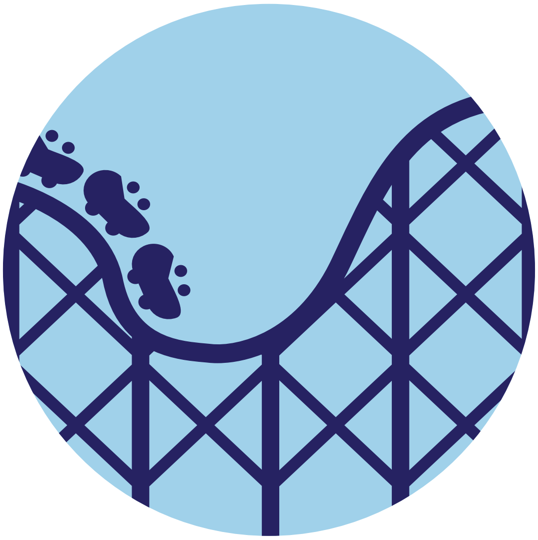

Amusement Park of the Future

STEM Road Map for Middle School

Grade 6

Edited by Carla C. Johnson,
Janet B. Walton, and Erin Peters-Burton

NSTA press
National Science Teachers Association

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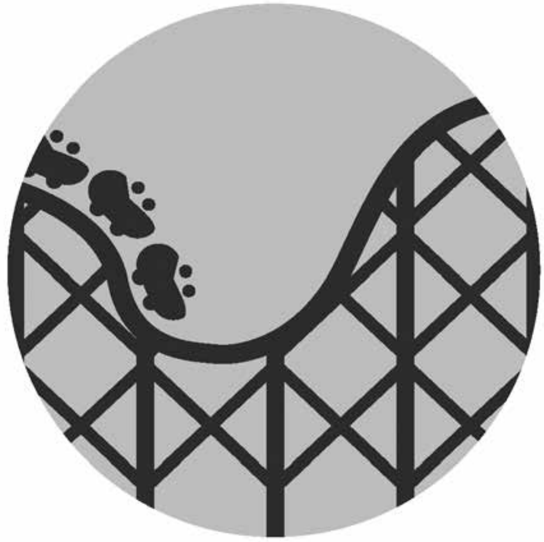

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NSTApress
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See *www.routledge.com/products/9781138804234* for more information about *STEM Road Map: A framework for integrated STEM education.*

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AMUSEMENT PARK OF THE FUTURE MODULE OVERVIEW

Erin Peters-Burton, Janet B. Walton, and Carla C. Johnson

THEME: Innovation and Progress

LEAD DISCIPLINE: Science

MODULE SUMMARY

We use buildings every day, but often take for granted how complex these structures are, and this unit gives students an inside look at the technologies and science necessary to understand these outstanding feats of engineering. In this module, students will examine micro and macro properties of construction materials, particularly those of high-rise buildings. For each subject area, the unit is split into three sections. During the first section, students will learn how high-rises are constructed, the influence these high-rises had on society, and how to communicate complex ideas clearly. In the second section, students will look at the factors for the collapse of the World Trade Center Twin Towers in New York, focusing on how engineers use failure to learn more about the designed world. In the last section, students will examine innovations in construction to propose new ways to construct high-rises (summary adapted from Peters-Burton et al. 2015).

ESTABLISHED GOALS AND OBJECTIVES

At the conclusion of this module, students will be able to do the following:

- Understand the big ideas around energy transfer, including potential and kinetic energy transfer.
- Use their measurement skills to find ratios and rates to describe their prototype amusements and graph the results of their investigations.
- Relate what they have learned about the history of amusements to understand why people seek thrills in their leisure time.

- Practice their English language arts (ELA) skills by understanding technical texts, creating multimedia communication products, and creating arguments for the claims they make based on the evidence of the investigations.
- See how the subjects they study not only provide information about the world around them but also work together to create a more comprehensive understanding of phenomena.

CHALLENGE OR PROBLEM FOR STUDENTS TO SOLVE: AMUSEMENT PARK OF THE FUTURE DESIGN CHALLENGE

Student teams are challenged to each produce a prototype of an amusement park. They begin by conducting research on the advances in amusement parks, starting with 19th-century amusement rides. Students also research the role of amusement parks in society and synthesize their research to inform the creation of their prototypes. They use this research to present their ideas for parks using today's technology, including rides and dart- or ball-throwing games. Students create blueprints of their models, build and test small-scale prototypes, and develop cost-benefit analyses for building and maintaining their parks, including impact studies for the local communities in which the parks will be located. Students also design marketing plans and infomercials with scripts and demonstrations to promote their amusement parks.

