Bonkers for Board Games

Probability influences Strategy

Grades 3rd-5th

Ali Biffany

July 18, 2019

Introduction

Bonkers for Board Games is a set of four lessons focusing on probability and how it influences strategy, using board games as a teaching tool and real-world example. Students will explore probability as a concept by reading about and playing board games to determine how probability influences strategy. These lessons were created for gifted third, fourth, and fifth grade students.

Rationale:

The primary goal of this unit is to encourage academically and/or intellectually gifted ("AIG") students to use critical thinking and higher-order thinking skills to design their own board games that involve probability. Each lesson explores how probability influences strategy while addressing a variety of skills, content and concepts. The overarching concept is probability. Since probability is used everywhere (examples include the weather, sports, and games, just to name a few) the ability to know what probability is and how it can affect why someone does something is very important. Understanding probability gives people the ability to make intelligent strategic decisions in any situation. People use probability every day. For example, investment advisers use detailed mathematical models to calculate whether the stock market will rise or fall in the coming year. Or, when a mother decides whether to walk with her child to the park or drive based on what she thinks will be the fastest method of getting to the park, she is using probability concepts. In each situation, the person hopes that by analyzing the probabilities of different outcomes, he or she will make the best choice possible.

During the unit, students are required to read and analyze texts, games, and videos. They will use these to analyze and have discussions, think logically and make connections. Higher-order thinking skills are very important for AIG students because they engage, encourage, and challenge the students. The four instructional models that are presented in this unit—Taba, Questioning, Team-Based Learning and Bruner—will foster the use of these higher-order thinking skills.

The content for this unit is directly linking to 4th-6th grade Common Core Standards in Math and English Language Arts. The math content focuses on probability. The focus of the English Language Arts standards is for students to do a close-read, make inferences, and give specific evidence from the text while having discussions and debates. This unit will also focus on speaking and listening skills.

Differentiation for Gifted Learners:

When working with AIG students, it is important to understand that not all students will learn in the same ways, come to class with the same knowledge, or have the same level of interest in any given topic. Since all students are different, it is important to differentiate instruction to make sure they are all engaged and challenged throughout every part of the lesson. In this unit, you will find different ways to differentiate instruction throughout each lesson.

Content: The content of this unit is differentiated for AIG students because students will read engaging reading materials that have challenging and sophisticated vocabulary. Students will read about probability, which is a concept and standard that is at least one grade level ahead of their peers.

Process: Each lesson's process is differentiated so that AIG students will be engaged and challenged. In the Taba Concept Development lesson, students will work in groups to identify categories for probability in Monopoly. Through this lesson, students will think critically while grouping words together. In the Questioning Model, students will use Costa's Levels of Inquiry to work with rigorous, open-ended questions. In the Team-Based Learning model, students will answer open-ended, higher-order thinking questions. Students will need to come to a consensus on responses and will need to defend their responses. In the Bruner model, students will take the role of a game designer and use their newfound knowledge about probability and strategy to review and evaluate different board games.

Product: Differentiation is seen in the product by allowing students to come up with the idea and design of their own board game. Students were also allowed to pick different materials that they wanted to use in making their board games. These materials were required to incorporate probability so that players could use probability concepts to come up with their own strategies for playing the games.

Learning Environment: Throughout the lessons, students will work independently, in pairs, in small groups, and by having whole-class discussions. This will challenge students with their social and emotional needs, but students will also have the comforts of groupings that they might feel more comfortable with.

Population of Gifted Students for Whom the Unit is Intended:

This unit is intended for third, fourth, and fifth grade students. Since probability is taught in sixth grade, students will have the prerequisite skills to understand this new skill ahead of their peers. This unit provides background knowledge to probability so all socioeconomic backgrounds will be successful. This unit is designed for AIG students, but since all students learn differently and at their own pace, these lessons can be expanded over a few days to keep pace with the students as necessary. These lessons would appeal especially to students who like to be creative, but will also appeal to students who like math and ELA.

Content, Process, and Concept Goals

Content Goals and Outcomes

Goal 1: To develop a probability model and use it to find probabilities of events

Students will be able to:

- Learn the definition of probability and apply to probability-based problems
- Describe what the probability formula is and how to use it
- Calculate the probability of any given problem

Process Goals and Outcomes

Goal 2: To predict probability and use it to inform strategy

Students will be able to:

- Analyze probability in a real world situation
- Articulate their findings of probability and how it will inform their strategy
- Evaluate whether their strategy was the best one for the real world situation

Concept Goals and Outcomes

Goal 3: To understand the concept of probability

Students will be able to:

- Use appropriate language to describe probability
- Transfer their knowledge about how probability influences strategy to another aspect about probability
- Create new examples of probability in our world beyond just board games

Assessment Plan

Formative Assessments:

Formative assessments are ongoing checkups conducted by the teacher throughout the lesson that instruct the teacher on where to go next. These formative assessments will help the teacher know thinks like whether she needs to slow the pace of the lesson down or whether the class came to the lesson with more prior knowledge then the teacher had thought. Formative assessments can also help the teacher understand which students need extra support or could benefit from extended activities.

Each lesson in this unit has a set of questions for use before, during and after the lesson to assess students' learning throughout the lesson and unit. These questions will also support the essential understanding, which is: Probability influences Strategy. When students are answering the before, during, and after questions, the teacher should listen to their responses and gauge the students' understanding.

