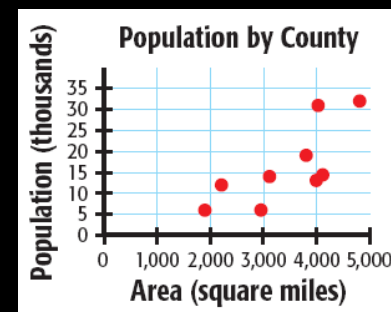
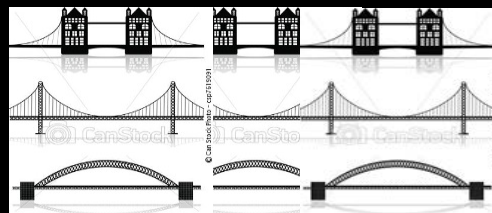
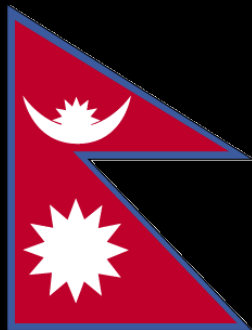


# *Differentiating the Mathematics College and Career Ready Standards for Advanced/Gifted and Talented Students Elementary Grades 3-5*

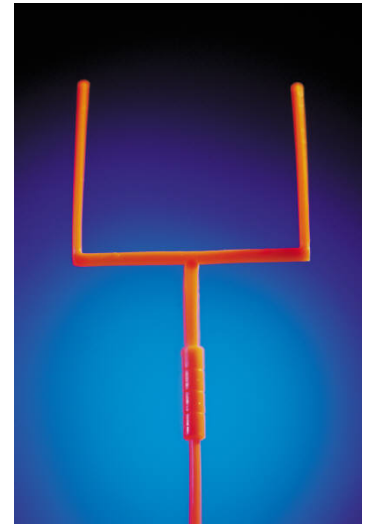


Maryland College and Career Readiness Conference  
2014

<https://msde.blackboard.com>

# Session Goals

1. Provide an overview of gifted and talented education in Maryland.
2. Introduce Maryland's design principles for differentiating instruction for advanced/gifted and talented students.
3. Review the MSDE differentiated units which model the design principles for gifted and talented students
4. Explore differentiated instructional strategies that can be applied to other units.



# Session Part 1. Differentiation

## “We practice what we preach.”

### CHOICE A. “Truth or Fiction?”

Take time to explore the links to learn more “truth.”

### CHOICE B. “Retrofit.”

Go to the Blackboard site and select a grade level lesson of interest. Apply the design principles to begin your retrofit

### CHOICE B. “New Construction”

See the Design Principles in action by walking through the lessons seeds in one of the GT ELA units on Blackboard.

### CHOICE D. GT Education PD Opportunities (last slide)

Explore the links to plan your next professional learning!

# Gifted and Talented Education in Maryland



## **TRUTH OR FICTION?**

1. Let's regroup.
2. Work with your group to decide if each statement is **TRUTH** or **FICTION**.
3. Record your answers.

# What Does the Research Say?



[Top Ten Myths in Gifted Education](#)



# TRUTH or FICTION?

1. All Maryland school systems must identify and serve gifted and talented students.

[http://marylandpublicschools.org/NR/rdonlyres/047CAC81-DEBA-42FE-A058-0C5C45947512/32797/COMAR\\_13A0407\\_GT\\_Education.pdf](http://marylandpublicschools.org/NR/rdonlyres/047CAC81-DEBA-42FE-A058-0C5C45947512/32797/COMAR_13A0407_GT_Education.pdf)

2. Acceleration can be beneficial for gifted students.

<http://nagc.org/index.aspx?id=383>

3. Gifted students learn better in heterogeneous classrooms.

[http://www.davidsongifted.org/db/Articles\\_id\\_10691.aspx](http://www.davidsongifted.org/db/Articles_id_10691.aspx)

