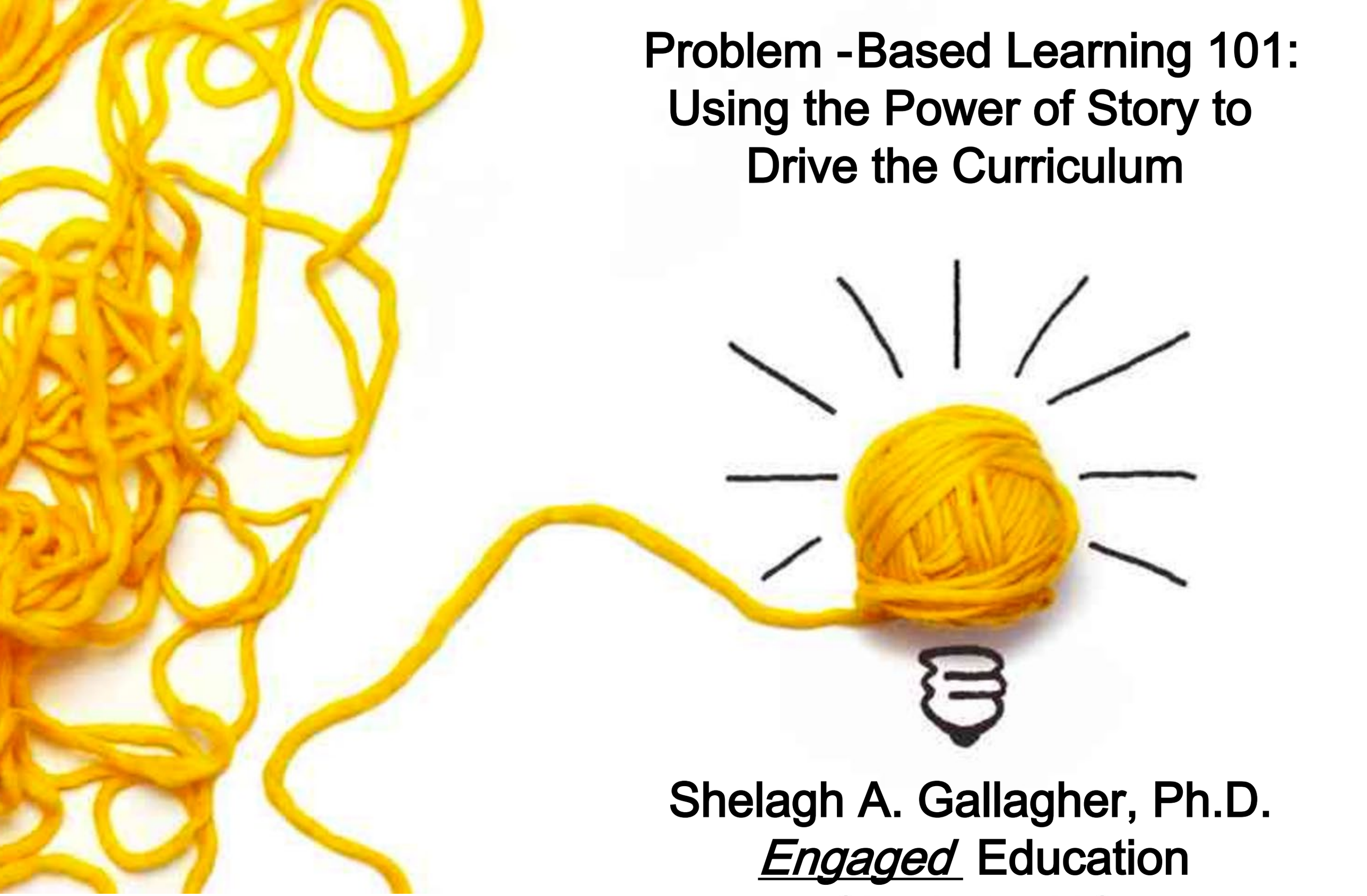
Problem -Based Learning 101: Using the Power of Story to Drive the Curriculum



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1.

The ONLY Reason to Alter Curriculum for Gifted Students

Their LEARNING NEEDS are **DIFFERENT**

because

THEY are **DIFFERENT**

The Gifted Mind

Rapid Learning
Conceptual Thinking
Inquiry
Intensity/Openness

2.

BECAUSE

they are **DIFFERENT**

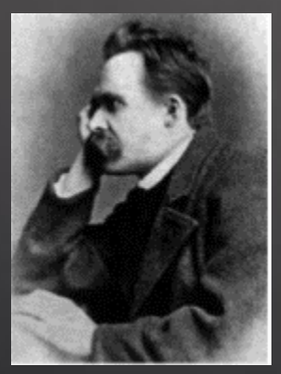
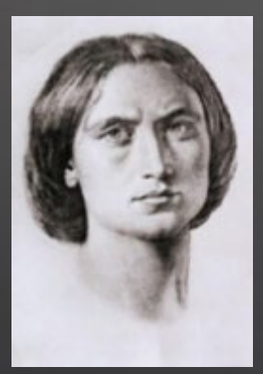
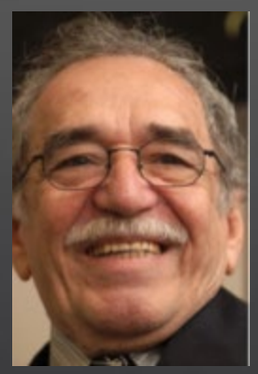
our **GOALS** are

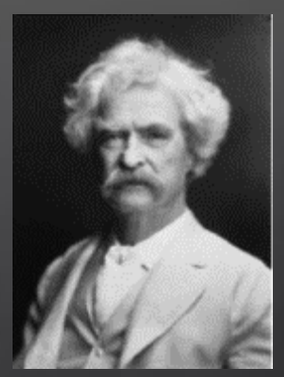
Different

What are the Aims of Gifted Education?

A Journey to Expertise

Knowledge
Thinking Skills
Problem-Solving
Metacognition
Tolerance for Ambiguity
Passion

Expertise requires a

DEEP DIVE

that

CANNOT

be achieved through

differentiated lessons alone

Curriculum IS a

DEEP DIVE

the consideration of

a significant idea

that grows and changes as

understanding evolves

http://www.blackfootedferret.org/

Department of the Interior
U.S. Fish and Wildlife Service

To: All Team Members, Black-Footed Ferret Recovery Reintroduction Team (BFFRRT)
From: Mitchell Ladner, U.S. Fish and Wildlife Service
Subject: Fort Collins Project

Progress on the reintroduction of the black-footed ferret into natural habitats is not moving quickly enough. Already there is media coverage suggesting that attempts to save the black-footed ferret are too expensive and too labor-intensive, given our minimal successes so far. Just look at the recent edition of *The Fort Collins Coloradoan*, and you'll see what I mean—the project was buried on page 4! Given the current strains on the economy, we need to make sure our efforts show decisive results.

Clearly something has to change, and that is why you have been brought together as a team. In the past we have been reactive—that is, we have responded to different problems as they have cropped up. I think it is important that we become proactive by anticipating potential problems and by creating a model of a feasible, functioning habitat that's suitable for the black-footed ferret and all other inhabitants.

We will use the Fort Collins, Colorado, region as the test site to develop our model habitat. Your job is to identify the different aspects of successful black-footed ferret reintroduction, paying particular attention to these questions:

1. How suitable is the natural habitat for black-footed ferret preservation? What, if anything, needs to change before we begin reintroduction?
2. What in particular needs to happen to the Fort Collins habitat to account for any changes the black-footed ferrets might experience as a result of the genetic bottleneck?
3. What is the nature of the "human climate" with regard to the black-footed ferret? Identify any necessary changes in that area and provide ideas on how the changes can be made.

These questions should be enough to at least get you started, but remember, you may encounter other unexpected factors along the way. Keep track of these and incorporate them into your model as appropriate. You will be presenting the model and findings to members of the BFFRRT Project Oversight Committee at its meeting in about two weeks.

I realize that this is a complex task, but I am confident that, given the nature and diversity of the membership of this group, you will be successful. With continued effort, the black- footed ferret will be able to once again fill its niche in the prairie ecosystem.