In each lesson, there is a "ticket out the door." Students will answer the essential questions: how does probability influence strategy? The students will use what they learned in that lesson to answer the question. Throughout the unit, the responses to the essential question should become more in-depth because each lesson builds on the previous ones. The teacher will use the "tickets out the door" to inform instruction for the rest of the unit.

Summative Assessments:

Summative assessments are used to evaluate students at the end of the unit. For this unit, students will be presented with a performance task on day one. Students will work on their performance task throughout the unit. On day one, students will make a plan for their board game. On day two, students will make a blueprint for their board game. On days three and four, students will create their board games.

Performance Task:

You just graduated from college and got your first job as a Game Designer at Hasbro, the company that developed such popular games as Monopoly, Clue, Scrabble, and Pictionary.

Target has asked Hasbro to design a children's board game exclusively for sale at Target and on Target.com. Your boss at Hasbro has given you this assignment as your first task as a Game Designer. She requires that, in addition to creating this kid-friendly board game, that you send her a document explaining how this board game you have created involves probability, and how that probability might influence a player's strategy as they play the game. Target also requires, in addition to submitting to them the game board and instructions on how to play the game, that you prepare a document for them explaining the best strategy to employ in order to win the game. Target will review your board games using these categories: eye appeal, age appropriate, and strategy. Be prepared to present your board game to a panel of Target's product testers to ensure that Target will be happy with the product you have developed.

TEACHER NAME			Lesson #
Ali Biffany			1
MODEL	**CONTENT AREA**	**GRADE LEVEL**	
Taba	**Interdisciplinary Math/ELA**	**3-5**	
CONCEPTUAL LENS		**LESSON TOPIC**	
Probability		**Real World Probability**	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

ELA and Speaking/Listening

SL.5.1.A- Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

RI.6.1- Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.4.6- Integrate information from two text on the same topic in order to write or speak about the subject knowledgeably.

SL.6.4- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Math

6.SPB.5.a- reporting the number of observations

6.sp.B.5.b- describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Probability influences strategy	**How does probability influences strategy?**
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
• Probability is defined by the likelihood of something happening.	• Students will be able to analyze probability

• Strategy is defined as a plan of action. • Probabilities can be assessed and analyzed using many tools (dice, cards, tiles), and can be deployed in many different ways. • Probability can have an effect on the way a person plays a game and what strategy he or she should use. • To influence means to have an effect on something.	• Students will be able to make predictions • Students will be able to categorize • Students will be able to work collaboratively • Students will be able to reason

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
• What is probability? • What are some things that use probability? • What jobs use probability? • What do you know about board games? • How is probability used in board games? • What is strategy? • Who uses strategy? • Why is strategy important in board games?	• How is probability used in monopoly? • What tools are used to determine probability in the game? • What aspects of probability appear in the game Monopoly? • Which aspects of probability might be related or go together? • Which groups can be combined together to make one group? • What can you say after reading the article that articulates the relationship between probability and strategy?	• What is the relationship between probability and strategy? • How is probability used in board games? • Why do we need to focus on probability when playing games? • How can probability change the way people play a game? • How does probability influence strategy?

DIFFERENTIATION ***(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.***			
Content	**Process**	**Product**	**Learning Environment**
The concept of "probability" is advanced for the age group.	Students will engage in in-depth critical thinking as they analyze the concept of "probability."	Students will use what they learned about probability to make their own board games.	

PLANNED LEARNING EXPERIENCES
(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

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.*

Icebreaker: To get students talking and to help them get to know each other, teacher will give each student a sticky note. Teacher will have four board games listed on the board, and students will have to pick the one game out of the four listed that is their favorite. Students will write their chosen board game on their sticky note.

After giving the students a minute to think and select a board game, the teacher will divide the students into groups based on the game they picked. When students get into their group, they will introduce themselves, share what school they go to, and why they like the board game they selected. All students will share.

When students of the same board game are done sharing, the teacher will number the students in the group. All 1s, 2s, 3s, and 4s will get together. These students will introduce themselves, share what school they go to, the board game they selected, and why they like playing that game.

When students are done sharing, the class will come together and discuss what they learned about their peers in the class.

Hook: Students will watch a Brainpop video defining probability. The video describes different ways to use probability. This video will provide students with common knowledge about the topic that they will be learning about over the next four days.

Brainpop Video: https://www.brainpop.com/math/probability/basicprobability/

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.*

Listing: Students will watch a video about probability in the game Monopoly. After watching the video, students will read an article about probability in Monopoly. After reading the article, students will work independently to make a list of all the ways in which the game uses probability.

Students will share their lists with the whole class. Teacher will make a list on the board of the words the students are sharing.

Video and Article:
https://www.youtube.com/watch?v=7_SXFtdf65s
https://www.inverse.com/article/32781-win-monopoly-using-math

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.*

Grouping and Labeling**:** Students, working in groups of three or four, will select about twenty words/phrases from the list the teacher made on the board. In groups, the students will create smaller groups of words based on similarities, answering the question: "Which of the words/phrases go together as they relate in some way to probability?"

Expectations**:** 1. There must be at least four different groups of words.
2. Each group must have at least three words.
3. No word can be used more than once.

While the students are working, the teacher will move around the room, listening and checking in on each group. The teacher will guide students as they are grouping the word/phrases with questions, but will allow the students to come to their own conclusions. As students finish, they will be instructed to label the groups to show how the words/phrases are related to the concept "probability."