Driving Question: How can we use what we know about the development of amusements, the ways people experience thrills, and the laws of physics to propose new amusements that are both safe and extreme?

STEM RESEARCH NOTEBOOK

Each student should maintain a STEM Research Notebook, which will serve as a place for students to organize their work throughout this module (see p. 25 for more general discussion on setup and use of this notebook). All written work in the module should be included in the notebook, including records of students' thoughts and ideas, fictional accounts based on the concepts in the module, and records of student progress through the engineering design process. The notebooks may be maintained across subject areas, giving students the opportunity to see that although their classes may be separated during the school day, the knowledge they gain is connected.

Emphasize to students the importance of organizing all information in a Research Notebook. Explain to them that scientists and other researchers maintain detailed Research Notebooks in their work. These notebooks, which are crucial to researchers' work because they contain critical information and track the researchers' progress, are often considered legal documents for scientists who are pursuing patents or wish to provide proof of their discovery process.

STUDENT HANDOUT

STEM RESEARCH NOTEBOOK GUIDELINES

STEM professionals record their ideas, inventions, experiments, questions, observations, and other work details in notebooks so that they can use these notebooks to help them think about their projects and the problems they are trying to solve. You will each keep a STEM Research Notebook during this module that is like the notebooks that STEM professionals use. In this notebook, you will include all your work and notes about ideas you have. The notebook will help you connect your daily work with the big problem or challenge you are working to solve.

It is important that you organize your notebook entries under the following headings:

1. **Chapter Topic or Title of Problem or Challenge:** You will start a new chapter in your STEM Research Notebook for each new module. This heading is the topic or title of the big problem or challenge that your team is working to solve in this module.
2. **Date and Topic of Lesson Activity for the Day:** Each day, you will begin your daily entry by writing the date and the day's lesson topic at the top of a new page. Write the page number both on the page and in the table of contents.
3. **Information Gathered From Research:** This is information you find from outside resources such as websites or books.
4. **Information Gained From Class or Discussions With Team Members:** This information includes any notes you take in class and notes about things your team discusses. You can include drawings of your ideas here, too.
5. **New Data Collected From Investigations:** This includes data gathered from experiments, investigations, and activities in class.
6. **Documents:** These are handouts and other resources you may receive in class that will help you solve your big problem or challenge. Paste or staple these documents in your STEM Research Notebook for safekeeping and easy access later.
7. **Personal Reflections:** Here, you record your own thoughts and ideas on what you are learning.
8. **Lesson Prompts:** These are questions or statements that your teacher assigns you within each lesson to help you solve your big problem or challenge. You will respond to the prompts in your notebook.
9. **Other Items:** This section includes any other items your teacher gives you or other ideas or questions you may have.

MODULE LAUNCH

To launch the module, have students investigate close-up photos of people riding amusements and then discuss why people seek thrill rides. The main goal of the launch is to connect the idea that people seek emotion-based thrills with the physics and engineering of amusement rides and games and to convey the message that physics and engineering are an integral part of generating these emotions. Next, students watch an artistically derived video of extreme amusements. Although the video and accompanying website appear to be a research project on amusements, the video has actually been manipulated to look like footage of a real park. Nevertheless, the extreme nature of the rides in the video and the ways the "scientists" talk about the rides will engage the interest of students and clearly illustrate how the rides use physical characteristics to evoke thrills.

PREREQUISITE SKILLS FOR THE MODULE

Students enter this module with a wide range of preexisting skills, information, and knowledge. Table 3.1 provides an overview of prerequisite skills and knowledge that students are expected to apply in this module, along with examples of how they apply this knowledge throughout the module. Differentiation strategies are also provided for students who may need additional support in acquiring or applying this knowledge.

