Project Based Learning Lesson Plan

Project Title: The Water Runs Deep

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Project Idea: An anonymous donor has given the school a Grant of 75,000 dollars. School board members are interested in using the money to build a pool at your school to be used for physical education classes, physical therapy for special needs students and possibly a swimming team. As civil engineers, your task is to design a pool and create a three dimensional model; research and create excel spreadsheets with estimated costs of construction and maintenance; and prepare a presentation for the school board members.

Entry Event: Students will read a letter stating their firm has been selected to be part of the designing process. Their boss has assigned them into groups to create the plan and determine which best one to present to the school board members.

Content Standards & Objectives: Solve real-world and mathematical problems involving area, surface area, and volume.

Objectives Directly Taught or Learned Through Discovery	Identified Learning Targets	Evidence of Success in Achieving Identified Learning Target
7.G.A.1. Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	• **Knowledge**: Students will know how to identify and solve the actual lengths of the figure they will draw. • **Reasoning**: Students should know the relationship between scale drawings and proportions. • **Skill**: Compute actual lengths from scale drawing. • **Product**: Scale drawing	Rubric for Scale drawing

7.G.B.6. Solve real world and mathematical problems involving area, volume and surface area of two and three dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	• **Knowledge**: Area, surface area and volume formulas • **Reasoning**: Identify the figure into a known shop and find the area of that shape. • **Skill**: Determine what formula to use to figure the area. • **Product**: Calculate the area of a given figure.	Teacher made quiz on area, surface area and volume
7.NS.A.3. Solve real world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)	• **Knowledge:** Students will know how to use the four operations. • **Reasoning**: Students will be able to create a formula for calculating costs including tax. • **Skill**: Students will decide what operations to use for different situations. • **Product**: Students will be able to use the four mathematical operations to calculate costs and stay within the budget provided.	Rubric for Budget

7.SL.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners texts and issues, building on others' ideas and expressing their own clearly. a. Come to discussions prepared having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.	Students will create a PowerPoint presentation to demonstrate their pool design and estimated costs of construction and maintenance.	Rubric for Scale Drawing Rubric for Budget Rubric for PowerPoint Presentation Rubric for Final Product

21st Century Skills: Identify the Learning Skills and Technology Tools Standards that students will practice in this project.

21st Century Skills	Learning Skills & Technology Tools	Teaching Strategies	Evidence of Success
Information and Communication	**21C.O.PK-2.1.LS1** Student uses text, people and electronic resources (e.g. interactive books, educational software, CD-ROMs, elementary multimedia encyclopedias and search engines) to locate information for classroom assignments and is able to identify the author and purpose for each source located. **21C.O.PK-2.1.TT10** Student begins to locate information in a variety of developmentally appropriate technology resources (e.g., interactive books, educational software, CD-ROMs, elementary multi-media encyclopedias and web-based search engines) to support classroom assignments.	In their respective groups, students will research information on the necessary materials needed to build a pool and the estimated costs. Students will research for online tools to create a scale drawing and alternate tools for the presentation.	Rubric for Budget Student Checklist of materials Rubric for Scale Drawing Rubric for Presentation Presentation Plan List of resource

Thinking and Reasoning Skills	**21C.O.PK-2.2.LS4** Student engages in discovery, exploration and experimentation to reach unexpected answers. Student makes unusual associations and provides a variety of solutions to problems. **21C.O.PK-2.2.TT3** Student identifies different purposes among software applications (e.g., puzzles, writing tools, graphing tools, concept mapping tools). Student selects technology tools and software to solve problems (e.g., presentation software to explain and communicate information, drawing or paint software to make a picture, email software to send messages, Internet browser to access websites, and word processing software to write a story).	Students discuss and decide what formulas to use to determine the dimensions of the pool. Students learn to use PowerPoint Software, Microsoft Excel or Google Spreadsheets, and SketchPad to complete their project.	Teacher made quiz Rubric for Scale Drawing PowerPoint Presentation Rubric Rubric for Budget Rubric for Scale Drawing

Personal and Workplace Skills	**21C.O.PK-2.3.LS2** Student demonstrates ability to assume different roles and responsibilities as assigned by the teacher and abandons ineffective strategies when introduced to more effective strategies for solving a problem or completing a task. **21C.O.PK-2.3.TT2** Student discusses with the teacher how the Internet can be a source of information.	Students will assign roles and goals within their group by using a checklists and calendars. Students will self-reflect how the internet helped them complete their project.	Management Log form Self-Reflection Evaluation form

Performance Objectives:

Know

Formulas for area, surface area and volume
Geometric shapes
The four operations

Do

Recognize geometry shapes
Identify and apply correct formulas
Create scale drawings
Research and calculate costs of construction and maintenance
Create a budget spreadsheet
Create a scale drawing
PowerPoint Presentation

Driving Question: Given the opportunity and the money, how would you design a school pool?

