Project-Based Learning: Balanced Assessment, Building Understanding

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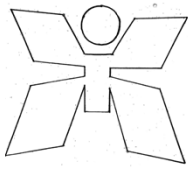
A. John Schmidt, School District of La Crosse, Wisconsin
Jon Hasenbank and Jenni McCool, University of Wisconsin-La Crosse

Abstract: Learn how to give your students a voice using projects that support learning, allow for authentic technology use, build understanding, and offer more balanced assessment. The speakers will share sample projects and rubrics used in geometry, precalculus, probability, and statistics and discuss how to support students and streamline assessment.

Purpose:

- A brief explanation of Project Based Learning from a practitioner
- Exploration of specific projects as applied to enhance a Geometry curriculum.
- Question and answers to share ideas of how to implement PBL into curriculum

The Butterfly Project



- Measure and report the exact area of a children's puzzle from an etching.
- Explain the process in detail that a typical seventh grader could understand. Include explanations of WHY all the equations used work. (Hint: Use internet for circle.)
- Initial report (33%) is returned with feedback.
- The second collection (67%) allows the student opportunities to revise to the level of the evaluator.

The GAP

- GAP = Geometric Art Portfolio
  - *Six week project.*
- Create a portfolio of examples where mathematical concepts are used in artistic expression. Reports must explain the concepts of daisies, mandalas, line art tessellation, reflections, perspective, and optical illusions.
- Include 30 examples for an average score and over 50 for exceptional. Fifty percent of the examples must be created by the student; all others must be referenced (MLA).

Project Based Curricula

- Prepare your students
- Follow a logical progression
- NOT all inclusive
- Students are the focus
- Variety is the Spice
- Meaningful
- Evolving

Project Ideas:

- Butterfly project: Find the area of a butterfly puzzle; prove your answer is correct (topic: formulas).
- Frigga and Freya's Doll Museum: Find an ideal route through the museum given constraints (networks)
- Mt. Olympus Golf Course: Use angle properties to design a golf course.
- Shadow Worlds: Use shadows to explore similarity.
- False Advertising: Translate advertising claims into if… then statements (logic).
- Honors Euler Line Project: Discover the Euler line.
- Baby on the Left: Do humans really carry a baby in their left arm 70-80% of the time? (prob & stats)
- Fly fishing model: Estimate the volume of the "strike zone" as a lure drifts downstream (calculus).
- Creative Fractions: Produce a skit or music video to illustrate fraction tips (math for elem teachers).
- The Sound of Math: Rewrite the lyrics of a famous song using math terminology.
- Butter-Brickle: Using two different methods, estimate the number of bricks in the high school; discuss strengths / weaknesses of each method.
- Round and Round: Explain and compute the number of tire rotations from home to school.
- Math-eye for the Floor-guy: Create a scale diagram of your kitchen floor, and construct and evaluate the working triangle (sink, stove, refrigerator). Research the cost of retiling the floor.

Butterfly Project Rubric

Category	Total Points	Incomplete/Inadequate	Adequate/Proficient	Advanced	Excellent
Introduction to Project[1]	5	vague introduction present (1)	Intro is vague or jumps into project too quickly (3)	Intro adequately shows that the project will be about (5)	Includes history of Puzzle or reference (+1)
Inspiring Cover Page[1]	5	Cover page is an afterthought (1)	Black and white image(s) (3)	Use of color and graphics to inspire (5)	Picture is correctly Referenced/ amazing effort(+1)
Referencing and bibliography[1]	5	Includes a bibliography page (1)	Bibliographies use MLA formatting (3)	Reference notation is imbedded in text (5)	Table of Contents (+1) or Annotated bibliography (+1)
Explanation of how the areas are separated[2]	5	Divisions occur without explanation or calculations(1)	Butterfly is vaguely divided into geometric sections without explanation (3)	Clear Explanation of how the figure is separated using diagrams (5)	Creates picture(s) to support and/or includes step-by-step divisions (up to +3)
Explanation of the derivation of Area Formulas[2]	5	Vaguely reference what the equations are for Rectangle and Triangle (1)	Previous info and adds in parallelogram and circle (3)	Fully explains <u>all</u> derivations used, Circle source is included (5)	Includes Trapezoid (+1)
Explanation of how to measure[3]	5	Explains steps to the level of peers (1)	Includes clear steps and samples (3)	Includes right angle and center of circle(5)	thorough beyond norm (+1)
Demonstrates calculated values[3]	5	Has an answer for total area (1)	Has some calculations lead up to the total (3)	Sample Calculations & summary chart (5)	
Integrates diagrams in report[4]	5	Hand drawn (1)	Straight lines with some text boxes (3)	Diagrams with captions/text wrap (5)	Color Pictures & Diagrams integrated (+2)
Uses algebraic formats/ equations[4]	5	Writes formulae in ink (1)	Uses rulers in diagrams & fills in equations (3)	Uses Symbols and superscript in eqns (5)	

Objectives: 1.Structuring Formal Reports 2.Understanding Area 3.Explaining Measurement 4.Using Desktop Publishing Methods

Student _____ Points_____/ (45) max 50 Comments/ extra effort _____