Table 3.1. Prerequisite Key Knowledge and Examples of Applications and Differentiation Strategies

Prerequisite Key Knowledge	Application of Knowledge by Students	Differentiation for Students Needing Additional Knowledge
• Use electronic and print media to find new information from reliable sources. • Summarize information gathered from several sources. • Measure linear distance and time in metric units. • Assess and address safety issues relative to amusements. • Use simple arithmetic operations (adding, subtracting, multiplying, dividing).	• Create a timeline for a variety of amusements. • Create a report featuring psychological factors of thrill seeking at amusement parks. • Use the internet find the tallest and the fastest amusement rides in the world, as well as the one with the most loops. • Research safety features of amusements. • Apply measurement and arithmetic operations to build an amusement park prototype.	• Provide a list of reliable sources for students to use. • Highlight key information from reliable resources for students to synthesize. • Review measurement skills and provide opportunities for practice throughout the module. • Review arithmetic operations and provide opportunities to apply operations to real-life situations.

POTENTIAL STEM MISCONCEPTIONS

Students enter the classroom with a wide variety of prior knowledge and ideas, so it is important to be alert to misconceptions, or inappropriate understandings of foundational knowledge. These misconceptions can be classified as one of several types: "preconceived notions," opinions based on popular beliefs or understandings; "nonscientific beliefs," knowledge students have gained about science from sources outside the scientific community; "conceptual misunderstandings," incorrect conceptual models based on incomplete understanding of concepts; "vernacular misconceptions," misunderstandings of words based on their common use versus their scientific use; and "factual misconceptions," incorrect or imprecise knowledge learned in early life that remains unchallenged (NRC 1997, p. 28). Misconceptions must be addressed and dismantled in order for students to reconstruct their knowledge, and therefore teachers should be prepared to take the following steps:

- *Identify students' misconceptions.*
- *Provide a forum for students to confront their misconceptions.*
- *Help students reconstruct and internalize their knowledge, based on scientific models. (NRC 1997, p. 29)*

Keeley and Harrington (2010) recommend using diagnostic tools such as probes and formative assessment to identify and confront student misconceptions and begin the process of reconstructing student knowledge. Keeley and Harrington's *Uncovering Student Ideas in Science* series contains probes targeted toward uncovering student misconceptions in a variety of areas. In particular, Volumes 1 and 2 of *Uncovering Student Ideas in Physical Science* (Keeley and Harrington 2010, 2014), about force/motion may be useful resources for addressing student misconceptions in this module.

Some commonly held misconceptions specific to lesson content are provided with each lesson so that you can be alert for student misunderstanding of the science concepts presented and used during this module. The American Association for the Advancement of Science has also identified misconceptions that students frequently hold regarding various science concepts (see the links at *http://assessment.aaas.org/topics*).

SRL PROCESS COMPONENTS

Table 3.2 illustrates some of the activities in the Amusement Park of the Future module and how they align to the SRL process before, during, and after learning.

Table 3.2. SRL Process Components

Learning Process Components	Example From Amusement Park of the Future Module	Lesson Number and Learning Component
BEFORE LEARNING		
Motivates students	Students watch a film with extreme amusement rides and evaluate the physical factors that make it exciting.	Lesson 1, Introductory Activity/ Engagement
Evokes prior learning	Students tap into their prior experience with amusement rides and recall the ways they moved in the ride.	Lesson 1, Introductory Activity/ Engagement
DURING LEARNING		
Focuses on important features	Students do a jigsaw activity with guidance from the teacher to form groups on • Spinning • Height • Feeling of weightlessness • Speed	Lesson 2, Activity/Exploration
Helps students monitor their progress	Students record findings for research on the speed and energy of various well-known amusement rides in their STEM Research Notebook. Teachers provide feedback on their completeness and accuracy.	Lesson 2, Elaboration/Application of Knowledge
AFTER LEARNING		
Evaluates learning	In the final challenge, groups present their final report on their new amusement park of the future project and receive feedback from the teacher and community members.	Lesson 3, Activity/Exploration
Takes account of what worked and what did not work	In the final challenge, students are asked to reflect on the feedback they receive on their group project and offer a plan of action for a re-design.	Lesson 3, Activity/Exploration

STRATEGIES FOR DIFFERENTIATING INSTRUCTION WITHIN THIS MODULE

For the purposes of this curriculum module, differentiated instruction is conceptualized as a way to tailor instruction—including process, content, and product—to various student needs in your class. A number of differentiation strategies are integrated into lessons across the module. The problem- and project-based learning approach used in the lessons is designed to address students' multiple intelligences by providing a variety of entry points and methods to investigate the key concepts in the module. Differentiation strategies for students needing support in prerequisite knowledge can be found in Table 3.1 (p. 26). You are encouraged to use information gained about student prior knowledge during introductory activities and discussions to inform your instructional differentiation. Strategies incorporated into this lesson include flexible grouping, varied environmental learning contexts, assessments, compacting, and tiered assignments and scaffolding.