4. Funding for gifted students is commensurate with their existence in the general population.

[http://blogs.edweek.org/edweek/speced/2010/08/federal\\_funding\\_for\\_gifted\\_edu\\_1.html](http://blogs.edweek.org/edweek/speced/2010/08/federal_funding_for_gifted_edu_1.html)



# TRUTH or FICTION?

5. Maryland schools can apply for the designation “Excellence in Gifted and Talented Education” (EGATE) school.

[http://marylandpublicschools.org/MSDE/programs/giftedtalented/docs/2010\\_2013\\_Excellence\\_GT\\_Ed\\_Schools.pdf](http://marylandpublicschools.org/MSDE/programs/giftedtalented/docs/2010_2013_Excellence_GT_Ed_Schools.pdf)

6. Advanced Placement courses meet the needs of gifted high school students.

<http://www.gifted.uconn.edu/nrcgt/hertcall.html>

7. Appropriate enrichment for gifted students consists of field trips, speakers, and after school activities such as drama club.

<http://education.wm.edu/centers/cfge/curriculum/index.php>

8. Teachers require specialized training in order to meet the needs of gifted students.

[http://marylandpublicschools.org/NR/rdonlyres/047CAC81-DEBA-42FE-A058-0C5C45947512/20852/COMAR\\_Gifted\\_Talented\\_Ed\\_Specialist.pdf](http://marylandpublicschools.org/NR/rdonlyres/047CAC81-DEBA-42FE-A058-0C5C45947512/20852/COMAR_Gifted_Talented_Ed_Specialist.pdf)



# TRUTH or FICTION?

9. Maryland has a professional organization for educators of gifted students.

<http://www.megsonline.net/>

10. Gifted and talented students have unique social and emotional needs

<http://www.sengifted.org/>

11. Environmental circumstances such as poverty can mask giftedness.

<http://www.nagc.org/index.aspx?id=656>

12. Students who are gifted may also have learning difficulties.

<http://www.2enewsletter.com/>



# What do these objects have in common?



# Universal Design (UD)

**Universal Design** is the design of all products and environments to be **as usable as possible** by as many people as possible regardless of age, **ability**, or situation.

## UD...

- originates from the belief that **the broad range of human ability is ordinary**, not special.
- accommodates people with disabilities, older people, children, and **others who are non-average**.
- has accessible features **integrated into the overall design** rather than added on later (**retrofit**).

# What is Universal Design for Learning? (UDL)

- A framework for designing curriculum that provides ALL individuals with **equal opportunities to learn**.
- Grounded in research of **learner differences** (neuroscience).
- Designed (up front) to remove **barriers to learning** for ALL students.
- *Change the materials and not the student.*

I. Provide Multiple Means of Representation

II. Provide Multiple Means of Action and Expression

III. Provide Multiple Means of Engagement

# Barriers for Gifted Students

- A barrier is anything that restrains or obstructs progress or access, such as....



# A UDL-Based Framework for GT Differentiation

***Our Goal is to...*** produce qualitatively differentiated Common Core units/lessons for Advanced/Gifted and Talented Students.

Differentiation is *deliberate* adaptation and modification to respond to the needs of gifted learners.

Key approaches are acceleration, depth and complexity, creative thinking and production.

**"The Common Core is the point of departure  
for gifted students."**

Joyce VanTassel Baska

# Did you know?

Gifted and talented students are defined in Maryland law as

***"having outstanding talent and performing, or showing the potential for performing, at remarkably high levels when compared with their peers (§8-201)."***



# Did you know?

- State regulations require local school systems to provide ***different services beyond the regular program*** in order to develop gifted and talented students' potential.
- Appropriately differentiated programs and services will ***accelerate, enrich, and extend instructional content, strategies, and products to apply learning*** (COMAR 13A.04.07 §03).





# An Advanced Learner in Math and Science \*

1. Is interested in numerical analysis.
2. Has a good memory for storing main features of problem and solutions.
3. Reasons effectively and efficiently.
4. Solves problems intuitively using insight.
5. Organizes data and experiments to discover patterns or relationships.
6. Improvises with science equipment and math methods.
7. Is flexible in solving problems.

