Let's Play !

Probability and decision making through games

Claire Benton

Middle grades 6th through 8th

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Introduction

Rationale

Why are the skills, content, and concepts presented in this unit important for students to learn?

Rationale

In this unit, students will get to view the games they love to play through the lens of probability. They will learn how to calculate the probability of desired outcomes through card and dice games and apply these concepts to all other card/board games. Students will also get to analyze strategies they naturally use in games with a perspective of probability.

The skills taught in this lesson such as calculating the probability of an outcome and using probability to create a strategy, are skills that students already subconsciously use, but may not have been explicitly taught. Teaching probability through the guides of decision making found in games is important to learn because probability is found in all decision making. Learning probability, and how to create strategy from it, is the building block to students being informed and well thought out decision makers. Understanding probability and strategy through games can also allow students to master intentionality while having fun. Making calculated choices in games promotes calculated choices in real life; which can create an overall more thoughtful and cognoscente learner. "An understanding of probability theory is essential to understand such things as politics, weather reports, genetics, sports, and insurance policies" (Why teach probability in the elementary school classroom F. Tylor)

Differentiation for Gifted Learners

In particular, the content of this lesson, probability with real world scenarios also known as game probability, is higher level concept that is not introduced until Math II in the Common Core State standards. For a standard level student, Math II is normally taken in the 10th grade.

Coming in, most middle schoolers have already been exposed to standard probability; the idea that you can find the likelihood of an outcome by the formula.

probability = number of out comes of anevent/number of all outcomes .

By building on their previous knowledge sooner than 9th or sometimes 8th grade, students are allowed to stretch this basic concept of probability to a more complex situation such as game probability. Game probability adds on to basic probability by adding in the concepts of random selection, replacement, non-replacement, union, and intersection . This acceleration, while talking about games, provides 6th - 8th gifted learners with the knowledge needed to give probability relevance. It also gives gifted students a mathematical process for decision making and shows them the prevalence of probability.

Description of population of gifted children for whom it is intended

To get the most out of the Let's Play unit, students must be competitive in nature and have a drive to figure out how to win most games. What makes this unit unique is that, it is teaching an advanced concept with a very low academic threshold, allowing students to have very unique entry points into the content. It also can be taught across all socioeconomic levels. Students simply have an

interest for card or board games to understand probability theory. Luckily, in almost every culture, people play games, which gives everyone the foundation to this unit.

Students should be gifted in math and should have not yet taken Common Core Math II. Students who learn this unit would enjoy it the most if they have an intensity about understanding "why", easily pick up on patterns and quickly draw parallels between mathematical patterns and real life situations. They should also "desire to organize people/things through games or complex schemas" (Webb, Gore, Ahmed, & Deries, "Common Characteristics of Gifted Individuals"). This will allow students to quickly use strategies based off probability in order to win a game. "A more linear approach to mathematics is often a better match for gifted children instead of the spiral curricula often found in textbook series and followed by classroom teachers" (Rotigel & Fello, "Mathematically Gifted Students: How Can We Meet Their Needs?", 2004, pp. 46-51). Let's Play Unit provides students with a linear approach to probability outside of the standard curriculum and allows students to go deeper into probability sooner.

Goals and Outcomes

Content Goal

Goal 1: To develop students understanding of probability

Outcomes

Students will be able to….

1. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring (7.SP.5)
2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.(CCSS.MATH.CONTENT.HSS.CP.A.2)
3. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. (CCSS.MATH.CONTENT.HSS.CP.A.5)

Process Goal

Goal 2: To develop strategy based on probability

Process Outcomes

Students will be able to….

Analyze decisions and strategies using probability concepts
(CCSS.MATH.CONTENT.HSS.MD.B.7)

Concept Goal

Goal 3: To understand the concept of strategy

Concept Outcomes

Students will be able to….

1. Look for and express regularity in repeated reasoning (CC High School: Stats & Probability Mathematical practice)
2. Use appropriate tools strategically. (CC High School: Stats & Probability Mathematical practice)
3. Reason abstractly and quantitatively. (CC High School: Stats & Probability Mathematical practice)

Assessment Plan

What evidence will show that students understand? Describe formative assessments and summative assessment (performance task) that will be used to monitor student progress in meeting established goals throughout unit. Include student work samples (copies and/or photos) that demonstrate student content knowledge, skill development, and understanding of the unit's concept.