Examples: Tools used for probability; How to use probability; Strategy; How to win the game

Students will share and explain their reasoning for their selected grouping of the words/phrases with the whole class. The students will describe the similarities and differences among groups.

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*

Subsuming, Regrouping, Renaming: Student groups will be challenged to regroups words/phrases. The new groups must be new categories with new labels.

Expectations**:** 1. Items can be used in more than one category.
2. New labels need to be assigned to the new categories.
3. There must be at least three words in each category.
4. Categories must be based on the concept "probability."

When students are finished regrouping, the teacher will ask them share their new groups and some words/phrases that are in their groups.

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

Generalization: Students will get with a partner to discuss the relationship between the concept "probability" and the concept "strategy." As a class, students will discuss the relationship. If needed, teacher will guide students to the essential understanding.

The teacher will tell the class that it will be their job to use their new knowledge of how probability influences strategy to make their very own board games. The students will need to decide what tools they will use to incorporate probability into their games. They will also need to think about what they want the game to be about, so that players will be able to use strategy while they are playing the game.

Teacher will introduce Performance Task:

You just graduated from college and got your first job as a Game Designer at Hasbro, the company that developed such popular games as Monopoly, Clue, Scrabble, and Pictionary. Target has asked Hasbro to design a children's board game exclusively for sale at Target and on Target.com. Your boss at Hasbro has given you this assignment as your first task as a Game Designer. She requires that, in addition to creating this kid-friendly board game, that you send her a document explaining how this board game you have created involves probability, and how that probability might influence a player's strategy as they play the game. Target also requires, in addition to submitting to them the game board and instructions on how to play the game, that you prepare a document for them explaining the best strategy to employ in order to win the game. Be prepared to present your board game to a panel of Target's product testers to ensure that Target will be happy with the product you have developed.

Students will work on their plan for their performance task.

Name:

Board Game Plan

What will your game be named? _____

What age group is it appropriate for? _____

How many people should be able to play it at one time? _____

What type of board game is it? _____

How will the game work?

_____
_____
_____
_____

What do you have to do to win the game?

_____
_____
_____
_____

How does the game use probability?

_____
_____
_____
_____

What will your board/playing surface be made of? What will it look like?

_____
_____
_____
_____

What materials will you need to prepare your game?

_____
_____
_____
_____

TEACHER NAME			Lesson #
Ali Biffany			2
MODEL	CONTENT AREA	GRADE LEVEL	
Questioning	Interdisciplinary ELA/Math	3-5	
CONCEPTUAL LENS		LESSON TOPIC	
Probability		Games	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

ELA and Speaking/Listening

SL.5.1.A- Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

RI.6.1- Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.4.6- Integrate information from two text on the same topic in order to write or speak about the subject knowledgeably.

Math

6.sp.B.5.b- describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Probability influences strategy	How does probability influence strategy?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
Students will know that: - Probability is defined by the likelihood of something happening. - Strategy is defined as a plan of action. - Probabilities can be assessed and analyzed using many tools, and can be deployed in many different ways.	- Students will be able to create and respond to higher order thinking questions - Students will analyze content. - Students will be able to create questions and/or use inquiry to make connections. - Students will gain information by doing

- Probability can have an effect on the way a person plays a game and what strategy he or she should use. - To influence means to have an effect on something.	research. - Students will be able to make generalizations. - Students will be able to compare and contrast.

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
- What is probability? - What makes up probability? - How do games use probability? - Why do you think games need to involve probability? - What is strategy? - How might strategy be influenced by probability? - Why is probability important to a person playing a game? - How would you describe what you saw in the video? - How were the games all the same? - How were they different? - How did the games you saw in the video compare to the games you play?	- What are the ways in which probability impacts games? - Why might probability affect different games differently? - How do people determine what strategy they will use in games? - Why might strategies vary even in the same game? - Why and how is the strategy different between the games Scrabble, Clue, and Backgammon? - How does probability influence how we play a game? - What criteria would you use to assess the strategy you will use for each game? - How would you decide how probability will help you form a strategy for the games?	- How have your ideas about games changed through the learning experiences today? - What caused you to change those ideas? - What is the relationship between games and strategy? - What is the relationship between probability and *forming* strategies? - What would happen if games did not involve probability? - How could a game have a strategy if there was no probability? - Why do all games need strategy? - Why do that all games need to involve probability? - What different games have you played where you can use probability to influence the strategies for playing those games?

- What examples or indications of probability do you see in the games in the video? - What examples or indications of strategy do you see in the games in the video?		- How does probability influence strategy?

DIFFERENTIATION

(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.

Content	Process	Product	Learning Environment
Selected texts are above grade level.	Students will be working with questions that are rigorous because they are at the top of Costa's Levels of Inquiry and are open-ended.		

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

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.*

As students enter the classroom, the teacher will have different pictures of games playing on a slideshow on the board. These games will not just be board games, but will other games such as video games, card games, etc.

Teacher will ask questions about the photos on the screen, including:

- How would you describe what you saw in the video?
- How were the games all the same?
- How were they different?
- How did the games you saw in the video compare to the games you play?

Teacher will let students discuss their answers.

Teacher will ask pre-lesson questions, including:

- What is probability?
- What makes up probability?
- How do games use probability?
- Why do you think games need to involve probability?
- What is strategy?
- How might strategy be influenced by probability?
- Why is probability important to a person playing a game?
- How would you describe what you saw in the video?
- How were the games all the same?
- How were they different?
- How did the games you saw in the video compare to the games you play?
- What examples or indications of probability do you see in the games in the video?
- What examples or indications of strategy do you see in the games in the video?