\*Johnsen, S.K. (2004). *Identifying Gifted Students: A practical guide*. Waco, Texas: Prufrock Press.



# **A Framework for Differentiation**

## **15 Design Principles for GT Learners**

### **Content Differentiation for GT learners**

- 1. Pre-assess to determine the starting point.**
- 2. Provide complex texts.**
- 3. Extend with above grade-level standards.**
- 4. Accelerate the pace through compacting.**
- 5. Organize around overarching concepts.**
- 6. Explore interdisciplinary connections.**
- 7. Study differing perspectives.**
- 8. Explore patterns/relationships.**

# **A Framework for Differentiation**

## **15 Design Principles for GT Learners**

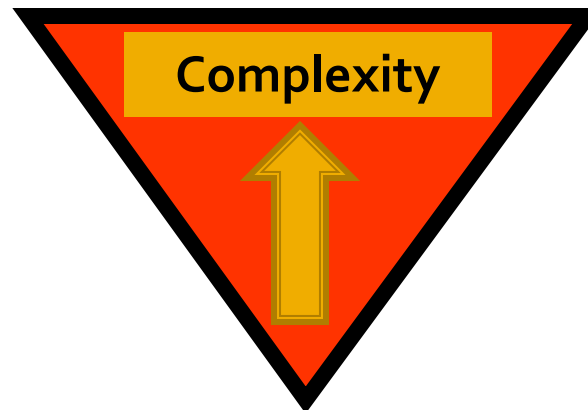
<b>Process/Product Differentiation</b>
<b>9. Design learning around ill-structured problems.</b>
<b>10. Develop the processes of professionals.</b>
<b>11. Increase the level of complexity.</b>
<b>12. Engage in goal-setting, planning, and self-monitoring.</b>
<b>13. Focus on inquiry and research.</b>
<b>14. Design authentic (real-world) performance tasks.</b>
<b>15. Provide authentic audiences /expert evaluators.</b>

# Removing Barriers for GT Learners

- All students have access to rigor, but advanced students require greater *frequency*, *intensity*, or *complexity* of the design principles.



*Greater frequency and intensity*



# More than the CORE:

## What is NOT covered in the standards\*

- **How** teachers should teach
- **All** or even most of the *content* students should learn.
- **All** that can or should be taught
- **Limits** or restrictions
- The nature of **advanced work** for students who meet the standards early
- **the whole** of what is defined as college and career readiness



\* Introduction, p. 6. *CCSS for ELA & Literacy in History/Social Studies, Science, and Technical Subjects.*

# About Acceleration...

- **Content-based** – bring advanced material to the grade
- **Grade-based** – Move student closer to the *cognitive* peer group
- **WHY?** The instructional level in one grade can vary 8 - 9 years!
- ***No other arrangement works as well for gifted learners*** (Rogers, 2010; Kulik, 2004).
- **Social effects** are positive or no change.

# Acceleration MYTHS:

## *Let's Move On..*




**Despite research, these myths remain...**

- **Academic** – learning is superficial. **False**
- **Social** – “You will pay a social price.” **False**
- **Political** – “elitist” and “unfair.” Makes others feel bad. **False: *Acceleration addresses individual differences.***
- “Better a big fish in a small pond.” **False: *Acceleration makes big fish into stronger fish in a bigger pond.***

# Evaluate Differentiated Tasks\*

\*Joseph Renzulli

*At this time, under these conditions:*

- **COULD** all students do this? **No.**
  - Assess readiness levels (ongoing).
- **SHOULD** all students do this? **No.**
  - Align instruction to identified needs.
- **WOULD** all students want to do this? **No.**
  - Align instruction to aptitudes/interests.
- **Appropriately differentiated task**