Flexible Grouping. Students work collaboratively in a variety of activities throughout this module. Grouping strategies you might employ include student-led grouping, grouping students according to ability level, grouping students randomly, or grouping them so that students in each group have complementary strengths (for instance, one student might be strong in mathematics, another in art, and another in writing). You may also choose to group students based on their interest in different types of amusements when conducting historical research for the time line. For Lesson 2, you may choose to maintain the same student groupings as in Lesson 1 or regroup students according to another of the strategies described here. You may therefore wish to consider grouping students in Lesson 2 into design teams for the trebuchet. For Lesson 3, grouping should be based on the types of amusements students wish to design for the park. Place students who want to design different amusements together so that the park they develop as a group has more variety.

Varied Environmental Learning Contexts. Students have the opportunity to learn in various contexts throughout the module, including alone, in groups, in quiet reading and research-oriented activities, and in active learning through inquiry and design activities. In addition, students learn in a variety of ways, including through doing inquiry activities, journaling, reading fiction and nonfiction texts, watching videos, participating in class discussion, and conducting web-based research.

Assessments. Students are assessed in a variety of ways throughout the module, including individual and collaborative formative and summative assessments. Students have the opportunity to produce work via written text, oral and media presentations, and modeling. You may choose to provide students with additional choices of media for their products (for example, PowerPoint presentations, posters, or student-created websites or blogs).

Compacting. Based on student prior knowledge, you may wish to adjust instructional activities for students who exhibit prior mastery of a learning objective. For instance, if some students exhibit mastery of energy transfer in Lesson 2, you may wish to limit the amount of time they spend practicing these skills and instead introduce ELA or social studies connections with associated activities.

Tiered Assignments and Scaffolding. Based on your awareness of student ability, understanding of concepts, and mastery of skills, you may wish to provide students with variations on activities by adding complexity to assignments or providing more or fewer learning supports for activities throughout the module. For instance, some students may need additional support in identifying key search words and phrases for web-based research or may benefit from cloze sentence handouts to enhance vocabulary understanding. Other students may benefit from expanded reading selections and additional reflective writing or from working with manipulatives and other visual representations of mathematical concepts. You may also work with your school librarian to compile a set of topical resources at a variety of reading levels.

STRATEGIES FOR ENGLISH LANGUAGE LEARNERS

Students who are developing proficiency in English language skills require additional supports to simultaneously learn academic content and the specialized language associated with specific content areas. WIDA has created a framework for providing support to these students and makes available rubrics and guidance on differentiating instructional materials for English language learners (ELLs) (see *www.wida.us/get.aspx?id=7*). In particular, ELL students may benefit from additional sensory supports such as images, physical modeling, and graphic representations of module content, as well as interactive support through collaborative work. This module incorporates a variety of sensory supports and offers ongoing opportunities for ELL students to work collaboratively. The focus in this module on amusement parks in a global context affords opportunities to access the culturally diverse experiences of ELL students in the classroom.

Teachers differentiating instruction for ELL students should carefully consider the needs of these students as they introduce and use academic language in various language domains (listening, speaking, reading, and writing) throughout this module. To adequately differentiate instruction for ELL students, teachers should have an understanding of the proficiency level of each student. WIDA provides an assessment tool to help teachers assess English language proficiency levels at *www.wida.us/assessment/ACCESS20.aspx.* The following five overarching WIDA learning standards are relevant to this module:

- Standard 1: Social and Instructional language. Focus on social behavior in group work and class discussions.
- Standard 2: The language of Language Arts. Focus on forms of print, elements of text, picture books, comprehension strategies, main ideas and details, persuasive language, creation of informational text, and editing and revision.

- Standard 3: The language of Mathematics. Focus on numbers and operations, patterns, number sense, measurement, and strategies for problem solving.
- Standard 4: The language of Science. Focus on safety practices, magnetism, energy sources, scientific process, and scientific inquiry.
- Standard 5: The language of Social Studies. Focus on change from past to present, historical events, resources, transportation, map reading, and location of objects and places.