Learning Issues Board

Hunches: Their habitats isn't suitable

What do we know?	What are our Learning Issues?	What is our Action Plan?
*Ferrets are in danger *We've been trying to save, too expensive too much work according to the Ft. Collins paper *We are the BFFRRT *We have not been very successful *The human climate is bad *The article was on page 4 of the paper *We are supposed to create a model ecosystem for Ft. Collins *We have two weeks	*What does a BFF need for survival? *What is the habitat of a BFF? *How much has the habitat changed since the ferret pop declined? *Why the population declined? *What happened to the environ to cause the decline *How have other populations been impacted? *What is the impact of the BFF disappearance on the ecosys? *What were the successes? *What is TOO expensive/labor? *What does success look like? *What is a genetic bottleneck? *What is the "human climate?"	

Learning Issues Board

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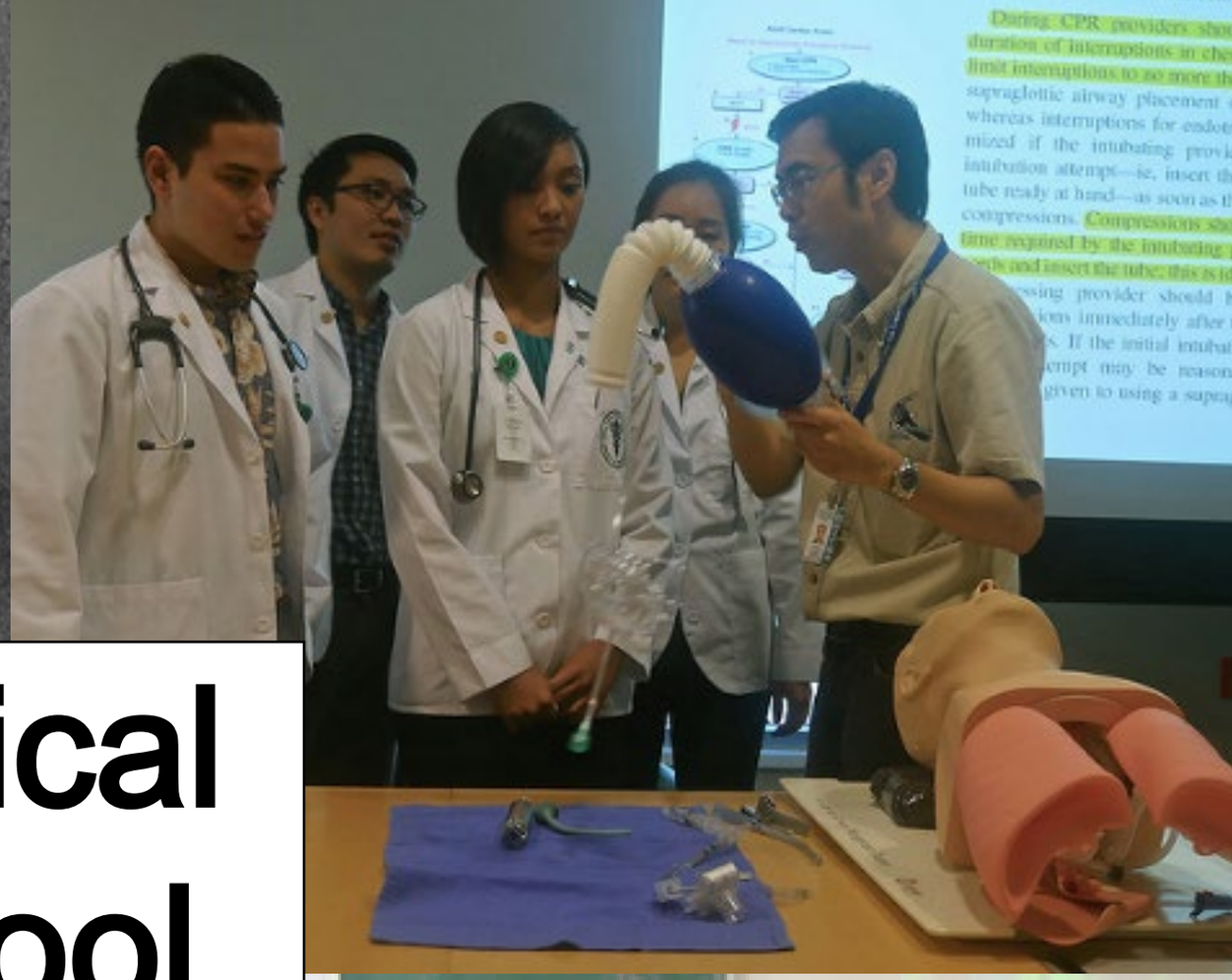
What is “Problem-Based Learning”?

A form of inquiry-based education,

originally invented for medical school,

where learning is initiated with an ill-structured problem and students **learn to** direct their own course of study.



Medical School Model

PBL

o

PBL

PjBL

r

???

Experiencing Subject Matter from an Expert's Perspective

Oversimplification and dogmatism are the twin enemies of creative thought.

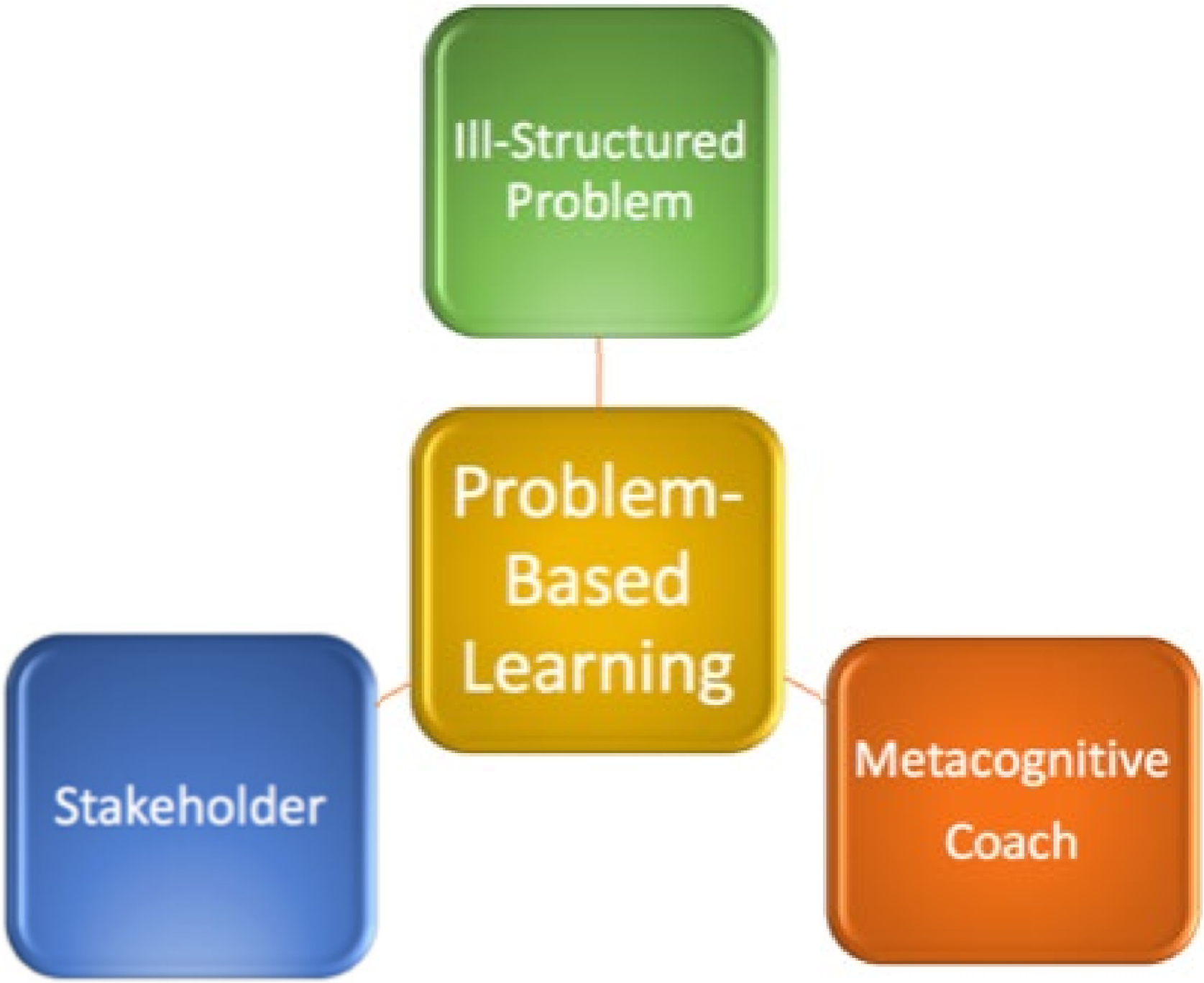
Experiencing Subject Matter from an Expert's Perspective

Premature closure on a productive question can destroy imagination.

