The savior of starvation maze

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Overview

In starvation maze the player must save a starving person in a dark maze. The starving person tells the player what kind of nutrients they need (e.g. 1000 calories). The player then must traverse the maze to find food items that each have a nutrition label along with other relevant information. The player will have to bring back the food items in order to save the starving person.

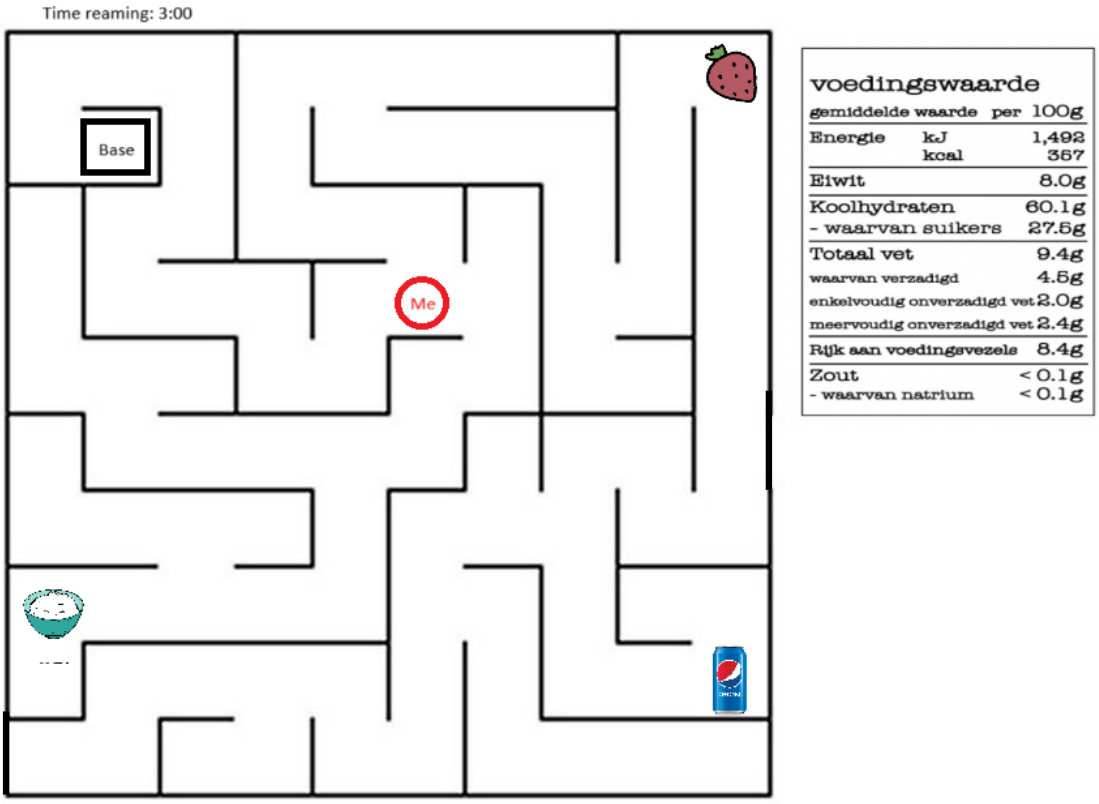


Figure 1 A very oversimplified overview of a game screen.

Problem definition

Starvation maze is a singleplayer exploration game for children aged 12. It's a browser game meant for a classroom setting.

The game aims to teach its player the following:

- How to read nutritional labels
- How many calories does a person need
- Why are certain foods unhealthy

Game core

Starvation maze starts with three difficulty options. After choosing one (and optionally playing through the tutorial) the player will be dropped in the dark maze. The area around them is lit up. The size of this area depends on the difficulty chosen. The player will also see a starving person who will tell them what kind of nutrition they need and how much. The player will then walk through the maze encountering different food items. These items will have nutritional info attached and it's up to the player to decide whether to take these items back. Once enough food has been brought back the way to the next level will open.

Figure 2 Rough example of the start of level 1. Red dot is the player, and green face is the starving person

Each level will have a different starving person who has different dietary needs along with each level having a different theme. This could range from certain vitamin deficiencies to being vegan. This will force the player to think about what items to bring back and what not. Once the player enters a level a countdown timer will start. The amount of time a player has per level will also be determined by the difficulty. If the player brings back an item that falls outside of the starving person's diet, they won't eat the food, and a time penalty will be incurred. If the player beats all five levels, they will get a final score. The score is determined by the total amount of time spent in the maze.

