

Game-based Learning App

Group: 3

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1. Introduction

Name: Tech Through Time

Purpose: Survival, natural science, self exploration and in classroom

Platform: PC

Short description: A sandbox-type game that teaches the natural sciences like chemistry through exploration and discovery where you invent new things to develop the world you are placed in.

Technology: A laptop/desktop with decent memory

2. Theory

Tech Through Times *learning objective* is natural sciences. Our goal is for our game to teach subjects such as chemistry and technology. The game promotes **learning** and exploration throughout the entire game, and specifically by our logbook functionality. This works both as a way of retention for learning and a way to provide hints for what their next possible steps could be. We believe our game can be used in several different *contexts*. We have several different game modes for playing and exploring freely on your own, game modes that encourage curiosity and exploration for the user. The game can also be used in a more formal learning **environment** like a classroom with our classroom mode.

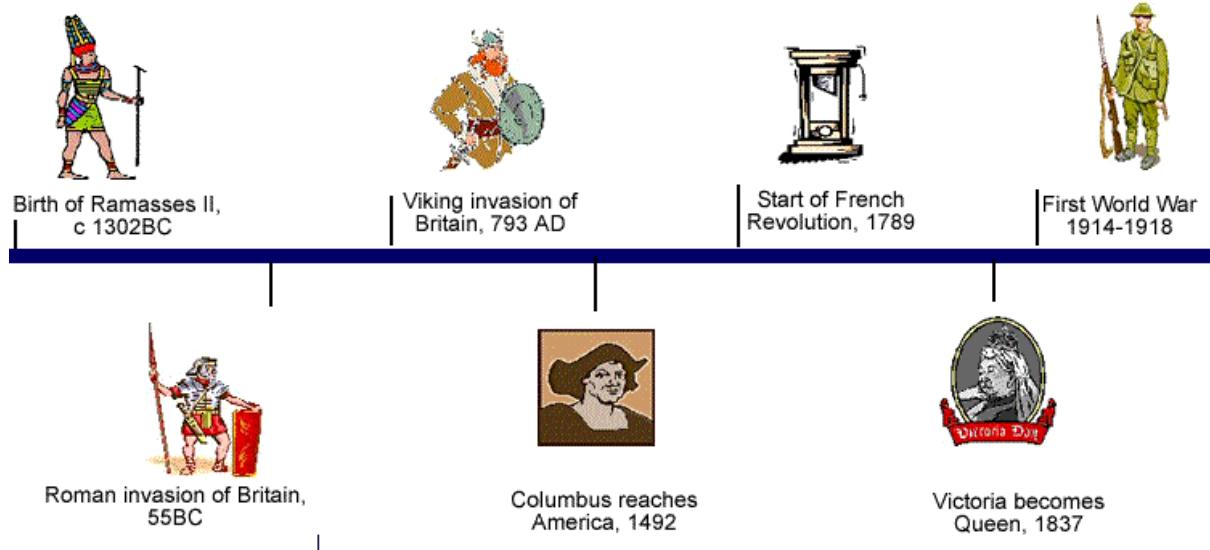
We decided that **affective cognitive reactions** is one of the most important factors of the game because these elements are big drivers for keeping a users interest in the game and thus continuously learning. Malones curiosity as a type of *engagement* and *flow* is a big inspiration for how we chose to balance exploration, rewards and hints. We have a progression tree that works as both a type of reward when they unlock something new and a way to trigger the player's curiosity by showing the name of the next unlockable achievement.

Our most important **game factors** are a cartoonish expression as our *game aesthetic* that hopefully appeals to our younger audience. The most important *mechanics* are gathering resources and being able to store them in your inventory and combining them to create something new.

For our games **usability factors** we tried to focus on *learnability* by having a sandbox type game that has simple mechanics. However the game will get

progressively more complicated as you discover new things and encourage more learning. Our target audience is students from middle school and up. We try our best to match these **users**' cognitive needs and learner profile in part by simplifying some of the end game concepts and "recipes". Like when the user gets to the modern day era you won't need to quite literally build a computer, but a simplified version that still gets the most important concepts across. In addition, using classroom mode the teacher can completely customise the game for their classes level and subject of the day.

