Packaging Design

STEM Road Map for Middle School

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

NSTA press
National Science Teachers Association

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NSTApress
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Arlington, Virginia

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PACKAGING DESIGN MODULE OVERVIEW

Adrienne Redmond-Sanogo, Sue Christian Parsons, Janet B. Walton, Carla C. Johnson, Erin Peters-Burton, Juliana Utley, and Toni A. Ivey

THEME: The Represented World

LEAD DISCIPLINES: Mathematics and English Language Arts

MODULE SUMMARY

Over the past decade, human ability to communicate through the use of technology has grown exponentially. Adolescents are engaged in communicating every day via texting or social media such as Twitter, Facebook, and Instagram, sometimes without one spoken word. In the Packaging Design module, students explore the realm of communication. English language arts and mathematics teachers take the lead in this unit, integrating with science and social studies contexts, which could be collaborations with these classes. In this 25-day extended three-lesson module, students explore packaging—in particular, nested packaging—to repurpose a product or market a product to a new user. As they explore, they develop both content knowledge and strong written and verbal communication skills. Persuasive writing is emphasized in this module, as students have to try to convince a client that their new product is marketable. As the students think about nested packaging, they develop understanding of geometric properties of three -dimensional shapes and engineering design. Learners' success in the 21st century workplace and beyond hinges on their ability to meld communication skills with content skills (adapted from Johnson et al. 2015, p. 100).

ESTABLISHED GOALS AND OBJECTIVES

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

- Explain how companies purposely target specific audiences to maximize profits when creating, designing, and marketing products
- Understand problem-solution text structures, and use that strategy to understand authentic literature

- Understand the role of demographics in packaging and marketing, and develop a demographic profile for their products
- Understand where products and packaging originate and end up (life cycle of a product)
- Discuss the sustainability issues associated with packaging and manufacturing of products
- Understand how surface area and volume are used in packaging and manufacturing
- Calculate surface area and volume of three-dimensional figures, and develop a general formula
- Understand that marketing is a complex process that requires feedback from a target market and revisions as needed
- Understand that statistics can be misleading and that it is the job of the consumer to fact check statistics
- Understand that all media messages are constructed, and when engaging with a media message, consider who created it and for what purpose
- Understand that media messages are constructed using a creative language with its own rules, and when engaging with a media message, consider what techniques are being employed to attract buyer attention
- Understand that different people experience the same media message differently, and consider their impressions and how others might view the message differently
- Understand that media have embedded values and points of view, and consider what values and points of views are represented
- Understand that most media messages are designed to gain profit or power, and consider why a message was sent and how an effective marketing message is created
- Select and use multiple forms of media (visual and textual) to convey information about a product and persuade an audience to buy it
- Understand the role that the economy plays in society

CHALLENGE OR PROBLEM FOR STUDENTS TO SOLVE: PRODUCT DESIGN CHALLENGE

In this design project, students are challenged to reimagine and develop a new way of packaging a current product on the market. This project can be launched in any of the content classes: English language arts, mathematics, science, or social studies.

CONTENT STANDARDS ADDRESSED IN THIS STEM ROAD MAP MODULE

A full listing with descriptions of the standards this module addresses can be found in the appendix. Listings of the particular standards addressed within lessons are provided in a table for each lesson in Chapter 4.

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. 12 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 (EDP). 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.

Each lesson in this module includes student handouts that should be kept in the STEM Research Notebooks after completion, as well as a prompt to which students should respond in their notebooks. You may also wish to have students include the STEM Research Notebook Guidelines student handout on page 26 in their notebooks.

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

This module can be launched in any of the content classes. Ideally, the schedule could be adjusted so that the team of content teachers could introduce the project together. You could also launch the module by producing a video involving all the teachers and then showing and discussing this video in the various classes.

Before students enter the room, create a display of products with nested construction and visually engaging packaging, including examples that demonstrate the kinds of product packaging they will seek to create. As much as possible, showcase the items for dramatic effect, using such things as labels, lighting, and background music. As students enter the room, hand each a name badge and welcome him or her to the Product Design Challenge. Once all your students have gathered, invite them to visit the display with the following question in mind: What aspects of the products displayed might make them appealing to a buyer? Then, divide the students into teams and provide each team with a copy of the Product Design Challenge Guidelines (pp. 93–94).