For starvation maze the following game pillars where determined: **exploration**, **nutrition** and **rescue**.

The goal for the player is to get through all five levels as quickly as possible while making as few mistakes as possible. If the player runs out of time they lose and will have to go back to level one. If the player saves all five people, they will get a final score. This score will be recorded on a high score board.

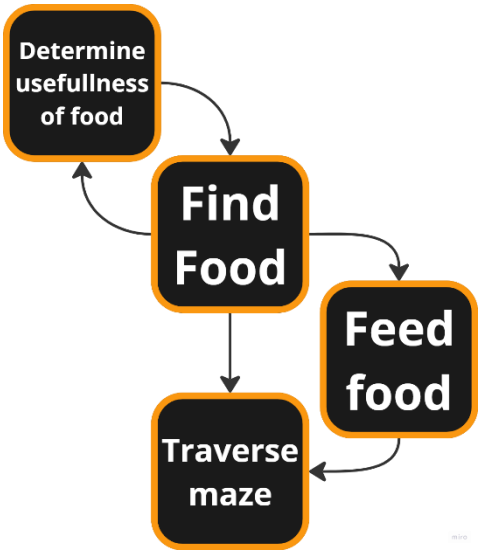


Figure 3 Main game loop of starvation maze

Player motivation

To describe the player's motivation the octalysis model has been used. From this model accomplishment and epic meaning were deemed to have the best fit along with social influence to a lesser extent.

Accomplishment: this motivation is obviously present in the scoring and high score system the game offers. This will encourage players to learn to quickly understand both the starving person and the food items as well as become adept at exploring the maze.

Epic meaning: The goal of the game is for the players to want to save the sad lonely starving person. When they successfully rescue someone, they will be verry grateful and thank the player. This is meant to instill a sense of importance in the players' actions and hopefully makes them want to save more people.

Social influence: As with any game that has an online scoreboard, the player is incentivized to play the game in order to beat their classmates' scores.

Gameplay

Game structure

Starvation maze is a straightforward game where the player linearly progresses through the five levels the game has to offer.

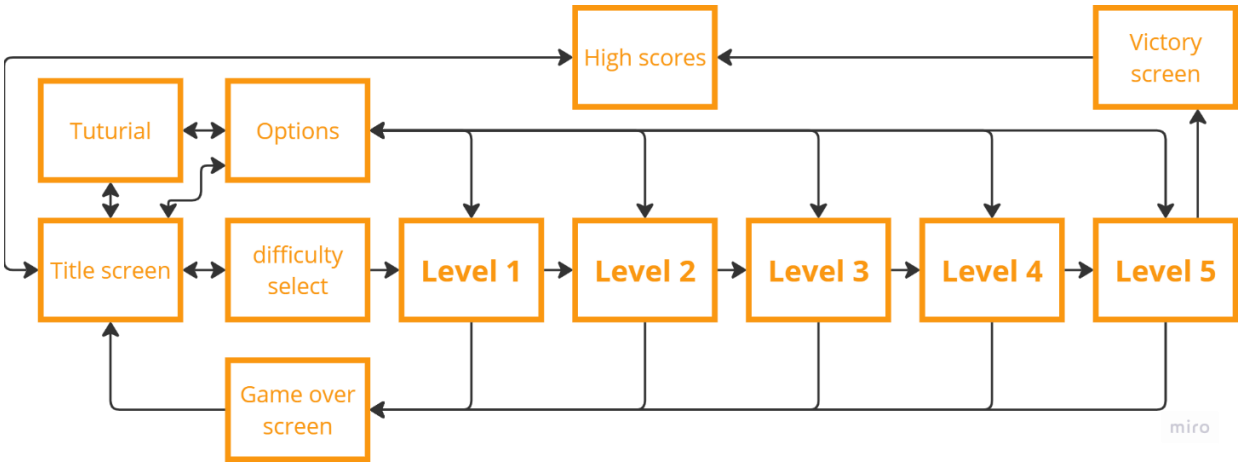


Figure 4 Game structure

The game starts at the title screen. From here the player can either check the high scores, go to the options, play the tutorial or start the game. Starting the game will bring the player to a difficult select screen after which they enter the first level. From each level the player can access the options menu and choose to either return to the level or the title screen (progress is not saved). It is not possible to go back to a previous level. If the player runs out of time during any of the levels, they will get a game over screen and will then be sent back to the title screen. If the player beats all five levels, they will get a victory screen showing how fast they were on each floor along with some miscellaneous info. They will then go to the high score screen to see where they rank and are lastly send beck to the title screen. Below is an example of how a player might beat starvation maze and what the intended points of focus are.