Experiencing Subject Matter from an Expert's Perspective

Concepts are worthless unless *they lead children to* ***new explorations****.*

Elements of
Problem -Based Learning



Ill-Structured Problems

Ill-Structured Problems

…cannot be defined with a high degree of completeness

The Center of Expert Activity …cannot be solved with a high degree of certainty

(King & Kitchener, 1994)

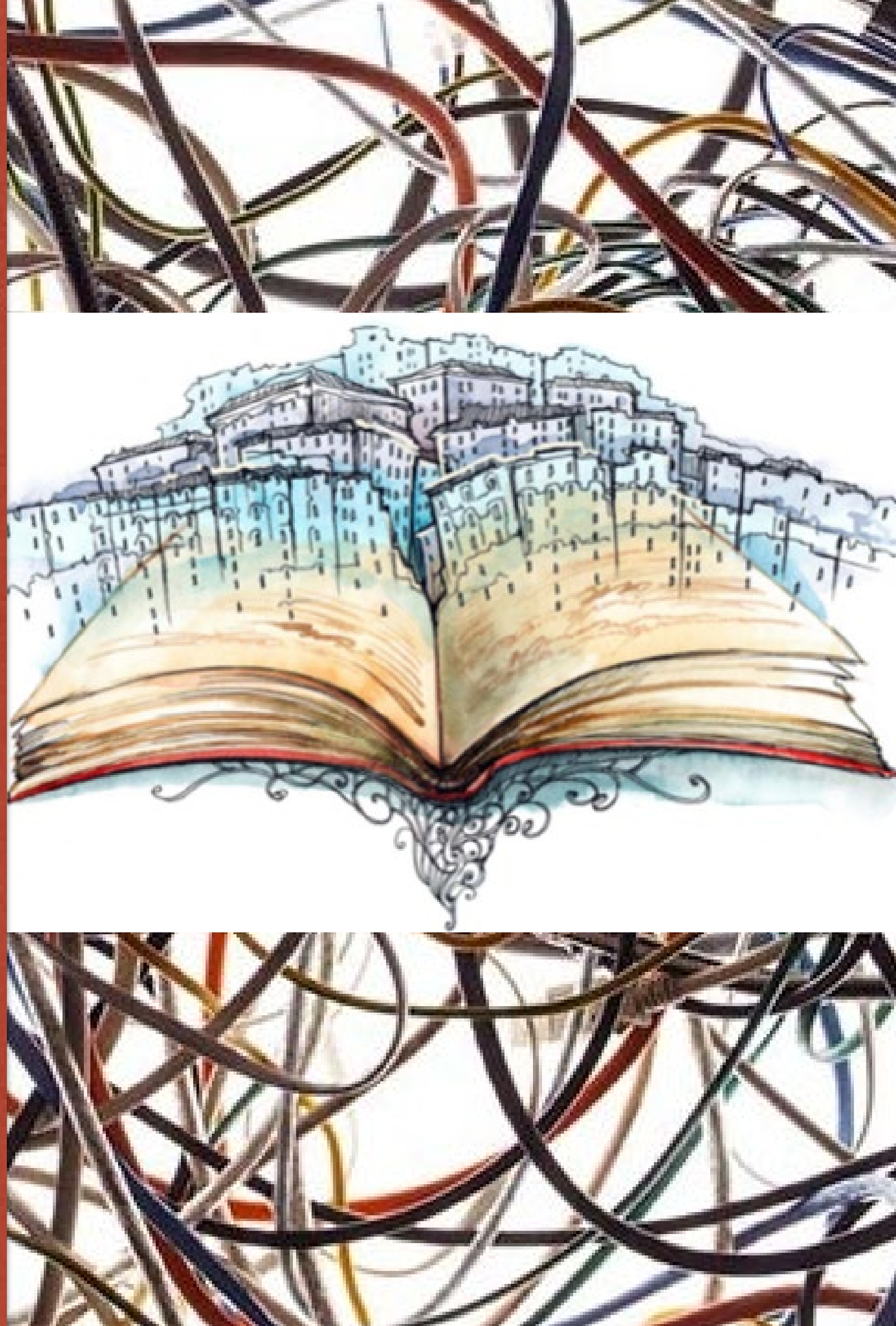
Ill-Structured Problems

Educational Benefits

Content Knowledge
Process Knowledge
Multiple Solution Paths
Choice and Decision Making
Evaluative Thinking
Metacognition

A Story

Realistic Fiction
Mystery



Stories

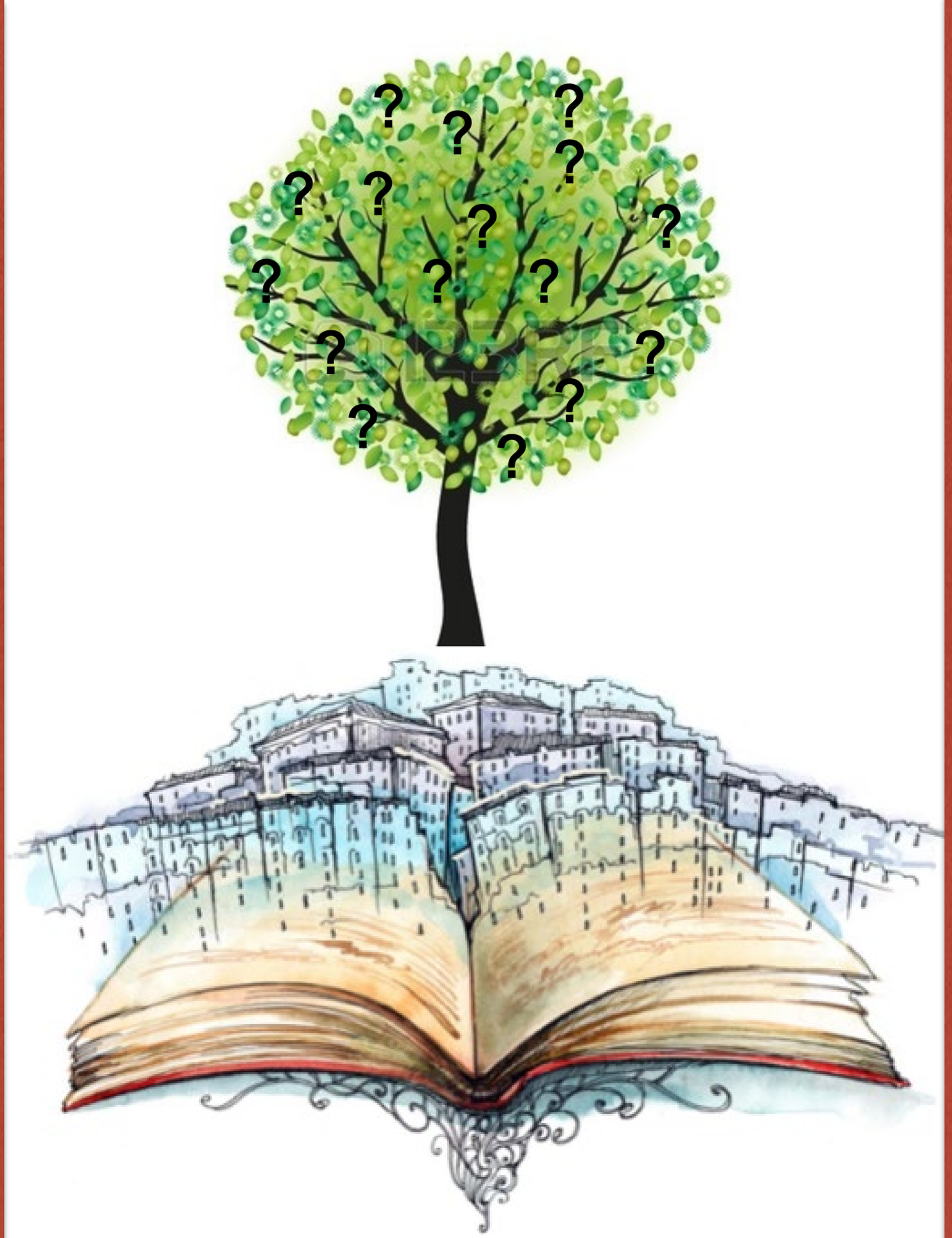
Data with a Soul

Dr. Brene Brown

STORIES

are ***more memorable*** than other forms of narrative (Graesser et al. 2002) even capturing the attention of children who are typically distractible (Willingham 2004)