We ensure we have ***clear goals*** for our users with our progressive progression tree. You won't be able to see all the achievements at once which could be overwhelming and confusing. Instead you will only be able to see the immediate next achievements that are related to your latest discovery. As previously mentioned our progression tree also works as a reward for the player as there are not a lot of other reward mechanics in place. We rely heavily on the player's curiosity. We discussed having some form of experience points for a reward, but considering there are no functions for these points we decided they would be unnecessary and not add anything to the value of the gameplay.



We have also adapted some gamification concepts. A user's drive for development and accomplishment is central to our concept with exploration, development of the user's world and unlocking new skills. Our progression tree works to motivate the

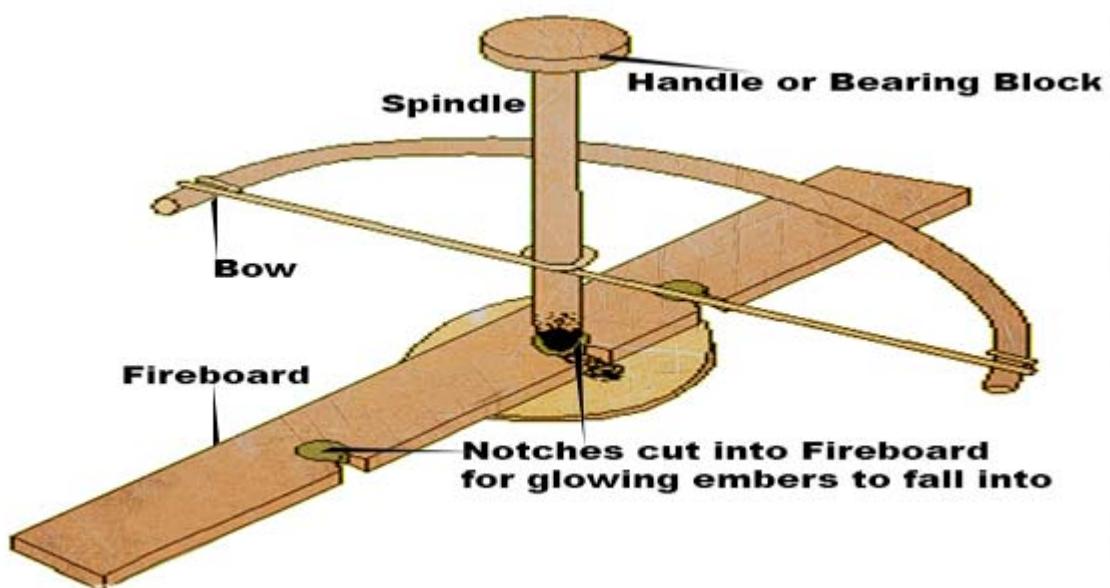
user with hints towards the next discovery/recipes. We also implement scarcity by pacing the users rewards which in our case is both the progression tree where new badges are unlocked with each discovery and by our milestone achievements. When your world reaches the technological level of a new historical era you will receive a notification of a new achievement being unlocked.

3. Game Design Document

Learning

To make the learning in the game as reasonably compatible with school syllabuses as possible we will work with educators and scientists from relevant fields to ensure some level of realism and to provide educational value. We won't be able to tailor the game to individual countries' syllabuses, but will try to generalise where possible, and if the game is successful we could continue to work with educators to create tailor-made game modules that are aligned with different countries' syllabuses.

The central idea is to educate students on natural sciences (and some history) by implementing scientific advancements as crafting in the game. For example, to start a fire, the players could collect sticks and stones, and craft rope to create a bow drill (image below) that makes it easier to start a fire. Alternative era-appropriate methods will also be available, but this is one example.



Additionally, as the players progress through different eras of the game the technology they interact with will become more advanced, branching into fields of science such as chemistry and metallurgy (for example through the historically important discovery of metal alloys such as bronze or steel). As the crafting becomes more advanced this naturally suits higher level subjects as the players get older.

Story

The game features very little story directly, as we instead focus on exploration and experimentation, but to provide the players with a sense of progression and also to act as a sort of hint system we have implemented the “Log book” mechanic.

The log book records advancements the players make such as unlocking new technologies or crafting particularly impressive items. We use a proprietary machine learning algorithm which generates the text in a diary-like style. Additionally, the system will also be able to use ML to detect when the player is struggling to make advancements, and will add hints in the log book that point the player in the right direction. These hints become progressively more obvious if the player continues to struggle.