Figure 5 Player journey describing how a player who has never played to game might beat it.

Game start and end

Start: The player starts each of the five levels in a room in the maze. This room contains the starving person. Upon interacting with this person they will some info (e.g. “My name is bob, I’m a vegetarian and so hungry please help me”) A info screen will then appear showing what this person needs. The maze is also filled with food that’s currently out of view for the player. After the player has talked to this person a timer will start counting down. The length of this timer is determined by the chosen difficulty and level the player is on.

End: If time runs out at any point the player will be shown a game over screen and goes back to the main menu. If the player manages to fill all bars before the time runs out the person will thank the player and a hatch to the next level will open. After level five has been beaten the player will get a final stats screen showing how long they took, what foods they fed and what mistakes they made, followed by a high score screen that leads back to the main menu.

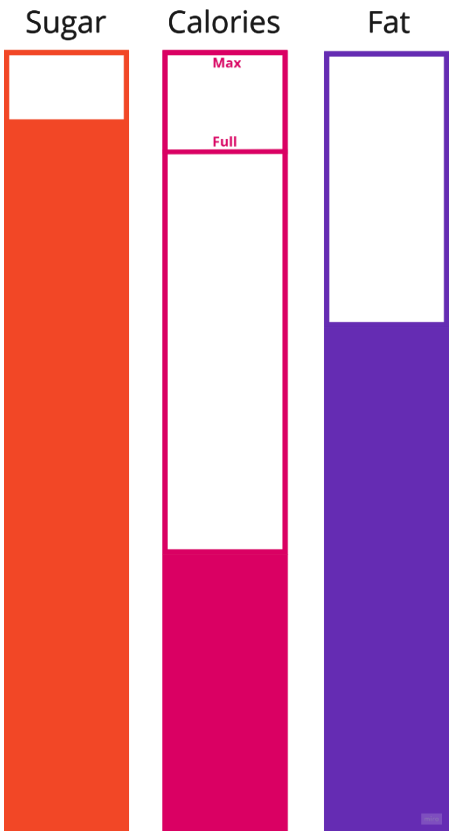
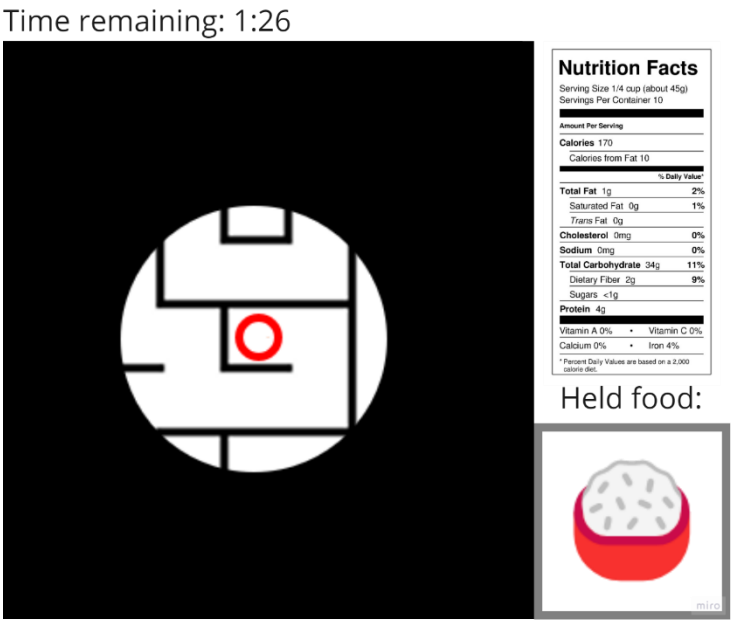


Figure 6 "Bob's" dietary needs

Controls and User interface

The game is controlled with 6 buttons. The arrow keys/WASD are used to move the player character and navigate menus. The Enter is used as the interact/confirm button. This is used for example to talk to the person and to give food. Backspace is the cancel button. This can be used to back out of menus or to drop the food you are holding. Food is picked up by walking over it.



