



Glue and Goblins

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Fields of Interest: Game Design, Statistics

Brief Overview: Mentees will be learning about the basic principles of game design and building a game of their own as well as playtesting it.

Agenda:

- Module 1: Give it a Chance (5–10 min)
- Module 2: Bored Game! (5 min)
- Module 3: Scratch (35-40 min)
- Module 4: Smarter, Better, Faster, Stronger (10 min)

Main Teaching Goals:

- Randomness
- Game
- Rule
- Fairness
- Obstacle
- Worldbuilding
- Playtesting

Background for Mentors

Module 1

- Randomness
- Probability Distribution

When a fair, six-sided die is rolled, there is **randomness** in what side the die will land on. The outcome of this event is unpredictable and not predetermined.

Probability is the measure of how likely an event is to occur, and it is typically expressed as a number between 0 and 1, where 0 means the event cannot happen, and 1 means the event will happen. Each of the six sides of the die has an equal $\frac{1}{6}$ chance of occurring. The **probability distribution** of the dice rolls is equally distributed among the numbers 1, 2, 3, 4, 5, and 6.

However, if we roll 2 dice, the probability distribution changes: middle values become more likely, and very high or low values become rarer.

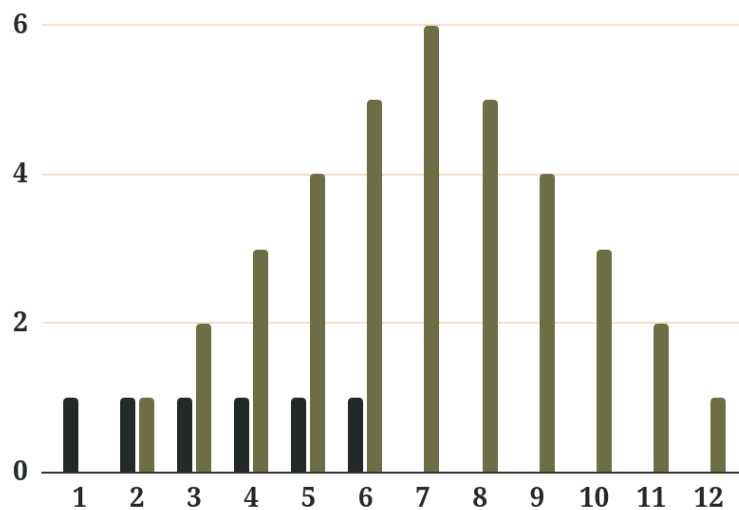


Figure 1: Total number of ways to roll different values with one die and the sum of two dice.

Background for Mentors

Module 2

- Game
- Rules
- Goal
- Boredom

A **game** is some form of play, usually with a set structure of **rules** that restrict what players can do.

Games usually have an objective or **goal** that players try to aim towards. For example, in soccer, the goal is to score goals! In Fortnite, the goal is to survive the longest. In Apples to Apples, it's to get the most green cards.



Figure 1: The goal is a goal

Boredom occurs when something is not fun or interesting. Boredom is healthy as it can allow one to come up with creative ways of not being bored.

Background for Mentors

Module 3 ● Balance ● Fairness ● Obstacle ● Reward ● Worldbuilding ● Currency	Balance is when the game isn't too easy or hard. If it's too easy, then it's boring, if it is too hard, then people will be frustrated. What makes a game balanced can be how long it takes to finish. For example, on average, how many cards does it take to finish Candy Land or how many spins to win Chutes and Ladders? A game where every other tile returns you to the start would be very frustrating! Fairness is when no player has a distinct advantage and everyone can do well. For example, all players should start at the same tile, and luck doesn't instantly cause one to win or lose. Obstacles arise from general game progression, misfortune, or the environment. For example, a bridge troll may require a roll of 5 to 6 to get past. In Chutes and Ladders, chutes send you back down towards the start. Rewards benefit the player, usually for taking some form of risk. An advanced example of this is rolling two dice, but a coin determines if you go forward or backward. Worldbuilding is the general setting and story of the game. Who are the characters? Does it take place in Star Wars? Super Mario Bros? Subway Surfers? Currency is some form of a token/money system. One can earn currency through challenges or luck and spend it on valuable rewards. For example, the money system in Monopoly where you get money from passing the GO square and from people landing on your property.
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Background for Mentors

Module 4 • Playtesting • Debugging	When making a game, oftentimes one can overcomplicate the game with dozens of ideas that may not work well together. Perhaps players misinterpret rules or exploit game mechanics you haven't previously considered. That is why playtesting, playing the game to discover its flaws or imbalances, is vital when designing a game. It allows you to separate what works from what doesn't to make your game more fun! Debugging is the act of identifying flaws or imbalances in your game and fixing them by changing the rules or characteristics or outright removing that game element. For example, maybe the chutes in your Chutes and Ladders game are too punishing, so you take some out.
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Introduction

Questions to Pique Interest

- What types of games do mentees like to play?
 - Board games?
 - Computer games?
 - Card games?
- Why are games fun?
- What would make a game not fun?
- Could a game work without rules?

