Odyssey of the Mind®

# How OM Meets Education Standards

The Beyond the Box experience

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# Problem 1: Omer's Shopping Service

In this problem, teams will develop their very own creative OMER's shopping service. They will build one or more vehicles that will perform tasks such as taking an order and shopping for the items requested. One of the items will not be available and the vehicle will choose a substitute item and eventually check out. For divisions 2 through 4 the items will be unloaded by a team-made device. As the finale, the vehicle will be released and return to its parking location.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| Understand the properties of objects and materials, and the changes in properties and matter in order to create one vehicle and its method of propulsion. | Use technology tools to enhance learning, increase productivity, and promote creativity. | Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | Use visualization, spatial reasoning, and geometric modeling to solve problems in the creation of the vehicle and propulsion systems, etc. |
| Research/understand energy, its sources, and how it applies to different propulsion systems. | Research different methods of control, steering, and propulsion in designing and building the vehicle. | Apply a structured approach to solving problems: define problem, brainstorm ideas, research, identify criteria, explore the possibilities, make a model, evaluate, communicate results, and revise to improve performance. | Utilize estimation, measurement, computational skills, and spatial/geometric relationships in order to:<br>(a) Work within budgetary, time, and space limitations.<br>(b) Analyze scoring criteria to prioritize problem elements such as vehicle and design, and propulsion systems. |
| Research/understand simple machines, transmissions, leverage, mechanics of motion, inertia, friction, braking. | Research different sources of energy for vehicle's propulsion. | Develop an understanding that engineers need to communicate effectively as individuals and as members of a team. | Solve real-world and mathematical problems involving area, surface area, and volume. |
| Research/understand the construction and materials in the design of vehicles and propulsion systems. | Use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. | Design, test and build systems, components, or processes to meet desired needs within realistic constraints as they relate to vehicles, propulsion systems, obstacles, etc. | Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem. |
| Apply scientific principles to design, construct, and test a device that either minimizes or maximizes energy transfer. | Demonstrate the ability to use technology for research, critical thinking, decision making, communication and collaboration, creativity and innovation. | Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. | |
| Research/understand simple reactions and their outcomes. | | | |

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## Problem 2: Haywire Hijinx

Oh no! Something has gone terribly wrong! In this problem, teams will create two "animatronic" devices. One device will "go rogue" and will make its own independent decisions, defying the orders it was assigned. The second animatronic character must correct the defiant actions and save the day, which allows the performance to continue. Each animatronic character will complete two tasks, and the setting must include a representation that allows each animatronic character to see what it looks like to others.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| Understand the properties of objects and materials, and the changes of properties in matter in order to create devices. | Use technology tools to enhance learning, increase productivity, and promote creativity. | Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. | Use visualization, spatial reasoning, and geometric modeling to solve problems in the creation of devices to complete tasks. |
| Research and develop an understanding of how energy may be used to power devices. | Use productivity tools to collaborate in constructing technology-enhanced models. | Apply a structured approach to solving problems: define problem, brainstorm ideas, research, identify criteria, explore the possibilities, make a model, evaluate, communicate results, and revise to improve performance. | Utilize estimation, measurement, computational skills, and spatial relationships in order to:<br>(a) Work within budgetary, time, and space limitations.<br>(b) Explore multiple ways an animated creature might be able to change appearance.<br>(c) Analyze scoring criteria to prioritize problem elements such as quality and creativity of the performance, creativity of engineering of how the creature changes appearance and completes tasks, and the originality and effectiveness of the searcher character. |
| Research and develop an understanding of simple machines, leverage, laws of motion, mechanics, and the effect of applied force on objects to complete the tasks. | Employ technology in the development of strategies for solving problems in the real world. | Develop an understanding that engineers need to communicate effectively as individuals and as members of a team. | |
| Research/understand simple reactions and their outcomes. | Understand and use technology systems. | Design, create and build a solution in which an animated creature can change appearance and complete tasks. | |
| | Use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. | | |