Formative assessment

To check for student understanding, probability checks are embedded after each game. In the Lesson plan, after we talk about a game as a class, I have planned questions to probe the probability, outcomes, and strategy used to win each game. After Day 1, students have the mathematical know how to calculate situational probability of almost all controlled outcomes in a game including cards and dice. Some of these questions include:

- What strategy can you use in a card game based on probability? (Day 1)
- How can replacement of card in a deck, according to probability, change your strategy? (Day 1)
- Assuming there are 4 players what is the probability that in the second round of throwing out cards, meaning everyone has thrown out once, the 2nd and 3rd player both throw out a Queen? (Day 1)
- What is the probability of him NOT drawing a 4 (without cheating) AND you winning.? (Day 2)
- When do moral decisions have a low probability of playing out as desired?(Day 2)
- How does probability influence strategy for each game we have learned so far? (Day 3)
- Which games have similar strategy to win and why? (Day 3)
- How likely is it that a player will win 2 times in a row?(Day4)
- How does probability influence strategy in your game? (Day 4)

Summative Assessment:

Students required to complete a performance task that requires them to create a brand new, never played before card or board game. In the performance task, students are game creators and must present their game to a gaming association so that they can add it to their raptor as a tournament. In the project students must include:

1.
    1. The objective
    2. How to play
    3. Who wins
    4. Rules and Regulations
    5. Materials needed to play
    6. Strategy to win

Below is the link to the performance task and accompanying pictures.

Summative Assesment link

TEACHER NAME
Claire Benton

GRADE LEVEL
Math 6th-8th

NC CURRICULUM STANDARDS
7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. 7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

CONCEPT
Strategy

ESSENTIAL UNDERSTANDING
Probability influences strategy?

ESSENTIAL QUESTION
How does probability influence strategy?

CRITICAL CONTENT - Students will know that...

- The probability of a chance event is a number between 0 and 1.
- Theoretical and experimental probabilities and proportional reasoning are used to make predictions. modeling real world experiments through trials and simulations are used to predict the probability of a given event.
- Chance has no memory. For repeated trials of a simple experiment, the outcome of prior trials has no impact on the next.
- The difference between compound events joined by the word "and" and the word "or".
- The difference between dependent and independent events.

PROCESS SKILLS - Students will be able to...

- Analyze data with inferential statistics
- Prepare tables, graphs, and diagrams
- Draw conclusions and make generalizations
- Make informed decisions
- Distinguish relationships
- Predict

MATERIALS

- 6 sets of playing cards
- Probability hand out
- Gold fish Guru chain
- Projector with computer
- Blank paper
- Extra pencils
- Pre types gold fish questions
- Pre types assessment questions

GUIDING QUESTIONS

Pre-Lesson Questions	During Lesson Questions	Post Lesson Question

Why did you choose this class?
What about the blurb made you interested in coming this class?
What are you hoping to learn?
At the end, What do you hope to be able to do ?
What is probability?
What is a synonym for probability?
What is strategy?
What is a synonym for strategy?
Where have you seen probability?
When do we use probability?
Where have you seen strategy?
When do we use strategy?

How do your groups of 4 differ from your groups of 3?
How do your groups of 4 differ from your groups of 3?
How did regrouping make you rethink one of the words listed?
How do your group names help define the words in the group?
What relationships did you notice between the groups?
What was different about the groups?
What was a common thread between the groups?
What did your groups say about winning?
How do you win the game? Who goes first?
When does the game end?
How do you know when to get a card from the deck?
What is a deck?
What if there are no more cards in the deck?
How do you get out of the game?
Who won the 2nd game?
How did they win?
How did they use strategy to win? How does luck play a factor in winning?
How probable was it that he/she won?
How can understanding probability help win card games?
How can calculating probability help you win Go fish?
What strategy can you use in a card game based on probability?
How can replacement of card in a deck, according to probability, change your strategy?

How does the probability change when you to take the Jokers out of the deck?
How Does starting with different amounts affect the probability of winning?
How Does starting with different amounts of cards effect strategy?
How probable was getting two cards back to back
What strategy could you use if you ran out of cards?
What patterns did you notice in player strategy
What strategy could you use to make sure someone stays out of the game?
What strategy did the game maker use by only allowing face cards to have special rules?
What strategy did the game maker use by allowing "slap" rules in the game?
How did the probability of putting out a face card change your strategy?
How does probability effect strategy?
Evaluation questions:
What is the probability that the first card that is played will be a face card?
Assuming there are 4 players, what is the probability that the fourth person will play a King on their first try?
Assuming there are 4 players what is the probability that in the second round of throwing out cards, meaning everyone has thrown out once, the 2nd and 3rd player both throw out a Queen?
What is the probability that after 4 rounds, no face cards have been played?

		After 7 rounds of how likely is it that no face cards have been played?
		How did probability effect strategy as you were trying to win ERS?

Engage and Connect

As students are walking in have a scene from Fortnight battle royal Playing:

Teacher Intro: Before starting the lesson take the time to do a teacher introduction. Be sure to speak about why you are here and some of your personal interests. This helps when connecting as you will only have 4 days with the students. After introducing yourself, have each student stand up tell their name and something interesting about their self.

Classroom expectations: Set simple and positive expectations for the class. Listen, Laugh and Learn

Listen: To your neighbor, to your instincts and the instructor

Laugh: Have fun! Learning is about sharing an experience

Learn: Take the time to put aside what you may already know in order to discover new things

Open up the class to a discussion, ask the following questions:

Why did you choose this class?

What about the blurb made you interested in coming this class?

What are you hoping to learn?

At the end, What do you hope to be able to do?

What is probability?

What is a synonym for probability?

What is strategy?

What is a synonym for strategy?

Where have you seen probability?