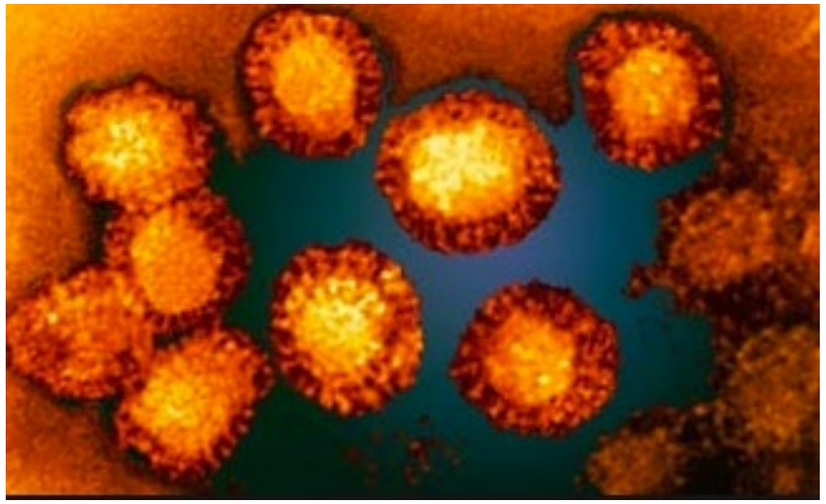
Growth

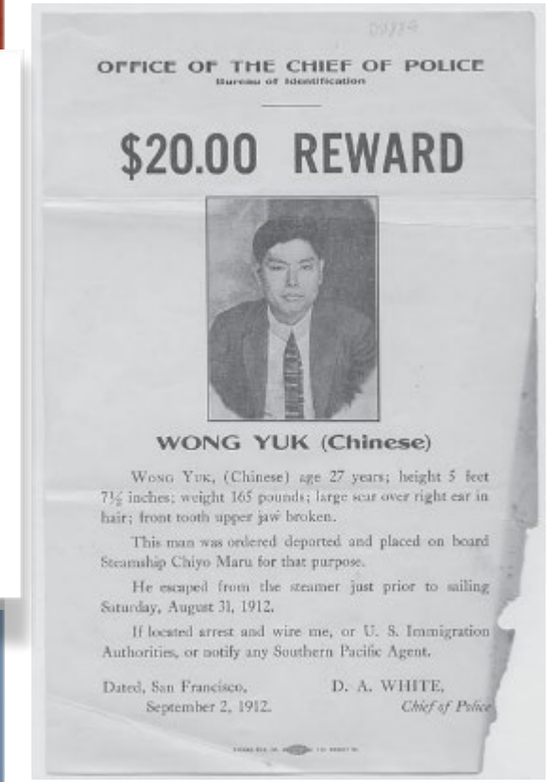


Is Rooted in the Story

Critical thinking only occurs in the face of perceived need

Recognizing the NEED to think precedes all thinking




OFFICE OF THE CHIEF OF POLICE
Bureau of Identification
$20.00 REWARD
WONG YUK (Chinese)
Wong Yuk, (Chinese) age 27 years; height 5 feet 7½ inches; weight 165 pounds; large scar over right ear in hair; front tooth upper jaw broken.
This man was ordered deported and placed on board Steamship Chiyo Maru for that purpose.
He escaped from the steamer just prior to sailing Saturday, August 31, 1912.
If located arrest and wire me, or U. S. Immigration Authorities, or notify any Southern Pacific Agent.
Dated, San Francisco, September 2, 1912.
D. A. WHITE, Chief of Police


IF YOU DON'T GET THE JOURNAL YOU DON'T GET THE NEWS!
NEW YORK JOURNAL
AND ADVERTISER.
IF YOU DON'T GET THE JOURNAL YOU DON'T GET THE NEWS!
NEW YORK, SUNDAY, AUGUST 22, 1897.—70 PAGES.
AMERICAN WOMEN UNITE TO SAVE MISS CISNEROS.
Mrs. Julia Ward Howe.
Mrs. Frances Hodgson Burnett,
Clara Barton,
AND ALSO
Mrs. Jefferson Davis,
Mrs. John A. Logan.
Mrs. John Sherman, Mrs. W. C. Whitney, Mrs. John G. Carlisle, Mrs. Mark A. Hanna and Mrs. E. D. E. N. Southworth.
Led by Mrs. Sherman, Wife of the Secretary of
Never Before Has There Been Witnessed Such an

YOU are the STORYTELLER

They are the

PROTAGONIST

Hi, guys. It's Pete calling. We just finished the count of released BFFs in the field for this week, and I wanted you to know that I noticed something kind of weird. Two out of seven seemed to be limping, and another one had a scabbed-over ear like it had been cut or something. Otherwise they didn't seem all that sick. No lumps or anything...but still, I'm worried. They were suffering, and it was keeping them from getting around well. I thought you'd want to know.

I gotta go. I have to get all these burrs off of me before I meet with Dr. Ladner this afternoon.

An Immersion

in

Significant Content

through

an Expert's Point of View

A
“Stakeholder”

An
Apprentice

Apprenticeship

Apprenticeship

The purpose of an **APPRENTICESHIP** is to provide both

hands-on training **and** theoretical instruction

so that an interested person can learn

the *full range of skills and information*

behind a *highly skilled occupation*.

By participating in an apprenticeship,

he can learn the

subtleties

of the craft from an expert and

can begin

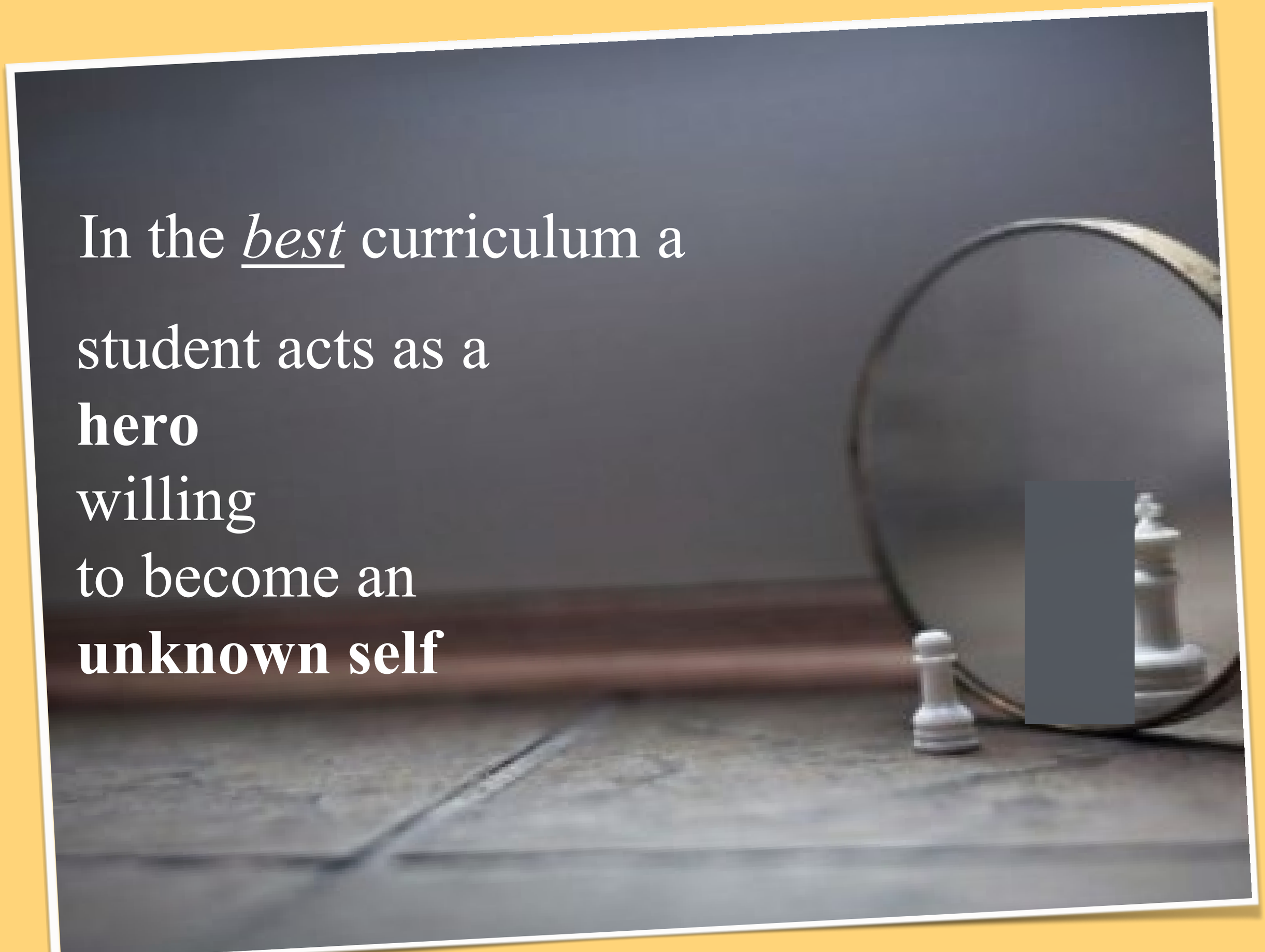
his own practice

under close observation.