# PROBLEM 3: *Classics…*Wonders of the Ancient World Awaken

It's alive! Teams will create a historian character who presents three of the seven Wonders of the Ancient World, explaining to the audience some of the lessons and meanings humans have learned from their creation. However, there might be more to these wonders than we think in modern times. During the performance, the ancient wonders will come to life and correct the historian character, explain to the audience what real lessons they gave to humanity, The performance will include the use of ARM&HAMMER™ Baking Soda and artistic replicas of the three selected ancient wonders.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| **Understand the properties of objects and materials, and the changes of properties in matter in order to design the creation.** | **Use technology tools to enhance learning, increase productivity, and promote creativity.** | **Design, test, and build a system, component, or process to meet desired needs within realistic constraints.** | **Use visualization, spatial reasoning, and geometric modeling to solve problems in the "recreation."** |
| **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.**<br><br>**Research/analyze chemical reactions and uses for the product of the reactions.** | **Use productivity tools to collaborate in constructing creative works.** | **Apply the engineering design process, troubleshooting, research and development, invention and innovation, and experimentation in problem solving and engineering design.** | **Utilize estimation, measurement, computational skills, and spatial/geometric relationships in order to:**<br>**(a) Work within budgetary, time, and space limitations.**<br>**(b) Analyze scoring criteria to prioritize problem elements such as the team-created court, the historic royal court, the team created instrument, etc.** |
| **Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships.** | **Know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, and solving authentic problems.** | **Use engineering as a vehicle for creative and critical thinking and inquiry.** | **Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.** |
| **Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.** | **Communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations.** | **Develop an understanding that engineers need to communicate effectively as individuals and as members of a team.** | **Look closely to discern a pattern or structure.** |
| **Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.** | **Utilize technology in research and design in all aspects of the solution.** | **Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.** | |
| | | **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.** | |

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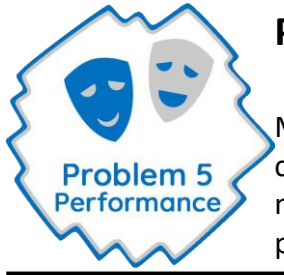



# PROBLEM 4: Copycat Structure

Are you copying me? In this problem, teams will use balsa wood and glue to make a structure which will be tested by balancing and holding as much weight as possible. They will also create a copycat structure that looks like the balsa wood and glue structure. During the performance, the copycat structure will mirror the actions and experiences of the balsa wood structure.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| Understand the properties of objects and materials, and the changes in properties and matter in order to create weight-bearing structures. | Use technology tools to enhance learning, increase productivity, and promote creativity. | Apply a structured approach to solving problems: define problem, brainstorm ideas, research, identify criteria, explore the possibilities, make a model, evaluate, communicate results, and revise to improve performance. | Use visualization, spatial reasoning, and geometric modeling to solve problems in the creation a balsa wood structure. |
| Research and understand material properties of balsa and various adhesives. | Use productivity tools to collaborate in constructing technology-enhanced models and produce other creative works. | Develop an understanding that engineers need to communicate effectively as individuals and as members of a team. | Utilize geometry and trigonometry to analyze component structures and how those components will be stacked as the final structure. |
| Understand effects of various environments on materials. | Utilize technology in research and design in all aspects of the solution. | Apply contemporary engineering tools and technology to define, analyze, model, and build prototype structures made of multiple, separate components. | Utilize estimation, measurement, computational skills, and spatial relationships in order to:<br>(a) Work within budgetary, time, and space limitations.<br>(b) Analyze scoring criteria to prioritize problem elements such as weight held, creativity of the performance, etc.<br>Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem. |
| Understand how design of a structure affects weight transfer through the structure and how weight placement impacts the ability to hold weight without collapsing. | Use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. | Evaluate structural characteristics of balsa wood and glued connections. | |
| Evaluate safety issues involved with materials being used in construction of the structure, particularly relating to structural collapse. | Demonstrate the ability to use technology for research, critical thinking, decision making, communication and collaboration, creativity and innovation. | Evaluate connections – surface area of joining pieces, geometry of joints. | |