Be brief to give mentees AS MUCH TIME AS POSSIBLE for their games.

Module 1: Give it a Chance

In this module, mentees will do a quick statistics activity to get themselves familiar with rolling dice.

Teaching Goals

1. **Randomness:** When something doesn't have a predetermined outcome/is unpredictable
2. **Probability Distribution:** A description of the expected values for a random event

Materials

- 2 dice per mentee
- Access to a whiteboard or the provided template

Different Methods for Teaching

1. **Randomness:** Picking Halloween candy, if a mentee closes their eyes, they don't know what candy they're going to get!
2. **Probability Distribution:** Analogies might be difficult for this topic, but a good way to teach this concept is to simply ask how we can get different sums with 2 dice (e.g. only 1 way to get a sum of 2, but 6 ways to get a sum of 7). Compare this with using only 1 die, there's only one way to get each possible number.

Procedure

1. Draw the provided template on a whiteboard if you have access to one. Otherwise, draw directly on the template.
2. Give each mentee 1 die.
3. Have them roll it 3 times and record the value of each roll.
4. Collect class data (combine all dice rolls) and discuss:
 - a. Is one number more represented than the others?
 - b. What would happen if we rolled the die more?
5. Give each mentee another die.
6. Have them roll two dice and record the **sum** of the dice.
7. Repeat 2 more times and record.
8. Collect class data and discuss:
 - a. Is one number more represented than the others?
 - b. What would happen if we rolled the dice more?



Figure 1: A die.



Figure 2: 2 dice!



Figure 3: You diligently recording your class' rolls

Classroom Notes

This could be made into a demo if your site is running low on time.

Module 2: Bored Game!

In this module, mentees will be playing a very boring game.

Teaching Goals

1. **Game:** Playing with rules
2. **Goal:** What the player works towards
3. **Rule:** Restriction on what the player can do
4. **Boredom:** The absence of fun

Materials

- Per mentee:
 - 1 printed board
 - 2 dice from the last module
 - 1 paper cut-out
 - 1 glue dot

Different Methods for Teaching

1. **Game:** Relate this to sports/recess games (this analogy can be used for all Module 2's teaching goals). Mentees will know how it can be frustrating when someone doesn't follow the rules, and we use rules to make sure the game is fair for everyone.
2. **Rule:** Tie it to the classroom! Just like how every student knows the classroom expectations/rules, which are important to make sure the students behave, we have game rules to make sure people have fun!
3. **Boredom:** Have your mentees imagine what it would be like to stare at a blank wall all day and not be able to do anything else. Ask them how they would feel in this setting and relate their feelings to boredom.

Procedure

1. Pass out materials to every mentee, making sure mentees write their name on their game board. **If this is your first site, you can skip the name game/nametags and use this to learn your mentees' names.**
2. Have each mentee make themselves a figure/game piece, by bending the paper as shown in the images below, and add a glue dot in the middle to hold it steady.
3. Have them play the game, where after every roll their figure moves that many places from the start.
4. Ask them if they had fun.

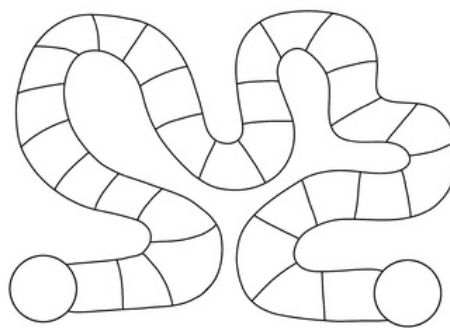
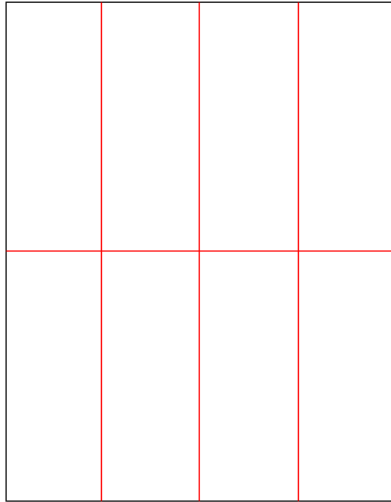