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.*

Students will be divided into three groups, groups 1, 2, and 3. Each group will be given an article to read.

> How to Win at Scrabble and Words with Friends: https://www.thesprucecrafts.com/win-at-scrabble-words-with-friends-409528
>
> How to Win at Clue: https://www.thesprucecrafts.com/how-to-win-at-clue-cluedo-strategies-and-hints-411239
>
> How to Win at Backgammon: https://www.thesprucecrafts.com/how-to-win-at-backgammon-411041

Groups will be instructed to use Costa's Levels of Inquiry. Before students start reading their articles, the teacher will give the students a mini-lesson on how to ask questions using Costa's Levels of Inquiry. The students will also be provided with a handout with the different levels of questioning. Teacher will tell students that questions must represent level two and three questions. Questions must be open-ended.

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.*

Students will gather in their jigsaw groups. The original members of groups 1, 2, and 3 will now provide equal numbers of members to form new groups A, B, and C. In their new groups, students will share what their article was about and share their questions to the members of their new group. The members of the new groups will answer questions based on what they learned from their articles.

Group members will discuss the responses to the questions and the person asking the questions will provide evidence of the best response to their questions.

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*

Students will select the best questions that were asked in their group. These questions will be provided to the teacher, who will include these questions in the "during lesson questions."

Students will come back together for a class discussion. The teacher will ask the "during lesson questions." If any of the groups came up with any of the same questions as the teacher's pre-planned questions, the teacher will give credit to the group.

During Lesson Questions:

- What are the ways in which probability impacts games?
- Why might probability affect different games differently?
- How do people determine what strategy they will use in games?
- Why might strategies vary even in the same game?
- Why and how is the strategy different between the games Scrabble, Clue, and Backgammon?
- How does probability influence how we play a game?
- What criteria would you use to assess the strategy you will use for each game?
- How would you decide how probability will help you form a strategy for the games?
- [Add group-created questions]

Students will answer the during lesson questions orally. Teacher will facilitate the discussion. Each group will get a chance to ask the questions that they created. Group members will facilitate the discussion surrounding their questions.

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

Teacher will ask post-lesson questions:

- How have your ideas about games changed through the learning experiences today?
- What caused you to change those ideas?
- What is the relationship between games and strategy?

- What is the relationship between probability and *forming* strategies?
- What would happen if games did not involve probability?
- How could a game have a strategy if there was no probability?
- Why do all games need strategy?
- Why do that all games need to involve probability?
- What different games have you played where you can use probability to influence the strategies for playing those games?
- How does probability influence strategy?

Students will respond to questions. Students may add on to contribute to previous answers.

Students will be given an index card on which to write a response. Teacher will say: based on what we have learned today, answer the following – how does probability influence strategy? Students will need to connect games, probability and strategy to answer the question.

Students will work on their blue prints for their board games.

Costa's Levels of Questions

Level 3	
Level 2	
Level 1	

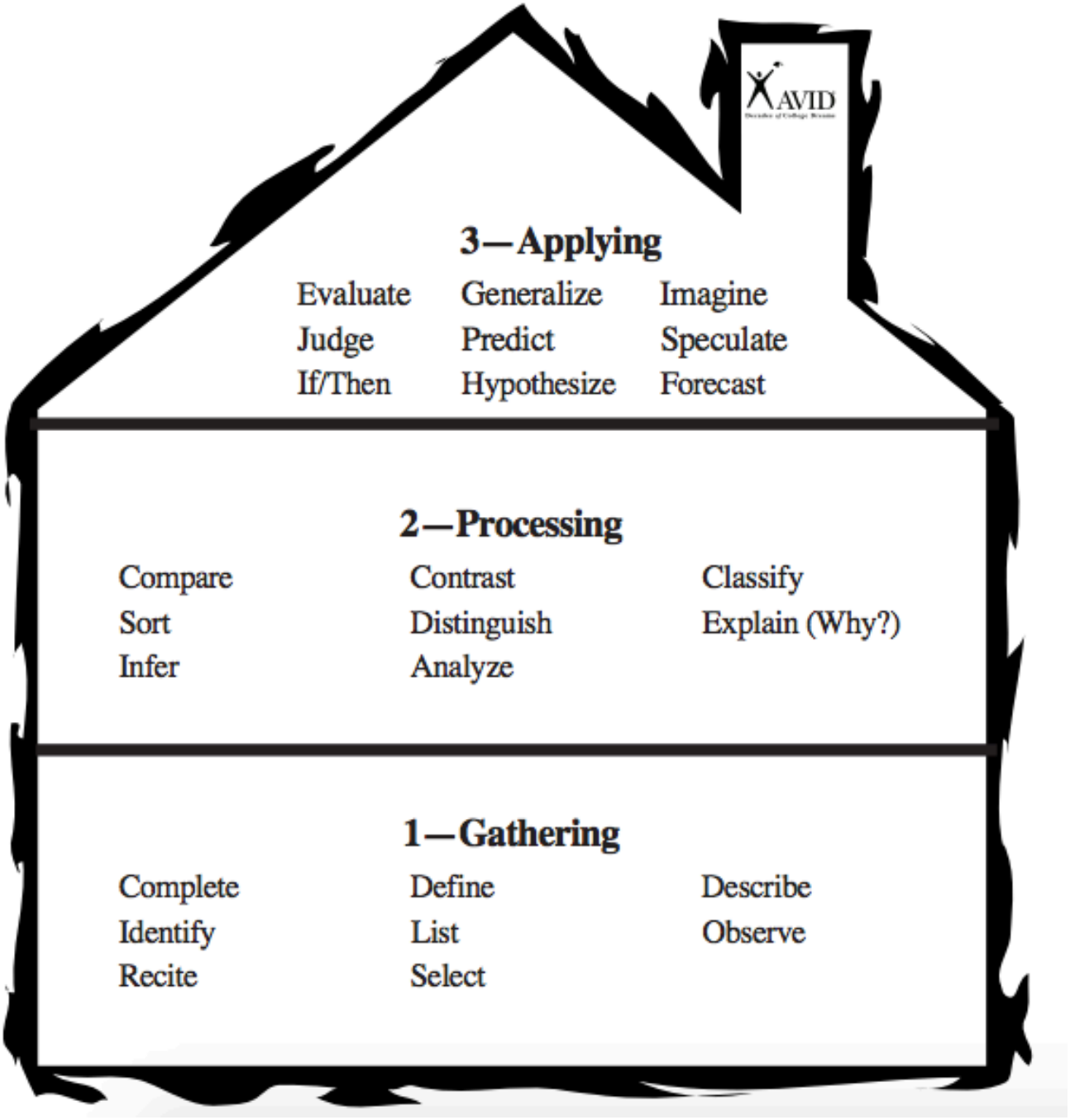
1. Name the elements that make up water.
2. What will NC's population be like in 2050 if we continue to grow as we have for the past ten years?
3. What is the definition of a trapezoid?
4. Imagine that you were in the character's position, how would you react?
5. Distinguish one candidate's platform from that of the other candidate.
6. Recite the Preamble to the Constitution.
7. What happened to the litmus paper when inserted in the liquid?
8. Create an invention that uses at least three types of simple machines.
9. Analyze the character's intentions in the scene
10. Make a plan to complete your science fair project.
11. Evaluate the expression (3x + 5)^2 if x = -2
12. Applying the principles espoused in the Fifth Amendment, how would you decide the case of....
13. Use four 4s and any math operational symbols to create expressions that equal the numbers 1 – 10.
14. Explain how involvement war impacts the economy.
15. Arrange the following numbers in order from smallest to largest: ....