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	Differentiation for Students Needing Knowledge
Science: • Identify materials based on their properties through observations and measurements. • Understand the movement of matter among plants, animals, decomposers, and the environment. • Understand the ways individual communities use science ideas to protect Earth's resources and environment. • Can represent data in graphic displays to reveal patterns in data. • Have explored engineering design and can define simple problems, generate and compare multiple solutions, and plan and carry out fair tests.	Science: • Use observation and measurement skills. • Explore sustainability. • Represent and graph data to answer questions. • Use the engineering design process to solve complex problems.	Science: • Students who struggle with measurement or observation skills may need to work with partners. • Provide some technology tools such as digital thermometers to help students who are unable to use instruments to measure. • Provide students with technology resources to produce graphic representations of data. • Scaffold instruction to support students who have had little experience with engineering design.
Mathematics: • Solve challenging problems. • Use fractions and decimals. • Display data in both whole number and fractional units to solve problems.	Mathematics: • Solve real-world problems. • Learn to use percentages in real-world problems.	Mathematics: • Scaffold lessons to support student problem solving. • Students who struggle with fraction concepts can use calculators and physical models to solve problems.

Continued

Table 3.1. (*continued*)

Prerequisite Key Knowledge	Application of Knowledge	Differentiation for Students Needing Knowledge
Mathematics (*continued*): • Understand concepts of area of various two-dimensional shapes. • Understand that volume is an attribute of solid figures and that unit cubes can be used to measure volume. • Understand and can name characteristics of three-dimensional shapes.	Mathematics (*continued*): • Design their own study, collect data, and use measures of center to describe the data. • Use understanding of area, perimeter, and volume to find surface area and volume of three-dimensional figures. • Explore the properties of three-dimensional shapes.	Mathematics (*continued*): • Students can use technology to represent data and explore measures of center. • Students who have not developed a conceptual understanding of area, perimeter, and volume may need support. For example, provide color tiles to students and have them build a square with a certain number of tiles. • Sorting activities are essential to help students move from level 0 of the van Hiele model of geometric thinking.
Reading: • Know the difference between fiction and nonfiction texts.	Reading: • Explore a variety of nonfiction text structures.	Reading: • None
Writing: • Able to write for a variety of purposes.	Writing: • Write blog responses and letters to a company, develop multimedia presentations, and create marketing campaigns.	Writing: • Students who struggle with writing may use speech-to-text apps to "write" their thoughts digitally.
Social Studies: • Understand proper nutrition and the difference between processed foods and fresh foods. • Understand the difference between fact and opinion in an argument. • Have had experience with filming, editing, and developing multimedia presentations. • Able to research using the internet.	Social Studies: • Exploring food deserts and food swamps. • Distinguish between fact and opinion. • Use video and presentation software to create a multimedia presentation. • Explore social justice issues and evaluate the validity of sources.	Social Studies: • If students have had limited experience with fresh produce and meats, provide examples and experiences to help them understand the difference between fresh and processed foods. • Provide students with examples of facts and opinions used in the media. • Enlist the school's technology expert to help students who are struggling with their multimedia projects or pair inexperienced students with knowledgeable peers.

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 and 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 Package Design module and how they align to the self-regulated learning (SRL) processes before, during, and after learning.

