimal.

Creating a game-based learning experience met many of these goals. As Kapp (2012) points out, games provide structure and motivation to learning and instruction. Implementing levels, scaffolding challenges, using story to provide relevance and meaning, establishing a learning environment where failure is permissible (if not encouraged), and relying on students' intrinsic motivation to complete the learning activity are all affordances of gamified and game-based learning that suited this design well.

Coordinating with Charissa Powell, three main goals for this project were identified. After completing the experience, students should be able to:

- Access the library's online discovery tool and use it to locate both an article and a book
- Navigate to the databases on the library's website and access one

- Identify both the chat function on the library's website and the public services desk at Hodges Library as ways to get help.

Another goal that heavily influenced design decisions was reducing library anxiety. Defined by Mellon (1986), library anxiety is the feeling that students' skills using the library are inadequate compared to their peers', and this inadequacy should be hidden, preventing them from asking for help. As described by Moran and Mulvihill (2017), students need a level of personal interaction to increase their comfort level with the library and staff, and I did not want to lose this positive effect despite relying on an online learning tool. For many users, this could be their first trip to the library for something other than a cup of coffee. This is an important goal of one-shots, and why they are most often held in the library rather than a librarian visiting the classroom where sessions are usually held. Whatever solution was implemented, visiting the physical space of Hodges would be important.

A last piece of the design problem was that I had no budget to work with. While Charissa and I hoped that we would be able to demonstrate the success of this approach to validate purchasing a subscription to a paid augmented reality application—with all of the analytics and support a paid tool would provide—our initial attempt would not be funded. This proved to be a barrier that would cause me to constantly pivot in my design, as I was approaching augmented reality at a time where there were some free tools still available, but they were rapidly being retired in favor of launching paid models that made them inaccessible for this pilot.

DESIGN PROCESS

Determining an Approach

At a meeting with Charissa Powell in September 2018, she tasked me with conducting a survey of the University of Tennessee, Knoxville's aspirational peer institutions to see what other libraries were doing to meet increasing instructional loads. I assembled a list of contacts from the thirteen universities and reached out with four questions:

- About how many library instruction sessions for first-year composition classes does your library teach in a semester, on average? What percentage of all first-year composition classes does that represent?
- What does the lesson plan for these instruction sessions look like?
- Who teaches them (public service librarians, student success librarians, etc.)?
- And are the information sessions in-person, online, or a mix of both?

Almost all respondents mentioned implementing online learning objects to meet the constraints of lack of physical space and number of instructors. These were often tutorials or online scavenger hunts. As a student myself, these options came loaded with preconceived expectations of the learning experience. A traditional tutorial would be something I would practice out of context, something I could click through without really engaging in the material. An online scavenger hunt would feel removed from any authentic learning environment, a high-effort activity for low return.

I knew I wanted to create something that students probably would not have encountered before and would therefore hopefully engage without those preconceived expectations. Influenced by my work with gamification and game-based learning, I was drawn to the idea of using a game to create intrinsic motivation and purpose, with a storyline that would engage players and provide relevance to the tasks and a memorable experience that would make recall easier in an authentic use environment.

I was taking a course in online learning environments with Dr. Miriam Larson at the time, who had recommended I use an augmented reality tool called Metaverse for an assignment. As I was showing my assignment to coworkers at Hodges, Kat Brooks, a Commons Librarian, suggested that this tool could also be used to solve the problem of expanding the scope of library instruction. Nikki Kirkpatrick, another Commons Librarian, echoed her support. They drew the connection between my coursework and my job responsibilities in a way I had not seen; once they pointed it out, however, the affordances of AR clearly aligned with design goals I had personally decided were important to me in solving this problem. Charissa approved the approach, and we set an initial deadline of February 2019 for a testable version of the game.

In addition to addressing library anxiety, I wanted this design to be as student-centered as possible. I aimed to leverage my position as a student to think about the design in practical terms: would students enjoy this learning experience enough for it to be impactful? Having determined AR as the tool, I was able to focus on creating an asynchronous experience that would allow students to complete the game at a time of their convenience. This meant the game itself needed to provide motivation for students to play it through to the end, which influenced several design decisions. First, the story needed to be established from the beginning, including what part the students are expected to play, which would need to be clearly communicated to the players early on. Second, the game needed to be short. In an effort to retain students' attention, I decided to start small and build out the game as needed; the initial design would include only the most important elements of library instruction. Third, not only did the game itself need to be short, but the content students were engaging with needed to be concise.

While the story element is important, it should also not serve as a barrier to student engagement.

In even the earliest conversations with Charissa Powell, accessibility was a concern. So, too, was the effort the game would require from faculty and staff in the library. This challenge was two-fold: first, this learning experience was being designed to lessen the demand on instruction librarians, so the more effectively students could play the game independently, the more aligned the game became to that goal. Second, previous gamified instruction had been implemented in the library and was met with varying levels of buy-in from library faculty and staff. While one of the tasks of the AR learning experience could easily have been to visit a service point and ask someone there for a clue, such tasks had not always been well received in the past.

Developing a storyline was also important; though it would be used more to inform design decisions, it was important to have a strong, logical narrative guiding the process. As a designer, the story, in combination with the learning objectives and assessment, is often the pieces of information I rely upon most heavily.

The Tools

Metaverse

I began the design in Metaverse, a free application with a low barrier to entry for introductory designers. Drag and drop tools are used to create primarily text-based stories that can be played anywhere. When using a mobile device, players scan a QR code that launches the game; images and text appear to float in the air, and users click through the story. Metaverse also has an option to have players interact with their environment by taking pictures that could prompt a response, as well as input text to answer questions.

I chose Metaverse because it was the only AR tool I was familiar with and it worked well for the class assignment I used it for. As I began to build on the platform, however, challenges quickly began to arise. The largest was the display of content. Despite choosing to limit the amount of information conveyed to students in the game, there was still a lot of explaining I was trying to accomplish in-game. Storytelling elements like communicating to students why they were playing this game and what their role was took a good number of words, as did explaining tasks like using an academic database or locating a book. The space available for text per screen in Metaverse was small, as seen in Figure 1, and as I typed up just one explanation that required six screens, I realized if I as the designer was getting bored, players would experience that same boredom in gameplay.

Games within Metaverse could not be paused. This meant if the student had to leave the app for any reason—even to receive a phone call or read a text—they would have to start