The Three-Story House

Level 1 (the lowest level) requires one to gather information.

Level 2 (the middle level) requires one to process the information.

Level 3 (the highest level) requires one to apply the information.



Vocabulary: Costa's Levels of Thinking and Questioning

LEVEL 1

Remember	Define Repeat Name	List State Describe	Recall Memorize Label	Match Identify Record
Show Understanding	Give examples Restate Discuss Express	Rewrite Recognize Explain Report	Review Locate Find Paraphrase	Tell Extend Summarize Generalize

LEVEL 2

Use Understanding	Dramatize Practice Operate Imply Apply	Use Compute Schedule Relate Illustrate	Translate Change Pretend Discover Solve	Interpret Prepare Demonstrate Infer
Examine	Diagram Distinguish Compare Contrast Divide	Question Inventory Categorize Outline Debate	Analyze Differentiate Select Separate Point out	Criticize Experiment Break down Discriminate
Create	Compose Design Propose Combine Construct	Draw Arrange Suppose Formulate Organize	Plan Compile Revise Write Devise	Modify Assemble Prepare Generate

LEVEL 3

Decide	Judge Value Predict Evaluate	Rate Justify Decide Measure	Choose Assess Select Estimate	Conclude Summarize
Supportive Evidence	Prove your answer. Support your answer.	Give reasons for your answer.	Explain your answer. Why or why not?	Why do you feel that way?

TEACHER NAME			Lesson #
Ali Biffany			3
MODEL	CONTENT AREA	GRADE LEVEL	
Team-Based learning	Interdisciplinary Math/Reading	3-5	
CONCEPTUAL LENS		LESSON TOPIC	
Probability		Board Game Strategies	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

ELA and Speaking/Listening

SL.5.1.A- Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

RI.6.1- Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Math

6.sp.B.5.b- describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Probability influences strategy	How does probability influence strategy?
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**

Students will know that: • Probability is defined by the likelihood of something happening. • Strategy is defined as a plan of action. • Probabilities can be assessed and analyzed using many tools. Some of those tools include: dice, cards and letter tiles. • There are ways to win board games by using probabilities and strategies. • To "influence" means to have an effect on something.	Students will be able to: • Work collaboratively in groups. • Come to a consensus. • Establish and defend a position. • Think critically • Analyze. • Evaluate and give feedback.

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	**During Lesson Questions:**	**Post Lesson Questions:**
• What do you know or think you know about probability? • How could board games represent probability? • What do you know or think you know about strategy? • How does probability have an effect on strategy? • What are some examples of how probability affects your strategy in a board game?	Questions included in Quiz: • In the game Guess Who, it is important to analyze and ask the right questions because…. • In the game Monopoly, the probability of landing on the orange properties is higher because… • The probability of winning McDonald's Monopoly is very low because… • When you play Battleship, your board should look like a checkerboard because…	• How did probability influence the game? • What tool was used in the game to incorporate probability? • How did strategy influence the game? • How did probability influence strategy? • What made the game interesting? • How challenging was the game? • What made the game challenging? • What is one thing the game designer should change? • Why would you recommend making this change?