Table 3.2. SRL Process Components

Learning Process Components	Example From Packaging Design Module	Lesson Number and Learning Component
BEFORE LEARNING		
Motivates students	Students complete the Where's My Stuff? exploration, in which they take digital pictures of their stuff and collect data.	Lesson 1, Introductory Activity/ Engagement
Evokes prior learning	Students use a familiar product, tortilla chips, to explore components of marketing and packaging.	Lesson 1, Activity/ Engagement
DURING LEARNING		
Focuses on important features	Students explore marketing and packaging from the perspective of each specific discipline: sustainability for science, shapes for mathematics, media messages for ELA, and geography for social studies. Teachers help students see the same concept through different lenses.	Lesson 2, Introductory Activity/ Engagement
Helps students monitor their progress	Students present their ideas about sustainability and life cycle of packaging to their peers. Teacher and peers help assess whether they have considered all facets of the challenge.	Lesson 2, Elaboration/ Application of Knowledge
AFTER LEARNING		
Evaluates learning	Students get feedback on their final challenge product from peers and classroom guests.	Lesson 3, Elaboration/ Application of Knowledge
Takes account of what worked and what did not work	Students reflect on the feedback they receive when they present to a panel of fictional "company executives."	Lesson 3, Elaboration/ Application of Knowledge

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 are designed to address students' multiple intelligences by providing a variety of entry points and methods to investigate the key concepts in the module (for example, investigating packaging from the perspectives of science and social issues via scientific inquiry, literature, journaling, and collaborative design). Differentiation strategies for students needing support in prerequisite knowledge can be found in Table 3.1 (pp. 28–29). 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 may choose to employ include student-led grouping, grouping students according to ability level or common interests, 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).

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 a variety of 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 determining arithmetic means and collecting data in Lesson 1, 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 (2012) 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. 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, you should have an understanding of the proficiency level of each student. 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, scientific process, and scientific inquiry.
- Standard 5: The language of Social Studies. Focus on consumers and producers, resources, and environmental issues.

SAFETY CONSIDERATIONS FOR THE ACTIVITIES IN THIS MODULE

In this module, a few safety concerns must be addressed with students before beginning Lesson 1. Caution students that they should not throw chips, weights, or other objects. When using weights, they must take care not to injure their classmates or school property. If a student has a food allergy, the Save the Chips Competition may need to be modified to use fictitious bags of chips that you create. For more general safety guidelines, see the Safety in STEM section in Chapter 2 (p. 18). Internet safety is also important. In this module, students are expected to conduct internet research on a variety of topics. Develop an internet safety protocol and discuss it with students. Share the safety protocol with parents so they can monitor students' use at home as they work on aspects of their projects and conduct internet research.

DESIRED OUTCOMES AND MONITORING SUCCESS

The desired outcomes for this module are outlined in Table 3.3, along with suggested ways to gather evidence to monitor student success. For more specific details on desired outcomes, see the Established Goals and Objectives sections for the module and individual lessons.

Table 3.3. Desired Outcomes and Evidence of Success

Desired Outcome	Evidence of Success	
	PERFORMANCE TASKS	OTHER MEASURES
Students work in a team to design packaging, create a logo, and develop a marketing strategy that they present to a panel of "company executives."	Students are assessed using project rubrics that focus on content and application of skills related to academic content. Students maintain STEM Research Notebooks that contain designs, research notes, evidence of collaboration, and unit-related work from all classes.	The project rubrics have participation built in, so there are no separate measures.

ASSESSMENT PLAN OVERVIEW AND MAP

Table 3.4 provides an overview of the major group and individual products and deliverables, or things that student teams will produce in this module, that constitute the assessment for this module. See Table 3.5 for a full assessment map of formative and summative assessments in this module.

Table 3.4. Major Products and Deliverables for Groups and Individuals

Lesson	Major Group Products and Deliverables	Major Individual Products and Deliverables
1	• Save the Chips Competition multimedia presentation	• Letter to company • Response to blog post • STEM Research Notebook prompts
2	• Package type research • Life Cycle poster • Social justice presentation	• STEM Research Notebook prompts
3	• Product Design Challenge • Social media campaign	• STEM Research Notebook prompts

Table 3.5. Assessment Map for Packaging Design Module

Lesson	Assessment	Group/ Individual	Formative/ Summative	Lesson Objective Assessed
1	Save the Chip Competition	Group	Formative	• Understand that companies purposely target specific audiences to maximize profits when creating, designing, and marketing products
1	Multimedia presentation	Group	Formative	• Understand that companies purposely target specific audiences to maximize profits when creating, designing, and marketing products.
1	Letter to the company	Individual	Formative	• Understand problem-solution text structures and use that strategy to understand authentic literature.
1	Response to blog post	Individual	Formative	• Understand problem-solution text structures and use that strategy to understand authentic literature.
1	STEM Research Notebook prompts	Individual	Formative	• Explain how companies purposely target specific audiences to maximize profits when creating, designing, and marketing products. • Understand and calculate the mean as a measure of central tendency.