When do we use probability?

Where have you seen strategy?

When do we use strategy?

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Getting to the essential question (Taba): Give each student a computer have the article the mathematically proven winning strategy for 14 of the most popular games pulled up.

Student Directions:

> Look through 2 to 3 game explanations and As you read the article(s), highlight or underline words or phrases that have to do with/are related to Strategy.

Give students 20 minutes to close read.

Have students call out their article findings and list them on the board. Ask students: How did math aid in winning?

After listing all student responses, direct students to their predetermined partners and have them to put all of our findings into four groups based off of things they have in common.

Before asking for student feedback, have students give each of the 4 groups they created a name. Now, take the time to have a discussion about their label choices. Write down each group labels on the board.

Ask each group to take the same article finding and create 3 categories instead of 4 and give them new titles. Students may not repeat any of the first 4 category names. Give students 10-15 minutes then have them share. Record the new grouping names on the board. Ask the students:

How do your groups of 4 differ from your groups of 3?

Are there some words that could fit into multiple groups?

How did regrouping make you rethink one of the words listed?

How do your group names help define the words in the group?

What relationships did you notice between the groups?

What was different about the groups?

What was a common thread between the groups?

What did your groups say about winning?

Explore

Split students up into 6 groups of 3 and sit them at 6 different tables in preparation for the game of Go Fish!

Before playing have students make name cards. On the name card, students should have an adjective + their name. For example, "Clever Claire". Have your name tag already made as an example. Give them about 10 minutes to decorate their name cards and get to know their neighbors.

Now pass out cards. Ask students:

How do you play the card game of Gold Fish?

If a student knows have him /her be the "Gold Fish Guru". Be sure to give him the Guru chain, big paper fish with a chain on it, as the student is explaining. Have all of the students gather around one table (or look at the board, whichever is most fitting) as the "Guru" is explaining. The teacher may have to help by asking pertinent questions for clarity during the lesson such as:

How do you win the game?

Who goes first?

When does the game end?

How do you know when to get a card from the deck?

What is a deck?

What if there are no more cards in the deck?

How do you get out of the game?

After the student has completed their explanation, it's time to play! Have students begin playing. Facilitators must walk around to observe and ask questions. As you are walking around, look for students who are naturally competitive, have trouble picking up strategy, pick up the game quick and other indicators of gaming level or confidence. This will help you guide the class and be more deliberate about groups in the coming days.

After each group's second round of goldfish have them individually answer the following questions (have the handout ready):

Who won the 2nd game?

How did they win?

How did they use strategy to win?

Does luck play a factor in winning?

How probable was it that he/she won?

Explain

Intro to probability: Now you will go into teaching probability using cards.

Specific Worksheet to follow. In this portion student will learn:

- **The make-up of a deck of cards and vocabulary**- Face card, King, Queen, Jack, 52 cards in a deck, 4 suits, Diamond, club, spade, hearts, 2 Jokers, Ace is viewed as 1, Order of cards, High card, low card.
- **Probability terms and calculations-** chance, and, or, possible outcomes, event. In probability 1= 100% that's the best outcome you can have, 0 is the lowest, *probability=* (event possible/outsomes) , replacement, without replacement, in probabilities one turn (add), probabilities in two different turns (multiply).
- **Questions to drill mathematical understanding (10)-** Examples: What is the probability you

will draw two kings without replacement? What is the probability you draw a 6, then the next player draws a face card after you, assuming there is no replacement?

Ask the students:

How can understanding probability help win card games?

How can calculating probability help you win Go fish?

What strategy can you use in a card game based on probability?

How can replacement of card in a deck, according to probability, change your strategy?

Elaborate

Game instructions: https://www.youtube.com/watch?v=1p0J0cjX48Y

Now that students have an understanding of probability They will learn a new card game called Egyptian Rat Slap (Originally Egyptian rat screw)

Start video at 20 and write down face card and slap instructions on the board.

After the video Have the students gather around as you play a 5 min example game with 3 other students. Then send the students back to their desks to play. At this point, you can regroup the students however you see fit. This will also allow them to get to know other people than in their first group.

Let the students finish a complete game. If a group finishing a game quickly they can play again. After everyone is done, have the students turn back in for a classroom discussion

Ask students:

How does the probability change when you to take the Jokers out of the deck?

How does starting with different amounts affect the probability of winning?

How does starting with different amounts of cards effect personal strategy?

How likely was getting two cards back to back?

What strategy could you use if you ran out of cards?

What patterns did you notice?

What strategy could you use to make sure someone stays out of the game?

What strategy did the game maker use by only allowing face cards to have special rules?

What strategy did the game maker use by allowing "slap" rules in the game?

How did the probability of putting out a face card change your strategy?

How does probability effect strategy?

Evaluate:

Now apply probability to Egyptian rat Slap with the following questions. Give the students a worksheet with these question already typed and have them complete it.

What is the probability that the first card that is played will be a face card?

Assuming there are 4 players, what is the probability that the fourth person will play a King on their first try?

