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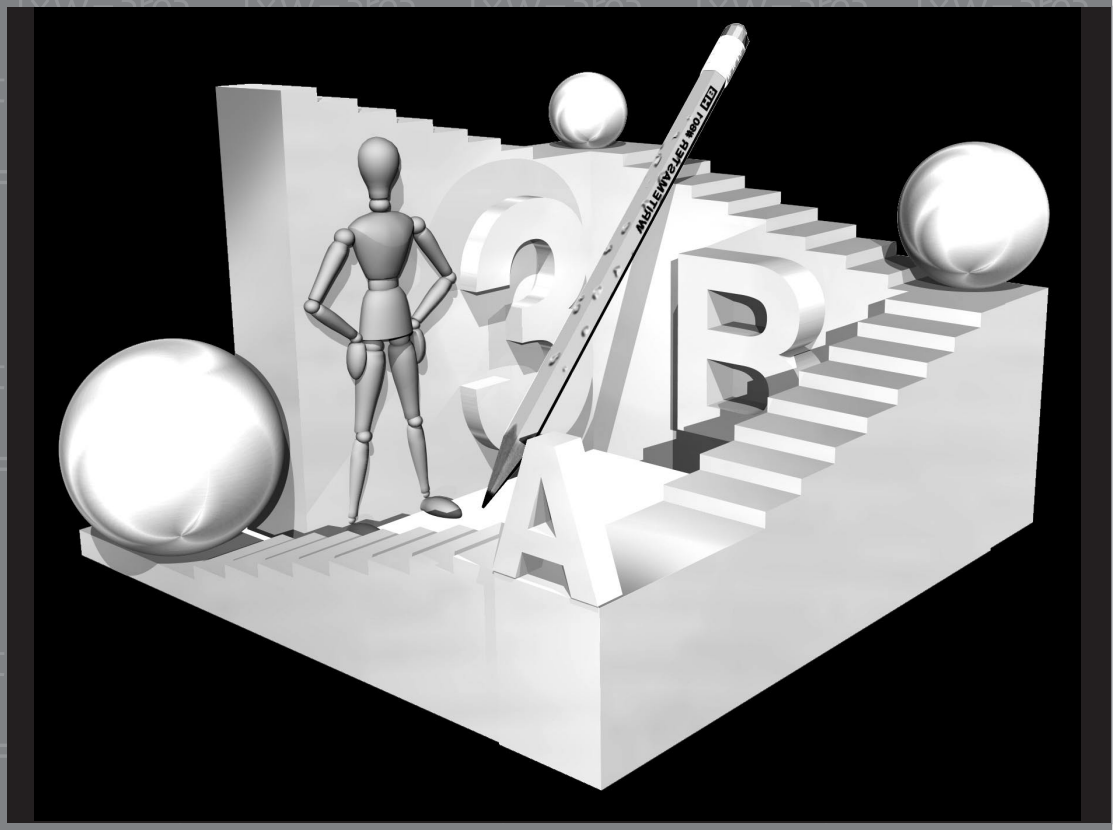
ARCHITECTS OF LEARNING



A Standards-Based, Project-Oriented Simulation in Which Students Apply Math Skills

WELCOME

Hours of Instruction 15+ **Grades** 5–8

Overview ARCHITECTS OF LEARNING students apply math skills in geometry, measurement, scale, and proportion to create a campus of pavilions designed to display a theme. The theme may center on a curricular content area or on a student-selected area of interest. The many varied activities in ARCHITECTS OF LEARNING recognize Gardener's multiple intelligences, and encourage students to use their special talents to demonstrate what they know.

Your students will

- Apply mathematical concepts to a real-world situation
- Strengthen oral language skills
- Solve problems and communicate their thinking using correct math vocabulary
- Plan, design, and construct three-dimensional models
- Work cooperatively to solve problems that arise during construction
- Present their projects and demonstrate what they have learned to an audience of peers, parents, teachers, and community members
- Assess their own and their team's accomplishments

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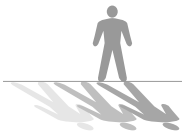
ICONS KEY When you see these icons...

Answer Key
For student activities with specific objective responses, this icon directs you to the answer key.

Learning Tip
Found in the Student Guide. This directs your students to important procedures or directions.

