

4: LESSON PLAN - Tic Tac Toe

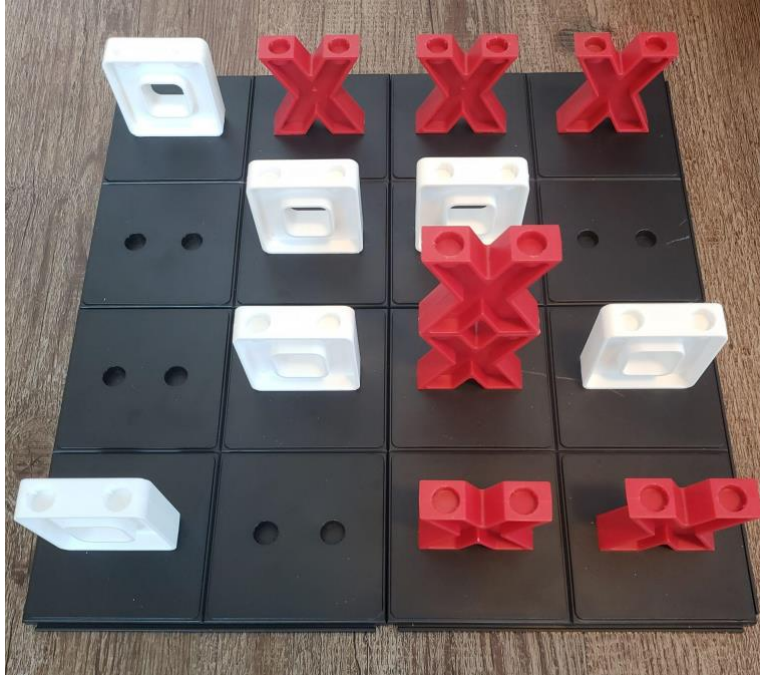
LEARNING AIMS	<p>Students will:</p> <ul style="list-style-type: none"> ● Engage in cooperative play (W1-5) ● Reflect on their own logical and spatial reasoning ● Gain a basic understanding of game mechanics, rules, fundamental gameplay, strategies, winning, cooperative principles ● Logical Reasoning: Exploring game mechanics and the three winning patterns (W1) ● Spatial Reasoning: Locating pieces in order to know where to place and stack (W1) ● Logical reasoning: Wondering about winning patterns – why they work and how to defend against them (W2) ● Spatial reasoning: Diagramming the final board in drawings (W2) ● Logical reasoning: Analyze winning patterns (W3) ● Spatial reasoning: Dimension-shifting between 2D drawing/photo and 3D game board (W3) ● Logical reasoning: Adapting previous strategies with the addition of blockers and make predictions (W4) ● Spatial reasoning: Dimension-shifting between 2D drawing/photo and 3D game board while adding in blockers (W3, 4)
MATERIALS	<ul style="list-style-type: none"> ● Enough copies of <i>Tic Tac Toe</i> for your class ● Whiteboard and marker ● Condensed rules sheet -- Tic Tac Toe How to Play ● Students need pen/pencil
SPECIAL CONSIDERATIONS	<ul style="list-style-type: none"> ● Tic Tac Toe is a quick game; one round takes a few minutes ● Organize groups according to student needs: Play in pairs, so two on two. Encourage discussion and understanding of the game.
LESSON ACTIVITIES	<p>1. Each week you get to play a lot of rounds of Tic Tac Toe. One student noticed that even though it's good to win, sometimes: "I keep losing, and I keep learning!" What do you think he meant by that?</p> <p>Last week you focused on creating winning strategies by thinking about building in 3D and drawing your boards. The reflection question had a tricky situation! Let's see what happened in some students' thinking: <i>Starter Image</i> (see below)</p> <p>[Note: Some prompts are in comments in the document. Student A may have drawn the board from her perspective, which is sitting opposite the assumed spot for the photo. Student B drew from the picture's perspective; B also uses the word "vertical" – may be interesting to find out what kids would call a win when 4 are stacked up, is that vertical, too? Student C's is interesting because there are many more moves, and C showed "pathfinding" with her drawing to show the win.]</p>