Assuming there are 4 players what is the probability that in the second round of throwing out cards, meaning everyone has thrown out once, the 2nd and 3rd player both throw out a Queen?

What is the probability that after 4 rounds, no face cards have been played?

After 7 rounds of how likely is it that no face cards have been played?

DIFFERENTIATION

CONTENT
Probability (Advancement of curriculum) Along with teaching the probability basics outlined, give students probability math notation and have them explore the game theory that goes along with it. This would cover: mutually exclusive results Non- exclusive results Expected valueThe Gambler's Fallacy Notating odds (using x and y) http://www.leagueofgamemakers.com/probability-for-game-designers/

PROCESS

PRODUCT

LEARNING ENVIRONMENT

TEACHER NAME

Claire Benton

GRADE LEVEL

6-8

NC CURRICULUM STANDARDS

CCSS.ELA-LITERACY.SL.6.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

12.R.1.1 Compare various perspectives in the field of psychology
12.D.1 Understand human differences and strategies for coping when those differences create dysfunction.

7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.

7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation

CONCEPT

Strategy

ESSENTIAL UNDERSTANDING

Probability influences strategy

ESSENTIAL QUESTION

How does probability influence strategy?

CRITICAL CONTENT - Students will know that...

- Students will know that characters moral development may impact their decisions when considering strategy.
- Students will know that moral dilemmas while gaming can be conducive to engagement.
- Students will know that strategy is essential to solving moral dilemmas while gaming.
- Theoretical and experimental probabilities and proportional reasoning are used to make predictions.
- Students will know that tools such as cards and dice are used in gaming to demonstrate probability in relation to real life situations
-
- modeling real world experiments through trials and simulations are used to predict the probability of a given event.

PROCESS SKILLS - Students will be able to...

- Analyze the strategy of Moral Dilemma
- Compare and contrast
- Infer characters moral development
- Create moral dilemmas
- Analyze data with inferential statistics

MATERIALS

GUIDING QUESTIONS

Pre-Lesson Questions	During Lesson Questions	Post Lesson Question
- What's your favorite game? - What stuck out to you from yesterday's lesson? - Who has seen the new Jumanji movie? - What elements of strategy were represented in the plot of the movie? - How did probability affect the main characters? - What was the game about? - How do they use strategy to win the game? - What improbable things happened to help them win? - How did probability play a factor in them winning?	- Why should each character have set skills? - Why should each character have at least 1 weakness? - What strategies can the characters use based on their strengths and weaknesses? - How can the characters use probability to accomplish tasks? - What strategy did the game maker use by making professor Braveheart have no weaknesses? - How can considering probability based on strengths be used to an advantage? - What strategy did Dr. Braveheart use? - How did probability play a role in his decision? - What other strategies could he have used? - What about the strategy he used was morally sound? - Why did you decide to keep or change the strategy? - Who will your created strategy effect? - Which stages did we most frequently go to? - How did morals guide Dr. Bravestone's strategy? - What about this dilemma required probability to solve? - What strategy would you promote to solve this dilemma?	- Different scenario: What is the likely hood of Player 3 plucking a 4 without cheating? - Different Scenario: What is the probability of him NOT drawing a 4 (without cheating) AND you winning.? - How does probability influence strategy? - How does probability influence moral decisions? - How does moral decision making influence strategies? - When do moral decisions have a low probability of playing out as desired? - Why does making the "right" decision not have 100% chance of playing out how you desired? - Where does making decisions have a 100% chance of getting a desired outcome? - How does probability influence strategy?

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Intro: Take this time to recap yesterday's lesson and get students mingling.

Opener: Find a person you didn't get to talk to yesterday. Tell them 1) Your name including your adjective 2) Your favorite game (video, board, etc.) 3) what stuck out to you the most from yesterday. Get ready to tell the class about your new friend!

For this Opener make sure you and your assistant participate as well.

Pull out the cards, time to play Egyptian Rat Slap! Number the students off by 4's to divide them into game groups. Its ok if some groups have more or less. Let each group play 2 rounds.

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Now you will introduce the game/movie of Jumanji (2017) to the class. Ask the class:

Who has seen the new Jumanji Movie?

Choose a student, different from the previous day, and make them the Jumanji guru. Give them the guru chain, a paper rhino with the chain on it. Ask them to explain the movie. You may have to ask the following questions to re-direct them to the probability and strategic aspect of it.

What elements of strategy were represented in the plot of the movie?

How did probability affect the main characters?

What was the game about?

How do they use strategy to win the game?

What improbable things happened to help them win?

How did probability play a factor in them winning?

Play the clip of Jumanji. Stop at 1:06 due to inappropriate content.

Jumanji: https://www.youtube.com/watch?v=EjcP49I5Hig

Have a sheet with the 4 characters' strengths and weaknesses outlined. Asked the following questions:

Why should each character have set skills?

Why should each character have at least one weakness?

What strategies can the character's use based on their strengths and weaknesses?

How can the characters use probability to accomplish tasks?

What strategy did the game maker use by making professor Braveheart have no weaknesses?

How can considering probability based on strengths be used to an advantage?