SAFETY CONSIDERATIONS FOR THE ACTIVITIES IN THIS MODULE

All laboratory occupants must wear safety glasses or goggles during all phases of inquiry activities (setup, hands-on investigation, and takedown). In this module, building the Rube Goldberg machine and the trebuchet will likely require a hot glue gun, and teachers should instruct students on proper use and storage to avoid burns or possible lighting of fires. For more general safety guidelines, see the Safety in STEM section in Chapter 2 (p. 18).

Internet safety is also important. The teacher should develop an internet/blog protocol with students if guidelines are not already in place. Since students will use the internet for their research to acquire the needed data, the teacher should monitor students' access to ensure that they are accessing only websites that are clearly identified by the teacher. Further, the teacher should inform parents or guardians that students will create online multimedia presentations of their research and that these projects will be closely monitored by the teacher. It is recommended that the teacher not allow any website posts created by students to go public without being approved first by the teacher.

DESIRED OUTCOMES AND MONITORING SUCCESS

This module is divided into three lessons. In Lesson 1, the goals include an understanding of the physical factors that cause thrills in amusement rides, the way innovations in amusement park design have increased the level of thrills, and the psychology behind why we find such experiences thrilling. The goals of Lesson 2 are an understanding of energy and how it is transferred in machines. Lesson 3 focuses on a total package of design elements for an amusement park, including rides, refreshments, lines, parking, and restrooms, and students work collaboratively in a group. The desired outcomes for this module are outlined in Table 3.3 (p. 32), along with suggested ways to gather evidence to monitor student success. For more specific details on desired outcomes, see the Established Goals and Objectives section for the module (p. 23) and for the individual lessons.

Table 3.3. Desired Outcomes and Evidence of Success in Achieving Identified Outcomes

Desired Outcome	Evidence of Success	
	Performance Tasks	**Other Measures**
Students work in teams to develop a comprehensive timeline, including history, innovations, and psychology behind amusements.	Students are assessed on the following using project rubrics that focus on content and application of skills related to academic content: • Accurate interpretation of research • Accurate labeling of time frames for each factor • Integration of factors along timeline • Explanation of related events in timeline	Students maintain STEM Research Notebooks to reflect on strategies that might work as they design their amusements of the future.
Students work in teams to develop a Rube Goldberg machine design and analysis.	Students are assessed on the following using project rubrics that focus on content and application of skills related to academic content: • Building of Rube Goldberg machine given design specifications • Analysis of energy transfer in machine • Analysis of potential and kinetic energy in machine	
Students work in teams to develop a trebuchet design and analysis, using proper safety procedures.	Students are assessed on the following using project rubrics that focus on content and application of skills related to academic content: • Building of trebuchet given design specifications • Conversion of scale measurements to actual measurements • Analysis of energy transfer • Analysis of potential and kinetic energy in machine	
Students work in teams to develop a business plan.	Students are assessed on the following using project rubrics that focus on content and application of skills related to academic content: • Working in groups collaboratively • Creating an accurate scaled blueprint • Creating an accurate cost-benefit analysis • Conducting a community impact study and communicating results • Creating a marketing plan that is reasonable, with accompanying infomercial	

ASSESSMENT PLAN OVERVIEW AND MAP

The assessment plan is created with a suite of formative and summative assessments designed to support student work in the final challenge. Students examine the factors of designing an amusement park through various disciplinary lenses, including physics, engineering, mathematical modeling of energy, language arts (through marketing), psychology of thrills, history of amusement, environmental sustainability, finance, and community impact. Table 3.4 provides an overview of the major group and individual *products* and *deliverables*, or things that constitute the assessment for this module, such as the time line, Rube Goldberg machine, trebuchet, and amusement park presentation. See Table 3.5 (p. 34) for a full assessment map of formative and summative assessments in this module.

Table 3.4. Major Products and Deliverables in Lead Disciplines for Groups and Individuals

Lesson	Major Group Products and Deliverables	Major Individual Products and Deliverables
1	• Jigsaw activity on physics of amusements	• Presentation of ideas about how amusements have developed over time, using a timeline as a communication tool • STEM Research Notebook prompts
2	• Group participation in investigations (students are responsible for their own analyses and communication of the results)	• Presentation of scientific explanations of the Rube Goldberg machine • Trebuchet energy analysis • STEM Research Notebook prompts
3	• Group presentation of the business plan for a collaborative amusement park	• Development of an individual amusement for the collaborative park • STEM Research Notebook prompts