Continued

Table 3.5. (*continued*)

Lesson	Assessment	Group/ Individual	Formative/ Summative	Lesson Objective Assessed
2	Package type research	Group	Formative	• Understand how surface area and volume are used in packaging and manufacturing. • Calculate surface area and volume of three-dimensional figures, and develop a general formula.
2	Life Cycle poster	Group	Formative	• Understand where products and packaging originate and end up (life cycle of a product). • Understand the sustainability issues associated with packaging and manufacturing of products.
2	PowerPoint slide	Group	Formative	• Understand the sustainability issues associated with packaging and manufacturing of products.
2	Social justice presentation	Group	Formative	• Select and use a variety of media (e.g., print, art, video) to communicate complex information. • Use oral and written language effectively to collaborate and problem solve in a work community context. • Understand that companies purposely target specific audiences to maximize profits when creating, designing, and marketing products. • Understand the role of demographics in packaging and marketing, and develop a demographic profile for their product.
2	STEM Research Notebook prompts	Individual	Formative	• Understand that companies purposely target specific audiences to maximize profits when creating, designing, and marketing products. • Understand the sustainability issues associated with packaging and manufacturing of products.
3	Product Design Challenge	Group	Summative	• Understand that companies purposely target specific audiences to maximize profits when creating, designing, and marketing products. • Understand that marketing is a complex process that requires feedback from a target market and revisions as needed. • Select and use multiple forms of media (visual and textual) to convey information about a product and persuade an audience to buy it.

Continued

Table 3.5. (*continued*)

Lesson	Assessment	Group/ Individual	Formative/ Summative	Lesson Objective Assessed
3	Social media campaign	Group	Summative	• Understand that all media messages are constructed and that when engaging with a media message, it is important to consider who created it and for what purpose. • Understand that media messages are constructed using a creative language with its own rules and that when engaging with a media message, it is important to consider what techniques are being employed to attract buyer attention. • Understand that different people experience the same media message differently, and consider their own impressions and how others might view the message differently. • Understand that media have embedded values and points of view, and consider what values and points of views are represented. • Understand that most media messages are designed to gain profit or power, and consider why a message was sent and how an effective marketing message is created. • Select and use multiple forms of media (visual and textual) to convey information about a product and persuade a targeted audience to buy it.
3	STEM Research Notebook prompts	Individual	Formative	• Understand that all media messages are constructed and that, when engaging with a media message, it is important to consider who created it and for what purpose. • Understand that media messages are constructed using a creative language with its own rules and that when engaging with a media message, it is important to consider what techniques are being employed to attract buyer attention.

MODULE TIMELINE

Tables 3.6–3.10 (pp. 39–43) provide lesson timelines for each week of the module. These timelines are provided for general guidance only and are based on class times of approximately 45 minutes.