	<p>What if I told you there was a way for Team X to win – even though A and B’s pictures looked like that was impossible?!? It’s with blockers!! Today, play with the blockers in order to see how using them changes your approach to stopping your opponents and winning the game. Rules for the blockers:</p> <ul style="list-style-type: none"> ● Each team gets ONE blocker to use ONCE during the game ● Can only use a blocker to block opponent from winning on their next turn (immediate win) ● Then, take your turn right away – place your own piece ● Anyone can build on top of a blocker <p>First reflection question is after the second game.</p> <ol style="list-style-type: none"> 2. Divide students into their groups. 3. Hand out the reflection sheet so students know what questions to think about. Encourage them to choose one round of the game and answer the questions. 4. Teacher circulates and prompts student discussion of strategies. Encourage students to ask each other the questions listed on the “How to Play” sheet. <ol style="list-style-type: none"> a. Why did you choose to do that? b. Could you have tried a different strategy? c. What are the benefits or risks of stacking? 5. Have them work on the second question in the reflection sheet (set up board, play through, reflect). Don’t mention this: but the picture is set up so that if Team O uses their blocker they can block and win right away.
<p>QUESTIONS/ REFLECTIONS</p>	<p>Questions for students/prompts: Focus for Lesson 4:</p> <ul style="list-style-type: none"> ● How might using the blockers make the game easier? ● How might using the blockers make the game harder? ● Is there a way you can plan ahead to use your blockers? Or is it best to only use them when your opponent surprises you? ● Are your blockers mainly for playing when your opponent is about to win? ● Is there a benefit to playing your blockers before your opponent is about to win? ● Can you use your blockers to trick your opponent into making a move you want them to?

	<ul style="list-style-type: none">● If you could choose, would you play with or without blockers? <p>“For Next Time” Reflection Question: Is it possible to use the blockers in order to block your opponent and win in the same turn? Can you think of a plan to make this happen next week?</p> <p>Other questions to consider:</p> <ul style="list-style-type: none">● Would rotating the board make a difference to your thinking?● Which level is that hardest to win on (base, 2nd, 3rd, 4th, across levels)?● Are there any places on the board where you try and put your pieces first?● What do you do if your opponent takes a spot you wanted to put your piece?● How many moves in advance are you planning?● Did any of your first three moves involve stacking your piece on top of another piece that had already been played?● During the middle of the game, how did you decide where to place a piece on the board? Use drawings and words.● Which types of patterns (horizontal, vertical, diagonal and multi-level versions) did you try and use to win your game?● Pick one of the patterns you used in your game, why did you choose to use that pattern?● Explain the similarities and differences you noticed between Tic Tac Toe and Tic Stac Toe.● Explain the similarities and differences you noticed between Gobblet Gobblers and Tic Stac Toe.● Mathematicians who research game theory are interested in all the different moves that can be made in a game. Can you show all the opening moves for the three related games: Tic Tac Toe, Gobblet Gobblers, and Tic Stac Toe? Draw pictures, give a count and reason for the count.● What is an important strategy you figured out while playing Tic Stac Toe. Use drawings and words.● Is it better to be the first player or the second player? Why?● Can you set up more than one way to win? 2 ways? 3 ways?● What do you do when you are thinking offensively?● What do you do when you are thinking defensively?● One group realized that with the board as pictured [include image], that the _____ team would win on their next turn. How did they know?● Imagine you’ve been hired to make a tips & tricks website for Tic Stac Toe. Create two important tips to help players. Use drawings to help explain. Tip 1: Tip 2:
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	<ul style="list-style-type: none">● In all of the games, students told us about playing on the sides or corners. Can you tell me how playing on the sides and/or corners helps in Tic Tac Toe? Use drawings and words.
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Last Week You Played This Game (Team O's turn)



Student A's Thinking:

They double crossed
like they had made it
so then they have
two ways to win, it is
technically an instant
win.

X	X	X	O
O	X	O	
O	O	O	O
X	X	X	O

QUESTIONS

Student B's Thinking:

they used vertical

O	X	X	X
O	X	O	X
O	X	X	X
O	X	X	X

QUESTIONS

Student C's Thinking:

use to win (horizontal, vertical, diagonal)?

O won
because she
tricked me
to win the
other way

Draw the final board!

O	X	X	X
X		O	O
	O	X	O
X		X	X

QUESTIONS

Reflection Sheet: Tic Tac Toe

Your Name: _____ Team Members: _____

1) Adapting Strategies to Use Blockers

a) Did using blockers make the game easier or harder? Circle One: YES / NO

Explain why blockers made the game harder or easier using the lines and space below to write and draw your ideas:

b) Draw the way the board looked after the final turn was played in the game.

2) Shifting Dimensions to Analyze a Win

- a) Set the board up so it matches the photo.

It is the 'O' team's turn.

- b) Circle the team you predict will win this game:

Team 'X' / Team 'O'

- c) **Play** this game to its end and circle the team that won:

Team 'X' / Team 'O'



- d) Draw the final board after this game has been played. **Which team won? Why?**

What pattern did they use to win?

Circle: horizontal vertical diagonal