Apprentice Definition | eHow.com http://www.ehow.com/about_5445995_apprentice-definition.html#ixzz2NLz72qOW

In the *best* curriculum a

student acts as a
hero
willing
to become an
unknown self



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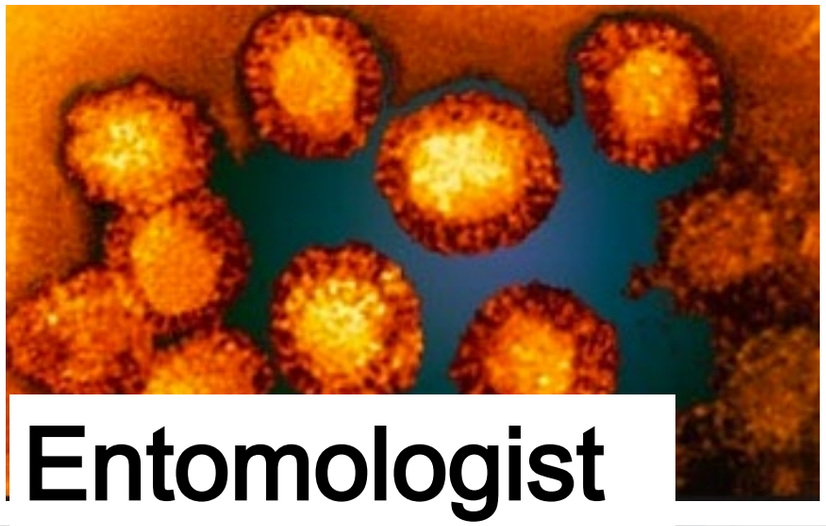
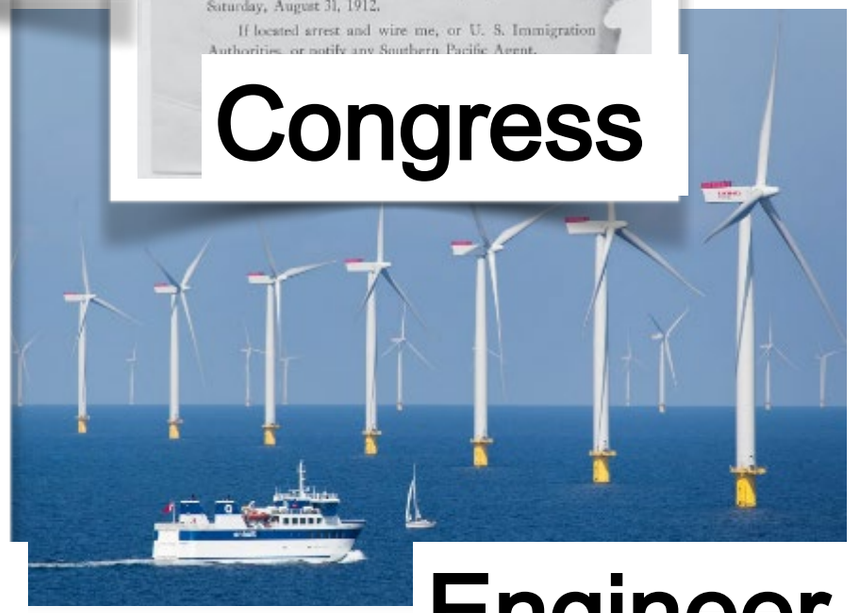


Entomologist

Congress

Task Force

Biologist



Engineer

Town
Elder

Journalist

Transportation Theory

Empathy

Investment

The Danger of Detachment

Complex emotional feelings like interest, inspiration, indignation or compassion …pertain …to

abstract inferences, interpretations and ideas.

Emotions, Learning, and the Brain
Mary Helen Immordino-Yang

“It is … neurobiologically impossible to *think* *deeply* about things that you *don’t care about.”*

Emotions, Learning, and the Brain, Mary Helen Immordino-Yang

NOT a Simulation

All Students Joining in a Single Perspective

Community of Practice

…a ***group of people*** who ***share a concern or a passion*** for something they do, and ***learn how to do it better*** as they ***interact regularly***.

(Wenger & Trainer, 2011)

Metacognitive Coach

Cruise Director

Organize Activities

Manage Level of Difficulty

Keep the Story Alive

Socrates

Helping Students Think

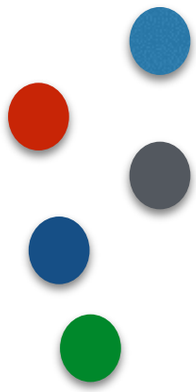
Building Intellectual Toolbox

Encouraging Independence

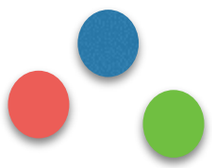
Flexible Grouping

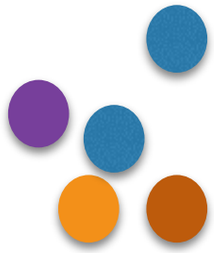
Know	Learning Issues	Action

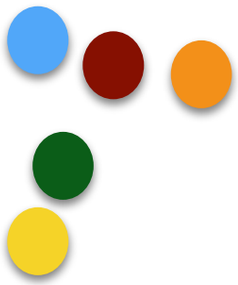
Flexible Grouping

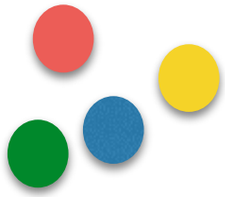


Know	Learning Issues	Action







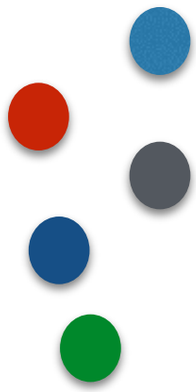
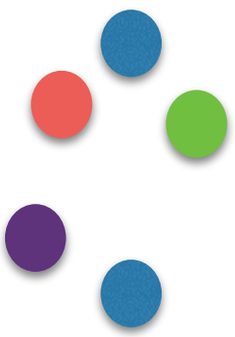


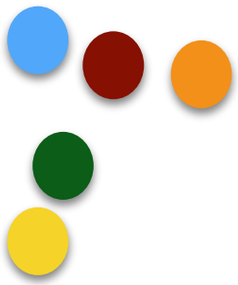
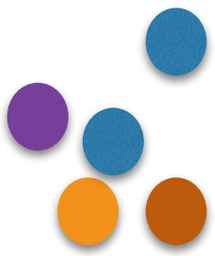
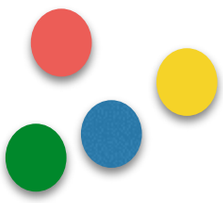
Flexible Grouping

Know	Learning Issues	Action

Flexible Grouping

Know	Learning Issues	Action

Flexible Grouping

Know	Learning Issues	Action

Help them Think about Thinking

Which questions should we consider first?