Table 3.6. STEM Road Map Module Schedule for Week One

Day 1	Day 2	Day 3	Day 4	Day 5
Lesson 1: The Product • Launch the module by giving students their product challenge and having them complete the Where's My Stuff? exploration (all content areas).	*Lesson 1: The Product* • In science, students begin to explore the engineering design process (EDP) by learning about chip manufacturing processes. • In math, they explore the number of broken chips in a bag. • In ELA, they begin to explore problem-solution text structures. • In social studies, they explore the effects of manufacturing, food deserts, and food swamps on communities.	*Lesson 1: The Product* • Students extend their understanding of the EDP by exploring the Doritos Locos Tacos from prototype to production. • In ELA, they use what they learned about problem structures to analyze an article about the EDP for the Doritos Locos Tacos. • In math, they continue to explore tortilla chips by finding the mean number of broken chips in a bag. • In ELA, they continue to explore problem solution, employing graphic organizers to illuminate an author's use of structure. • In social studies, students discuss banning junk food in schools.	*Lesson 1: The Product* • Students use the EDP to develop a prototype of a bag or container that will result in fewer broken chips. • In math, they continue to explore mean in the context of broken chips. • In ELA, they further develop strategies for recognizing problem-solution structure and using it to comprehend an informational article. • In social studies, students create multimedia presentations about a ban on junk food in schools.	*Lesson 1: The Product* • Students continue to develop, test, and redesign their chip packaging. • In math, students develop a survey that will allow them to determine what most people at their school consider an acceptable number of broken chips. • In ELA, students develop media literacy strategies for critically analyzing media marketing messages. • In social studies, students finalize and present their multimedia presentations.

Table 3.7. STEM Road Map Module Schedule for Week Two

Day 6	Day 7	Day 8	Day 9	Day 10
Lesson 1: The Product • In science, students continue to use the EDP to test and complete their packaging. • In math, students use their data to develop a representation and choose how to answer the question about what is an appropriate number of broken chips in a bag. • They share the findings of their investigation by writing a letter on their findings to the company. • In ELA, students focus on how marketers use audience awareness (demographics) to construct effective messages. • In social studies, students continue to explore the economic impact of the Doritos Locos Tacos and the U.S. obsession with junk food.	*Lesson 1: The Product* • In science, students conduct their crush test and a winner is chosen for the Save the Chips Competition. • Students explore the caloric impact of eating an entire bag of tortilla chips. • In ELA, students work in pairs to construct an effective media message for a particular audience. • In social studies, they explore the impact of trans fats and monosodium glutamate (MSG) on their health.	*Lesson 2: The Packaging* • Students explore marketing and packaging through a variety of lenses. • In science, they look at sustainability of packaging. • In math, they explore the shapes of packages. • In ELA, students critically analyze media messages for techniques authors use to market to youth and explore Q&A text structure. • In social studies, they explore the geography of marketing.	*Lesson 2: The Packaging* • Students create a Life Cycle poster for their product's packaging and brainstorm sustainability options. • They continue to explore three-dimensional shapes in relation to packaging. • In ELA, students use Q&A text structure to support critical comprehension of an informational article about targeting in media messages. • In social studies, students examine demographics.	*Lesson 2: The Packaging* • Students continue to discuss sustainability of packaging by creating a PowerPoint presentation as a group. • In math, students explore packaging by looking at surface area and volume. • In ELA, students analyze targeted marketing in television commercials, then examine the construction and use of argumentative texts. • In social studies, students trace the journey of their product.

Table 3.8. STEM Road Map Module Schedule for Week Three

Day 11	Day 12	Day 13	Day 14	Day 15
Lesson 2: The Packaging • In science, students present their PowerPoint slides and begin working on their Life Cycle posters. • In math, students explore surface area and volume of packages. • In ELA, students use the reading strategies of summarizing and synthesizing to provide a framework for writing an argumentative response to the article. • In social studies, they explore social justice and the environment.	*Lesson 2: The Packaging* • Students complete their Life Cycle posters and present them to the class. • In math, they continue their exploration of surface area and volume. • In ELA, students use the framework from day 11 to craft a written argumentative response. • In social studies, they continue to explore social justice issues associated with their product.	*Lesson 2: The Packaging* • Students finish presenting their posters to the class. • They then brainstorm ideas about materials for their module project. • In math, they explore materials and create a scale drawing of their prototype package. • In ELA, students use media literacy concepts as an analytical framework for critically examining advertising media. • In social studies, they give their social justice presentations.	*Lesson 3: Marketing Your Product in a Global Economy* • Students explore misconceptions about colds and other viruses and how this relates to marketing of products. • In math, they build on that by learning about the Federal Trade Commission and the consequences of making false advertising claims. • In ELA, students apply media literacy concepts as a framework to construct an effective marketing message about their product. • In social studies, they explore the marketing strategies of Coca-Cola.	*Lesson 3: Marketing Your Product in a Global Economy* • In science, students continue to explore viruses and how misconceptions about them are used in marketing campaigns. • In math, they look at misleading statistics. • In ELA, students use nonfiction reading strategies and collaborative communication to learn about marketing techniques, ultimately designing a marketing campaign for their product. • In social studies, they discuss the difference between needs and wants.