Level & Environment Design

The game features a randomly generated world that is designed to resemble the real natural world to a good extent, through biomes and such. We will not make our biomes and general world scale realistic though, as we want to make it convenient for the players to access resources that in the real world are scarcer and far apart.

Custom maps can be loaded or created for the sake of educational or entertainment reasons. These maps can be created both by our company as official modules, or by third party educators who wish to tailor scenarios to their syllabus and class.

As the player advances through the game and reaches new eras the levels will subtly change to assist and guide the players (e.g. upon reaching the bronze age metals will be easier to find and more plentiful in the game world).

Gameplay

Progression trees:

We use progression trees both as a form of motivation for the players as they will act as achievements (bragging rights), but also as a hint system for the players to see what they can work towards next. The specific unlock conditions for a progression won't be explicitly stated, but the title of the progression will be visible, and designed to give hints to the players. Additionally, to avoid overloading the players only progressions that are possible to progress at the player's current technological level are visible.

Another mechanic that is tied to the progression trees is the era unlocking progressions called “Advancement” which requires several steps to unlock. Advancements correspond to real historical eras such as the stone age, iron age,

industrial revolution, etc. Upon reaching an advancement the player gets a big notification on screen, and the world progresses as outlined in the “Level & Environment Design” section.



Multiplayer:

To facilitate collaboration and socialising the game will have both single player modes and multiplayer modes. This allows multiple players to collaborate in the game, and when used in classroom mode this lets the entire class or groups in the class to play together. To avoid making the game too easy the game will dynamically scale difficulty and progression tree costs.

Exploration & Classroom Mode:

In “Exploration mode” the game has no special scenarios or pacing mechanics to guide or restrict the players, and they can enjoy the game at their own pace. The mode is similar to Minecraft in that the player starts with nothing and works their way through the game by developing new technology. When inventing something new, an automated note appears in the logbook which explains what they did as well as a hint to what the next step is. Exploration mode can be either single player or cooperative multiplayer.



Exploration mode has several sub-modes available to cater to different players:

- Survival: In survival mode, players can die from hunger, thirst, and environmental hazards (like blizzards, bears, wolves, falling off a cliff, getting crushed by a tree). Players must develop technology to not die from these dangers. Dying results in them respawning with temporary stat debuffs, and they must retrieve their items.
- Adventure: In adventure mode, players can only die from environmental hazards, but otherwise identical to survival.
- Freedom: In freedom mode, players can't die, but gameplay is otherwise identical.



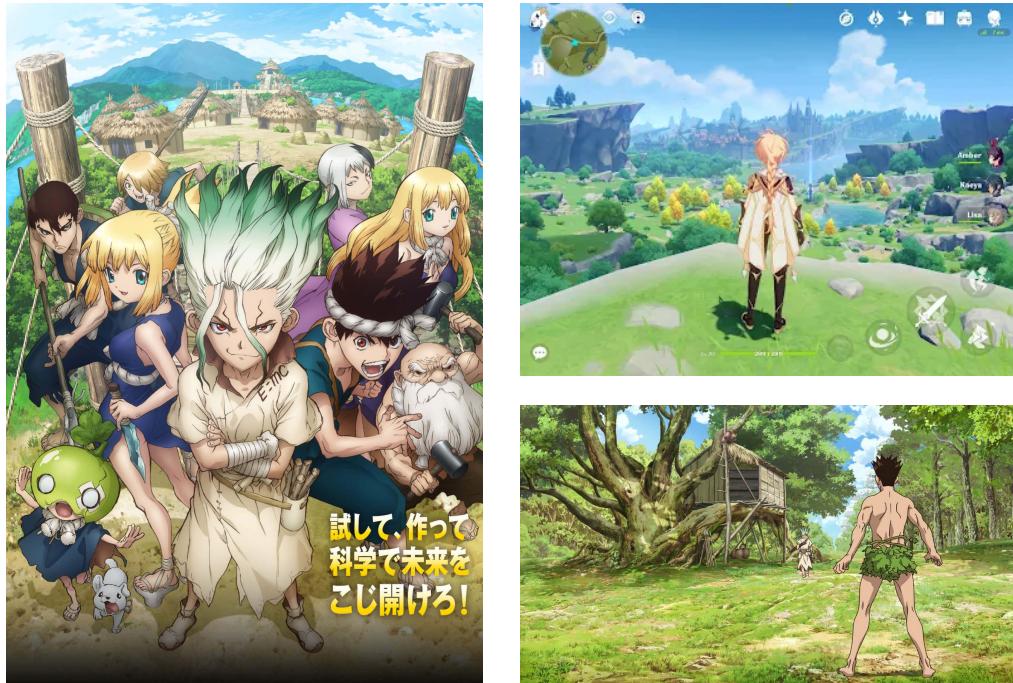
In “Classroom mode” the student(s) play through predefined scenarios that either come bundled with the educational version of the game or that have been created by their teacher. These scenarios can also be shared, allowing teachers to create high-quality scenarios tailored to their syllabus and class.