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

Moral discussion about probability

Teacher: Here is another clip that I found interesting

Play the below video clip below stop the video at 2:00 because of foul language

https://youtu.be/w5yJV_TKOWg

Ask the following questions:

What strategy did Dr. Braveheart use?

How did probability play a role in his decision?

What other strategies could he have used?

What about the strategy he used morally sound?

Direct the students:

After watching the clip the students will be asked to agree or disagree with Dr. Bravehart's strategy, explain why? Be sure to write down your answer clearly so that you can compare and contrast with your peers.

Elaborate—*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways*

Place students in groups of 3 or 4 by likeness (all agrees together, all disagrees together) have them, as a group, come with a strong argument based on their opinion. Be sure to tell them to examine the perspectives of the main character as well as other characters as it relates to this dilemma.

Bring the class back together and ask the following question:

After discussing all the perspectives of this event, why did you decide to agree or disagree with Dr. Bravehart's strategy?

Teacher: Explain Kohlberg's stages of moral development. Give out handout on it.

Have the students decide **which stage their decision matched to** [AG2] their group decision matched to and explain why. Have the students write their solution on a sticky note and place it on a pre-made poster with the titles of the 6 stages of moral development where it belongs.

Have a class discussion about the trends we may see amongst the places we placed our sticky notes.

Ask the class the following questions:

1. How did morals guide Dr. Braveston's strategy?
2. What about this dilemma required probability to solve?
3. What strategy would you promote to solve this dilemma?

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Present the Go Fish Moral dilemma and have the students write down the answers to the following questions. You can have a sheet with the questions preprinted for your convenience.

1. Create 6 responses and explanations to this dilemma, each one representing one of Kohlberg's stages
2. Assume in this Go fish game there were 4 players and the jokers had been taken out of the stack. You had the 4 of spades, the previous player picked up the 4 of hearts, and no 4 pairs had been made. Also, 12 pairs had been made between all the players, Player 1 had 5 cards, Player 2 had 3 cards, Player 3 (the previous player) had 5 cards BEFORE plucking the 4 of hearts. What was the likely hood of you winning on this turn without the previous player cheating assuming the card on top of the deck was not a 4. You may use a table of graph to help.
3. Different scenario: What is the likelihood of Player 3 plucking a 4 without cheating.
4. Different Scenario: What is the probability of him NOT drawing a 4 (without cheating) AND you winning.
5. How does probability influence strategy?

Post Lesson questions:

- How does probability influence moral decisions?
- How does moral decision making influence strategies?
- When do moral decisions have a low probability of playing out as desired?
- Why does making the "right" decision not have 100% chance of playing out how you desired?
- Where does making decisions have a 100% chance of getting the desired outcome?
- How does probability influence strategy?

ASSESSMENTS

Present the Go Fish Moral dilemma and have the students write down the answers to the following questions. You can have a sheet with the questions preprinted for your convenience.

1. Create 6 responses and explanations to this dilemma, each one representing one of Kohlberg's stages

2. Assume in this Go fish game there were 4 players and the jokers had been taken out of the stack. You had the 4 of spades, the previous player picked up the 4 of hearts, and no 4 pairs had been made. Also, 12 pairs had been made between all the players, Player 1 had 5 cards, Player 2 had 3 cards, Player 3 (the previous player) had 5 cards BEFORE plucking the 4 of hearts. What was the likely hood of you winning on this turn without the previous player cheating assuming the card on top of the deck was not a 4.

3. Different scenario: What is the likely hood of Player 3 plucking a 4 without cheating.

4. Different Scenario: What is the probability of him NOT drawing a 4 (without cheating) AND you winning.

5. How does probability influence strategy?

Go Fish Moral Dilemma

In a game of Go Fish, you have 1 card left, a black 4, and it's about to be your turn. The player before you asks another player if he has a 9 and he replies "Go Fish". As the player before you plucks, the cards slide on accident and you notice that he did not pick the card on top but one of the ones that slid off the deck and you see that it is a black 4. Do you call the player before you out for noting picking the card on top?

DIFFERENTIATION

CONTENT

PROCESS

PRODUCT

Having students answer above grade level probability scenarios in the Assesment portion of the lesson plan

LEARNING ENVIRONMENT

TEACHER NAME
Claire Benton

GRADE LEVEL
Math 6t-8th

NC CURRICULUM STANDARDS

7.C.1

Understand how cultural values influence relationships between individuals, groups and political entities in modern societies and regions

6.C.1

Explain how the behaviors and practices of individuals and groups influenced societies, civilizations and regions.

CCSS.ELA-LITERACY.RI.6.1

Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

CCSS.ELA-LITERACY.RI.6.8

Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

CCSS.ELA-LITERACY.SL.6.1

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

CCSS.ELA-LITERACY.SL.6.1.A

Come to discussions prepared, having read or studied required material; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.

CONCEPT
Strategy

ESSENTIAL UNDERSTANDING
Probability Promotes Strategy

ESSENTIAL QUESTION
How does probability promote strategy?

CRITICAL CONTENT - Students will know that...