Table 3.9. STEM Road Map Module Schedule for Week Four

Day 16	Day 17	Day 18	Day 19	Day 20
Lesson 3: Marketing Your Product in a Global Economy • Students explore the nature of science. • In math, they discuss how to protect themselves from misleading statistics. • In ELA, students continue working on marketing plans. • In social studies, they explore the impacts of chocolate consumption on one community in Ghana.	*Lesson 3: Marketing Your Product in a Global Economy* • Students explore the role of media in distributing ideas about science. • Students develop a social media campaign to address some misconceptions about science. • In math, students explore marketing metrics and problem solving. • In ELA, students continue to work on marketing plans. • In social studies, they explore the life cycle of their favorite chocolate bar.	*Lesson 3: Marketing Your Product in a Global Economy* • Students give their science presentations to the class. • In math, they continue to explore marketing metrics such as return on investment. • In ELA, students learn about logo design. • In social studies, they talk about economic interdependence.	*Lesson 3: Marketing Your Product in a Global Economy* • In science and math, students work on their module projects. • In ELA, students create effective logos for their products. • In social studies, they present their findings to the class and discuss interdependence in depth.	*Lesson 3: Marketing Your Product in a Global Economy* • In science and math, students work on their module projects. • In ELA, they work on all components of the advertising campaign for the product. • In social studies, they explore a case study to determine the impact of an economic downturn on the global economy.

Table 3.10. STEM Road Map Module Schedule for Week Five

Day 21	Day 22	Day 23	Day 24	Day 25
Lesson 3: Marketing Your Product in a Global Economy • In science, math, and ELA, students work on their module projects and advertising campaigns. • In social studies, students continue their discussion on economic interdependence.	*Lesson 3: Marketing Your Product in a Global Economy* • In science, math, and ELA, students work on their module projects and advertising campaigns. • In social studies, students explore the impact the U.S. economy has on the rest of the world.	*Lesson 3: Marketing Your Product in a Global Economy* • Students participate in the competition.	*Lesson 3: Marketing Your Product in a Global Economy* • Students participate in the competition.	*Lesson 3: Marketing Your Product in a Global Economy* • Students answer questions about what they learned in the module.

RESOURCES

The media specialist can help teachers locate resources for students to view and read about packaging and related content. 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 marketing specialists, packaging experts, economists, and bloggers.

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Grade 6

STEM Road Map for Middle School

Packaging Design

What if you could challenge your sixth graders to create packaging that's engineered to both protect a product and make it a hot seller? With this volume in the *STEM Road Map Curriculum Series,* you can!

Packaging Design outlines a journey that will steer your students toward authentic problem solving while grounding them in integrated STEM disciplines. As are the other volumes in the series, this book is designed to meet the growing need to infuse real-world learning into K–12 classrooms.

The book is an interdisciplinary module that uses project- and problem-based learning. Because success in the 21st-century workplace requires blending content and communication skills, the lessons prompt students to do the following:

- Explore how marketing, packaging, and communications connect. Students will examine how to repurpose a product, or market it to new customers, through innovative containers such as nested packages (or packages within packages).
- Build persuasive writing and speaking skills. Using PowerPoint presentations and social media campaigns, students must convince a client that their team's repackaged product is marketable and then convince customers to buy it.
- Develop content knowledge. For example, as students think about nested packages, they learn about geometric properties of three-dimensional shapes and engineering design.
- Consider the complexities of marketing—from grappling with sustainability issues to meeting customer needs while making a profit. Activities include designing a package that keeps tortilla chips from breaking and transforming an old product with new packaging and marketing techniques.

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, *Packaging Design* 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.

Grade 6

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