The UI consists of 4 elements. The active screen that the player walks around in. This element contains the player character in the middle with a lit-up area around them. Above this is the timer that’s ticking down. In the bottom right corner is the inventory which shows what food the player is currently holding. Finally, above this is space for the nutrition information of the held food. This is also where the dietary needs of the person show when the player interacts with them.

Features

Level layout

Each of the levels will have a larger and larger maze. For each of these levels five maps are made for a total of 25 maps. The first two and fourth levels are rectangular, with the grid being made up of squares. The size of this maze is measured by height and width. The third maze is hexagonal meaning that the grid is made up of hexagons. The size of these mazes is measured in the distance between a corner and the center. The final maze is circular, meaning the mazes are made up of a circular grid with the cells growing as they go further and further out. The size of these mazes is determined by the diameter of the circle in cells. The base of the player will be in the center of the maze each time. This area is about 2x2 in size and contains the players spawn, a starving person and a closed trapdoor. Scattered throughout the level will be food items (explained in the next section). When the player enters a level one of the five maps is chosen. Each maze will have a different aesthetic. Going from a simple dirt maze to a lava maze.

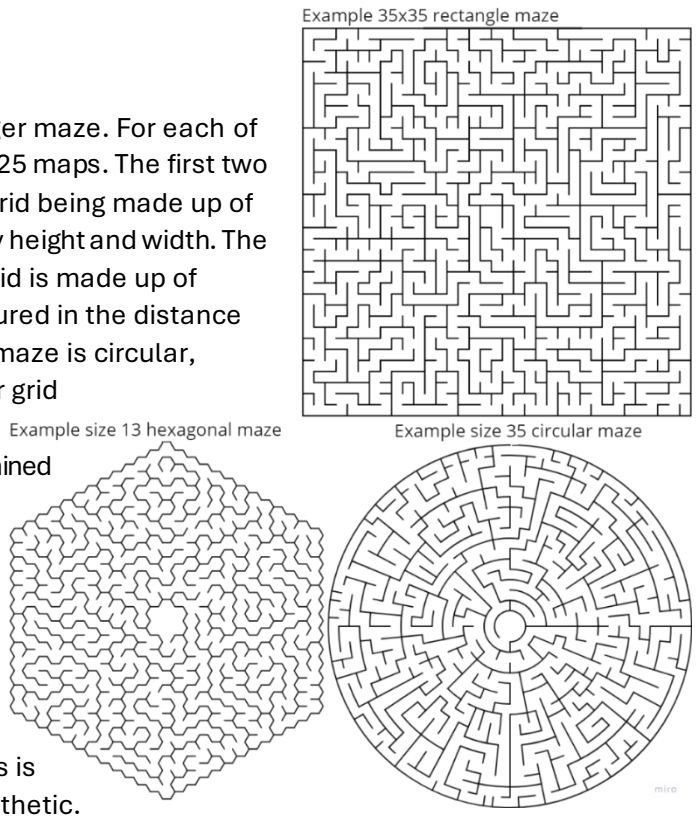


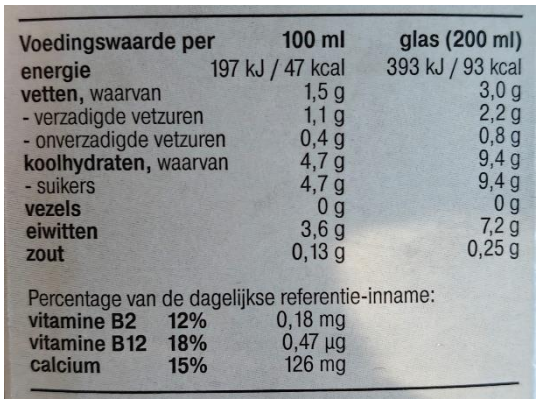
Figure 7 Example mazes using random maze generator

Level	1	2	3	4	5
Size	20*20	25*30	13	30*30	35
Type	Rectangular	Rectangular	Hexagonal	Rectangular	Circular
Aesthetic	Dirt	Overgrown	Cave	Medieval Dungeon	Marble

Starving person

Each level will have someone else who needs the players' help. This person has aesthetic matching to the environment they are in. (e.g. The dirt maze will have a dirty peasant and the marble maze a tired centurion) As the player progresses through the game the needs of these people will change as well. The idea behind the game is to teach the player about these labels. As such the following can be required by the starving person: Energy (in calories), fats, saturated fatty acids, carbohydrates, sugar, protein and salt. Along with these values from the nutrition label the person can also require fluids and fibers.