- Arranged marriages happen / what is an arranged marriage
- Strategy from real-world situations is often also game strategy.
- Culture influences games

PROCESS SKILLS - Students will be able to...

- Analyze a text
- Infer truths
- Critique methods
- Draw conclusions

MATERIALS

- The article: Darkness Masked in Lightness': the designer using a board game to avoid arranged marriage" for every student with questions for thought. Copy of the abbreviated article here.
- Essential question ready to display
- Pre-made Organizer for steps of the Socratic method on a large sheet of paper
- Ticket out the door (table)

GUIDING QUESTIONS

Pre-Lesson Questions	During Lesson Questions	Post Lesson Question

Sometimes true, always true or never true statements (refer to plan):

- Probability of an event changes with the number of possible outcomes.
- The probability of an event can be a negative number if it is almost impossible.
- Probability helps you win.
- Winning Egyptian rat slap is strictly luck.
- Go fish requires thinking less than Egyptian rat slap
- Morals guide decisions
- People who steal have no morals
- Probability sways morals
- People who strategize to win consider probability
- Probability is a strategy Probability influences strategy

- ## What is an arranged marriage?
- What can we do to fully execute this step of Socratic seminar?
- What can you do while reading to prepare you for conversation?
- How can you use your reading to help you consider a question?
- How can we have productive class conversation?
- Who would use the strategy of an arranged marriage?
- Why was the strategy of an arranged marriage created?
- How does probability play a part in the culture of arranged marriages?
- What strategies does cultures use to create a sense of urgency around arranged marriages?
- Based off of Nashra's account, what strategies could she use to help her get married quicker?
- What strategy would Nashra create as opposed to an arranged marriage?
- What strategies does Nashra create to not get married?
- How does probability influence Nashar's decisions?
- What strategies are similar between Nashra's life experiences with arranged marriages and the game she created?
- What games rules did Nashra create to reflect probability?
- Why do you believe her real-life strategies could easily be used as creative inspiration for a game?
- What do any two of these games have in common?
- Which games have similar strategy to win and why?
- Which games have different strategies to win and why?
- How does the strategy in Nasher's game compare to the strategy in Jumanji?
- How is the probability in Go fish compare to the probability is Nasher's game?

- How does probability influence strategy for each game we have learned so far? (Refer to lesson)

| | Which of these are closes to your created game in strategy and why? Which of these games are closer to your game in probability and why ? | |

Engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Intro: Icebreaker

To continue to build community in the class have the class play an icebreaker name game with their adjectives. Split the class up into 2 groups, 1 big group if it is small enough, and grab a hand-sized ball. Have the first student throw the ball to any student in the circle, but before tossing it they must say the person's adjective and name "Crazy Claire". This continues around the circle until everybody has gone and it gets back to the original person. Once they have completed it the first time, instruct the class to do it again, in the same path, but speed it up. Now it is a race for speed! Have the students repeat it 3 or 4 more times, each round, time them to see if they can beat there previous time. If it is 2 groups, you can make it a competition.

Information Recall: 3 corners

Label 3 corners of the room as always true, never true, and sometimes true. Call out the following statements, based off the first two lessons and have the students move based on what they believe. Have 1-2 students give their opinion after each round.

Probability of an event changes with the number of possible outcomes.

The probability of an event can be a negative number if it is almost impossible.

Probability helps you win.
Winning Egyptian rat slap is strictly luck.
Go fish requires thinking less than Egyptian rat slap
Morals guide decisions
People who steal have no morals
Probability sways morals
People who strategize to win consider probability
Probability is a strategy

Probability influences strategy

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Now that we have recalled and got warmed up for the day, we can break into our Socratic seminar. Began by explaining to the students that we are going to participate in Socratic seminar.

"Socratics Seminar is a way to dig deeper into a reading by holding a constructive and thought-provoking conversation about it. Today's reading will be Darkness masked in lightness: using a board game to avoid

arranged marriage. In Socratic Seminar, there are 3 steps, 1. Preparing for conversation, 2.considering the question, and 3.Digging into text through conversation."

You can create the Table, write all three steps across the top of the board with lines in between, on the board and take the time as a class to create rules for each step of Socratic Seminar. Ask the question:

What can we do to fully execute this step of Socratic seminar? Here are other questions you may have to ask to guide the conversation:

What can you do while reading to prepare you for conversation? How can you use your reading to help you consider a question? How can we have productive class conversation?

Have students call out responses for each step to help guide them before starting the Socratic Seminar. You may have to redirect conversation or add needed rules. Read over rules with the class. Now you are ready to start!

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

Ask students to read The article: Darkness Masked in Lightness': the designer using a board game to avoid arranged

marriage". Have them to read through the article 1 time for understanding and the next time to close read. If students need help with what to notice when reading, they have guiding questions at the end of the article. Also, refer to the list of rules we just created.

Divide students up into even groups of 6- 10 students for the Simultaneous Class arrangement shown here. Be sure to strategically separate by comfort level of expressing ideas, making sure to mix up talkative with reserved. Display your Essential question on the board and give students 30 secs to a minute to consider the question. Now give students 23-30 minutes to create dialogue from the class reading to answer the question. Walk around and monitor conversations.