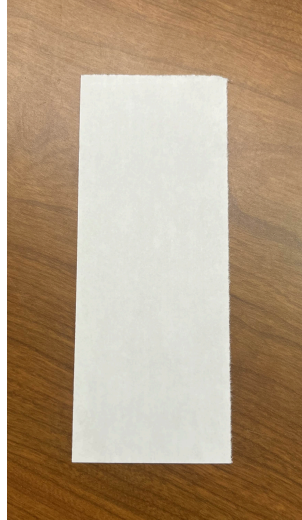
Figure 1: Example board

Classroom Notes

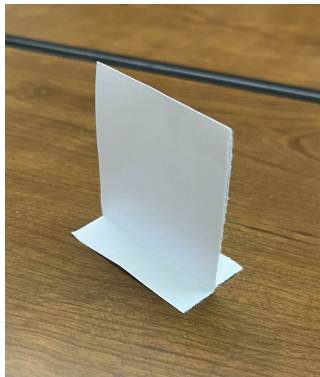
To save even more time, this can be made into a demo.



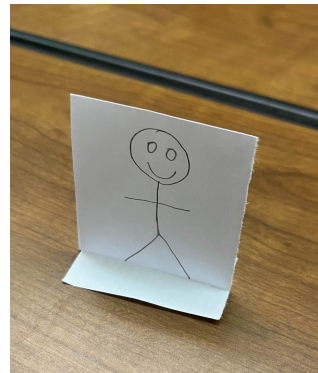
1.



2.



3.



4.

Module 3: Scratch

In this module, mentees will design their own game by adding new mechanics and decorating their board.

Teaching Goals

1. **Balance:** The game being not too easy or hard
2. **Fairness:** No player has a distinct advantage
3. **Obstacle:** Makes the game harder
4. **Reward:** Makes the game easier
5. **Worldbuilding:** Setting of the game
6. **Currency:** Something to earn and spend

Materials

- Per mentee:
 - ½ sheet of blue paper
 - ½ sheet of white paper
 - 8-10 glue dots
- Scissors
- Markers

Different Methods for Teaching

1. **Note:** You don't need to *explicitly* teach the vocabulary in this module; as long as you can teach the ideas that each teaching goal conveys, that's what is important!
2. **Sports / Video Game Analogy:** You can continue to use sports or video games to tie in all of these teaching goals! Possible ideas: soccer, basketball, 4-square, Roblox 😊

Procedure

1. Pass out supplies to mentees.
2. Have them spend a few minutes brainstorming on the blue sheet of paper by drawing or writing out different ideas for making their game more fun.
3. Mentees can either decorate their game with figures like the one in Module 2 **OR** decorate directly on their game board.
4. If mentees are struggling to come up with ideas, provide them with the examples of games seen on the right.
5. Let them have fun!



Figure 1: He Chutes, and He Ladders?



Figure 2: Candy Land



Figure 3: MONOPOLY! A fairly high level example involving resource management, trade-offs, etc.

Classroom Notes

Younger mentees may not have been exposed to that many board games so they'll need more examples! If they're having trouble coming up with ideas, try brainstorming in pairs or in groups with a mentor to help them.

Use the examples you will brainstorm during DeCal!

Module 4: Smarter, Better, Faster, Stronger

In this module, mentees will perfect their games by iterating!

Teaching Goals 1. Playtesting: Playing a game to discover flaws or imbalances 2. Debugging: Fixing those flaws or imbalances	Materials • None!
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Different Methods for Teaching

1. **Playtesting:** Some foods need a lot of time to cook properly. If they are eaten before they are ready, they won't taste that good!
2. **Debugging:**
 - a. Ask mentees what they do when they encounter a problem. Lead them to the idea that when you encounter a problem, you work on a solution to get past the problem. When working on a game mentees can repeat this process of problem solving to perfect their game to be fun and balanced.
 - b. For mentees who have to write essays / personal narratives, they might have their teachers proofread them to correct spelling/grammar mistakes. Similarly, we might ask our friends to play our game to see if there are any issues.

Procedure

1. Have mentees play their games in pairs or by themselves
2. Have them talk with a partner or a mentor about what worked in their game and what didn't
3. Iterate! Have them make changes to the game to make it better
4. Let them bring their game **AND DICE** home so they can continue playtesting!



Figure 1: Your mentees playtesting

Classroom Notes

This module doesn't need to be very separated from Module 3 as they'll still be modifying and building their game. **Leave as much time for the mentees to work on their games as possible.**

Conclusion

Make sure mentees take **everything** home with them, including their **games, pieces, and dice.**