

Game Design Document for Blackout

Team:

Connor Barajas, Producer:

- Class of 2021
- Major: Computer Science, Minor: IDEAS (Integrated Design, Engineering & Applied Sciences)
- Work Experience: Served as Teaching Assistant for several Computer Science Courses, 3 years of experience tutoring elementary school students in STEM.
- Relevant Coursework: Computer Science I & II, Algorithms and Complexity, Computer Structure and Organization

Madeleine Kusel, Level Designer, Composer, Writer:

- Class of 2020
- Majors: Computer Science and Mathematics
- Work Experience: 7+ years of teaching and tutoring elementary school age children, served as course assistant for both Math and Computer Science courses.
- Relevant Coursework: Creative Coding, Computer Science I & II, High School Music Production Course, Video game Storytelling.

Stanley Markman, Programmer:

- Class of 2023
- Prospective Computer Science Major
- Work Experience: Personal projects with Unity and Blender going back several years, completed research programs at the Weizmann Institute and Weill Cornell Medical College
- Relevant Coursework: Computer Science I and II.

Naraa Altai:

- Class of 2022
- Major: Computer Science, minor: Data Analysis
- Work Experience: Tutored middle and high schoolers for three years and also worked in the Math Workshop for this past academic year.
- Relevant Coursework: Computer Science I & II, Computer Structure and Organization, Art Studio Drawing

Maxine Ma:

- Class of 2023
- Major: Sociology, FGSS(Feminism, Gender, and Sexuality Studies)
- Work Experience: Experience of tutoring high schoolers; tutor children in Wuhan during COVID-19
- Relevant Coursework: AP Computer Science Principle, self-learned marketing since high school

High Concept:

Teach fundamentals of electricity and renewable energy through fun, story-driven and engaging gameplay.

Genre:

3D story-driven puzzle game.

Gameplay:

The gameplay of Blackout consists of two phases. Students explore an open-world city, talking to NPCs, learning about electrical concepts, and collecting parts. In the second phase of gameplay, players use the parts they've collected to put together circuits that have a real impact on changing the city they can explore.

Features:

Blackout features interactive NPCs with branching dialogue options, various UI elements to help students interact with these NPCs like quest markers and a minimap, and a hoverbike vehicle that players can use to fly around the city and access otherwise closed-off locations. Blackout also features a circuit design mode, where components snap into place to build complete circuits.

Setting:

Cyclone, a fictitious robot city.

Story:

Our protagonist arrives in Cyclone, a wind-powered city inhabited by Robots. Unfortunately, a massive storm ravaged the city causing all the power lines to break. The player needs to restore power to the city by collecting electrical parts while moving through a detailed 3D city, either on foot or with a hoverbike! Once they collect the required pieces, they restore power to the city

through connecting wire pieces from turbines to the target in a circuit builder level. We wanted to combine aspects of 3D open-world games that students are familiar with like Minecraft with simple, easy to pick up puzzle levels. We wanted to reward exploration and good problem solving skills, while giving the player a high stakes objective to keep them going. They are the hero, it is up to them to save the city using their engineering skills.

Target Audience:

The intended audience for Blackout is 2nd to 5th graders. We were able to survey a group of 2nd to 5th graders where we learned their likes and dislikes towards video games. We used the data we collected into consideration while developing the game. However, we didn't want to only focus on 2nd to 5th graders that knew English. Since our team is not only diverse in skills, but also culturally, we wanted to use that to our advantage to reach kids around the globe . From languages like Spanish to Mongolian, we will be able to reach a bigger group of kids and teach them what Blackout has to offer.

Hardware:

Blackout has been tested on Windows and OSX operating systems, and runs on both low-end and high-end hardware. The game is playable with a keyboard and mouse or a USB/Bluetooth gamepad controller, such as an XBOX or PS3 controller.