After sufficient conversation, give students 10 minutes to write up how this reading shows us how probability influences strategy. Each group needs a response that is 4 sentences or less. To close this portion of the lesson, have each group read their answer to their question.

Post Seminar questions:

1. Who would use the strategy of an arranged marriage?
2. Why was the strategy of an arranged marriage created?
3. How does probability play a part in the culture of arranged marriages?
4. What strategies does cultures use to create a sense of urgency around arranged marriages?
5. Based off of Nashra's account, what strategies could she use to help her get married quicker?
6. What strategy would Nashra create as opposed to an arranged marriage?

7. What strategies does Nashra create to not get married?

8. How does probability influence Nashar's decisions?

9. What strategies are similar between Nashra's life experiences with arranged marriages and the game she created?

10. What games rules did Nashra create to reflect probability?

11. Why do you believe her real-life strategies could easily be used as creative inspiration for a game?

Elaborate—Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

Now we can take the time to analyze Nashar's game, Jumanji, Egyptian rat slap and Go fish! and trouble to help get an outline for our own games (Performance Task). In a class discussion, ask the students the following questions:

What do any two of these games have in common?
Which games have similar strategy to win and why?
Which games have different strategies to win and why?
How does the strategy in Nasher's game compare to the strategy in Jumanji? How is the probability in Go Fish compare to the probability is Nasher's game? Which of these are closes to your created game in strategy and why? Which of these games are closer to your game in probability and why?

After discussion, give students time to work on their performance Task

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Ticket out the Door:

Fill in the following Table:

Game name	Rules	How to win	How probability promotes strategy in this game
Go Fish !			
Egyptian Rat Slap			
Trouble			

Jumanji

Arranged Marriage

Fill in the following Table:

Game name	Rules	How to win	How probability promotes strategy in this game
Go Fish !			
Egyptian Rat Slap			
Trouble			
Jumanji			
Arranged Marriage			

DIFFERENTIATION

CONTENT

The content of the text in high school level

PROCESS

In the Evaluation portion of the lesson, students are asked to use knowledge from all games discussed and answer the EQ.

PRODUCT

LEARNING ENVIRONMENT

TEACHER NAME
Benton

GRADE LEVEL
Middle School

NC CURRICULUM STANDARDS
VA.Re.7.2.4a Analyze components in visual imagery that convey messages VA.RE.7.2.3a Determine messages communicated by an image. CCSS.ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions with diverse partners on topics, texts, and issues building on others ideas and expressing their own clearly CCSS.ELA-Literacy.S.L.9-10.4 Present information, findings and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience and task.

CONCEPT

Strategy

ESSENTIAL UNDERSTANDING

Probability influences Strategy

ESSENTIAL QUESTION

How does probability influence strategy?

CRITICAL CONTENT - Students will know that...

- art has many perspectives
- art communicates truths
- All games have strategy to win
- Games can come in many different formats
- Probability influences strategy

PROCESS SKILLS - Students will be able to...

- Analyze art
- Interpret meanings
- Create a game
- Critique peer work
- Synthesize truths

MATERIALS

- Photo to analyze for VTS click here
- Worksheets for student feedback on presentations

GUIDING QUESTIONS

Pre-Lesson Questions	During Lesson Questions	Post Lesson Question
- How did probability dictate a winner? - What strategy could you use to win? - What makes a great rock paper scissors player?	- What do you see? - What do you see that makes you say that? - What else do you see? - What could the expressions on the dogs faces tell you about this game? - Why might the chair on the far right be empty? - Why might the payer in the right of the picture's cards be in the table? - What might the circle things in the middle of the table be? - What probability can we find in this piece? - What strategy could we be observing? - What strategy could the player whose back is to us be using? - How does probability play a factor in winning? - Have you thought of any immoral strategies someone could use to win your game? - What strategy could a player use to consistently win your game? - What strategies could player use if they were allowed to have a partner? - How likely is it that a player will win 2 times in a row? - How does probability influence strategy in your game?	- How did probability play a factor in everyone's games? - What interesting strategies did you see while observing? - Which game requires more complex strategy? - How does probability influence strategy?

PLANNED LEARNING EXPERIENCES

engage and Connect - *This phase focuses on piquing students' interest and helping them access prior knowledge. This is the introduction to the lesson that motivates or hooks the students.*

Opener:

Rock Paper Scissors Tournament. Have students break up into two big groups and have each group make two lines that face each other. Have each line leader play best 2 out of 3 with the person in front. Winners go to the back of their line, losers are now the cheerleader to the person who beat them and must stand beside them. Once someone beats someone with their own cheering section, all of the cheering section becomes the winners. The winner of this game becomes the Rock Paper Scissors Guru and gets a chain (Big paper hand with a chain tied on it). After the game asks students following questions:

How did probability dictate a winner?

What strategy could you use to win?

What makes a great rock paper scissors player?