Teaching Tip
In the margins of your Teacher Guide, these tips clarify materials or procedures.

Read or Tell
This is important information your students need for the activity. Be sure to read the passage or clearly instruct your students as stated in your Teacher Guide.



Grouping
This shows if your students work independently, in partners or in cooperative groups for each activity.

Reproducible
Find this icon in the upper outside corner of every master page needing duplication.

Timing
Many activities vary in length. Use this icon to help plan your teaching time.

ARCHITECTS OF LEARNING

A Standards-Based, Project-Oriented Simulation in Which Students Apply Math Skills

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STANDARDS

The nationwide movement for high standards has not only determined what students should learn, but also has mandated that students demonstrate what they know. ARCHITECTS OF LEARNING addresses Level III Standards in Mathematics, Language Arts, and Applied Learning.

For the purposes of determining Standards met, Interact consulted a Standards resource published by the Association for Supervision and Curriculum Development (ASCD), and the Mid-continent Research for Education and Learning (McREL). ARCHITECTS OF LEARNING meets the following standards set forth within *Content Knowledge: A Compendium of Standards and Benchmarks for K–12 Education*. This document gathers standards set by such organizations as the National Council for Teachers of English (NCTE) and National Assessment of Educational Progress (NAEP). Standards met by ARCHITECTS OF LEARNING include:

NCTM National Standards for School Mathematics

Number and Operations Standard

- Compute fluently and make reasonable estimates

Geometry Standard

- Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
- Use visualization, spatial reasoning, and geometric modeling to solve problems

Measurement Standard

- Understand measurable attributes of objects and the units, systems, and processes of measurement
- Apply appropriate techniques, tools, and formulas to determine measurements

Problem Solving Standard

- Build new mathematical knowledge through problem solving
- Solve problems that arise in mathematics and in other contexts
- Apply and adapt a variety of appropriate strategies to solve problems
- Monitor and reflect on the process of mathematical problem solving

Communication Standard

- Organize and consolidate mathematical thinking through communication
- Communicate their mathematical thinking coherently and clearly to peers, teachers, and others
- Use the language of mathematics to express mathematical ideas precisely

Representation Standard

- Use representations to model and interpret physical, social, and mathematical phenomena

Language Arts Level III (Grades 5–8)

Listening and Speaking

8. **Uses listening and speaking strategies for a variety of purposes**
   - Plays a variety of roles in group discussions
   - Asks questions to seek elaboration and clarification of ideas
   - Listens in order to understand topic, purpose, and perspective in spoken texts; organizes, summarizes, and paraphrases spoken ideas and details
   - Conveys a clear main point when speaking to others and stays on the topic being discussed
   - Makes oral presentations to the class
   - Uses appropriate verbal and nonverbal techniques for oral presentations

California Applied Learning Standards

Standard 1: Students will understand how to solve problems through a project design process. Students will design a product, service, or system to meet an identified need.

Standard 6: Students will understand how to apply communication skills and techniques. Students will demonstrate ability to communicate orally and in writing.

Standard 8: Students will understand the importance of teamwork. Students will work in teams to achieve objectives.

Gardener's Multiple Intelligences

Mathematical learners benefit from the application of skills.

Verbal learners benefit from the research, writing, and oral presentation tasks.

Kinesthetic learners benefit from the three-dimensional construction and model building.

Interpersonal learners benefit from the opportunity to share what they know.

Visual Spatial learners benefit from seeing their designs become realities.

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Although students often solve many math problems in a classroom, they rarely get the chance to apply math skills to class projects. ARCHITECTS OF LEARNING students plan, design, and construct three-dimensional models of pavilions in an educational theme park. As they participate in the process, students apply math skills to determine perimeter and area, draw to scale, and solve math problems that arise from their construction. As a culminating activity, student teams present their architectural models including the math strategies they used to create the model, problems they faced and solved, and the detailed dimensions of their pavilions. As "tour guides" they also present content relating to their theme to an audience of peers, parents, and invited guests.

Using multiple intelligences to show what they know engages students in the learning process and excites their interest and creativity. As a result of completing an involved, challenging, long-term project, students become more knowledgeable and achieve a heightened sense of accomplishment.

