# Game Outline

The game consists of creatures that swim around in a 2-dimensional world, each of which has the ability to move and shoot. Creatures are controlled either by the player or an AI.

The focus of the game will be to teach year 10 students about the principles of genetic inheritance. It will focus on Mendel's laws, including:

1. **Law of segregation:** Every individual possesses a pair of alleles for a trait, one from each parent chosen at random.
2. **Law of Independent Assortment:** Traits are inherited independently of one another.

The game will also illustrate how dominant and recessive genes are involved in determining the traits of a creature. This will be achieved by having the player's creature be able to steal the DNA of any enemy that it kills. This DNA is then combined with it's own genetic material, producing an offspring that has genes based on the combination of the two DNA sequences.

The game will have various traits that can be inherited. These will be illustrated mostly through the game graphics, such as by changing the way the creature looks. These traits include (but are not limited to):

* **Movement based traits** – affect the movement of the creature, for example:
  + Acceleration
  + Top Speed
* **Attack based traits** – affect the way the creature attacks other creatures, for example:
  + Attack Damage
  + Attack Speed
* **Life based traits** – affect how long a creature will live for, such as:
  + Lifespan
  + Max Health

After the player kills an enemy, they will have a choice of whether of not to acquire their DNA. If the player does, a new creature will spawn. Its characteristics will be calculated based on the DNA of the two parent creatures, with the genes picked at random, and the final traits calculated based on whether the selected genes are recessive or dominant.

The player will be shown the results of the merging of DNA, and then gain control of the newly spawned creature.

# Game Design Elements

# Game physics:

Game physics is implemented using the JBox2d library. This deals with collisions between objects in the game as well as their physical characteristics and behaviour.

This is achieved through the use of BodyDef and FixtureDef objects for each object in the game, which defines its physical attributes, and affects its acceleration, drag, and handling, as well as interactions with other game objects.

# Creature AI:

The game AI is state based, and has the following states:

* **Fleeing** – The creature runs away from other creatures
* **Fighting** – The creature chases and shoots another creature
* **Wandering** – The creature moves randomly around the game world
* **Seek** **DNA** – The creatures looks for and picks up any nearby DNA

Creatures transition to the fleeing state when they are on low health.

A wandering creature will transition to fighting if there is a nearby creature.

A fleeing creature will transition to ‘seek DNA’ if there are no other creatures nearby.

A fighting creature will flee if they are on low health, or wander if there are no more nearby creatures.

# DNA and Genetic Inheritance:

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A creature’s characteristics are defined by its DNA, which is designed to mimic real world DNA. This object consists of various genes, each corresponding to a specific character trait. These genes are composed of two alleles, which determined whether the trait is expressed in the creature or not.

Alleles can be either dominant or recessive, and a gene consisting of two recessive alleles will be expressed, causing the corresponding attribute in the creature to be modified.

For example, if the HealthGene is expressed, the creature has double the base health.

To show these principles in the game, whenever a creature dies, it leaves behind its DNA, which can then be picked up by the player, causing it to be combined with its own DNA, and spawning a child based on the results.

# Game Difficulty:

AI creatures spawn randomly throughout the duration of the game. Initially they are fairly weak, with relatively poor DNA in which only one or two traits are expressed. As the game progresses, stronger AI creatures spawn, with better DNA.

# Game Controls

The game is controlled using the keyboard (arrow keys and WASD keys), the player has an option to change these keys in the settings menu.