The person can also have a diet which restricts what can't be eaten. The possible diets will be vegetarian, vegan, lactose intolerant and gluten free. The needs of the person will be shown in bars that need to be filled up. (see figure 4 for a mockup). The amount of food a person needs is based on the weight of the person, their gender and the situation they find themselves in.



Voedingswaarde per	100 ml	glas (200 ml)
energie	197 kJ / 47 kcal	393 kJ / 93 kcal
vetten, waarvan	1,5 g	3,0 g
- verzadigde vetzuren	1,1 g	2,2 g
- onverzadigde vetzuren	0,4 g	0,8 g
koolhydraten, waarvan	4,7 g	9,4 g
- suikers	4,7 g	9,4 g
vezels	0 g	0 g
eiwitten	3,6 g	7,2 g
zout	0,13 g	0,25 g
Percentage van de dagelijkse referentie-inname:		
vitamine B2 **12%**	0,18 mg	
vitamine B12 **18%**	0,47 µg	
calcium **15%**	126 mg	

The values on the bars will show the total amount the person needs per nutrition as well as how much they need per kg and how heavy they are. As well as a factor that it's increased by as the person is starving. Once all bars have been filled the person will thank the player and tell them to proceed to the next level. If a player brings back food that either falls outside of their diet or that doesn't add anything to the required bars the player gets a time penalty of 15 seconds. Furthermore, some of the bars have a "full" point and a "max" point. The player has to fill the bar the full point but can't cross the max. If they do a steeper time penalty of 20 seconds is incurred.

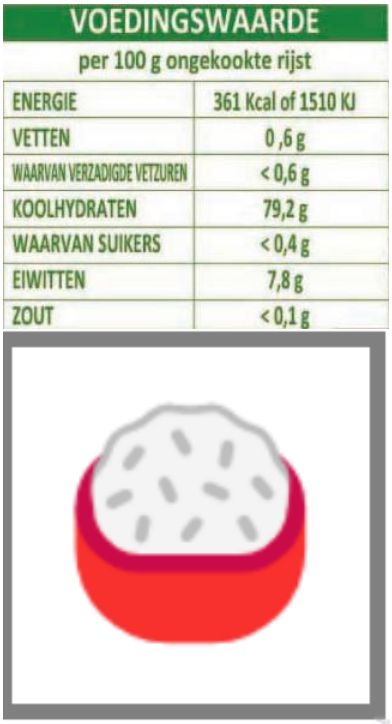


Figure 8 Inventory example with rice as held item

Food items

When a player picks up a food item a nutrition label will pop up on the right of their screen. Here they can see all the items listed out as they should be on an official Dutch nutrition label. The food item will also have a weight/volume attached to it. The player will have to use this along with the "nutrition per 100gr" to determine how much the item will give. Along with this info there might also be some important ingredients listed relevant to specific diets. For example, if the player picks up bread under the label will be a note "contains grain". The player must then put together that grain contains gluten and thus can't be given if a gluten free diet is required. The food items will not be aesthetically matched with the environment. This is to make sure the player is reading real labels that match with the food in real life.