A PLAN

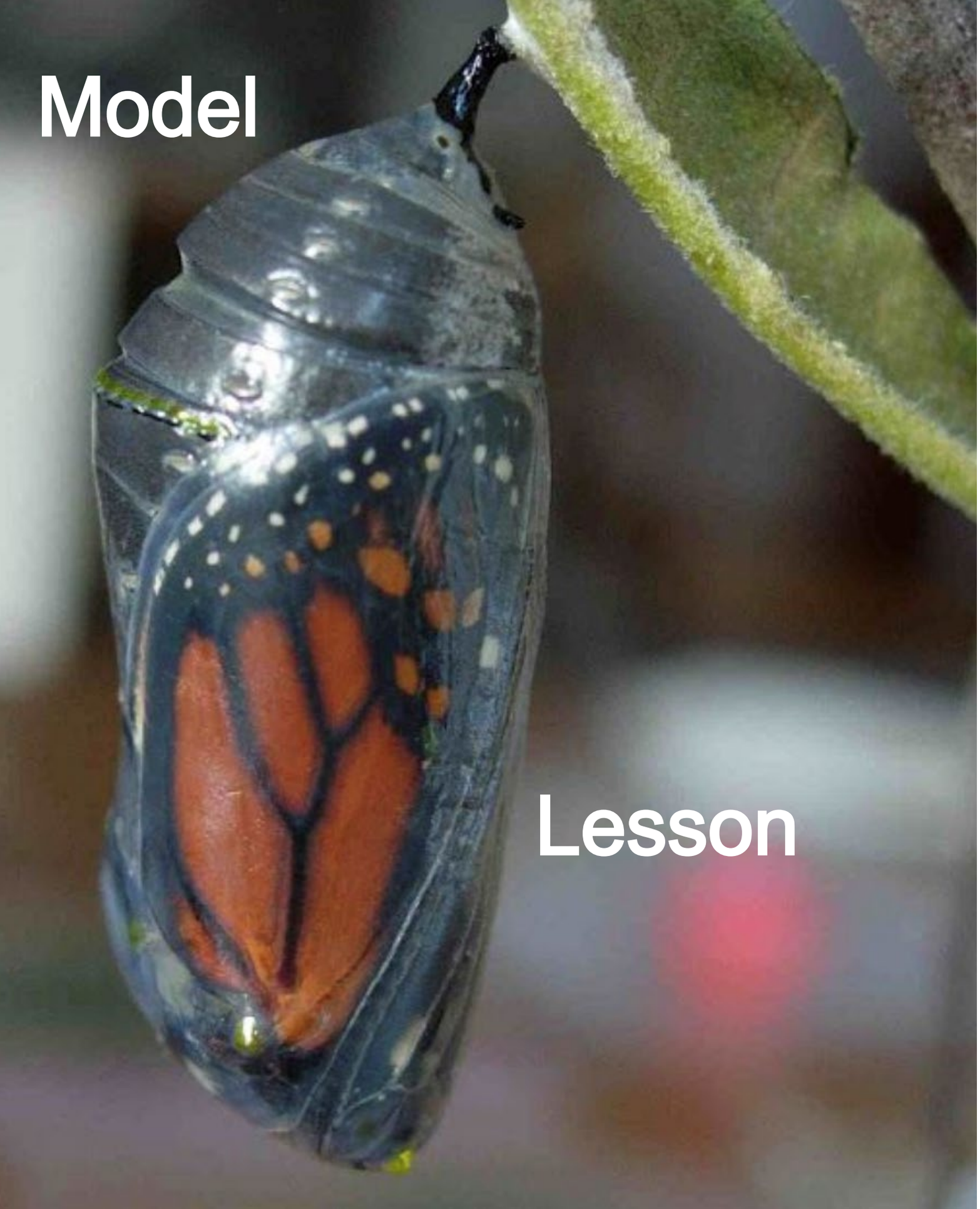
3.

CURRICULUM MODELS

provide the opportunity for sustained investigation/evolution of an idea

LESSONS

establish the level of rigor.



The Crucial Relationship Between Curriculum Model and Lesson

METACOGNITION

Core Content

Problem Solving

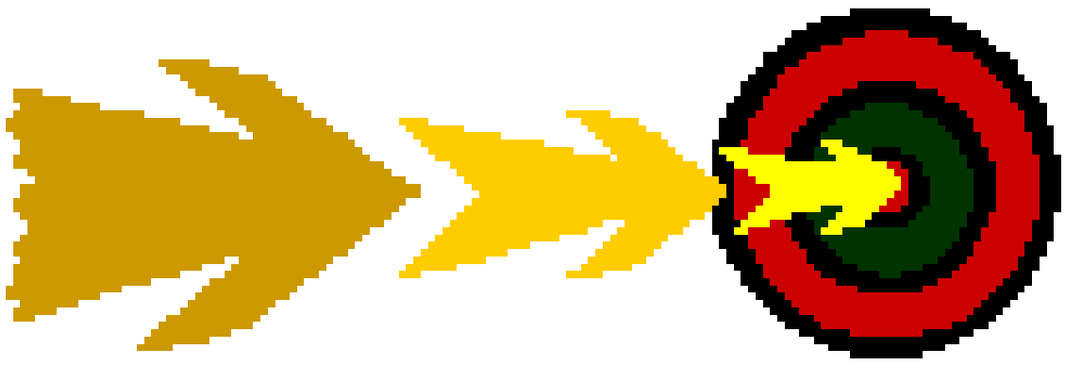
Conceptual Reasoning

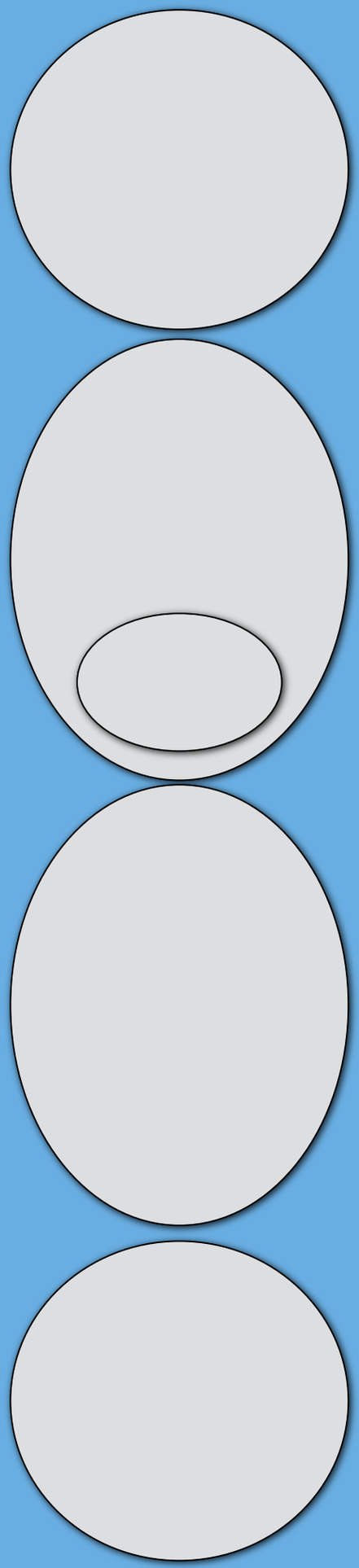
Research

Dispositions

Thinking Skills

Ethics





Engagement

Inquiry and Investigation

Problem Definition

Problem Resolution

Problem Debriefing

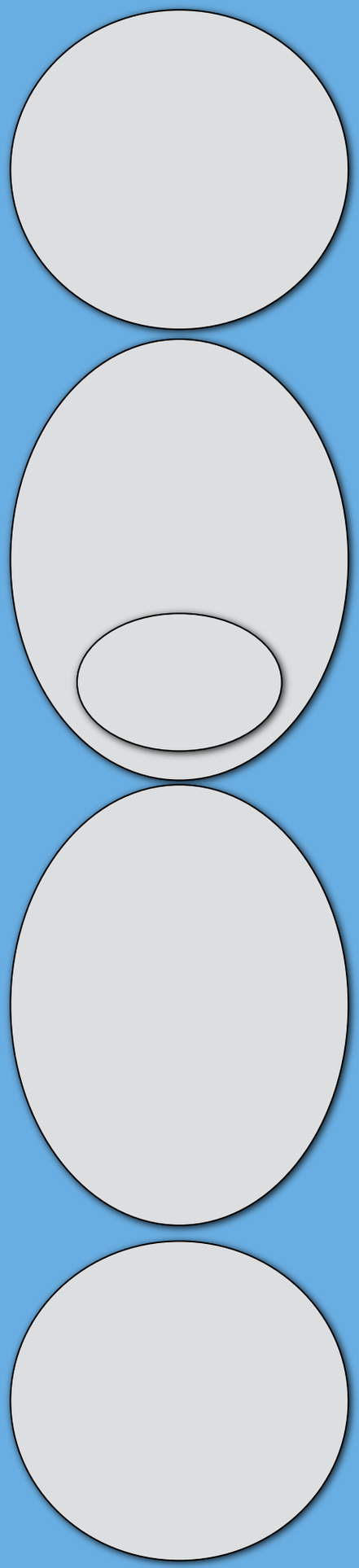
The Flow of the Problem

Concepts: Systems

Content: Biology and Habitats

Primary Resources

Process: Perspective Taking



Engagement

Inquiry and Investigation

Problem Definition

Problem Resolution

Problem Debriefing

Problem Solving

Research Strategies

Questioning

Socratic Seminars

Communication

Organizing Information

Collaboration/Consensus

Concepts: Systems

Content: Biology and Habitats

Primary Resources

Process: Perspective Taking

Embedded Instruction:

☒ **Teacher Reference**

Sample Learning Issues Board

Hunches: Efforts to save the ferret have not been very successful, and we need to change our tactics. We might lose our funding. Maybe something is wrong with the ferret. It must be hard to reintroduce black-footed ferrets into a suitable habitat.