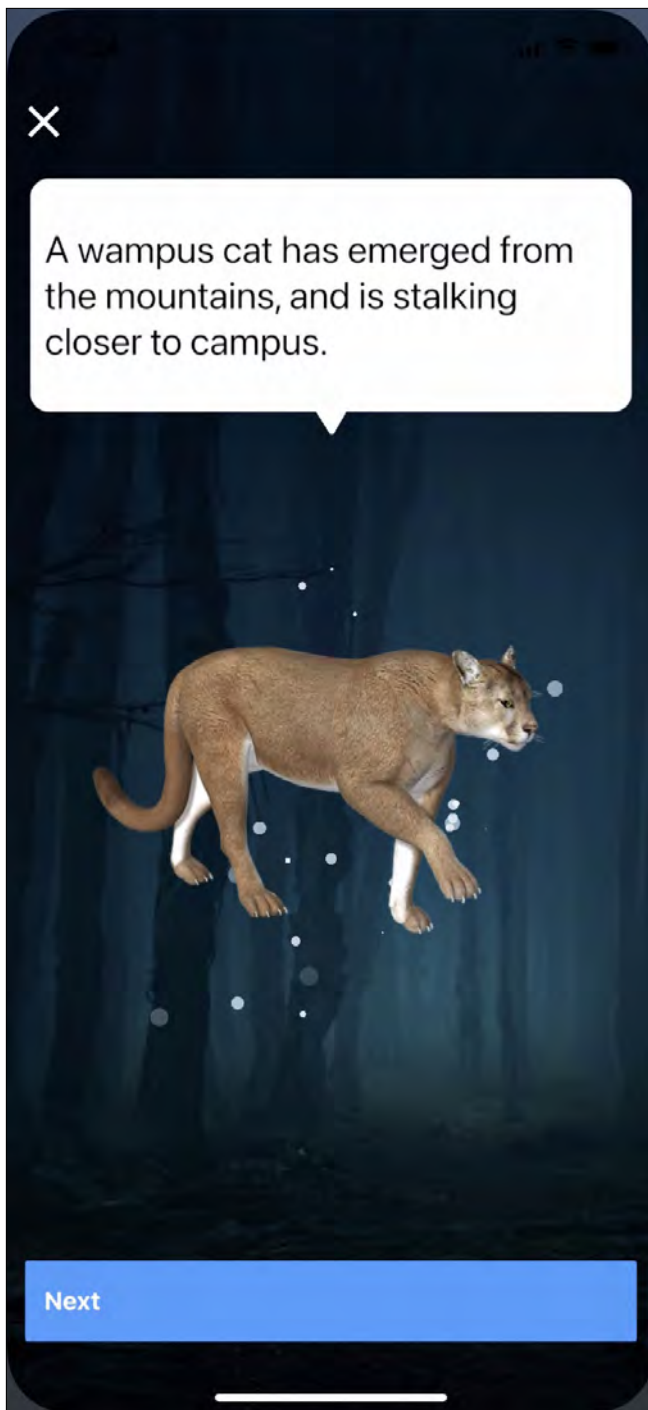


FIGURE 1. Screenshot of Metaverse (not in AR mode).

the game all over. With so many scenes to progress through, this would have been a major barrier for players. I did explore an option to include a suspend button on each page, which is similar to a pause function, but this alternative only took up more space on the screen without the guarantee students would think to use it before clicking a notification. Rather than use the suspend function, I chunked the content, requiring multiple QR codes to be hidden around the library to prompt each new portion of the game.

To address concerns about accessibility, I decided to make a podcast that mirrored players' in-app journeys. In the brainstorming phase, I planned for a simple website where players could access chunked audio and would have to input some information to demonstrate they had reached the correct service point or completed the correct research task before gaining access to the next audio portion. My lack of experience in using these technologies came into play; I did not have the practical knowledge to make a website where players could unlock different audio files after entering a correct answer and did not have the time to teach myself before the pilot deadline.

An opportunity arose during this time to test Metaverse in a different instructional environment. While helping design a murder mystery dinner in collaboration with Nikki Kirkpatrick, she requested I incorporate Metaverse into one of the clues. This proved to be a valuable opportunity, as some of the quirks of the app (including the need to tilt the screen to prompt new messages even after pressing the Next button) served as a major challenge for students. Watching students engage with the app revealed that the application itself would be too large a barrier to engagement for students to overcome without guided instruction on how to navigate within the tool. As one of the key elements of this game was its asynchronous nature, a new augmented reality application was needed.

HP Reveal

After doing a survey of library literature to find other gamified learning experiences, I found a new tool to try. LaBrake and Deptula (2018) described the use of HP Reveal, another free AR app, in a case study of their library orientation. This tool allowed for the use of video, as well as text. This was a major improvement on Metaverse's text-only content delivery and addressed some accessibility concerns. I was able to download the app and immediately begin creating AR content on my phone, demonstrating the ease of use of the tool. While creating simple content was reassuringly easy, HP Reveal required more than dragging and dropping tiles and adding pictures and text.

LaBrake and Deptula (2018) also described incorporating Springshare's LibAnswer chat function in their game design. This tool allowed students to text the library's SMS number to receive clues that guided them throughout the game. Unique codewords could be sent to the number, generating a canned response that was automatically sent to students.

HP Reveal used images of physical spaces as triggers for AR content, an affordance I saw as creating an even more immersive experience as the library itself became part of the gameplay. There were challenges, however, to creating these trigger images; the chief obstacle was editing the images enough so HP Reveal could recognize them as triggers while preserving enough of the actual location that when students

scanned the entrance of Special Collections, for instance, it could pair the live image with the trigger image.

Another challenge posed by HP Reveal was that in order for the AR content to play, the device had to stay on the image the entire time. While I intended to keep the videos short, 25 seconds was still a long time to require a student to hold a phone or iPad up to the trigger images.

The largest challenge with HP Reveal, however, was revealed when I reached out to Matthew LaBrake before I progressed from storyboarding to creating the content within HP Reveal. I asked for any advice or problems they ran into when using HP Reveal for the library orientation. He did give me some tips, some of which made me realize that while I had been testing everything out in the mobile app, to design a game of this scale, I would need to be creating content in their web version. Before I could worry about all the things I did not know about the web version, he also pointed out that HP Reveal was being retired, and a paid model would be implemented in its place.

ARIS

With this latest tool upset, I met with Charissa Powell to conduct an evaluation of AR tools that we could use for this project. It became apparent that research published on AR tools very quickly became outdated; often applications that were free at the time of implementation had switched to a paid model by the time an article detailing their use was published.

ARIS, however, was an exception. It was an app created by Field Day Labs at the Wisconsin Center for Education Research at the University of Wisconsin—Madison. Because it was created by a higher education institution, we hoped ARIS would remain free, at least long enough until data could be gathered to validate a subscription to a paid AR tool.

ARIS's AR tool functioned similarly to HP Reveal, so there was no drastic learning curve for using this tool, despite the fact I had been using the mobile app to create content in HP Reveal. It also allowed designers to use physical spaces as triggers, as seen in Figure 2, and had the option to have videos as triggered content. I did have to use a separate website, Vuforia, to create databases of images to use in ARIS and then import them, which was an additional step that took some getting used to. ARIS also had a decent set of tutorials available, which was hugely useful for me as a designer with no team and little experience.

There were many small challenges in learning to use the AR function of ARIS. Details like sizing images to upload to Vuforia, knowing how to name trigger databases so they uploaded properly to ARIS, and that in order for audio of the videos to play, devices could not be in silent mode were



FIGURE 2. AR feature in ARIS using a banner in the library as a trigger.

all obstacles that took a good amount of time—and no small amount of frustration—to figure out. While the initial tutorials were helpful, it was difficult to find answers to new questions.

The app was sensitive when it came to the AR scanner; the device had to be held in just the right position to trigger the videos. Sometimes the videos were jumpy, in the

wrong orientation, or started over if the user shifted too much. Hornick and Wade (2018) provided a solution to the last problem by explaining how they took several pictures of each trigger location/item from different angles, then linked each image with the same video. While this helped, it became difficult to organize the backend of ARIS with so many images.

During playtesting, the app often crashed and drained the battery of my iPhone quickly. This did turn out to be a problem only with older devices, which could still prove a challenge for students. ARIS was also only compatible with iOS devices, bringing into question the accessibility of technology. Both of these challenges were addressed by having iPads with ARIS already downloaded available to students for checkout at the public services desk.