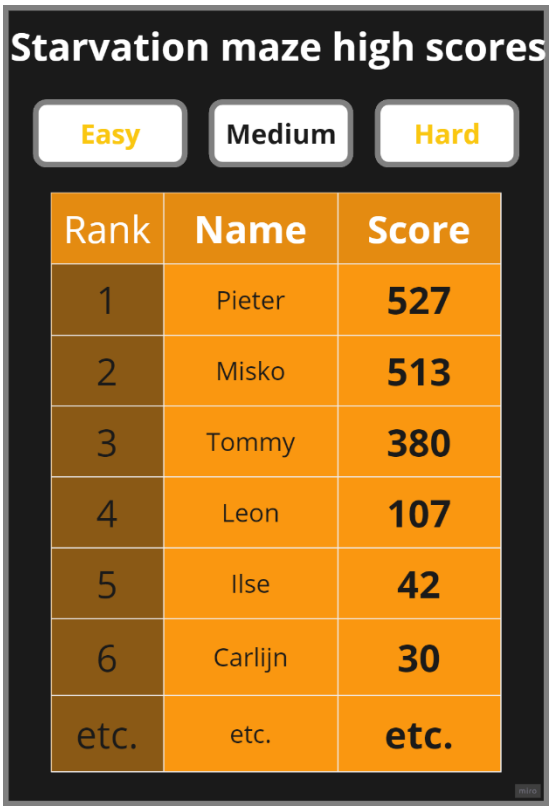


Figure 9 Rough concept for high score screen

Inventory

The player can hold up to one food in their inventory. The properties of the food are shown above it. The player picks up food by walking over it with an empty inventory. If the player has a full inventory the items are swapped instead. The player can also choose to drop an item in their inventory by pressing backspace.

Score

If the player beats the fifth level, they will get a score. The score is based on the sum of the remaining time left on all five levels in seconds. If a player for example had 2:15, 1:49, 0:36, 1:13 and 0:27 remaining then their total score would be 380. Since a player gets a time penalty for bringing the wrong food, they implicitly also get a score penalty, thus this isn't factored into the final score. This score is then listed on the high score board. The scoreboard can be seen at the end of the game and from the home screen. The scoreboard is also subdivided into three separate boards. You get placed on a board according to the difficulty selected before the game.

Difficulty

At the start of the game the player can choose a difficulty. This can be easy, medium or hard. On easy difficulty the player gets an extra 3 minutes per level, and their field of view allows them to see over three walls on the square board. On medium difficulty no extra time is granted and the player can see over two walls. On the hard difficulty the player has one minute taken away on each level and can only see over a single wall.

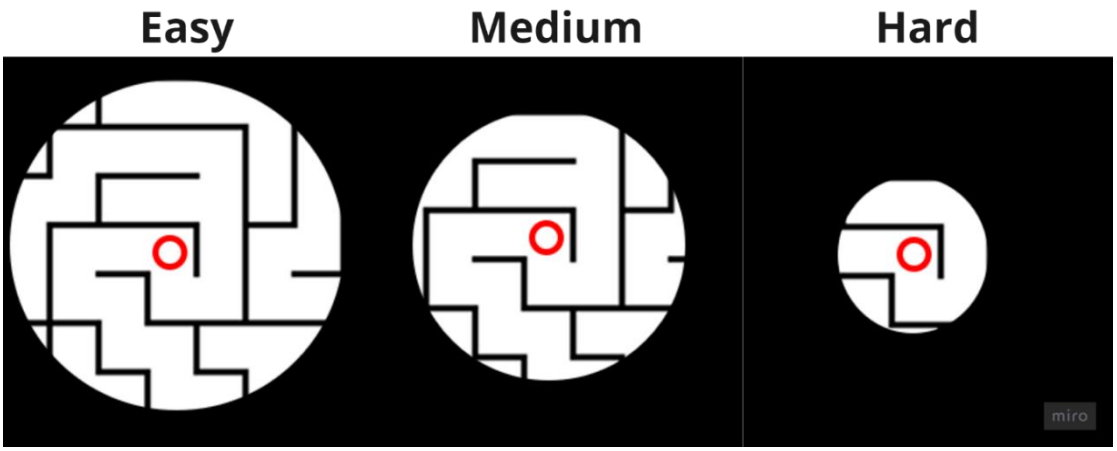


Figure 10 Field of view examples on different difficulties

Tutorial

In the tutorial the player gets a chance to learn about the nutrition label, how the maze works and how to help a starving person. The player will be dropped in a very small maze next to the starving person. Here the game will pause the screen and give some popups to explain the bars that appear when a player is next to the starving person. This explains what kinds of nutrition the player needs to find, how to tell how much more you need and explains that some of them can't exceed the "max" value. The tutorial will tell the player that the goal is to fill those bars up and will point out the dietary part of the interface. Then an arrow will point left guiding the player to their first piece of food as the controls appear on screen. The first food item will be an unhealthy item (e.g. cola). The game will then go over the nutritional label that appears. In these pop-ups the game will explain all the relevant nutrients present on the label. Finally, the game will tell the player to drop this item as the starving person doesn't need it. Next the player will be guided to two pieces of food both of which fit the starving person but one gives too many nutrients (crossing the max threshold if fed) while the other gives the perfect amount. From here there will be no more pop-ups, and the player can finish the tutorial by bringing back either food item. If they bring back the bigger item a pop-up will appear explaining that this would incur a time penalty in the game. After this the tutorial is done and the player will go back to the home screen.

