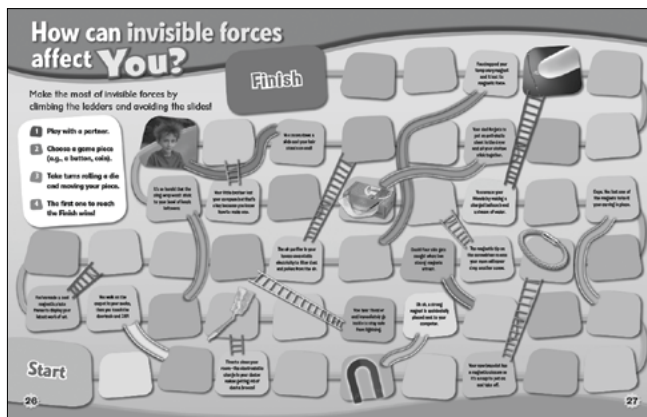


Design Challenge: What Can You Make That Uses Invisible Forces?



Focus: Students demonstrate their understanding of invisible forces by designing and constructing a toy or game that makes use of attraction and/or repulsion.

Specific Curriculum Outcomes

Students will be expected to:

- 28.0 identify problems to be solved [GCO 2]
- 29.0 identify materials and suggest a plan for how they will be used [GCO 2]
- 30.0 respond to the ideas and actions of others and acknowledge their ideas and contributions [GCO 2]

Performance Indicators

Students who achieve these outcomes will be able to:

- work collaboratively to develop a detailed design plan
- build a prototype product that will satisfy a set of given criteria

NOTES:

Attitude Outcome Statements

Encourage students to:

- show concern for their safety and that of others in carrying out activities and using materials [GCO 4]

Cross-Curricular Connections

English Language Arts

Students will be expected to:

- speak and listen to explore, extend, clarify, and reflect on their thoughts, ideas, feelings, and experiences [GCO 1]
- interact with sensitivity and respect, considering the situation, audience, and purpose [GCO 3]

Getting Organized

Components	Materials	Before You Begin	Vocabulary
• Student Magazine, pages 26–29 • IWB Activity 9 • <i>What Is the Design Process?</i> poster	• buttons or coins to use as game pieces, dice • variety of games and toys using invisible forces for the Curiosity Centre • students' Science Journals • variety of materials such as balloons, plastic rods, plastic wrap, various fabrics • magnets of different shapes, sizes, and strengths • magnetic materials such as paper clips magnetic tape, washers, screws, tin cans • various craft supplies • tools such as scissors, staplers, and tape	• Arrange for a group of kindergarten or grade 1 students to visit the classroom to act as a focus group.	• attraction • repulsion

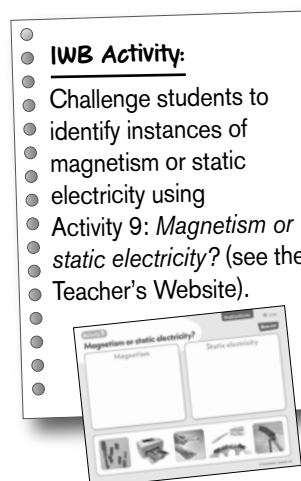
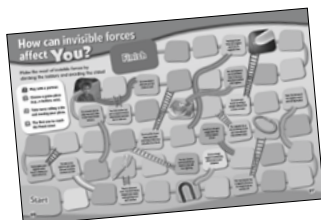
Safety

- If any students have a latex allergy, modify the materials or the activity accordingly to avoid the use of latex balloons.
- Reinforce classroom safety rules for handling tools.

ACTIVATE

Slides and Ladders

Share pages 26–27 of the Student Magazine with the class. Invite students to play the game in partners or small groups to review information about static electricity and magnetism.



Game On!

Invite students to bring in toys and games from home which use invisible forces to work. In addition, provide a variety of games and toys with magnets at the Curiosity Centre. Encourage students to play with the toys and games in order to explore how the invisible forces work.

CONNECT

Introduce the Challenge

Explain to students that they are going to work in small groups to design and build a toy or game that uses an invisible force (magnetism or static electricity) and appeals to younger students.

Direct students to read pages 28–29 of the Student Magazine. Students should examine the photos of toys and games that use an invisible force and discuss how they work. Invite students to share any experiences they have had with these or similar toys and games.



Focus Group Research

If possible, invite a group of kindergarten or grade 1 students to visit the classroom as a focus group representing the “consumer” to discuss what they feel makes the best toys and games. Students can elicit what younger students think make games fun. Encourage students to note ideas they feel are important or helpful and which could be used to develop criteria for designing a toy or game that will appeal to younger students.

Display the *What Is the Design Process?* poster and review the steps with students. You may also use this time to review safety procedures for working with various tools.



Design Process

Step 1. Identify a problem. Think of a solution. Make a plan.

Have students form small groups and begin the design process. Give students time to brainstorm possible games and toys individually and to gather information and ideas from approved websites. Students should use their Science Journals to make notes (e.g., noting the problems they must solve with their design and listing the materials they will need). Students should also include detailed sketches labelled with the design components and possible materials.

Emphasize the need for students to listen to and acknowledge every group member’s ideas and contributions. Once each group has discussed all the possible products and collaboratively decided on one design, ask them to sketch their final toy or game idea in their Science Journals and explain how it will apply an invisible force.

Step 2. Gather materials. Build your solution.

Groups can now decide on the materials and tools they will need to build their toy or game. Materials may include items to create static electricity



(e.g., balloons; plastic rods, plastic wrap; fabric such as satin, silk, felt, and fur); magnets of various shapes, sizes, and strengths; and magnetic materials such as paper clips, magnetic tape, washers, screws, and tin cans. Additional craft supplies may also be provided. Tools may include scissors, staplers, and tape.

As each group gathers the tools it will need, encourage students to repeat any safety rules associated with the tools. Give students time to build the first prototype version of their toy or game. As they carry out their plans, encourage students to make changes or modifications as necessary.

CONSOLIDATE

Make It Fun!

Students can work with their group to consider the feedback from the focus group to see if the suggestions for making the game fun have been addressed with their design plan and prototype toy or game.

EXPLORE MORE

Create an Assessment Checklist

Encourage students to collaborate with classmates to create a peer/self-assessment checklist to reflect on how well the group has collaborated in the design process. Students might consider:

- how well they understood the problem,
- whether they actively participated in brainstorming ideas,
- if they contributed to the development of design criteria,
- whether they worked co-operatively, and
- if they shared group responsibilities.