# Applying the Design Principles: What if I live in “This Old House”?

“Retrofit” a grade  
level lesson to  
remove barriers for  
gifted learners

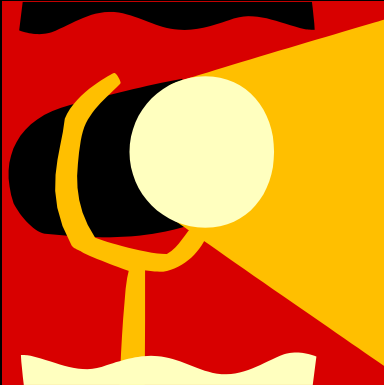




# Applying the Design Principles “New Construction”

Design a stand-alone unit that is differentiated for advanced/gifted and talented learners





**Spotlight on one  
differentiated  
approach:**

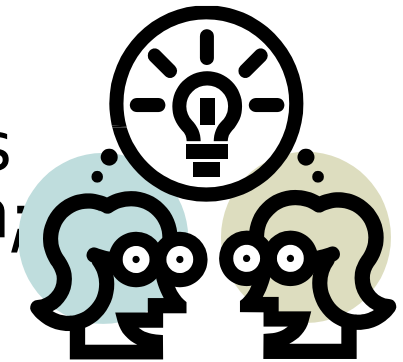
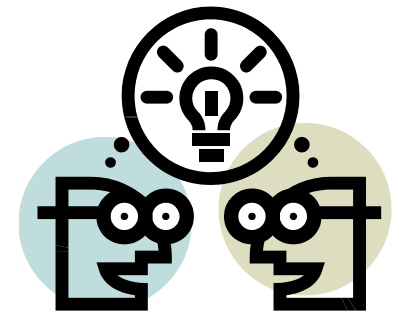
# **Problem-Based Learning (PBL)**

**IMSA PBL NETWORK**

<http://pbln.imsa.edu/>

# Problem-Based Learning

- Organizes curriculum and instruction around “ill-structured” problems
- Develops critical and creative thinking, collaboration, and *joy in learning (authentic engagement)*.
- Meets a real need or solves a real problem
- Interdisciplinary
- Uses the methodology of professionals
- Has an audience beyond the classroom; preferably experts in the field.
- Contributes “new knowledge” in a unique product.



# The Ill-Structured Problem: GT 4 Math: *The Third Bridge*



**With traffic growing,  
state begins another  
study of Bay Bridge  
capacity**

**Two-year analysis will  
determine when a new  
crossing should be built**

By Candy Thomson, The Baltimore Sun  
4:25 p.m. EDT, May 25, 2013

- Problem must be identified and defined.
- Additional information is needed to solve the problem.
- Multiple solutions are possible.
- Problem has a social context.
- There is a high motivation to solve the problem.

<http://www.baltimoresun.com/news/breaking/bs-md-third-bay-crossing-20130508,0,5867276.story#ixzz2VNhSP3ce>

# Third Bay Bridge?

[illegible]

# Meeting the Problem: The Problem Scenario



MARYLAND TRANSPORTATION AUTHORITY

## **CALL FOR PROPOSALS: A THIRD BAY BRIDGE**

The Maryland Transportation Authority (MDTA) is conducting a study to determine when a third Bay Bridge should be operational.

The MDTA is seeking to save time and money by soliciting volunteers to develop Third Bay Bridge proposals. We recognize that many students in Maryland schools are interested in our Bay and understand how to apply mathematics to solve real-life problems. We seek to engage your input into a major decision that will affect your future life in Maryland.

- In what ways is the problem authentic?
- What is engaging about the problem?
- What is the role of the students?
- What are the issues connected to this problem?

Defining the Problem: **Formulate a Problem Statement which frames the PBL task and specifies the criteria for success.**

**Use this frame:**

How can we as (*who are we?*) create a (*what is the task/product?*) that presents to (*audience*) a reasoned argument that (*the criteria for the product as listed in the PBL scenario*)



# Defining the Problem:

**Formulate a Problem Statement which frames the PBL task and specifies the criteria for success.**

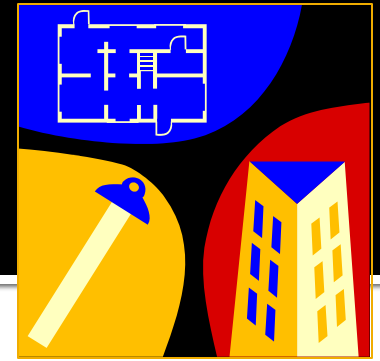
## Sample:

How can we as proficient mathematics students (**role of students**) create a proposal for the location of a third Bay Bridge (**task/product**) that presents to the MD Transportation Authority a reasoned argument that (**purpose/ audience**):

- Analyzes the local impact on environment, business, and community
  - Communicates how solutions make sense based on demographic data
  - Develops an accurate budget
  - Justifies conclusions using tables and graphs
- (the conditions/criteria for the product)**



# PBL models the Process/Product Design Principles (#9 – 15)



- The problem-solving process is structured by what students need to learn and be able to do to create a **solution**, thus ensuring that students reach the required learning objectives (#9).
- PBL investigations culminate in student-created **projects**, exhibitions, or other artifacts that address the overarching questions (#10, 11, 12, 13).
- The investigation culminates in an oral presentation with **experts from the relevant business or community as the audience and/or evaluators** (#14, 15).

# Elementary GT Math Problem-Based Learning Units

## **Grade 1:** *Oh the Places You'll Go!*

A PBL Unit in Operations and Algebraic Thinking



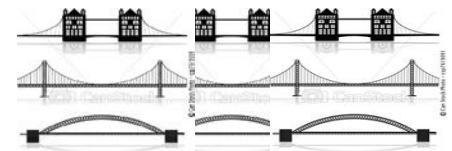
## **Grade 3:** *Olympic Field Day*

A PBL Unit in Numbers and Operations - Fractions



## **Grade 4:** *The Third Bridge*

A PBL Unit in Operations and Algebraic Thinking



## **Grade 5:** *Armour for All!*

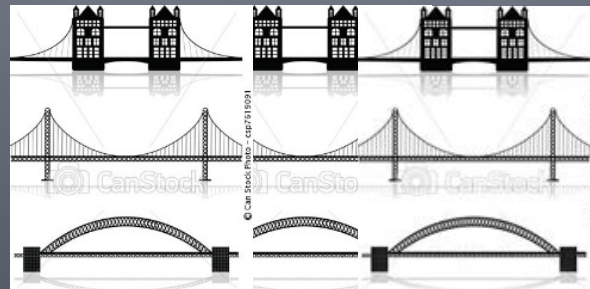
A PBL Unit in Collecting, Representing and Interpreting Data



# The 15 Design Principles

## Content Design 1-8

### The Third Bridge: A Problem-based Unit in Operations and Algebraic Thinking



# *The Third Bridge Overview*

Do you see the Content Design Principles in action?

- Duration: 15 – 20 days
- Composed of 1 lesson and 5 lesson seeds
- Interdisciplinary Connections:
  - **Science connections** - students explore plant growth, island erosion, and other environmental issues and bridge building.
  - **Social Studies connections** - students investigate the laws of supply and demand in the relationships between watermen & crab populations, in a local fishing economy.
  - **Reading Language Arts** connections are made to cause & effect using Dr. Seuss's *The Lorax* and a narrative in the Watermen of Hooligan Bay to derive function rules.
  - **STEM connections:** Students learn, apply, interpret and communicate rigorous content through inquiry, logical reasoning, collaboration, and investigation (STEM Standards of Practice).
- **Core Standards:**
  - Measurement & Data
  - Operations & Algebraic Thinking
  - Numbers in Base 10
  - Numbers & Operations-Fractions

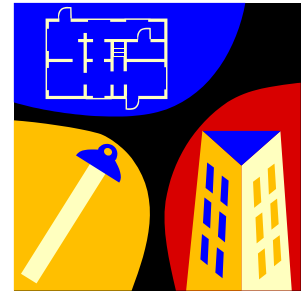
# Design Principles for Content Acceleration

## "The Blended Approach"

### A Natural Progression to Extend Concepts

Domain: Operations & Algebraic Thinking

Cluster: Generate and analyze patterns and relationships



- **Standard: 4.OA.5** – Generate **a number or shape pattern that follows a given rule**. Identify apparent features of that pattern that were not explicit in the rule itself.
- **5.OA.3** – Generate **two numerical patterns using two given rules**. Identify apparent relationships between corresponding terms. **Form ordered pairs** consisting of corresponding terms from the two patterns and **graph the ordered pairs on a coordinate plane**.
- **6.EE.9** – **Use variables** to represent two quantities in a real world problem **that change in relationship to one another**; write an equation to express one quantity, thought of as the **dependent variable**, in terms of another quantity, thought of as the **independent variable**.