What We Know	Learning Issues	Plan of Action
• We are members of the Black-Footed Ferret Recovery Reintroduction Team. • Progress on reintroduction of black-footed ferrets is not moving quickly enough. • Some believe efforts are too expensive and too labor-intensive. • The media is covering our efforts. • We need to be proactive by anticipating problems and by creating a model of a feasible habitat suitable for ferrets and other inhabitants. • Fort Collins, Colorado, is the test site. • Black-footed ferrets are fragile. • We need to take into account the "human climate." • We are required to present a feasible model to the Project Oversight Committee in about two weeks.	• **What is the Black-Footed Ferret Recovery Reintroduction Team (BFFRRT)?** • Why are we reintroducing ferrets? • What is so special about the black-footed ferret? • **What is a genetic bottleneck?** • What did the media say? • How much does it cost to reintroduce black-footed ferrets? • Why were we brought together as a team? • Could we just go somewhere else? • **What makes a suitable habitat for this kind of ferret?** • **What challenges have occurred during past reintroduction efforts?** • What can we learn from less successful attempts? • Do we need to change anything at the test site in order to be successful? • Do we need to do anything to accommodate the fragility of black-footed ferrets? • **What does "human climate" mean?** • What makes a good model?	• Research the goals and objectives of the BFFRRT. • Research past ferret reintroduction efforts to [illegible] if there are things we can learn. • Look at maps of the Fort Collins area. • Read the newspaper article. • Ask a biologist why the black-footed ferret is "fragile." • Find information about the black-footed ferret habitat.

What learning processes, thinking skills, habits of mind do I want my apprentices to learn?

Information for Research

What concepts?
What advanced readings
What complex ideas?
What interdisciplinary connections?

Laying out the Plan...

Problem Engagement

1. The BFFRRT

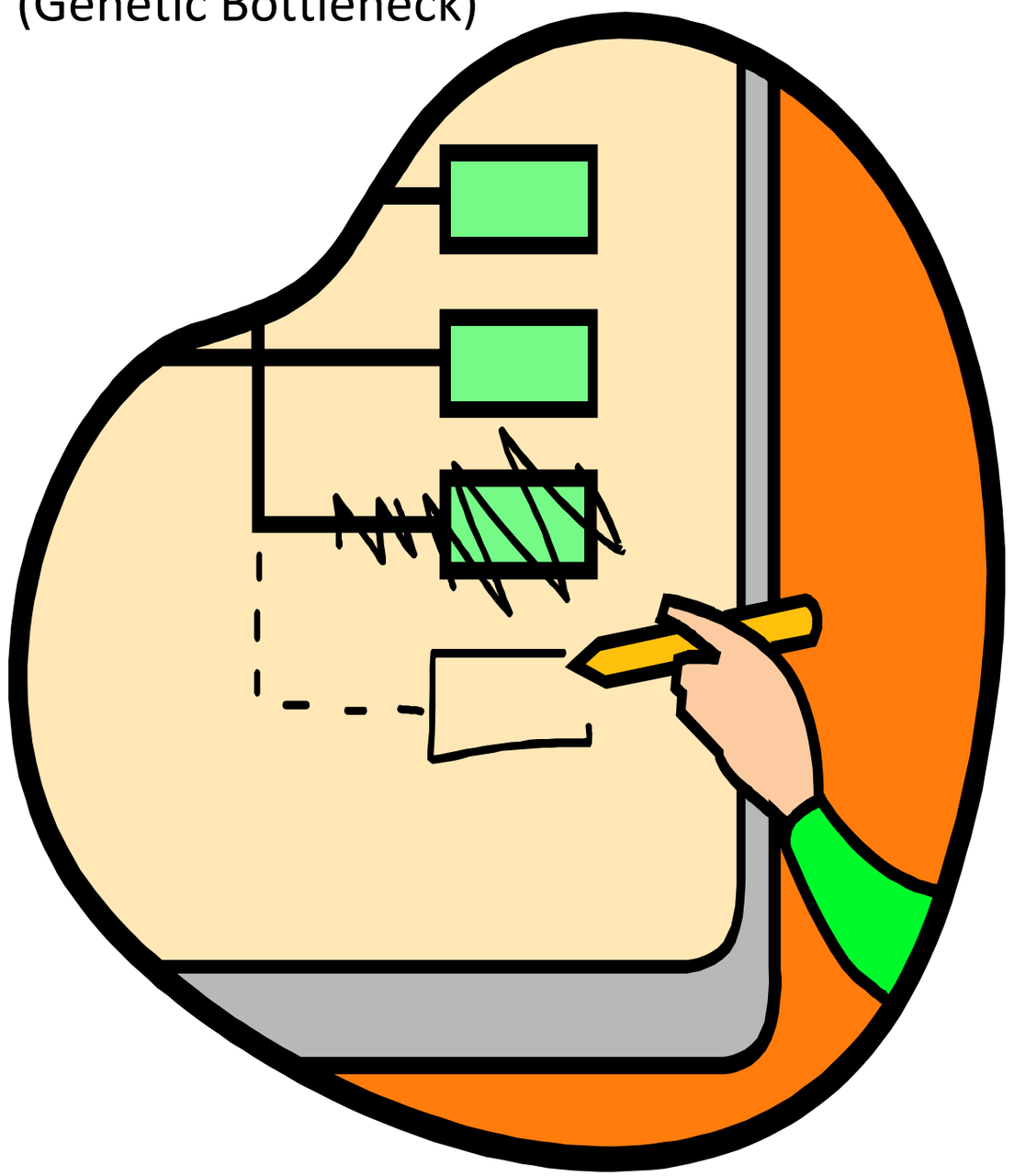
Inquiry and Investigation

1 Ferret Facts (research)
2 Habitat Threats
3. Systems and Risk
4. What's the Source

5 Problem Definition

(Ferret Math)

(Genetic Bottleneck)



Resolution

1. The Model
2. Presentation

Debriefing

1. Review/Reflect/Extend

is ONLY PARTIALLY
Appropriate for
Gifted Students

(the same is true of other
curriculum
models in gifted education)

