Magnet Motion

Background: Magnets can be used to create motion. They can pull something (attract) or push something (repel). Magnets attract or repel only certain metals.

Design Challenge: Design and create an object that can be pushed or pulled on a course by using magnets. You may not touch the object. You will present your work to the class.

Criteria: The object must

- ☐ be moved by magnetic force
- ☐ have a path or a course to follow
- ☐ represent an animal, plant, person, or thing, and the path must relate to the object.

Materials: Select from the items listed below.		**Tools:** Select from the items listed below.
• cardboard	• paper clips	• magnets
• cardboard tubes	• scrap paper	• markers/crayons
• construction paper	• scrap fabric	• pencils
• glue	• small magnet rounds	• scissors
• magnetic tape	• tape	

Targeted Standard of Learning: Science K.3

Supporting SOL: English K.2, K.3, K.8; Science K.1, K.4; Mathematics K.12

Targeted Standard for Technological Literacy: 16

Supporting STL: 5, 8, 11, 12

Tips for Teachers

Targeted Standard of Learning:

Science K.3   The student will investigate and understand that magnets have an effect on some materials, make some things move without touching them, and have useful applications. Key concepts include
- a) magnetism and its effects; and
- b) useful applications of magnetism.

Supporting SOL: English K.2, K.3, K.8; Science K.1, K.4; Mathematics K.12

Targeted Standard for Technological Literacy:

16   Students will develop an understanding of and be able to select and use energy and power technologies.

Supporting STL: 5, 8, 11, 12

Prior Knowledge & Skill	Materials & Preparation	Safety Issues	Class Management	Materials Provided	Design Process
• Exposure to vocabulary: *repel, attract, push, pull, metal, nonmetal, attraction/non-attraction* • Exposure to magnet principles • Shared books on magnets	• Magnets • Games using magnets • Use recyclables: cardboard, scraps, and fabrics • Check Design Brief for recommended materials.	• Use of materials and tools, especially scissors and magnets	• Small groups of two to four • Materials can be placed in paper bags and labeled by groups so that work in progress and materials can all stay together. Cleanup is easier, and less distribution time is required.	• Design Brief • Guided Portfolio (adapt as appropriate/ optional) • Rubric Assessments	Follow the Design Process: • Restate the problem. • Brainstorm solutions. • Create the best solution. • Test the solution. • Evaluate the solution.

Guided Portfolio

Name _____

Group Members _____

1. **What is the problem?** State the problem in your own words.

_____

_____

_____

_____

_____

_____

_____

_____

Name _____

2.   Brainstorm solutions. Sketch and/or describe some possible solutions.

Name   _____

3.   Create the solution you think is best.
Keep notes about your problems and how you solve them. Make sketches if they help.

_____

_____

_____

Name   _____

4.   Test your solution.

Does your object move by magnetic force?   YES   NO

What path or course does your object follow?_____

What does your object represent? _____

Name _____

5. Evaluate your solution.

Was it the best solution? Why or why not?

_____

_____

_____

What would you have done differently?

_____

_____

_____

Rubric for Shapes All Around Us

Name_____   Date _____

0—no evidence; 1—limited understanding; 2—some understanding with room for improvement; 3—good understanding with room for improvement; 4—substantial understanding

Student Evaluation	0	1	2	3	4
Oral Presentation: The student					
• used complete sentences					
• used descriptive words.					
Guided Portfolio: The student participated in					
• restating the problem					
• brainstorming solutions					
• creating a solution					
• testing the solution					
• evaluating the solution.					
Team Skills: The student					
• used appropriate voice					
• encouraged team members					
• listened to team members					
• was involved in all aspects of the project					
• respected team members.					

Tested Criteria	YES	NO
The student used magnetic force to move the object.		
The student designed a path or course.		
The object is representational.		
The path or course is related to the object.		

Standards of Learning

English (2010)

Oral Language

K.2   The student will expand understanding and use of word meanings.
- a)   Increase listening and speaking vocabularies.
- b)   Use number words.
- c)   Use words to describe/name people, places, and things.
- d)   Use words to describe/name location, size, color, and shape.
- e)   Use words to describe/name actions.
- f)   Ask about words not understood.
- g)   Use vocabulary from other content areas.

K.3   The student will build oral communication skills.
- a)   Express ideas in complete sentences and express needs through direct requests.
- b)   Begin to initiate conversations.
- c)   Begin to follow implicit rules for conversation, including taking turns and staying on topic.
- d)   Listen and speak in informal conversations with peers and adults.
- e)   Participate in group and partner discussions about various texts and topics.
- f)   Begin to use voice level, phrasing, and intonation appropriate for various language situations.
- g)   Follow one- and two-step directions.
- h)   Begin to ask how and why questions.