While I was able to conduct a pilot of the game with ARIS in 2020, I found out at a webinar in February 2021 that ARIS was also being retired. No new tool was determined for this project, due in part to my move to another university and change in job duties, and also due in part to the changing nature of AR applications. There are now considerably fewer free applications that do not require programming knowledge, if any other than Metaverse, which at the time of writing is still free. This is in line with my experience designing this project, where I was constantly trying to stay ahead of the free apps I was working with retiring so a paid model could be implemented in their place.

Story Development

As an instructional designer, once I have the learning objectives and tool determined, the story is often what guides the rest of my process. I want to know why the learners should be invested, what their motivations are, and what the experience will feel like for them. Once I had gotten approval to create an AR learning experience, my next step was to determine what story the game would tell.

At UTK, composition instructors often choose a theme for the English 102 course, and this list of course themes is available on their website. Charissa Powell suggested I look at that list to provide relevance to the learners and generate more buy-in from the teaching faculty. The most popular course theme was myths and monsters, and I came up with the idea that students could go on a monster hunt through the library. The wampus cat was the closest local monster to Knoxville, and I did some searching to ensure there were enough sources in our library holdings to support it as a focus. With the main character identified, I created a scenario where a wampus cat was headed to campus, and students would have to conduct research to prepare for its arrival. At the end of the game, students would use the research they found to help them decide whether to vote to welcome the wampus cat or fight it; this story element would also serve as motivation for students to complete a short assessment of

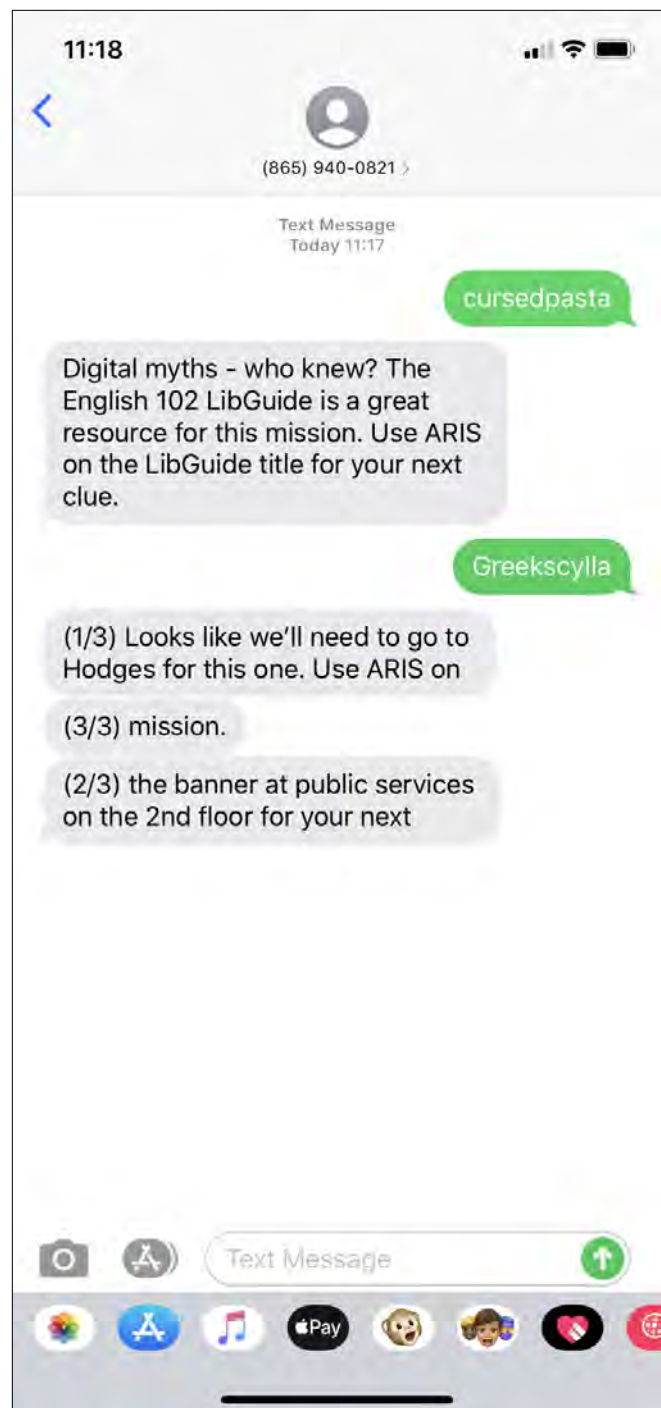


FIGURE 3. A screenshot of the SMS chat function. Codewords *cursedpasta* and *Greekscylla* were submitted, and the automated responses give the next clues.

the learning experience, as they would cast their vote in the assessment form.

In an effort to retain students' attention, I decided to keep videos as short as possible, not exceeding 30 seconds. To do this, the amount of storytelling incorporated into the game was drastically reduced. As described by Giles (2015), too

much narrative can distract players who are already being challenged by navigating unfamiliar spaces. The story was simplified; instead of researching a wampus cat, students would now conduct a more general myths and monsters hunt through the library. I sent out a call to librarians for volunteer actors; one librarian responded, and she and I served as guides in the game, giving students a little bit of information about each resource they encountered and delivering a codeword at the end of each video.

Incorporating Springshare's SMS chat function to guide students through the library allowed for another story element to be added: the anonymous expert. Each video would end with a codeword students would text the library's chat number, which would provide them with their next location, as seen in Figure 3. I hoped this would increase engagement for students while also establishing the library as a resource for help during gameplay.

With the use of physical spaces in the library as triggers for the AR app, and with the anonymous expert to guide students through the game, I was able to create more structure for the story. In the initial stages with the wampus cat, there was no linear progression of a story: students would be introduced to the scenario (the wampus cat is

heading for campus), and they could explore the resources in whatever order before finally casting their vote. With the anonymous expert as a guide, I was able to lead students on a better-crafted journey, allowing the narrative to build as they progressed.

After testing the game with a small group of students, the largest piece of feedback I received was to dramatically increase the amount of storytelling involved. Students liked the theme, but wanted more of it: they wanted more monsters, stronger characters, costumes on the actors in the videos, quests, and an inventory of items. While this went against research I had read, it aligned with my instincts as a storyteller and game designer.

Game Development

While other tools were considered to address the design problem, augmented reality was quickly determined to be the best fit for our design goals and constraints. Not only would it fit my goals of creating an authentic and fun learning experience, but the ability to see and interact with the physical space with AR was well-aligned with the main goal of reducing library anxiety, allowing the library itself to become a component of the game.

