Performance Assessments, Portfolio Assessments, Rubrics, and STEAM
Introduction

• Topics:
  • Performance Assessments
  • Portfolio Assessments
  • Rubrics

• Classroom:
  • 9th Grade Science, Technology, Engineering, Arts, and Mathematics (STEAM) Class
  • Interdisciplinary classroom setting provides us an opportunity to examine our topics from a complex, unique perspective.
What is STEM?

• **STEM:**
  
  • The idea of educating students in four disciplines, science, technology, engineering and mathematics, through an interdisciplinary approach.
Best STEM Assessment Practices

- Performance
- Portfolios
- Rubrics
- STEM to STEAM
Furthering STEM Education: STEAM

• STEAM incorporates art & design at the center of STEM

• A STEAM curriculum fosters creativity in business and science industries by education students to address complex problems facing human society

• Assessments revolve around problem-based learning, student choice and authentic assessment
Benefits of a STEAM Curriculum

• The curriculum shifts around students’ interest, and aims towards topics such as science in society

• Build on experiences and relationships between the individual and community

• Promotes self-reflection, deep engagement and responsibility for students’ own learning

• Fosters multiple levels of divergent thinking
E-Portfolios

- Hanyand Elementary School, Seoul, Korea
- Implemented a STEAM e-portfolio in the classroom.
- Study showed:
  - Higher level of creative and critical thinking
  - Higher level of enjoyment in the classroom across multiple contents
Rubrics: WHERE TO

- **W**: “Where are we going? What is expected?”
- **H**: “How will the students be engaged?”
- **E**: “Students’ expected performance.”
- **R**: “Rethinking, or revise.”
- **E**: “Self-evaluation & reflection of thinking.”
- **T**: “Accommodation of learning styles, interests and needs.”
- **O**: “Organization of assessment and learning.”
Breaking Apart a STEAM Assessment:

- In small groups list the skills that could be assessed in this STEAM Assessment.
  - Science:
  - Technology:
  - Engineering:
  - Arts:
  - Math:
- Be ready to share 😊
Breaking Apart:

- **Science**: developing and using a model to describe the function of a plant cell
- **Technology**: using digital technology to research, document learning, and support inquiry.
- **Engineering**: constructing a 3D model of a plant cell
- **Arts**: using creative expression to design and develop a cell
- **Math**: measurement and design of the shapes of organelle
Performance Assessments

Overview and Discussion
Literature Review

- An increase in STEM instruction can lead to an increase in academic performance, catalyzed by an active learning experiences (Freeman, 2014).

- Active learning (learning by doing) can lead to an increase in examination performance and raises students’ average grades to a statistically significant degree.
  - Failure rates under traditional lecturing are 55% higher than rates observed under active learning.

- As national and state standards are focusing more and more on authentic learning, exposure to performance assessments is critical to student success (Pandey, 1990).

- Qualitative studies support the transformation of science classrooms into areas where students “do science and develop habits of mind” (Shymansky, 1997).
Performance Assessments vs. Traditional Testing
Louis C.K: Standardized Tests = BAD!

My kids used to love math. Now it makes them cry. Thanks standardized testing and common core!

Part A:
Fill in the blanks below with whole numbers greater than 1 that will make the number sentences true.
1. 63 + ___ = 7
2. 63 = 21 x ___
3. 21 = ___ x 7
4. 7 x (___ x ___) = 21 x 7.5. (21 x 3) ÷ ___ = 7

Part B:
If the product of two whole numbers greater than 1 is 63, what could the two whole numbers be? _____, _____

Look at 4 of part a. And the point isn't that it's too hard. Just read #4. Please.
Counterpoint: Standardized Tests are Good!

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So Are Standardized Tests Good or Bad?

Questions for Discussion:

• Who do you agree with and why?
• What do you feel makes an assessment good or bad?
• What role can performance assessments play in the development of “good tests”?
Portfolio Assessments
Literature Review

• Portfolios can serve a powerful purpose in all content areas, including STEM.

• It is important that teachers facilitate the content of the portfolio to reflect the standards and learning objectives they teach (Whitworth, 2013).

• When properly implemented, portfolios allow students to reflect on their course work and guide their future goals (Cruz, 2013).

• Working with students in creating their portfolios provides teachers with an opportunity to improve communication and understanding of their students (Kim, 2014).
Portfolio Types

- Growth and Best Works (Nitko, 2015)
- **GROWTH**
  - Formative
  - Progression over time
- **BEST WORKS**
  - Summative
  - Final product
Groups for STEM Portfolio Activity

• Group One
  • Jess, Corinne, Carlyn, Anthony

• Group Two
  • Annie, Cassidy, Stephen, Kat, Dr. Powers?

• Group Three
  • Nicki, Sam, Megan, Jude-Mary, Brie
Rubrics

Overview and Activity
Purpose of STEM Rubrics

- Assess higher-order thinking skills in addition to content area knowledge
- Grade performance tasks, portfolios, and problem-solving tasks
- Improve reliability and validity of assessments
- Communicate teacher’s expectations
- Provide opportunities for creativity and innovation
The Nature of Scientific Knowledge

EMPIRICAL: based on observations
TENTATIVE: new observations or interpretations
INFERENTIAL: scientific claims ≠ evidence
THEORY-LADEN: influenced by backgrounds
EMBEDDED: within a wider culture
FOUNDED: on no specific scientific method
CREATIVE: models used to represent concepts

Sample Criteria for STEM Rubrics

• Synthesis of information
• Use of supporting details
• Use of accurate scientific terms
• Application of information
• Evidence of conceptual understanding
Sample Criteria for STEM Rubrics

- Communication skills (written, oral, visual)
- Applying correct formulas
- Reflection of learning
- Evaluation of data/sources
Your Challenge

• Each group will receive a STEM performance task.
• Select a HOTS that the task assesses.
• Create a criterion and describe the highest performance level.
• Share your criterion, performance level, and any challenges you encountered.

• Cruz, H. L., & Zambo, D. (2013). Student data portfolios give students the power to see their own learning. Middle School Journal, 44(5), 40-47.