	• In the game Guess Who, why is the "facial hair" question useful? • In the game Clue, the best strategy to increase your chance of winning it to… • Out of the 4 trillion different Connect Four possibilities, there are ……. to win. • In Connect Four, the best strategy to increase your chance of winning is… • Probability influences strategy in the game Battleship because… • Probability influences strategy in the game Monopoly because…	• What did the game designer do really well to give players the opportunity to make their own strategy for the game? • How did the designer provide this opportunity? • How does probability influence strategy?

DIFFERENTIATION

(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.

Content	Process	Product	Learning Environment
Content and standard are above grade level.	Students will answer open-ended, higher-order thinking questions. Students will need to come to a consensus on responses and will need to defend their responses.		

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

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.*

When students walk into the classroom, the teacher will engage the students by having on loop slides of different board games. Students will use prior knowledge to answer the pre-lesson questions.

The teacher will ask the following pre-lesson questions:

- What do you know or think you know about probability?
- How could board games represent probability?
- What do you know or think you know about strategy?
- How does probability have an effect on strategy?
- What are some examples of how probability affects your strategy in a board game?

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.*

Students will read the article "Fool proof strategies to win board games," located at: https://www.urbo.com/content/fool-proof-strategies-to-win-popular-board-games/

The teacher will pass out a paper with the ten questions about the article. Students are instructed to complete the quiz independently. They are instructed to pick the best answer.

The teacher will group students in their team-based learning teams. The groups will discuss their answers to each of the questions and will be required to develop a consensus on their responses to each of the questions.

Once the students decide on the answer they think is correct, the teacher will provide each group with a scratch off card. Students will discuss the answers and which one they think are correct. If they scratch off the correct answer, they will move on to the next question. If the team's responses are incorrect, the team members will revisit the questions to come to revised answers. This will continue until all groups have found all the correct answers.

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.*

The teacher will facilitate a discussion by going through each of the ten questions with the entire class. (the questions will be on a PowerPoint so that everyone can see the questions)

For instances in which students have gotten questions wrong, the teacher will discuss any misconceptions or misinformation the students had. The teacher will add factual and conceptual knowledge to the discussion.

Students may challenge a right response to a question by making a formal appeal. The formal appeal is a written rebuttal to the question, using the article as evidence.

Teacher will ask the following during-lesson questions:

- In the game Guess Who, it is important to analyze and ask the right questions because….
- In the game Monopoly, the probability of landing on the orange properties is higher because…
- The probability of winning McDonald's Monopoly is very low because…
- When you play Battleship, your board should look like a checkerboard because…
- In the game Guess Who, why is the "facial hair" question useful?
- In the game Clue, the best strategy to increase your chance of winning it to…
- Out of the 4 trillion different Connect Four possibilities, there are ……. to win.
- In Connect Four, the best strategy to increase your chance of winning is…
- Probability influences strategy in the game Battleship because…
- Probability influences strategy in the game Monopoly because…

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*

Each group will be given a graphic organizer and a board game. The students will be instructed to play a board game while going through the questions as a group. (Scrabble, Clue, War, and Backgammon) While they are playing, students will use what they have learned about probability and strategy to analyze and evaluate the board game.

After 20 minutes, the students will come back together as a group. Teacher will ask the post-lesson questions, students will reply and discuss.

Teacher will ask the following post-lesson questions:

- How did probability influence the game?
- What tool was used in the game to incorporate probability?
- How did strategy influence the game?
- How did probability influence strategy?
- What made the game interesting?
- How challenging was the game?
- What made the game challenging?
- What is one thing the game designer should change?
- What did the game designer do really well to give players the opportunity to make their

own strategy for the game?
- How does probability influence strategy?

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

After students play their board games, teacher and students will go over the answers to the questions. Students will have to use what they learned about probability and strategy to answer the questions.

Teacher will ask the following post-lesson questions:
- How did probability influence the game?
- What tool was used in the game to incorporate probability?
- How did strategy influence the game?
- How did probability influence strategy?
- What made the game interesting?
- How challenging was the game?
- What made the game challenging?
- What is one thing the game designer should change?
- What did the game designer do really well to give players the opportunity to make their own strategy for the game?
- How does probability influence strategy?

After students and teacher went over questions about the board game. Teacher will pass out an index cards and students will answer the essential question: How does probability influence strategy?

Students will start working on their board games.

Name:

Fool- Proof Strategies to Win Popular Board Games

In the game Guess Who, it is important to analyze and ask the right questions because….

a. Every question eliminates 50% of the characters.
b. It eliminates the most people in one question.
c. The average ratio is 8:16.
d. The average ratio is 6:19.

In the game Monopoly, the probability of landing on the orange properties is higher because…

a. Players like the orange the best so they buy those properties.
b. Players get in jail the most often.
c. Most likely dice rolls will land players on the orange properties.
d. Chance cards put players on the orange properties.

The probability of winning McDonald's Monopoly is very low because…

a. You don't have to step foot into McDonalds to play.
b. McDonald's puts the same amount of each piece out to find.
c. Boardwalk piece is close to 1 in 602 million to find.
d. Boardwalk piece is close to 1 in 600 to find.

When you play Battleship, your board should look like a checkerboard because…

a. Each ship is at least two spots long, that means you don't need to hunt every single spot.
b. Once you make a hit, you target the surrounding areas.
c. It will confuse your opponent.
d. It will be harder for your opponent to find your ships.