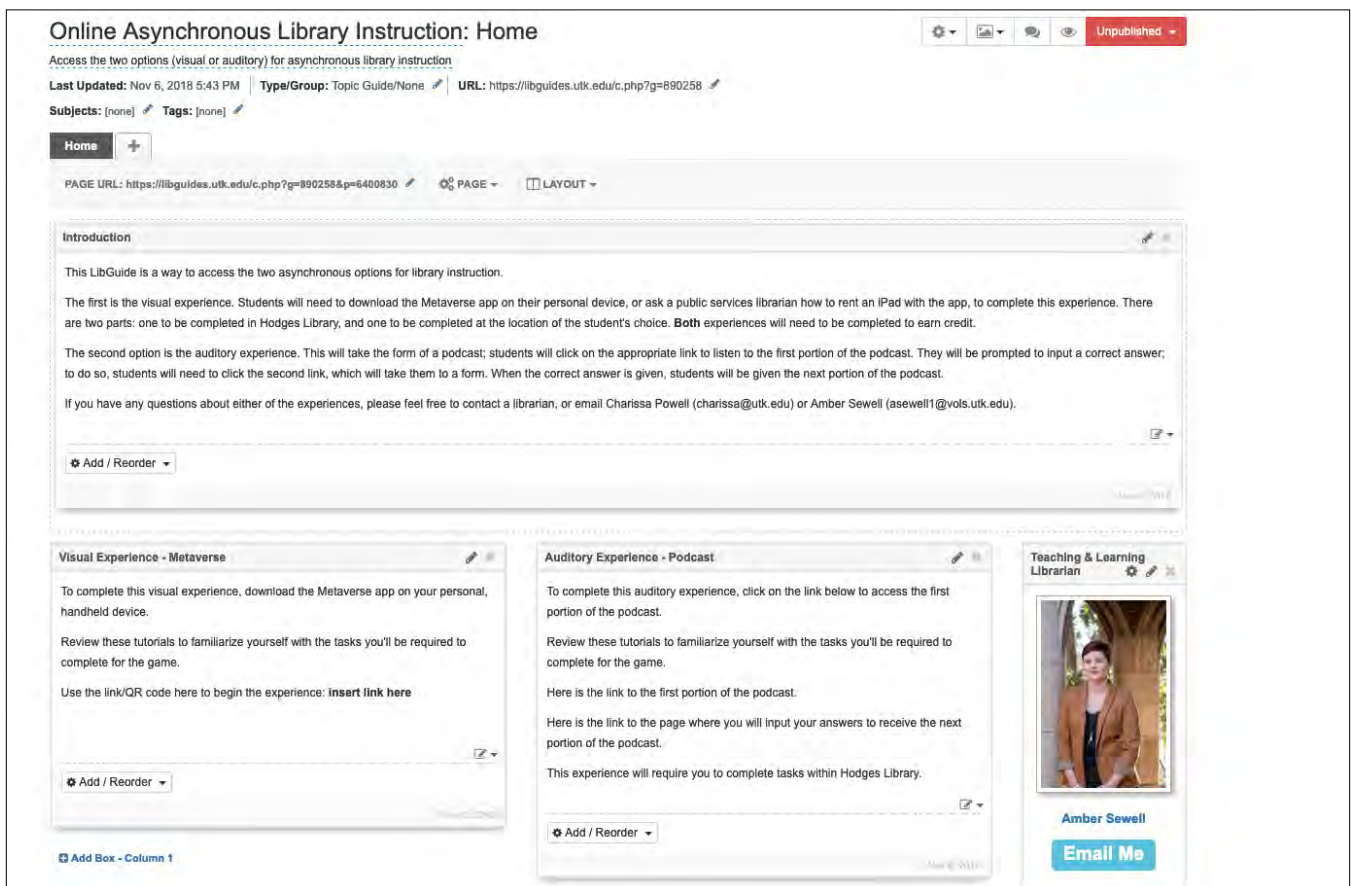


FIGURE 4. A screenshot of the instructor page on the research guide for the augmented reality learning experience.

Because first-year composition courses feature an archival research paper, Charissa and I decided to expand the original learning objectives to include a visit to UTK's Special Collections. Though counter to the design decision to keep the game short, we decided adding a task requiring students to stop by Special Collections was valuable enough to warrant the extra time it would take. The decision to use the wampus cat as the main character also provided a tie to Special Collections' Smoky Mountain collection, making it a relevant stop for the story while increasing collaboration within the library and furthering buy-in.

The initial phase of game design began with Metaverse as the tool. To access the game, students and instructors would use a research guide found on the library's website—this would be provided to instructors via newsletters, emails, and other correspondence to promote its use. The research guide, seen in Figure 4, would allow instructors to read about the game's purpose before assigning it to their students and would feature the QR code to launch the game for students. It would also allow alternative versions of the game to be uploaded in the same space. Because accessibility was a concern, and Metaverse was such a text-heavy tool, I decided to create an audio alternative that would follow the same structure as the augmented reality version of the game. To address accessibility of the technology, iPads would be made available at the public services desk with the Metaverse app pre-loaded, so students who could not or did not wish to use their own devices could check them out for the duration of the game.

The structure of the game fell into place naturally. There were two gameplay environments; one involved online components, such as the chat function on the library's homepage and the databases. The second required students to actually visit Hodges Library, including a stop at Special Collections, public services, and the stacks where the physical books were kept. Each location would require the student to conduct research and answer a question in order to proceed to the next part of the game; if asked to look up a book in the online catalog, students would have to type in the author's last name to demonstrate their ability to complete the task. At the end of the game, students would be asked to vote on a course of action: fight the wampus cat or welcome it to campus. This voting would give us a good idea of participation numbers.

Charissa and I developed a second set of learning objectives to share with internal stakeholders, namely our general education committee within the library. This group was primarily responsible for teaching first-year composition and first-year programs one-shots and would be valuable partners in promoting the use of this game. I used these internal objectives to present the AR learning experience as a valuable instructional tool for library faculty and staff who might receive questions about the game or witness students

playing it. To gain faculty and staff buy-in, I proposed the game would:

- Broaden the scope of library instruction without additional effort from library faculty/staff
- Provide an engaging, active way to familiarize students with the library and its resources
- Get students in the library and into the stacks
- Teach basic research skills.

Reception to my pitch was positive, and the group expressed appreciation at the consideration I gave to limiting faculty and staff involvement in gameplay. A member suggested that one of the tasks include visiting the research guide for the ENG 102 course, which I agreed was helpful and would introduce them to another resource I had not originally considered.

To further promote engagement, I decided the final step in gameplay would take advantage of a feature in Metaverse called the photo wall. An image of the wampus cat would be posted at the final location of the game, where students would be encouraged to take a photo with it using the app. These would be uploaded to a photo wall in Metaverse, which could be shared with the composition instructor to help create a sense of community and shared experience around the game. It could also serve as proof of participation if instructors assigned value to the activity. If instructors preferred to assign this as a group activity, the photo wall is also where I could create a form asking for the course section number and team name.

Once I witnessed students engaging with Metaverse using an iPad during the murder mystery dinner, it quickly became apparent that this would not work as an unfacilitated game. I had designed the clue in the murder mystery dinner to not require facilitation from myself; the few students who did pick up the iPad and try to use the app quickly became frustrated with the experience. The mix of the game environment and the new technology was too much for students who just wanted to find a clue and move on to the next room. Although the setup would have been different for this AR game, I wanted to eliminate all unnecessary barriers to engagement, and it was obvious Metaverse's affordances could not overcome its usability obstacles in this game context.

The ability to incorporate video into the AR experience with HP Reveal was an improvement on the original design in Metaverse and brought the game closer into alignment with the goal of reducing library anxiety. Not only would the use of AR enable students to interact with the physical space, an affordance of Metaverse, but HP Reveal also used actual landmarks as trigger images for the content of the game. This meant pictures of service locations within the



VIDEO 1. One of the videos used in the game available at <https://purl.dlib.indiana.edu/iudl/media/346d07pt53>.

library would serve as part of the game itself, rather than the backdrop.