Specifically, ARCHITECTS OF LEARNING benefits students in the following ways:

Knowledge

- Architectural concepts through hands-on experiences
- The step-by-step process from idea through design to construction
- Subject area content
- Overview and implications of the Americans with Disabilities Act

Skills

- Using measurement to design and check design elements in a floor plan and model
- Using measurement to make models to scale
- Using math vocabulary to communicate math thinking
- Applying and describing problem-solving strategies in real-world context
- Applying mathematical skills to create models that meet specific guidelines
- Utilizing oral language and media skills in the presentation of projects to an audience
- Drawing and reading floor plans
- Following directions and building to specifications
- Working cooperatively with other students to make decisions, solve problems, and complete tasks successfully

Attitudes

- Appreciate that knowledge attained in mathematics classes has real-world applications
- Proudly complete a multi-layered project through patience, determination, and cooperation
- Attain personal growth through collaboration, risk-taking, and self-evaluation
- Recognize the need to make all buildings handicap-accessible

PURPOSE

OVERVIEW

During ARCHITECTS OF LEARNING, students simulate architectural design teams as they plan, design, construct, and present three-dimensional scale models of pavilions in an educational theme park. The project represents shared team ideas and decisions. ARCHITECTS OF LEARNING encourages students to synthesize and apply their learning as they prepare a presentation to impart to others what they have learned.

Phase 1: Warmups **2–3 days**

The whole class experiences warmup activities to both introduce architectural concepts and to promote healthy team dynamics. Students read an essay on Architecture and choose team names.

Phase 2: Investigations and Problem Solving **2–10 days**

Team members investigate area, perimeter, and scale. The tasks include both individual and group activities. The first five investigations may be optional if students have recently completed a thorough study of area, perimeter, and scale. The sixth investigation teaches students how to present their problem-solving strategies, an important skill needed for the unit's final presentation. (Phase 2 also includes a two-day challenge problem.)

Phase 3: Plan and Design **3–4 days**

The teacher either assigns a theme or allows the students to determine a theme. In a whole class discussion, students divide the theme into major topics of study. Each pavilion of the theme park will house one topic supporting the theme. The architectural teams then self-select, choose randomly, or are assigned a topic. Teams assume their roles (Chief Architect, Clerk of the Work, General Contractor, Interior Designer, or Landscape Designer) and collaborate to decide what information they will present. They may need to research and collect the information from classroom resources, library resources, and the Internet. Depending on your course objectives, students may also begin work on a research paper.

The architectural teams decide what their pavilion will look like and where they will be sited on the project platform. They cooperate to draw *general* floor plans for the structure they will construct. As an added challenge, teams must consider building codes from the Americans with Disabilities Act (ADA) as they design their floor plans.

Phase 4: Construct the Project **3–4 days**

Team members fully assume the tasks of their roles. Each day the teams develop a daily agenda to complete their architectural tasks cooperatively and on time. They follow directions to create a three-dimensional scale model and detailed floor plans. Each member of the team must solve a problem related to his or her role. Students also prepare to present their strategies and solutions to these problems as part of their final presentation. After completing the structures members decorate outside walls and finish landscaping the property around the models.

Phase 5: Prepare Presentations **2–3 days**

In teams students prepare an oral architectural presentation that consists of a "tour" of their floor plan and model. Students prepare a detailed description of the dimensions of the pavilion, a recounting of the problems they faced and solved during the construction, and a short explanation of what might appear in each room of their pavilion.

Phase 6: Present, Debrief, and Assess **2 days**

As teams put on their presentations, other students and the audience evaluate them. On the following day(s) in a class debriefing, students relate experiences and reflect on their successes and frustrations as they worked through the ARCHITECTS OF LEARNING process. The teacher also recognizes achievement, both individual and cooperative, by awarding certificates.

Accommodating Special Needs Students

Like all Interact units, ARCHITECTS OF LEARNING provides differentiated instruction through its various learning opportunities. Students learn and experience the knowledge, skills, and attitudes through all domains of language (reading, writing, speaking, and listening) and through kinesthetic activities. Adjust the level of difficulty as best fits your students. Assist special needs students in selecting activities that utilize their strengths and allow them to succeed. Work together with the Resource Specialist teacher, Gifted and Talented teacher, or other specialist to coordinate instruction.

OVERVIEW