In the game Guess Who, why is the "facial hair" question useful?

a. It eliminates 8:19 characters.
b. It eliminates 5:19 characters.
c. It eliminates 5:16 characters.
d. It eliminates 8:16 characters.

In the game Clue, the best strategy to increase your chance of winning is to…..

a. Take notes
b. Withhold as much information as possible.
c. Spend less time in the hallways.
d. Focus on trap door rooms.

Out of the 4 trillion different Connect Four possibilities, there are _____ to win.

a. 4 trillion ways
b. 3 trillion ways
c. 1 trillion ways
d. 2 trillion ways

In Connect Four, the best strategy to increase your chance of winning is….

a. Putting your piece in the two outer most aisles.
b. Placing your piece in the absolute center.
c. Placing your piece on either side of the center aisle.
d. It doesn't matter where you put your piece.

Probability influences strategy in the game Battleship because...

a. You should put all of your ships together.
b. You should fire at the edges first.
c. Once you get a hit, you should target that spot.
d. The smallest ship has two spots so you do not need to fire at every spot.

Probability influences strategy in the game Monopoly because…

a. There are certain numbers you are most likely to roll on a dice.
b. there is a certain amount of chance cards.
c. There is a certain amount of railroad spots.
d. You are more likely to go to jail.

Name:

Game Review

How does probability influence the game?

What tool was used in the game to incorporate probability?

How did strategy influence the game?

How did probability influence strategy?

What made the game interesting?

How challenging was the game?

What made the game challenging?

What is one thing the game designer should change?

What did the game designer do really well to give players the opportunity to make their own strategy for the game?

TEACHER NAME			Lesson #
Ali Biffany			4
MODEL	CONTENT AREA	GRADE LEVEL	
Bruner	Interdisciplinary Math/Reading	3-5	
CONCEPTUAL LENS		LESSON TOPIC	
Probability		Board Game Reviewer	

LEARNING OBJECTIVES *(from State/Local Curriculum)*

ELA and Speaking/Listening

SL.5.1.A- Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

RI.6.1- Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

SL.6.4- Present claims and findings, sequencing ideas logically and using pertinent descriptions, facts, and details to accentuate main ideas or themes; use appropriate eye contact, adequate volume, and clear pronunciation.

Math

6.SPB.5.a- reporting the number of observations

6.sp.B.5.b- describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

THE ESSENTIAL UNDERSTANDING ***(What is the overarching idea students will understand as a result of this lesson?***	**THE ESSENTIAL QUESTION** ***(What question will be asked to lead students to "uncover" the Essential Understanding)***
Probability influences strategy	***How does probability influence strategy?***
CONTENT KNOWLEDGE (What factual information will students learn in this lesson?)	**PROCESS SKILLS (What will students be able to do as a result of this lesson?)**
• Students will know the characteristics of a game designer/game reviewer. • Students will learn how to analyze/evaluate a board game.	• Students will be able to evaluate • Students will be able to analyze • Students will be able to communicate information to others • Students will be able to make

• Students will learn how to make generalizations about what a game designer or game reviewer is and does. • Probability is defined by the likelihood of something happening. • Strategy is defined as a plan of action. • Probabilities can be assessed and analyzed using many tools (dice, cards, tiles), and can be deployed in many different ways. • Probability can have an effect on the way a person plays a game and what strategy he or she should use. • To influence means to have an effect on something.	inferences • Students will be able to make generalizations

GUIDING QUESTIONS

What questions will be asked to support instruction?

Include both "lesson plan level" questions as well as questions designed to guide students to the essential understanding

Pre-Lesson Questions:	During Lesson Questions:	Post Lesson Questions:
• What do game designers do? • Where do game designers work? • What are some of the things game designers might need to make a game? • What are some tools/materials game designers might use? • What do you think game designers need to keep in mind when making a game? • How do you think they come up with the ideas for the games? • What might game designers need in order to make a game that people will want to play?	• What characteristics do game designers possess? • How do you think Brian Tinsman would review a game? • What do you think he would look for? • What makes games/game designers get rejected from companies? • What make games/game designers get accepted to companies? • Why is it important to have a board game reviewer? • How would Brian Tinsman come up with strategies for the game he is reviewing?	• What did you learn about being a game reviewer? • What did you look for when reviewing the board game? • What other questions would you add to the review sheet? • How was your questions different from your group's questions? • How were your questions and your group questions similar? • How was your review different from your group's reviewer? • How were your review and your groups review similar?

	• What would you look for as a game reviewer?	• How did you come up with a strategy for the game as a reviewer? • How important is it to have a reviewer for board games?

DIFFERENTIATION

(Describe how the planned learning experience has been modified to meet the needs of gifted learners. Note: Modifications may be in one or more of the areas below. Only provide details for the area(s) that have been differentiated for this lesson.

Content	Process	Product	Learning Environment
Content and standards are about grade level.	Students will use new knowledge to review and evaluate different board games.	Students board game will show understanding of a higher level concept probability.	

PLANNED LEARNING EXPERIENCES

(What will the teacher input? What will the students be asked to do? For clarity, please provide detailed instructions)

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.*

As students enter the classroom, the teacher will have different games playing on a slide show. The games on the slide show will include board games, video games, and games you can play outside.

Students will be instructed to create lists independently of what they know about game designers.
The list should include:

- What game designers do;
- What game designers look like;
- What tools game designers might use;
- Where game designers work;

- Characteristics game designers should possess; and
- Ways game designers might come up with games.