Assessment Plan: Final Product Rubric
Scale Drawing Rubric

Major Group Products	PowerPoint Presentation Budget Spreadsheet Scale Drawing
Major Individual Projects	Students will compute the area and surface area of their own pool and create a scale drawing using graphic paper.

Assessment and Reflection:

Rubric(s) I will use: (Check all that apply.)	Collaboration		Written Communication	
	Critical Thinking & Problem Solving		Content Knowledge Budget Rubric Scale Drawing Rubric Final Product Rubric	X
	Oral Communication PowerPoint Rubric	X	Other	
Other classroom assessments for learning: (Check all that apply)	Quizzes/ tests Teacher made quiz	X	Practice presentations	
	Self-evaluation	X	Notes	
	Peer evaluation		Checklists/observations Inventory Checklist	X
	Online tests and exams		Concept maps	
Reflections: (Check all that apply)	Survey	X	Focus Group	
	Discussion	X	Task Management Chart Management log	X
	Journal Writing/ Learning Log		Other	

Map the Product:

Knowledge and Skills Needed	Already Have Learned	Taught Before the Project	Taught During the Project
1. Identify geometric figures	X		
2. Apply formulas and compute area, surface area and volume	X		
3. Compute construction and maintenance costs			X
4. Create Scale drawings			X
5. Presentation Skills		X	
6. Research skills	X		
7. Collaboration skills	X		
8. Communication skills	X		

Resources:

School-based Individuals:
Principal
Co-math teachers

Technology:
Computer lab
PowerPoint Software
Internet: search engines
Sketchpad Online Software
Online Metric Graphing Paper

Community:

A local civil engineer and building contractor will visit the classroom to give students ideas about designing and costs. Teachers and school administrators will be invited for the presentations.

Materials:
Computers
Graphing paper
Rulers

Manage the Process:

Before staring the project: students will review geometric figures and the associated formulas for area, surface area and volume. Students will complete a series of mini-activities involving the use of the formulas in groups to promote collaboration and divided assigned tasks.

Step 1: Students will be introduced to the scenario of the donated grant to the school and its intended use. They will be given the rubric for the final products and explained the necessary steps in completing it.

Step 2: Teacher initiates a discussion of possible pool designs and presents various images. Students are broken into their groups and given the opportunity to discuss and decide a possible design or shape they would like.

Step 3: Students must find the relationship between the possible designs to a geometric figure to determine the necessary formulas to find the proper dimensions.

Step 4: A local civil engineer and building contractor will meet with the class to discuss designing ideas and the calculated costs of construction. Students will be given the opportunity to ask questions and present their ideas.

Step 5: The teacher will demonstrate how to use the website Sketchpad Online Software to complete a scale drawing of the classroom. Students will practice by completing a scale drawing of their own.

Step 6: Students will each produce a scale drawing of a pool design and then bring it back to the group and compare drawings. Then the members will design a group drawing. Students will work collaboratively to produce a scale drawing of the chosen pool design.
Step 7: Students will research costs of materials and construction by using a list of resource provided by the teacher and the use of the internet and computer. Students will collaboratively assign each other research tasks to collect data efficiently and complete an inventory checklist. They will use the management log to determine each others roles.

Step 8: The teacher will demonstrate to students how to use an excel spreadsheet to create budget with appropriate titles, labels, quantities and prices. Students will collaboratively produce a budget spreadsheet with calculated costs that are within the given budget.

Step 9: Students will prepare their presentation plan and power point presentation including their scale drawing and budget spreadsheet.

Step 10: Students will present their final products to the teachers, school administrators and community representatives.

At the end of the project: Students will participate in a self-evaluation, survey and class discussion.

Project Evaluation: Students will reflect on their learning by completing a self-evaluation during the project. At the end of the project students will complete a survey and participate and in a class discussion.

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