Table 3.5. Assessment Map for Amusement Park of the Future Module

Lesson	Assessment	Group/ Individual	Formative/ Summative	Lesson Objective Assessed
1	STEM Research Notebook *prompts*	Group / individual	Formative	• Determine the types of physical characteristics (dropping, spinning, traveling at great heights) that amusement rides use to create thrills in people.
1	Argumentation *graphic organizer*	Group/ individual	Formative	• Connect psychology research regarding what people experience on amusement rides with the history of amusement rides.
1	Performance *rubric*	Group	Formative	• Determine the types of physical characteristics (dropping, spinning, traveling at great heights) that amusement rides use to create thrills in people.
1	Participation *rubric*	Group	Formative	• Determine the types of physical characteristics (dropping, spinning, traveling at great heights) that amusement rides use to create thrills in people.
1	Timeline *rubric*	Group	Formative	• Create a timeline of one type of amusement ride or game and document its history and how it has changed over time.
1	Narrative *rubric*	Group	Formative	• Create a timeline of one type of amusement ride or game and document the history of the ride/ game and its change over time.
2	STEM Research Notebook *prompts*	Group/ individual	Formative	• Explain the sustainability issues involved in running an amusement park. • Compile costs and incomes of the business of amusement parks.
2	Rube Goldberg Machine *rubric*	Group	Summative	• Explain transfer from one type of energy to another (kinetic and potential). • Measure and graph kinetic energy of a moving object. • Create Rube Goldberg machine from a minimum of 3 different simple machines.

Table 3.5. (*continued*)

Lesson	Assessment	Group/ Individual	Formative/ Summative	Lesson Objective Assessed
2	Engineering Design Process *scoring guide* Kinetic and Potential Energy Calculations from Trebuchet *scoring guide*	Group	Formative	• Build a working trebuchet to launch gumdrops. • Measure and graph kinetic energy of a moving object.
3	STEM Research Notebook *prompts*	Group/ individual	Formative	• Describe components of amusement park project.
3	Presentation and Report *rubric*	Group	Summative	• Draw a scaled blueprint of the amusement park with group members, taking into consideration foot traffic and refreshment issues. • Conduct a cost-benefit analysis for the amusement park. • Conduct an impact study for the proposed amusement park. • Create a marketing plan and infomercial for the proposed amusement park. • Write a report including blueprint, scale prototype drawing or mock-up, cost analysis, impact study, and marketing plan for the ride or game.

MODULE TIMELINE

The module can be described as three segments of work: (1) investigations involving the history and psychology of amusements; (2) exploration of the physical principles behind amusements; and (3) design and development of the amusement park prototype, with accompanying business plan. Tables 3.6–3.10 (pp. 37–38) provide lesson timelines for each week of the module.

Table 3.6. STEM Road Map Module Schedule for Week One

Day 1	Day 2	Day 3	Day 4	Day 5
Lesson 1 *The Thrill of the Ride—History and Psychology of Amusement Parks* • Students launch the module by having students study close-up photos of people riding amusements to discuss why people seek thrill rides and establish extreme versions of different rides, examining the types of motion the rides offer.	*Lesson 1* *The Thrill of the Ride—History and Psychology of Amusement Parks* • Students investigate amusement parks throughout history, beginning with London World's Fair in 1851 and Coney Island in 1880, and make predictions for amusements in the future.	*Lesson 1* *The Thrill of the Ride—History and Psychology of Amusement Parks* • Students each choose to focus on one type of amusement (roller coasters, height amusements, spinning amusements, or games) and work as a class to create an elaborated timeline. • Students present findings in a gallery walk.	*Lesson 1* *The Thrill of the Ride—History and Psychology of Amusement Parks* • Students research psychological reasons people seek thrills and amusements. • Students synthesize their ideas to show major themes and connect the themes to evidence from their research.	*Lesson 1* *The Thrill of the Ride—History and Psychology of Amusement Parks* • Students synthesize their elaborated timelines with their findings from the research on the psychology of amusement rides and present to the whole class and to outside reviewer.