In classroom mode the teacher can prepare a "lecture" with slides and tasks in between, much like Kahoot!. In our case, the tasks entail putting students in the sandbox world (which is set to an era and pre-configured with items by the teacher). During the task, students are supposed to "invent" something based on hints in the logbook, which is written by the teacher (allows the teachers to make a custom story). The presentation changes to the next slide when the students complete the task or the teacher decides so. The teacher decides whether the lecture is singleplayer or if the students should cooperate in multiplayer (homework vs. in-class).

Art

We want to use a somewhat cartoonish art style using cell shading inspired by games such as The Legend of Zelda: Wind Waker and other similar games. The intent is to create something that is visually appealing with a distinct artstyle, while not focusing too much on hyper “realistic” graphics. Cell shading seems like a good fit for this.



Sound and Music

The game will have a custom OST with music inspired by era-appropriate music, using a mixture of older instruments. A good example of games that use similar styles of music is the Assassin’s Creed series, or the God of War series (particularly the recent games). The intent is to invoke a feeling of “being there” to help with immersion.

<https://www.youtube.com/watch?v=V5Ar0dKnI6Y>

<https://www.youtube.com/watch?v=FSVHx23ByhM>

<https://www.youtube.com/watch?v=viM0-3PXef0>

User Interface, Game Controls

The game is played using a PC and features traditional first-person mouse and keyboard controls, akin to what one might be familiar with from games such as Minecraft and et cetera.

Accessibility

Because of the traditional control-scheme we will also offer several traditional accessibility features to make sure students with disabilities can enjoy the game as much as possible. These features will include mappable controls, support for external controllers, colour-blind mode, text-to-speech, and many others. To make sure our game is as accessible as possible we will hire experts to cover areas we are not familiar with, and accessibility will be a priority (we want to make sure as many students as possible can play the game since it will be used in an educational environment).

Monetization

Our game is monetised primarily through direct game sales, but we will also offer a subscription-style monetisation of the game for educational institutions that allow educators greater customizability of the educational section of the game and access to student accounts, which allows pupils to play without a private account and which tracks their progress in the game.

4. Concept

Provide the URL to a max 2 minute YouTube video (unlisted) that demonstrate/show/describe the problem or challenge being solved and demonstrate/show the game-based learning app.

URL: https://youtu.be/McMZpKEG3_A

Note: given the time limit, we had to oversimplify when explaining game modes in the video. When talking about "survival mode" in the video, we actually mean "exploration type". Survival mode and the other modes in exploration types are not mentioned in the video.

5. Reflection

For our last project together we took full advantage of what we learned from working with the previous assignments, both our own experience and the feedback we got was very helpful. Amongst other things we focused more on being low level with our description of theory in this assignment as we got feedback last time that it was a bit too vague and not specific enough for our game. Continuing to meet on a regular basis is still working great for us, giving us more time to carefully consider all the parts of the assignment without rushing like we had to in the first group exercise. Developing this concept was a lot of fun as we ended up with a game that several of the team members would like to play. We took some inspiration for our concept from both other similar sandbox games, particularly from Minecraft, but after establishing that we wanted to create an exploration game, our main inspiration for this game was a series called Dr. Stone. Working with the LEAGUE theory was exciting and felt

quite intuitive as most of the factors were naturally connected to a game where the main objective is to learn something.