# Seed 4. The Watermen of Hooligan Bay



1. Read the scenario.
2. Identify the rules for each pattern.
3. Use the rules to populate the data tables.
4. Determine relationships among tables.
5. Discuss: What are the implications for the Watermen? How does mathematics help us to understand real world relationships?

# ANSWER KEY A

Year	Number of watermen in
2012	5,000
2013	6,000
2014	7,000
2015	8,000
2016	9,000
2017	10,000
2018	11,000
2019	12,000
2020	13,000
2021	14,000

Year	Crab Population in
2012	4,000,000
2013	3,900,000
2014	3,800,000
2015	3,700,000
2016	3,600,000
2017	3,500,000
2018	3,400,000
2019	3,300,000
2020	3,200,000
2021	3,100,000

# ANSWER KEY B

Year	Industry Sales
2012	\$50,000,000
2013	47,500,000
2014	45,000,000
2015	42,500,000
2016	40,000,000
2017	37,500,000
2018	35,000,000
2019	32,500,000
2020	30,000,000
2021	27,500,000

Year	Price of Crabs (per bushel)
2012	\$150
2013	160
2014	170
2015	180
2016	190
2017	200
2018	210
2019	220
2020	230
2021	240



# Concept Extensions for Blended Acceleration

- Construct line graphs for each data table prior to examining the relationships between the data sets.
- **Explore : Is a line graph the most effective way to show the data? Why/why not? How else could we graph, display the data?**
- Introduce the vocabulary of dependent and independent variables, domain and range, input, output, correlations, line of best fit, etc.
- Input the data on a graphing calculator and graph the line or choose to show line of best fit and scatter plot to test correlation.
- Investigate their own community:
  - Is there a correlation between the population of your city and the amount of air pollution?
  - Is there a correlation between the temperature in a city and the amount of trees?

# Connection to PBL Scenario



- **Hooligan Bay:** Students understand the impacts of certain variables on a local bay economy.
- **The Third Bridge:** Students will explore the impacts of bridges on the community, such as:
  - Increase revenue but decrease air quality (increase/decrease situation).
  - Increase traffic flow but increase motor vehicular accidents (an increase/increase situation)

# See the 15 Design Principles in Practice

## Explore the Units!



1. **Select a unit** closest to the grade level you teach.
1. Read the **unit overview** (a “map” of the unit.)
2. **Select a starting place** to explore (Lesson#)
3. **Locate** the unit/ lesson on <http://msde.blackboard>
4. **Use the 15 Design Principles** (your compass) to guide your review.
5. **In what ways do you see the Design Principles modeled in the unit?**

# What are your Take-Aways?

1. Provide an overview of gifted and talented education in Maryland.
2. Introduce Maryland's design principles for differentiating instruction for advanced/gifted and talented students.
3. Review the MSDE differentiated units which model the design principles for gifted and talented students
4. Explore differentiated instructional strategies that can be applied to other units.



# GT Education PD Opportunities

- Earn [MD certification](#) as Gifted and Talented Education Specialist (JHU, Notre Dame, McDaniel have programs)
- [Attend the NAGC conference in Baltimore November 12-16, 2014](#)
- Take [MSDE online CPD](#) courses in gifted and talented education
- Join [MEGS](#) and [MCGATE](#)!



NAGC 61<sup>st</sup> Annual Convention and Exhibition  
November 13-16, 2014 > Baltimore, MD  
National Association for Gifted Children

