

# Card game and presentation notes

---

## Game design Prompt

Develop a card game to help students learn about limiting reactants. In this game, students must gather cards to make a rover. A complete rover will include a body, a brain(computer), four directional sensors, and four sets of wheels and gears. Each card will have one item. Students have to collect 10 of the appropriate cards to make a complete rover. The entire deck can make 4 rovers.

## Game Design

### Presentation outline **Limiting Rover: A Card Game for Limiting Reactants**

This card game helps students understand limiting reactants by simulating a chemical reaction where students need specific components (reactants) to build a complete rover (product).

#### Materials:

- Cards (enough for 4-6 players):
  - Body (4 cards)
  - Brain (computer) (4 cards)
  - Directional Sensor (16 cards) - 4 sets of 4 (North, South, East, West)
  - Wheel & Gear Set (16 cards) - 4 sets of 4

#### Gameplay:

1. **Preparation:** Shuffle all cards and deal 5 cards face down to each player. Place the remaining deck face down in the center as a drawing pile.
2. **Turns:** On their turn, a player takes two actions:
  - **Draw:** Draw two cards from the deck.
  - **Play/Discard:**
    - Play a set of four matching cards (Body, Brain, Directional Sensor set, or Wheel & Gear Set) to the discard pile. This indicates they have built that component of their rover.
    - Discard any unwanted cards to the discard pile.

3. **Winning:** The first player to collect and play sets of all four components (Body, Brain, 4 Directional Sensors, 4 Wheel & Gear Sets) wins the game. They have successfully built a complete rover!
4. **Optional Rule (Adding Limiting Reactant):**
  - Designate one type of card (e.g., Directional Sensor) as the "limiting reactant." Reduce the number of that card type in the deck (e.g., remove 4 Directional Sensor cards).
  - Now, even though there are enough components overall to build 4 rovers, there won't be enough of the limiting reactant (Directional Sensors) for all players. This simulates a scenario where one reactant limits the amount of product that can be formed.

### Learning Through Play:

- **Limiting Reactant:** As players compete, the limited availability of a specific card type (limiting reactant) will hinder some players from completing their rovers first, even if they have other components. This reinforces the concept of limiting reactants controlling the amount of product formed.
- **Stoichiometry:** The fixed number of cards needed for each component (e.g., 4 Directional Sensors) reflects the stoichiometric ratios in a chemical reaction.
- **Competition and Strategy:** Players need to strategize by drawing cards, discarding unwanted ones, and anticipating what their opponents might need.

### Differentiation:

- **For younger students:** Reduce the number of components needed for a rover (e.g., 3 Directional Sensors instead of 4) or limit the number of cards drawn per turn.
- **For advanced students:** Introduce additional card types representing tools or resources needed to build the rover, adding another layer of complexity.

This card game provides a fun and interactive way for students to learn about limiting reactants and stoichiometry.