Content

The game has no introduction to the player or explanation for the player being in the maze. The mazes themselves are themed. As the player goes deeper, they will meet people from different time periods who have inexplicably found themselves stuck in the maze. When a player meets a starving person for the first time a small dialog will be started in this the person will talk about how they have no idea how they ended up here and that they are starving. They will ask the player for help and tell them about any restrictions they have. When the player saves them, they are very thankful and open the stairway to the next level.

Characters:

The player:	This is the character the player controls. They are dressed up in a 21st century outfit.
Peasant:	The starving person on lvl1. They look like a beggar from medieval times.
Gardner:	On lvl2 the player will find a gardener in an overall with a hedge shear next to them.
Miner:	In the cave on lvl3 a miner in 19th century clothes with a headlamp can be found.
Knight:	Lvl4 will be home to a knight with sword and shield.
Centurion:	Finally on lvl 5 the player will encounter a roman centurion.

Figure 11 Reference images for starving persons

Learning content

The learning content is present in two places. The first is the starving person. Here the player sees what kinds of foods a person needs and gets insight into what a normal daily intake of different nutrients is. They will also see that products like sugar aren't bad on their own, but that the problem lies in quantity.

The second learning moment comes from the food items. Here the player must do a couple of things. Firstly, they have to find the relevant nutrients on the label. They then must get the actual value by checking the weight against the nutrition, and finally they have to check if the food contains anything that the player can't give to the starving person. This will force them to engage with the label.

The values on the labels will come from real world food labels found in supermarkets and online. The European union also has a website where they detail what a label needs to contain and values that need to be present, this guideline will be followed. For dietary needs the DRV (dietary reference value) is used. The DRV has been created by the European Food Safety Authority to guide lawmakers and nutrition experts in creating healthy diets. For the DRV a calculator has been created which will be used as a guideline for the nutritional needs of the starving people.

Appendix

Feasibility

The project is in its core very simple. It's just a maze with random food items scattered throughout and a place to bring these items to. This means that the core gameplay and logic of the game should be relatively easy to implement. As with any game however there is a lot of room for polishing, making the levels feel cohesive, making creative food items, designing cool maze layouts, etc... The game doesn't feature enemy ai, projectiles, complicated 3d environments or a large story to work out. Because of this it should be relatively easy to deliver a working game within 5-6 weeks that includes all of the important mechanics, with all extra time going into making the game look better, feel better and look better.

List of Educational games

Game	Description
Rocksmith	A game that allows you to learn to play a real guitar trough a game interface
Cell Anatomy Viewer	A game that teaches you about the anatomy of cells in different organisms by having players name various parts of the cells
Combined Multiplications and Coordinates	A visual math problem that needs to be solved on a grid revealing a picture by solving equations and mapping them to a grid
Kerbal space program	A game about getting a rocked into space with some semi realistic orbital and thrust mechanics where you build a rocket ship from scratch and try to get it into space
Capitalism	A business building game where the player opens stores sells products and manages properties
Elevate	An app that includes games about a bunch of different subjects through minigames
Wolf quest	You play as a wolf in Yellowstone Park as you make up part of the ecosystem
Ports of call	In ports of call you run a global trade empire and try to make as much money as possible

Influence of other educational games

Wolf quest uses a very simple and quick tutorial to help get the player up to speed while not sticking around for verry long, I also liked how the tutorial was outside of the main game, so it felt more like you where really getting into the game once you started playing the real game.

Cell viewer uses a nice and stylized art style with colors clearly denoting different cell parts and making the game look nice and pretty, even though they are working with very little. Furthermore, I also liked the clean interface they used.

Kerbal space program is not intended to be an educational game. They nonetheless include a lot of real world items into their otherwise fantastical game. This makes it a lot easier for players to get something out of the game even though a lot of it doesn't apply to our real world. I tried to do something similar with having real food in the fantastical maze.