Using video, like Video 1, which was triggered halfway through the game, was also an affordance accounting for one of the greatest disadvantages of an online tool: lack of librarian interaction. I felt it best to err on the side of no interaction with library faculty and staff while initially designing the game; I planned to assess this design choice during the pilot. Not only was there past history at Hodges of gamification efforts being viewed poorly because of extra demand on others' time, but I hoped the nature of the game would encourage students to play at the point of need and convenience. The ability to use library faculty and staff as actors in the videos offered a new way to demonstrate to students that librarians are friendly and approachable, familiarizing them with some of the people they might run into while using the library. This decision also aligned with the goal of keeping effort on the part of instruction librarians to a minimum; participating librarians might spend a few minutes at most filming the video, and then their involvement in the game was over.

The 30-second limit would not apply, however, to the introduction video. This video would demonstrate to students how exactly to use the app, as well as provide essential story elements before students began playing, including assigning students a role within the story. Demonstration of the app in action was a crucial element after I witnessed the challenges students had with Metaverse. While HP Reveal was more user-friendly, this was one potential stumbling block I could easily account for.

Switching platforms from Metaverse to HP Reveal meant the structure of the game needed to be reworked. All of the locations (the website, a database, the discovery tool, book stacks, public services, research guide, and Special collections) were included in the new plan. With the physical objects/spaces acting as the trigger for the video content, however, pictures would have to be taken of each location. The chat messages from their anonymous experts

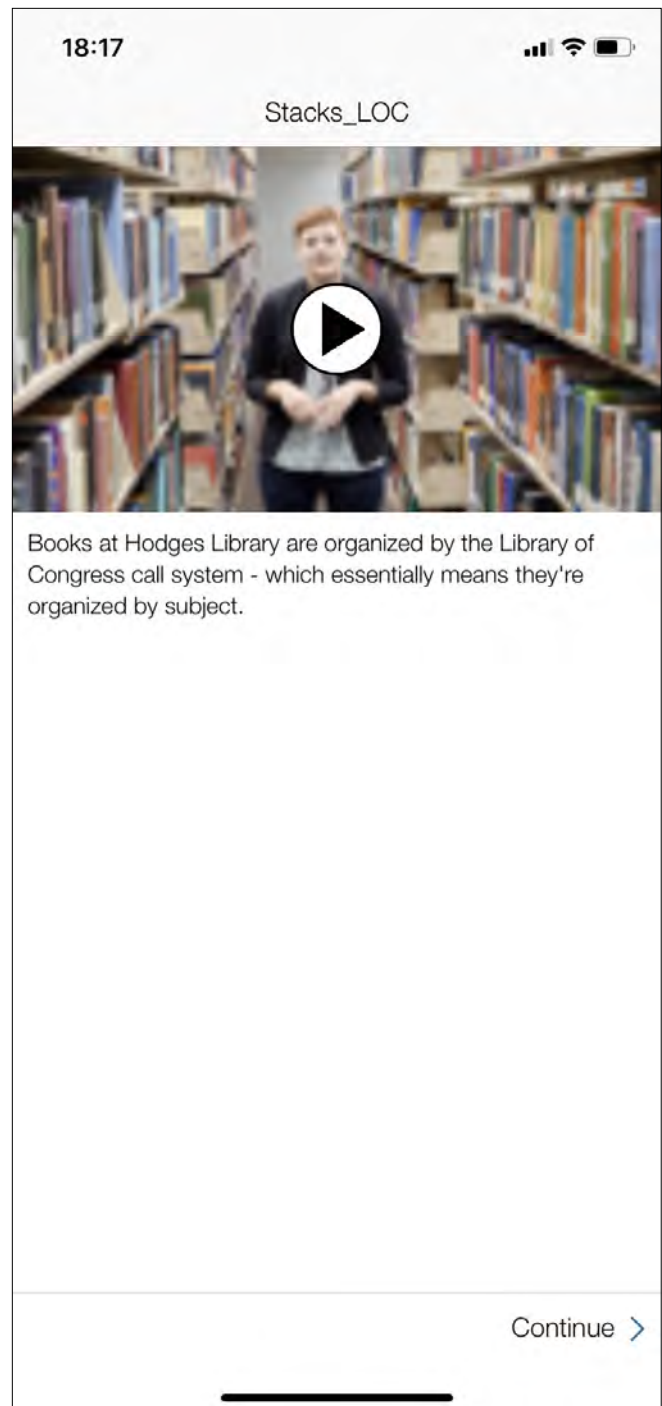


FIGURE 5. A screenshot of a plaque in ARIS. Users can click on the video to play; a summary of the video is provided underneath.

via LibAnswers would guide students from one marker to another. I collaborated with Ingrid Ruffin, then interim head of the Learning Commons, to choose effective codewords and match them with the directional content of the game in LibAnswers. Collaboration with Allison McKittrick, instruction librarian with Special collections, was also necessary, as the

use of video meant the game could highlight some of their interesting items related to myths and monsters.

I was still worried that some students might have difficulties finding the locations, especially if this was their first trip to Hodges Library. I asked the library's marketing department for some kind of image I could post at the locations to indicate to players they had made it to the correct spot; this had been done for previous games in Hodges. While I was hoping for some kind of monster, the back-and-forth took long enough that I settled for orange vinyl dots. These were especially helpful for marking the specific bookshelf students had to locate, as students often struggle to navigate the stacks.

Because I had not left the storyboarding stage before learning HP Reveal was being retired, the transition to ARIS did not impact the game design much. By that point, it came down to assembling all of the component parts I had mapped out. I sent a call for volunteers to the library's general education committee for any individuals willing to serve as actors for the videos; Sarah Johnson, a Commons librarian, agreed to be featured at her service point, and Charissa was featured in the video explaining the course guide she had created. Two volunteers from Special Collections agreed

to show off related artifacts, and I served as the main actor for the remainder of the videos. I arranged filming times at various locations throughout the library and wrote up loose scripts for each of the nine videos. Eight videos were edited to ensure they did not pass the 30-second mark, and I made notes for the transcripts.

ARIS did have a feature that addressed one of the challenges of using HP Reveal: videos could be put on things called plaques, shown in Figure 5. Say a student comes to the public service desk and uses the AR scanner on the banner, which triggers the video content associated with that location. Instead of having to hold their device in that position for the duration of the video, students could tap on the video, which would take them to the stable plaque where they could continue to view the video.

While prototyping the game in HP Reveal, I realized having tutorials available for students on the game's research guide would be valuable. Students were going to have to conduct searches in the library's online discovery tool and in a database, and some students may not know how to perform those searches. Initially, I wanted to design tutorials with custom searches that fit the myths and monsters theme, but as the game design had already far exceeded the initial