Table 3.7. STEM Road Map Module Schedule for Week Two

Day 6	Day 7	Day 8	Day 9	Day 10
Lesson 2 *Faster, Higher, and Safer* • Students investigate various types of energy transfer and share with the whole class their research on roller coasters that claim to be the highest, fastest, and steepest. • Students also examine roller coaster simulators to play with variables and observe their outcomes.	*Lesson 2* *Faster, Higher, and Safer* • Students build a Rube Goldberg machine and calculate kinetic energy in different energy transfer scenarios, graph results, and share with the whole class.	*Lesson 2* *Faster, Higher, and Safer* • Students begin plans for building a trebuchet.	*Lesson 2* *Faster, Higher, and Safer* • Students start to build the trebuchet and calculate the kinetic and potential energy in the systems.	*Lesson 2* *Faster, Higher, and Safer* • Students finish building the trebuchet and calculate the kinetic and potential energy in the systems. • Students create graphs to represent their results and develop arguments for their design decisions.

Table 3.8. STEM Road Map Module Schedule for Week Three

Day 11	Day 12	Day 13	Day 14	Day 15
Lesson 2 *Faster, Higher, and Safer* • Students begin to research and compile safety factors for their designed amusement park ride or game.	*Lesson 2* *Faster, Higher, and Safer* • Students continue to research and compile safety factors.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Students work on scale drawings of a chosen ride from a local amusement park, noting design features of types of rides, games, refreshments, and areas for lining up.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups work on blueprint for amusement park.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups complete blueprint for amusement park.

Table 3.9. STEM Road Map Module Schedule for Week Four

Day 16	Day 17	Day 18	Day 19	Day 20
Lesson 3 *Amusement Park of the Future Design Challenge* • Groups start to make scale prototype for amusement park.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups continue to work on scale prototype for amusement park.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups complete scale prototype and present it for a peer review.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups work on cost-benefit analysis for amusement park.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups complete marketing plan for amusement park.

Table 3.10. STEM Road Map Module Schedule for Week Five

Day 21	Day 22	Day 23	Day 24	Day 25
Lesson 3 *Amusement Park of the Future Design Challenge* • Groups develop infomercial for amusement park.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups work on integrating and polishing pieces of their challenge product: blueprints, prototype, cost-benefit analysis, impact study, marketing plan, and infomercial.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups begin to present blueprints, prototype, cost-benefit analysis, impact study, marketing plan, and infomercial. • Students, teacher, and community members document strengths and weaknesses for future discussion.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Groups continue to present blueprints, prototype, cost-benefit analysis, impact study, marketing plan, and infomercial. • Students, teacher, and community members document strengths and weaknesses for future discussion.	*Lesson 3* *Amusement Park of the Future Design Challenge* • Whole class engages in discussion and analysis of strengths and weaknesses of each group's challenge product. • Groups meet to improve and adapt plan based on discussion.

RESOURCES

Teachers have the option to coteach portions of this module and may want to combine classes for activities such as mathematical modeling, geometric investigations, discussing social influences, or conducting research. The media specialist can help teachers locate resources for students to view and read about the history of amusements and provide technical help with spreadsheets, timeline software, and multimedia production software. Special educators and reading specialists can help find supplemental sources for students needing extra support in reading and writing. Additional resources may be found online. Community resources for this module may include town council or business bureau members for hearing the business plan presentations, school administrators, and parents.

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Grade 6

STEM Road Map for Middle School

Amusement Park of the Future

What if you could challenge your sixth graders to design an amusement park for children of tomorrow to safely enjoy? With this volume in the *STEM Road Map Curriculum Series*, you can!

Amusement Park of the Future outlines a journey that will steer your students toward authentic problem solving while grounding them in integrated STEM disciplines. The series is designed to meet the growing need to infuse real-world learning into K–12 classrooms.

This book is an interdisciplinary module that uses project- and problem-based learning. Drawing on their previous experience with amusement parks or carnival rides, students will work in teams to do the following:

- Connect those experiences with a variety of science and social studies concepts, including energy transfer, ratios and rates, technical texts, multimedia communications, historical inquiry, and the influences of technology on society.
- Use mathematics and English language arts to research the history and designs of amusement parks.
- Create blueprints of their models, build and test small-scale prototypes, and develop cost–benefit analyses.
- Design marketing plans and infomercials to promote their models.

The STEM Road Map Curriculum Series is anchored in the *Next Generation Science Standards*, the *Common Core State Standards*, and the Framework for 21st Century Learning. In-depth and flexible, *Amusement Park of the Future* can be used as a whole unit or in part to meet the needs of districts, schools, and teachers who are charting a course toward an integrated STEM approach.

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