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# PROBLEM 5: The Musician

Many songs have been written about great events and people, but we don't hear so many songs about everyday life. Teams will create a humorous performance featuring a musician character who meets a disheartened/saddened community. The musician must create a musical instrument out of "trash" items, play music and present songs that celebrate the ordinary parts of life. The performance will include a dancer character, a growing audience that loves the performances, and a grand finale.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| **Understand the abilities of technological design.** | **Use technology tools to enhance learning, increase productivity, and promote creativity.** | **Design, test, and build a system, component, or process to meet desired needs within realistic constraints.** | **Make decisions about units and scales that are appropriate for problem situations involving measurement in order to design attention-getting effects.** |
| **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | **Use productivity tools to collaborate in constructing technology-enhanced models and produce other creative works.** | **Apply the engineering design process, troubleshooting, research and development, invention and innovation, and experimentation in problem solving and engineering design.** | **Utilize estimation, measurement, computational skills, and spatial relationships in order to:**<br>**(a) Work within budgetary, time, and space limitations.**<br>**(b) Analyze scoring criteria to prioritize problem elements.** |
| **Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause-and-effect relationships.** | **Employ technology in the development of strategies for solving problems in the real world, including those related to social situations.** | **Use engineering as a vehicle for creative and critical thinking and inquiry.** | **Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.** |
| **Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.** | **Communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations to create attention-getting effects.** | **Develop an understanding that engineers need to communicate effectively as individuals and as members of a team.** | **Look closely to discern a pattern or structure.** |
| **Develop a diagram or simple physical prototype to convey a proposed object, tool, or process.** | | **Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.** | |




# PRIMARY PROBLEM (Grades K-2): Teamwork Effect

Are you seeing what I'm seeing? Team members will create and wear costumes that present different images at different times and from different perspectives. The performance will include an announcer character who explains the action of the images being changed and portrayed during the performance. The performance will conclude with a surprise humorous ending.

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | **Use technology tools to enhance learning, increase productivity, and promote creativity.** | **Design, test, and build a system, component, or process to meet desired needs within realistic constraints.** | **Use visualization, spatial reasoning, and geometric modeling to solve problems in the creation of various features, exhibits and displays.** |
| **Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.** | **Use productivity tools to collaborate in constructing technology-enhanced models of various displays other creative works.** | **Apply the engineering design process, troubleshooting, research and development, invention and innovation, and experimentation in problem solving and engineering design.** | **Utilize estimation, measurement, computational skills, and spatial relationships in order to:**<br>**(a) Work within budgetary, time, and space limitations.**<br>**(b) Analyze scoring criteria to prioritize problem elements such as creativity, presentation quality, display use and impact, performance, humor, and character.** |
| **Ask questions, make observations, and gather information about a situation.** | **Employ technology in the development of strategies for solving problems in the real world.** | **Use engineering as a vehicle for creative and critical thinking and inquiry.** | |
| **Research/understand energy, its sources, and how it applies to different propulsion systems.** | **Understand and use technology systems.** | **Develop an understanding that engineers need to communicate effectively as individuals and as members of a team.** | |
| **Research/understand simple machines, transmissions, leverage, mechanics of motion, inertia, friction, braking.** | | **Recognize design is a creative process, and everyone can design solutions to problems.** | |




## SPONTANEOUS:

Spontaneous is the "short term" portion of Odyssey of the Mind, in which students are given a problem and must solve it in a given amount of time, on the spot. Some spontaneous problems build verbal skills, some build mechanical skills, and some build both; all help improve problem solving skills. Spontaneous problems vary from hands-on problems (e.g., use materials to build/design/change an item), to verbal problems (e.g., name types of trees).

| Science | Technology | Engineering | Mathematics |
|---|---|---|---|
| **Use innovation to solve problems.** | **Utilize innovation in the creative use of everyday objects (e.g., toothpicks, clay, and paper plates) as tools and materials to solve problems.** | **Apply knowledge of science, technology, engineering, and mathematics to define, analyze, and solve problems** | **Utilize estimation, measurement, computational skills, and spatial relationships in order to:**<br>**(a) Work within time and space limitations outlined in the problem.** |
| **Apply an intuitive understanding of gravity, motion, force, and other physics concepts.** | **Implement nontraditional communication methods (gestures, tapping on table) to brainstorm and solve problems.** | **Utilize engineering design process to define roles of team members (who will build, who will keep track of time), brainstorm (what materials will be used, how will solution be presented), and communicate possible solutions, and to reflect upon outcomes.** | **Analyze scoring criteria (what is worth the most points) to prioritize problem elements (what should we do first to get a higher score?)** |
| **Apply an understanding of the composition, properties, and creative use of materials. (e.g., what can we use to support the structure, what can we use to make it taller, etc.)** | | **Develop an understanding that engineers need to communicate effectively as individuals and as members of a team.** | |
| **Test alternate hypotheses. (e.g., what is another way to build this?)** | | **Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.** | |
| **Evaluate results.** | | | |
| **Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.** | | | |