Estimated Schedule and Budget:

We are planning to have three major stages and specific deliverables over the course of 12-months development process. Our plan is to have our fully finalized product with customizable characters and three comprehensive levels each following themes of wind, solar energy and hydropower. During our field at MacDonough school, we found that kids like games that allow them to customize their characters to look like them or however they want it to look. So we wanted to integrate that into our game and have a customizable player character. Also,

incorporating renewable energy concepts into our game, our three levels will be designed to showcase and teach wind, solar energy and hydropower. So by end of 12 months we will have delivered:

- Fully rigged and animated player character and different themed NPCs
- Polished puzzle mechanics
- Complete 2nd level Complete 3rd level with solar and hydropower theme
- Game dialogue transcript translated into 4 different languages
- Animation and sound FX-integrated polished UI

Our expected expenses consist of wages, marketing expenses and hardware/tools expenses, which bring our total to \$68'060 for a 12-months-long development process.

Competitive Analysis:

One online game that we found similar to ours is Circuit Construction Kit: DC. This free online educational game is intended for 3rd to 12th graders. When starting off the educational game, there are no clear instructions as to what the player is supposed to do. The player has to figure out what to do by themselves. Circuit Construction Kit does contain resistors and switches to place within the circuit you make, but these are also elements that we wanted to provide in future levels of Blackout. We want to start off at the basic level especially for the younger end of our targeted audience, and as the player progresses through the story, they will use resistors and switches to help complete their cycles to restore power to the city they are in. We also plan on using the circuits to teach the player what conductors and insulators are.

Another free online game was Circuit World which is marketed to 1st to 4th graders. This game also does not include any clear instructions as to what is supposed to be done. Similarly, to Circuit Construction, it's an educational game to practice building complete circuits. The player is also able to switch between an actual circuit representation and circuit diagrams.

Both of these games are more of games that you have to do along with a worksheet with a teacher. They do not teach how to build a circuit or how it works. They also have no incentive for the player to keep playing. They contain no story to keep the player intrigued at least, which is what Blackout has.

Silicon Spies is a game most similar to Blackout since it is story driven. The player plays as a spy that has to fix a power outage caused by villains. It is a free online educational game marketed to 3rd to 5th graders. However, it doesn't use puzzles to teach circuits and electricity. It follows more of a quiz format and heavily text-based learning, which can be hard to be perceived as fun. It aims to teach kids about electricity and how it works, how electricity flows through a circuit, and how to draw circuit diagrams. Blackout on the other hand does not want to rely on only text to relay information to the player. We use text to explain how to play the game and what the missions are but plan to use the puzzles to teach about circuits and electricity.

Another competitor that needs to be taken into consideration is Electricity Lab Kits. These are the usual ways teachers would teach students about electricity and circuits. They start off at \$34 per kit which makes them expensive especially for a class of 20 students. These kits are simply outdated especially with a generation that learns more through tablets and computers. They also contain a lot of pieces per kit that can be broken or lost. We plan on doing a subscription model

for \$10 per year for our game. This is to make it affordable compared to the lab kits. Even though most of our competitors are free, we believe we are providing a better game that is story driven and has puzzle aspects to learn about circuits, electricity, and renewable resources.

Risk Analysis:

When we developed our game for itch.io and we tested the game on a group of 2nd to 5th graders, the feedback that we got made us realize that the game was working on some laptops and others not, which did not happen when testing in Unity or on our own team's computers. In order to work around this, we want to work on other online game websites like Steam to see if the issues are the same and check constantly with different computers to see if our program works on the websites. When putting our game on itch.io, we saw that the game would have a lot of lagging issues. Some options would be to look into other gaming websites to see if the case is the same, but also to reduce the world we made. We also tested out recently that when we reduced the visibility of our trees in our game that lagging improved immensely. Another risk since we plan on advertising to teachers directly is that some teachers are used to teaching things in a specific way, like the electricity lab kits, so making them change that would require giving them more training in our software, while with others not as much. As we saw in our competitors, there are a lot of games that try to teach electricity and circuits. Especially since they are free, there will be a risk in trying to justify paying for a program rather than doing one for free. However, we believe that Blackout actually is an edutainment game. The combination of our story-driven game and puzzles is something that has not been done before in teaching circuits. Additionally, Blackout revolves its entire story around renewable energy which none of our competitors touch on.

Summary/Recap:

BLACKOUT is an intersection between story driven games and educational games, which

overcomes the challenge of educational games being boring and fun games being not educational or useful in learning science. We aim BLACKOUT to be a more accessible and cheaper option than the current alternatives, which are the games already on the market and to the science learning kits that some schools or classes use.