Reading

K.8   The student will expand vocabulary.
- a)   Discuss meanings of words.
- b)   Develop vocabulary by listening to a variety of texts read aloud.

Science (2010)

Scientific Investigation, Reasoning, and Logic

K.1   The student will demonstrate an understanding of scientific reasoning, logic, and the nature of science by planning and conducting investigations in which
- a)   basic characteristics or properties of objects are identified by direct observation;
- b)   observations are made from multiple positions to achieve different perspectives;
- c)   a set of objects is sequenced according to size;
- d)   a set of objects is separated into two groups based on a single physical characteristic;

e) nonstandard units are used to measure the length, mass, and volume of common objects;
f) observations and predictions are made for an unseen member in a sequence of objects;
g) a question is developed and predictions are made from one or more observations;
h) observations are recorded;
i) picture graphs are constructed;
j) unusual or unexpected results in an activity are recognized; and
k) objects are described both pictorially and verbally.

Force, Motion, and Energy

K.3   The student will investigate and understand that magnets have an effect on some materials, make some things move without touching them, and have useful applications. Key concepts include
a) magnetism and its effects; and
b) useful applications of magnetism.

Matter

K.4   The student will investigate and understand that the position, motion, and physical properties of an object can be described. Key concepts include
a) colors of objects;
b) shapes and forms of objects;
c) textures and feel of objects;
d) relative sizes and weights of objects; and
e) relative positions and speed of objects.

Mathematics (2010)

Geometry

K.12   The student will describe the location of one object relative to another (above, below, next to) and identify representations of plane geometric figures (circle, triangle, square, and rectangle) regardless of their positions and orientations in space.

Standards for Technological Literacy

Standard 5:   Students will develop an understanding of the effects of technology on the environment.

Standard 8:   Students will develop an understanding of the attributes of design.

Standard 11:   Students will develop abilities to apply the design process.

Standard 12:   Students will develop the ability to use and maintain technological products and systems.

Standard 16:   Students will develop an understanding of and be able to select and use energy and power technologies.

Please give us some feedback.

Complete the form below to let us know how this design brief worked for you and your students. Please be specific so that we might use your suggestions to improve the activity. *You can fill this out on your computer, or you can print it, fill it out manually, and scan it.*

Teacher: _____

School: _____

School division: _____

Design brief title: _____

Background *Put an X in the appropriate column:*	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does it set the context for the activity?			
Is it age-appropriate in language, length, and complexity?			
Does it reference prior learning and/or research that the students did that will facilitate designing a solution to a problem?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Design Challenge	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Does the challenge support your curriculum?			
Is it age-appropriate in language, length, and complexity?			
Is it detailed enough that an adult will understand the purpose for the design brief?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Criteria Criteria are part of the challenge. They set the limitations for the design. They are not directions.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Are the limitations age-appropriate?				
Do the limitations encourage critical thinking?				
Is the application of mathematic knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of science knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Is the application of social studies knowledge/skills integrated into the criteria? If not, should the skill area be addressed?				
Are language skills integrated into the criteria? If not, should the skill area be addressed?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Materials Materials help set the limitations for the design. The list should include materials that might work.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use	N/A
Does the materials list encourage a variety of design solutions?				
Does the materials list include a variety of choices for joining items?				
Does the materials list include materials that force students to make decisions?				
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*				

Tools Tools can be used in the construction of the designed product. They are used to manipulate materials. They cannot become part of the product.	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the tools listed age appropriate?			
Are all tools needed for the activity included?			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Standards of Learning	Yes	No
Does the design brief reinforce the targeted Standard of Learning(s)?		
Are the supporting Standards of Learning appropriate?		
What Standards of Learning would you add or remove?		

Standards for Technological Literacy	Yes	No
Does the design brief reinforce the targeted Standard(s) for Technological Literacy?		
Are the supporting Standards for Technological Literacy appropriate?		
What Standards for Technological Literacy would you add or remove?		

Tips for Teachers	Yes	No
Are the tips listed in the chart helpful for a first-time teacher?		
What tips would you add?		

Guided Portfolio	Needs to be rewritten	Needs minor adjustment	Is ready for classroom use
Are the instructions and questions age appropriate and clear?			
In the "Test your solution" section, do the questions force students to thoroughly test their solutions?			
In the "Evaluate your solution" section, do the questions force students to honestly evaluate their solutions			
COMMENTS. *If any of the questions above are marked other than "ready for classroom use," please provide suggestions here.*			

Additional Comments
Please use this area to provide general suggestions for improving this design brief.