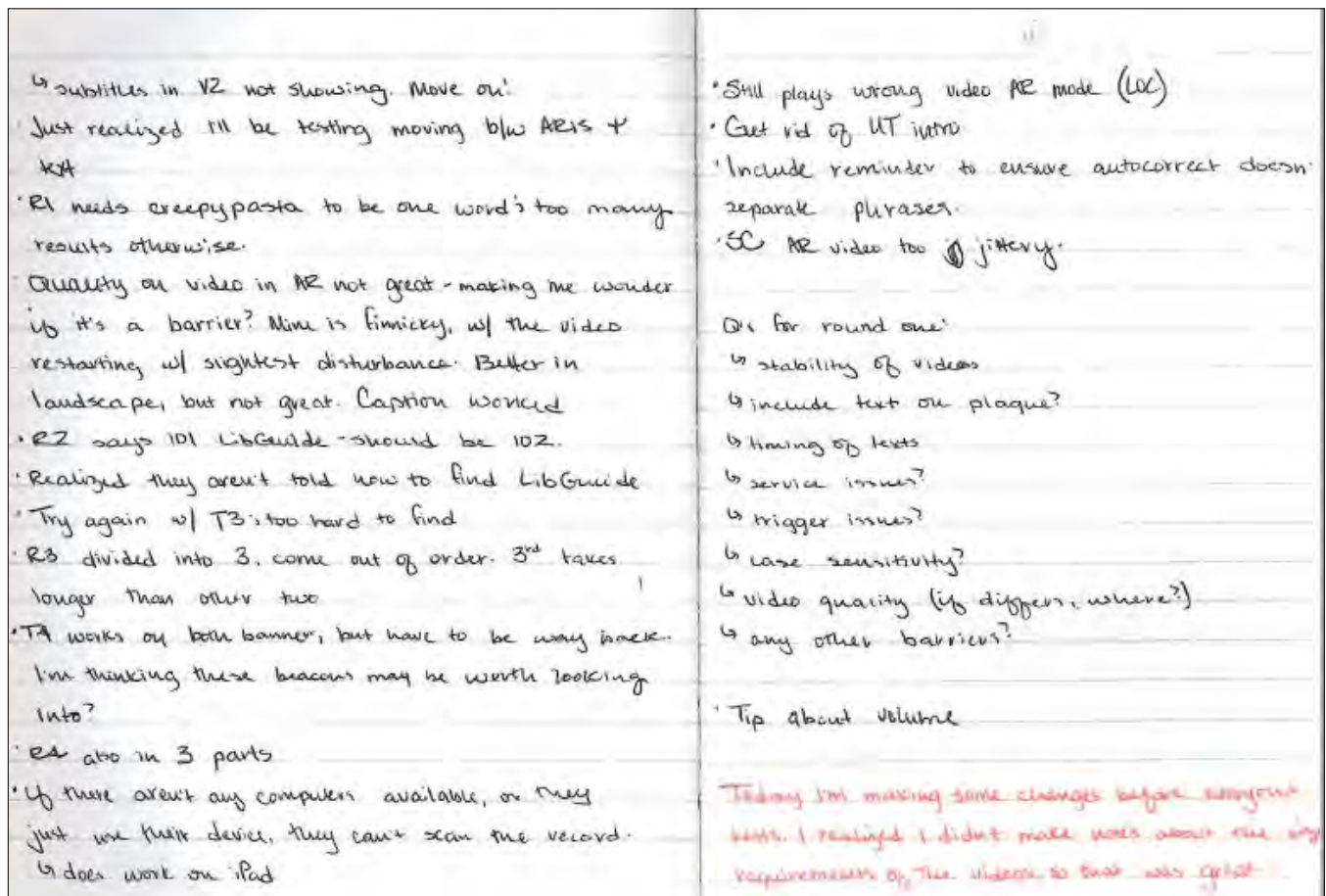


FIGURE 6. A scan from my notebook showing notes taken during a round of playtesting.

implementation date, I decided to use tutorials that were already available on the library's website.

At this point, I also began putting together the research guide for the game. This would be the access point for the game; the link to this guide would be distributed to composition instructors for them to then give to their students. The home page contained a brief description of the game, as well as my and Charissa's contact information. A tab for instructors listed the learning outcomes for the game, an explanation of why I chose to use augmented reality, and my contact information. The third tab had all of the information needed to play the game. This included a brief introduction for players, a list of needed components (a mobile device, the app, and a phone to send and receive text messages), tips and tricks, tutorials, and hints. It is also where the introduction video, where players were introduced to the premise and the AR app, served as the starting point for the game.

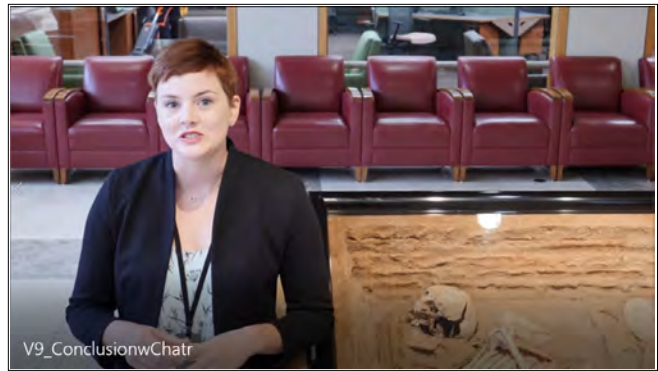
For assessment, I planned to use data gathered from a Google Form. None of the tools provided usage analytics, which would have been helpful in knowing how many players started the game, how many finished, and even where they stopped playing. Unable to gather that information, I designed the exit survey to ask students if they enjoyed the game, if they learned anything, and if they felt more comfortable in the library after playing using a 5-point Likert scale. As the designer, these were the most important questions for me during the first iteration; if the game was not fun, or if students did not learn anything, that would need to be addressed before diving into more complex questions.

The game required multiple playtests by myself before it was ready for others to test. I was still experiencing problems with videos being in the wrong orientation or poor quality; my notes from this time, some of which are shown in Figure 6, are a list of problems, complaints about the lack of online support for solving these issues, and occasional moments of success, though not always any idea of how I achieved it.

Almost a year past the first implementation date of February 2019, the first testable iteration was completed in November 2019.

DESIGN USE

Finding individuals willing to test the game was a challenge, but in February 2020, a group of 4-5 undergraduate student ambassadors at Hodges Library completed the game and met with me to give feedback. They were asked to give specific feedback on the flow of the game, whether the task order made sense, any technical problems they encountered, how long the game took to complete, and whether the game was enjoyable. Feedback on any other topics was welcomed.



VIDEO 2. The conclusion video of the game, available at <https://purl.dlib.indiana.edu/iudl/media/494v53sd18>

Students started at the research guide. From there, they navigated the library, completing tasks like looking up an article in a database with keywords, locating a physical book in the library, and visiting key service locations like the public services desk and special collections. Students ended the game at the centaur, a permanent display in front of Special collections that worked well with the theme (shown in Video 2), and were directed to a Google Form survey asking about their experience playing the game. A visual representation of this process, which was essential in ensuring all steps were clear and in order, is shown in Figure 7.

Overall feedback was positive. They liked the format, that they got to use their own devices, and even requested that the game, which took them 15-20 minutes to complete, be longer. Testers suggested that the game be advertised as a team experience, and provided additional stops they thought other students would find important. One student in particular mentioned they liked that the game did not require interaction with librarians, as it reduced social anxiety. Story and game elements were interesting, but students requested more of both; they responded very positively to the idea of making each service point/task a quest. Students enjoyed the myths and monsters theme and the variety of each game featured.

There were critiques of the game, as well. These were largely technical in nature; some of the triggers did not work for the players, despite working during my final run-through. Students did not like having to download an app to play, but that was balanced with being able to use their own device. One player suggested the marker on the bookshelf be moved to a more visible location. Finally, one task which required students to locate a book's record in the online discovery tool and use that record as the trigger, was too complicated for the students to figure out with the information provided.