Explore - *In this phase, the students have experiences with the concepts and ideas of the lesson. Students are encouraged to work together without direct instruction from the teacher. The teacher acts as a facilitator. Students observe, question, and investigate the concepts to develop fundamental awareness of the nature of the materials and ideas.*

Click here for photo

VTS Model:
Present the attached picture to the class and ask the following questions:

What do you see?
What do you see that makes you say that? What else do you see?

Give enough wait time to allow students to say what comes to them, and respond to their peers' observations. Once ideas have calmed down you can come back and ask the following questions:

What could the expressions on the dogs' faces tell you about this game?

Why might the chair on the far right be empty?
Why might the payer in the right of the picture's cards be in the table? What might the circle things in the middle of the table be?
What probability can we find in this piece?
What strategy could we be observing?
What strategy could the player whose back is to us be using?

Explain - *Students communicate what they have learned so far and figure out what it means. This phase also provides an opportunity for teachers to directly introduce a concept, process, or skill to guide students toward a deeper understanding.*

Now it is time for students to prepare for their performance task. Give them time in class to complete and practice presenting their games. Reiterate that students need to be able to Explain.

1. The objective

2. How to play

3. Who wins

4. Rules and Regulations

5. Materials needed to play

6. Strategy to win

They also need to be ready to answer any questions about by the "Gaming association". And try their best to explain it clearly and with excitement the first time! It is their job to sell us on their new idea!

Elaborate—*Allow students to use their new knowledge and continue to explore its implications. At this stage students expand on the concepts they*

have learned, make connections to other related concepts, and apply their understandings to the world around them in new ways

Now it's time to present! Allow students to present, have a sample round of the game, and be asked to follow up questions. Your follow up questions can include:

How does probability play a factor in winning?
Have you thought of any immoral strategies someone could use to win your game?

ASSESSMENT

Post Presentation Discussion: Everyone must contribute thoughtful commentary at least twice for credit.

1. How did probability play a factor in everyone's games? 2. What interesting strategies did you see while observing? 3. Which game requires more complex strategy?
4. How does probability influence strategy?

What strategy could a player use to consistently win your game? What strategies could player use if they were allowed to have a partner? How likely is it that a player will win 2 times in a row?
How does probability influence strategy in your game?

As students are presenting. Have the other students make a list of things they love about each other's game and things their peers could work on. Observing students need to have 1 cheer and jeer for each game presented. Be sure to give students time to consider and reflect each presentation to have good feedback at the end.

Evaluate: *This phase assesses both learning and teaching and can use a wide variety of informal and formal assessment strategies.*

Post Presentation Discussion:

1. How did probability play a factor in everyone's games?

2. What interesting strategies did you see while observing?

3. Which game requires more complex strategy?

4. How does probability influence strategy?

ASSESSMENTS

Post Presentation Discussion:

1. How did probability play a factor in everyone's games?

2. What interesting strategies did you see while observing?

3. Which game requires more complex strategy?

4. How does probability influence strategy?

DIFFERENTIATION

CONTENT

PROCESS

In order to engage students while watching presentations, they must write down something they like and something they would do differently for each presentation. This will prepare them for the post-lesson conversation.

PRODUCT

LEARNING ENVIRONMENT

Unit Resources

Provide a listing of books, Web sites, videos, and/or other instructional materials that are intended to supplement the unit. Include resources intended for both teacher and student use. Be sure to use APA style for books/articles and provide a brief (1-2 sentence) annotation for Web sites and instructional materials.

Rotigel, J., & Fello. (2004). Mathematically Gifted Students: How Can We Meet Their Needs?*Gifted Child Today*,*27*(4), 46-51. Retrieved from http://www.davidsongifted.org/Search-Database/entry/A10514
Probability for Game Designers. (n.d.). Retrieved from http://www.leagueofgamemakers.com/probability-for-game-designers/

This online article helped me to very easily gather knowledge about Game Probability that I may have needed to sweep up on. It also helped me to condense probability concepts to a one day lesson

Reis, S. M., & Renzulli, J. F. (n.d.). Differentiation.*Compass Learning White Paper*. Retrieved from https://confratute.uconn.edu/wp-content/uploads/sites/990/2015/07/Compass-Five_Dimensions-Renzulli.pdf.

This was a resource for clarity on domains of differentiation

Taylor, F. M. (2016). Why Teach Probability in the Elementary Classroom?*LATM Journal*,*2*. doi:10.18411/d-2016-154

This source helped me find educators perspective and research on the benefits of teaching probability

Webb, J., Gore, J., Ahmed, E., & Deries, A. (n.d.). Common Characteristics of Gifted Individuals. Retrieved from https://www.nagc.org/resources-publications/resources/my-child-gifted/common-characteristics-gifted-individuals

This article helped me identify some common characteristics of gifted students

Rotigel, J., & Fello. (2004). Mathematically Gifted Students: How Can We Meet Their Needs?*Gifted Child Today,27*(4), 46-51. Retrieved from http://www.davidsongifted.org/Search-Database/entry/A10514

This article opened helped inform me of ways to meet students needs in math

final unit pic.png

png (262 KB)