After five minutes of creating the list, students are asked to share their thoughts with the class. The teacher will record responses so that the list is visible to the class. Students are asked to elaborate on their responses.

Teacher will ask pre-lesson questions, and students will respond to these questions orally:

- What do game designers do?
- Where do game designers work?
- What are some of the things game designers might need to make a game?
- What are some tools/materials game designers might use?
- What do you think game designers need to keep in mind when making a game?
- How do you think they come up with the ideas for the games?
- What might game designers need in order to make a game that people will want to play?

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.*

The teacher will introduce the article *Understanding the Tabletop Game Industry*. The teacher will discuss Brian Tinsman and how he has published 35 board games, but has also reviewed over 100 board games. While the students are reading the article, they will focus on what game designers do, how to publish a board game, and characteristics of a board game designer.

Article: https://www.gamedesignworkshop.com/understanding-the-tabletop-game-industry

After reading the article, students are referred back to their original lists. Teacher asks: What other things would you add to your list? The teacher will then ask the during lesson questions:

- What characteristics do game designers possess?
- How do you think Brian Tinsman would review a game?
- What do you think he would look for?
- What makes games/game designers get rejected from companies?
- What make games/game designers get accepted to companies?
- Why is it important to have a board game reviewer?
- How would Brian Tinsman come up with strategies for the game he is reviewing?
- What would you look for as a game reviewer?

Students will split into three groups. Each group will go to a station
Station 1: Clue/Eye appeal. Students will come up with questions a game reviewer would ask that pertains to eye appeal of the game.

Station 2: Chutes and Ladders/ Age appropriateness. Students will come up with questions a game reviewer would ask that pertains to age appropriateness of the game.

Station 3: Trouble/ Probability and strategy. Students will come up with questions a game reviewer would ask that pertains to age probability and strategy.

After playing the game at each station, teacher will give groups time to meet to discuss what questions they came up with. Students will rotate to all stations.

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.*

After students have completed all stations, the teacher will provide time for the students to get together to discuss their questions.

Teacher will make a list of questions that students have created on the board. Students will come to a consensus on what questions they would want on the game reviewer sheet.

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*

Teacher will review the performance task and tell them that Hasbro is ready to see their games.

Performance task: You just graduated from college and got your first job as a Game Designer at Hasbro, the company that developed such popular games as Monopoly, Clue, Scrabble, and Pictionary. Target has asked Hasbro to design a children's board game exclusively for sale at Target and on Target.com. Your boss at Hasbro has given you this assignment as your first task as a Game Designer. She requires that, in addition to creating this kid-friendly board game, that you send her a document explaining how this board game you have created involves probability, and how that probability might influence a player's strategy as they play the game. Target also requires, in addition to submitting to them the game board and instructions on how to play the game, that you prepare a document for them explaining the best strategy to employ in order to win the game. Be prepared to present your board game to a panel of Target's product testers to ensure that Target will be happy with the product you have developed.
Students will come up and introduce their game to the class. They will discuss how to play the game.

Students are then divided into groups. The teacher tells the students that they will be board game reviewers. They are to observe and play the board games. They are to play and observe the game just as a reviewer like Brian Tinsman would so that they can review the game.

After students have completed all stations, the teacher will provide time for the students to get together with the game designers to discuss the reviews. Before going over the reviews, teacher will review expectations about how we should have respectful discussions about the games.

Post-lesson questions are posed by the teacher, and students will respond to the questions orally:

- What did you learn about being a game reviewer?
- What did you look for when reviewing the board game?
- What other questions would you add to the review sheet?
- How was your questions different from your group's questions?
- How were your questions and your group questions similar?
- How was your review different from your group's reviewer?
- How were your review and your groups review similar?
- How did you come up with a strategy for the game as a reviewer?
- How important is it to have a reviewer for board games?

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

Teacher will use the game "Snowball" to assess whether students understood the essential understanding. The teacher will pose the question: "How does probability influence strategy?" The students will think back about the games they have just played. The students will then answer the question on a sticky note. The teacher will ask the students to ball up their sticky note sand throw them around the room. When the teacher says to stop, each student will be instructed to pick up a sticky note. Teacher will then ask for volunteers to read the response on the sticky note, and add their own knowledge about the question to the answer on the sticky note.

Unit Powerpoint:

https://docs.google.com/presentation/d/1rVwpgOm5fyLa-DLMeeyr2aoOjIFNK9hK/edit#slide=id.g5ece0ae529_0_76

Unit Resources

Below is a list of resources that were used to create this unit. These resources can be used to supplement the unit for teachers or students.

Resources	Annotation
Book: Goldstone, B. (2014). *That's a possibility! A book about what might happen.* New York: Scholastic.	This book teaches children about the concept of probability. It gives children easy-to-understand scenarios.
Website: https://hasbrogaming.hasbro.com/en-us	This website will allow students to explore different popular board games.
Website: www.gearhungry.com/types-of-board-games/	This website will educate teachers and students about the different types of board games. This will help when students are making their own board games for the performance task.
Website: https://www.brainpop.com/math/probability/basicprobability/	This website will give students basic knowledge of probability.
Website: https://www.urbo.com/content/fool-proof-strategies-to-win-popular-board-games/	This website will give students information about how to use strategy to win board games.

Video: https://www.youtube.com/watch?v=7_SXFtdf65s https://www.inverse.com/article/32781-win-monopoly-using-math	These videos will give the teacher and students information about how you can win Monopoly using math skills.