The game met the learning outcomes according to student feedback; not only that, it reinforced my instincts as a game designer that students would prefer more game and story

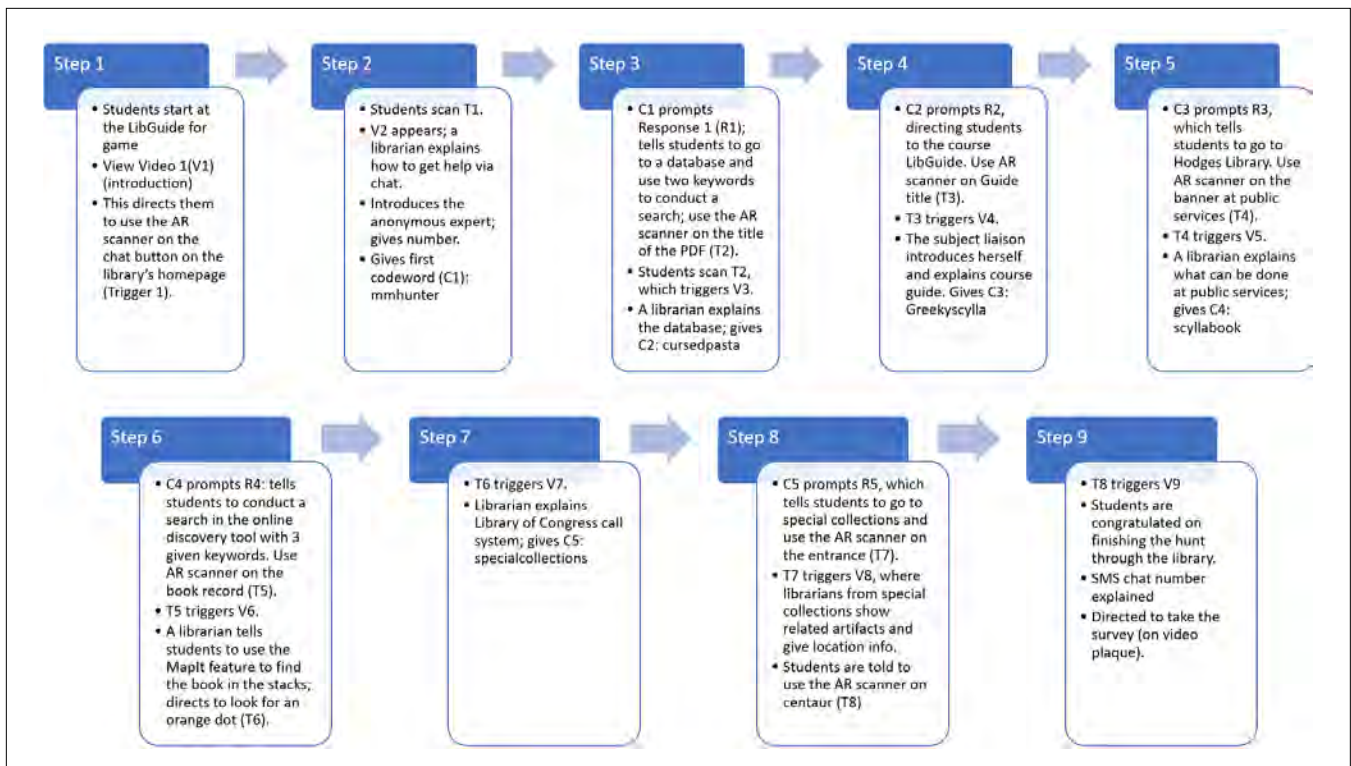


FIGURE 7. Visual representation of final game flow.

elements that library literature discouraged. Students felt confident in completing the tasks required by the gameplay, they were more familiar with different areas of the library, and they had an enjoyable experience. This feedback also helped address some library staff’s initial concerns about replacing interaction with librarians with a digital experience; given that one student stated they appreciated being able to complete the game without interacting with a librarian at that time, this indicates that either (a) students are not looking for interactions with librarians for the sake of engagement itself or (b) that students may appreciate the chance to increase their comfort with the space before approaching a librarian.

DESIGN TENSIONS

I experienced a number of design tensions building this game. On a larger scale, there were questions of whether this game replaced in-person instruction or supplemented it. Some worried that with the game available, composition instructors would not bring their classes to the library for classroom instruction. While I understood this concern, the design problem I had been given was framed in such a way that I and my supervisor could think of no better alternative. Part of this would come down to communication; if this game was presented to composition instructors only after having their in-person request denied, or after the scheduling deadline for in-person instruction had passed, that alleviated some of the concern that the game would become

more popular than in-person instruction. Should the game become popular, however, I saw that as an opportunity to create a flipped-classroom approach to library instruction, which we had been trying to promote for a while. Students could play the game, then come in for an in-person session that could focus more on the research assignment, instead of research basics like how to find a database or a book.

Similarly, questions were posed about how well a non-facilitated game that required no librarian interaction could address library anxiety. As a librarian, I know the value of positive student interaction with library faculty and staff. As an instructional designer, however, I valued the chance to get students into the library and demystify the space when those students may not have otherwise gotten that chance. The lack of interaction, as one of the student ambassadors pointed out, could have been a positive aspect of the game for the more socially anxious. And again, given the design problem and the history of gamification at Hodges Library, I believe it was the best approach.

One tension I grappled with was whether or not I could actually teach students research skills in this learning environment. While this was one of the original goals, I realized it was not necessarily a practical one. I could show students how to navigate to a resource, and could walk them through entering keywords and viewing an article—one such task required it—but when it came to developing skills, in-person facilitation was needed. As this helped alleviate some of the

tension about this game replacing the need for in-person instruction, I was happy to strike that goal off my list.

On a smaller scale, I wondered if efforts to make the experience accessible rendered the game moot. In the final design, I had a hints section where the trigger images were located. I hoped this would help students who got lost due to a lack of familiarity with the space and services, and intended to point to that section for any student who wanted to complete the game on their own but might struggle with various parts of the gameplay. Clever students might realize that they could simply use those images as triggers and never venture into the library at all, but in the end, I decided that was a risk I was willing to take; after all, if as an instruction librarian, I am aware not all students are paying attention to me in the classroom, I could not expect everyone who was required to play the game would be as invested as others.

FAILURE ANALYSIS

I encountered many unforeseen obstacles while designing this learning experience, none of which are specific to augmented reality itself and are therefore applicable in a large variety of design contexts. Many of these obstacles are in part due to the challenging nature of taking on any project wherein you are doing something for the first time. As a designer, this was my first attempt at a project of this scale. It was very close to my first time working with augmented reality, and this was a new type of project for academic libraries. While I found one article during the project that described a similar experience, using emerging technology to solve a large-scale problem in the profession with constraints common to others in academic libraries was not something I had seen described holistically enough to give me a guide for my own experience. Trying to tackle a design of this nature while being the only person on the team compounded the challenges of trying to be one of the first to propose an innovative solution to a profession-wide problem.

My lack of experience with AR tools, or lack of any programming experience, was another major obstacle. I completed the most basic of AR games for a class and proceeded with this design confident I could overcome whatever barriers I faced. While I largely succeeded, there were many aspects of this design that would have been easier had I done some initial research and training. The fact that I almost got to the building stage in HP Reveal without realizing I was in the wrong version of the platform is just one illustration of how my lack of experience impacted the design process.

Along the same track, I realized at various points throughout the two-year design process that my journey would have been much smoother if I had taken more notes. For someone totally new to designing a game, much less in augmented reality, it took an astonishingly long time for me

to remember I needed to write down dimensions for images and take notes on processes. I would often spend an entire day devoted to working on images, for instance, and would consider them done; when I needed to make changes months later, however, I had forgotten all the specifics that became second nature the first time around. As my tendency to dive into projects with tools I have no experience in has not diminished, this was a valuable learning experience.

One failure I did not realize until looking back was the lack of community or collaborators. I began the project as a graduate teaching assistant and continued work after I became a full-time faculty librarian in the same department. While I worked with Charissa by providing updates and bouncing ideas around about the content, she did not have the same interest in game design or have the time to dedicate to such an involved process. This problem arose again when I sought play testers for the pilot; a combination of the timing—everyone is typically just looking forward to break at the end of a semester—and the siloed nature of my project meant it took much longer than I anticipated to find someone other than myself to playtest the game and generate feedback.

Combining my lack of technical experience with the lack of collaborators, I would recommend that instructional designers interested in working with similar emerging technologies form a team for such a project. While these projects can be completed by a single individual, for those who are limited in their technical skills especially, I would recommend a team of no less than four work on a project of this scale. Two project members would work on the story development and learning content; two other project members would work on the tool itself and the assembly and delivery of content. Even if the two working on the technical side have little experience, having someone else to problem-solve with will benefit the team. This also means that each team will be able to test the efforts of the other, reducing some of the stress I experienced in finding others to test my design.

The largest obstacle for me as a designer, however, was morale. One of the reasons the game design took so long, overshooting the deadline by almost a year, was the periods of extremely low morale I experienced. These hit at different times and were triggered by a variety of factors. Sometimes I would be confronted by my lack of notes and get frustrated with my lack of organization and experience; I needed to completely redo a database of images for the game and had to start from scratch again, looking up how to properly size and upload pictures of service points around the library. Sometimes I would be faced with a new problem and have no one with more experience or a fresh take to help me solve it. Tutorials for AR in ARIS were basic; once I mastered those skills, when I wanted to do something new and could not make it work, I would walk away from the project for a couple of weeks.

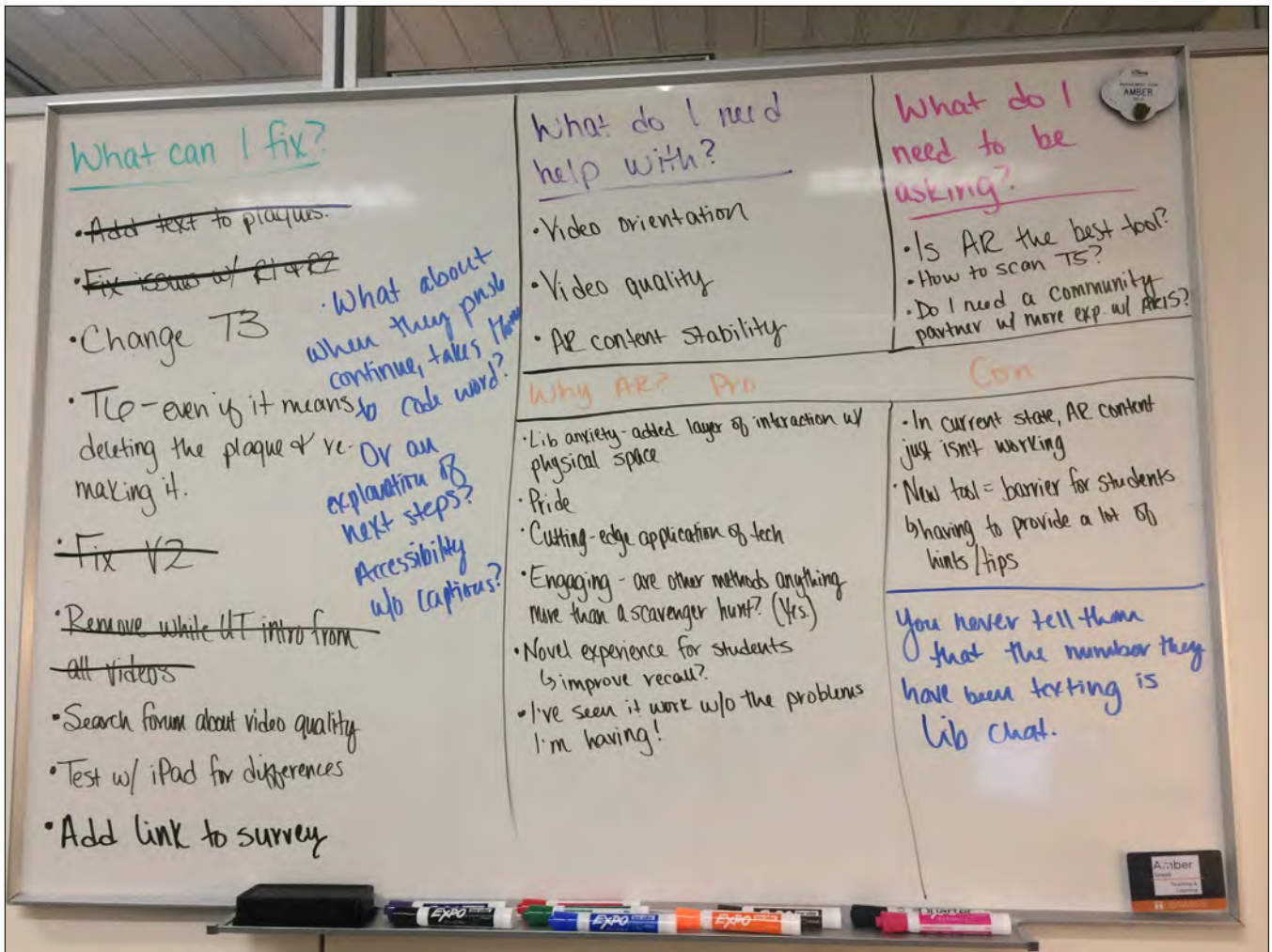


FIGURE 8. Office whiteboard during a low morale period late in game design, demonstrating multiple issues and doubt about the project.

Another contributor to low morale was my dissatisfaction with the game elements. Talking with others in the library about the game, I would be bolstered by their enthusiasm. After reading about others' efforts, or after trying to use a new feature in ARIS and not being able to figure it out, I would despair that the game was not enough. I had grand visions of what the game could be, but did not have the technical know-how, the resources, or the time to implement those ideas—even if I did, it meant I had put over a year of work into a game only to decide it was a waste of time.

For myself, and other designers who may be facing a similar design context, I have learned that dips in morale are an inevitable part of a long design process. Being armed with this knowledge has allowed me to monitor my enthusiasm for a project while in the design process, and take steps to address it if needed. For instance, I love the creative aspect of a project, but if I am getting too bogged down in the

constraints of a project, it is a good time to step back and evaluate the full picture, as demonstrated by Figure 8. If it is the technical learning that is causing frustration, usually that is a sign to ask for help and step away until I either have an answer from someone else, or I feel that I have enough energy to tackle the problem again. Knowing what can cause me to lose momentum on a project and having strategies to counteract those have been instrumental as a designer.

Looking back, even though the design was never fully realized, I learned a lot of valuable information, both about design and about myself as a designer. I have still not stopped throwing myself into projects I have no background experience in, but I have learned to take better notes and look for communities that can help me out when my own knowledge is not enough. I know to trust my instincts as a storyteller and designer and have learned not to say deadlines out loud unless I must.

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