Conceptual Reasoning

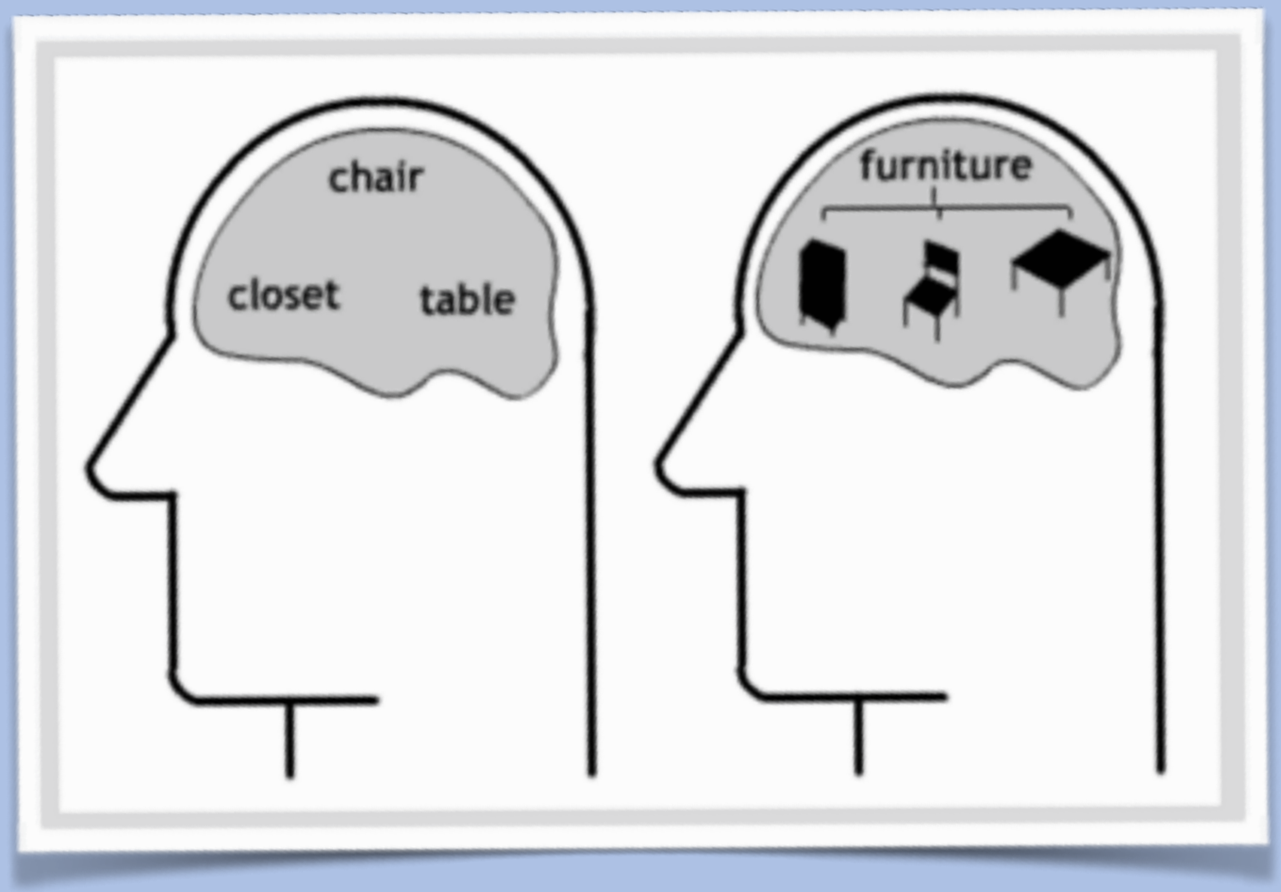
CONCEPTS:

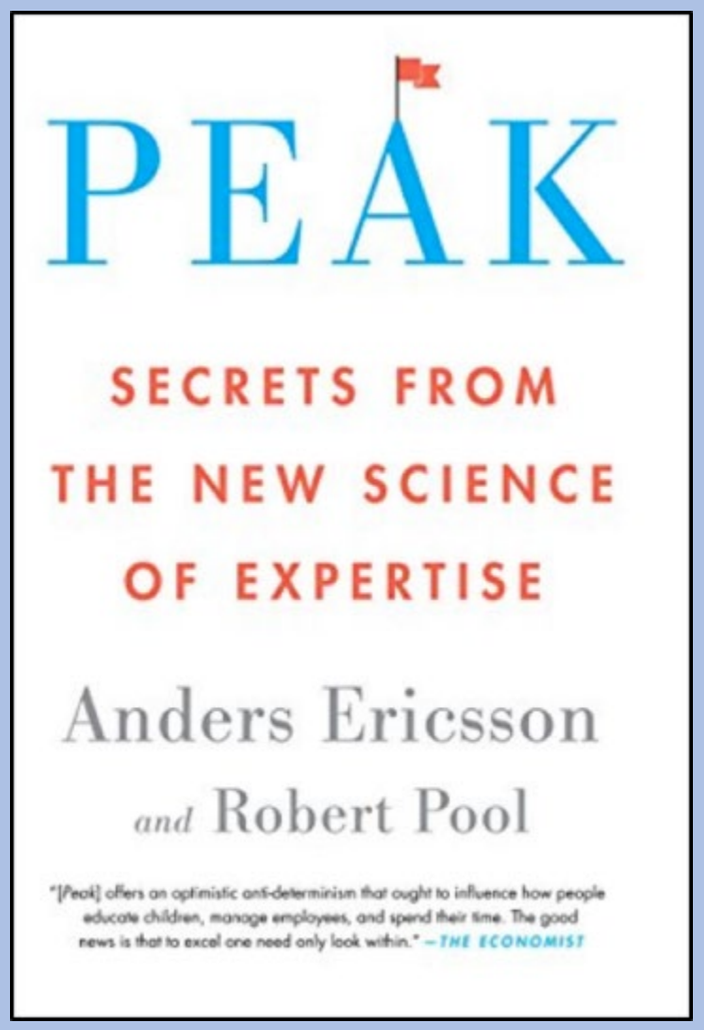
MORE than just a BIG IDEA

Conceptual Reasoning

"What sets expert performers apart from everyone else is the quality and quantity of their mental representations. ...

These representations allow them to make faster, more accurate decisions and respond more quickly and effectively in a given situation.



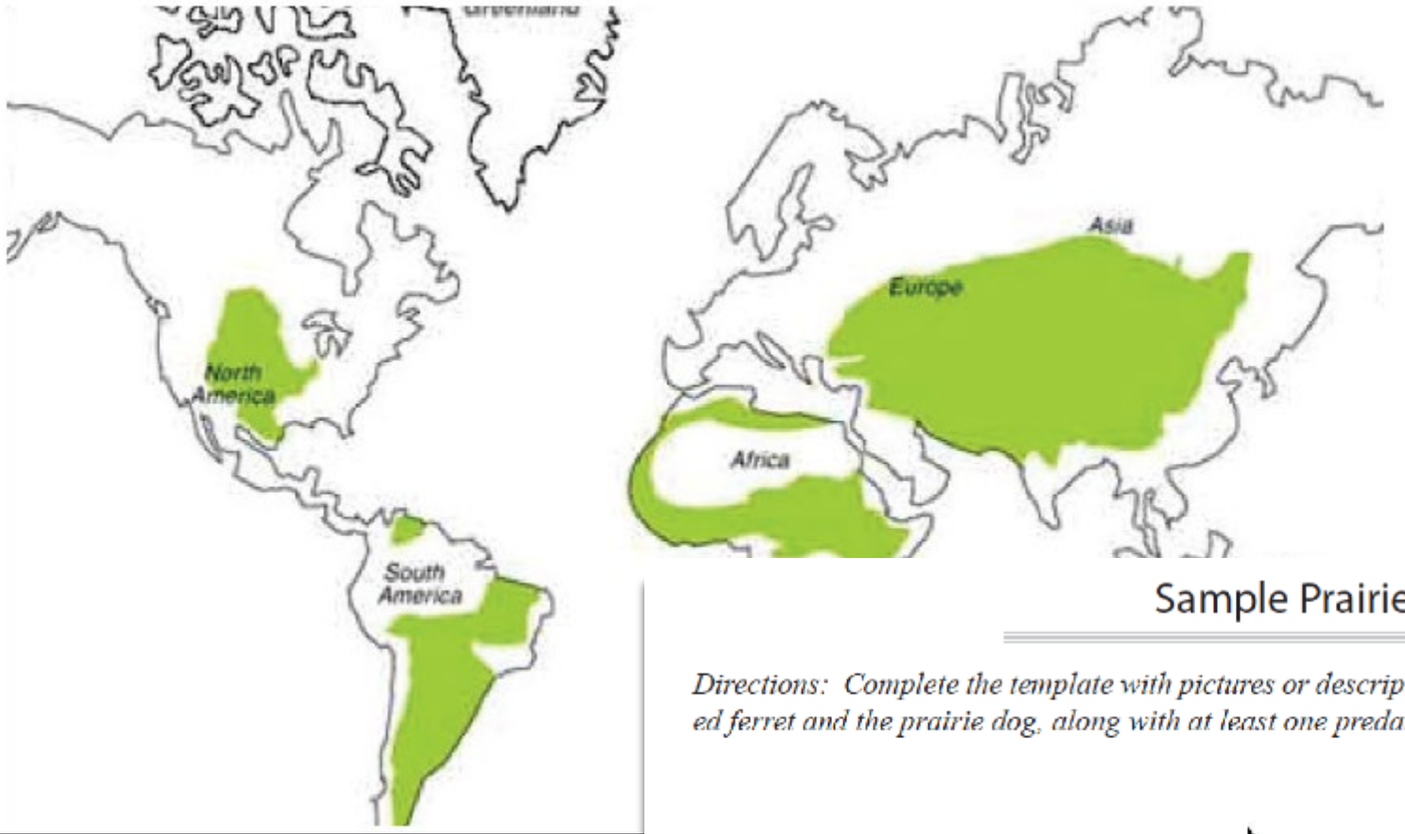


Systems

Elements of a system must all operate in appropriate balance and proportion

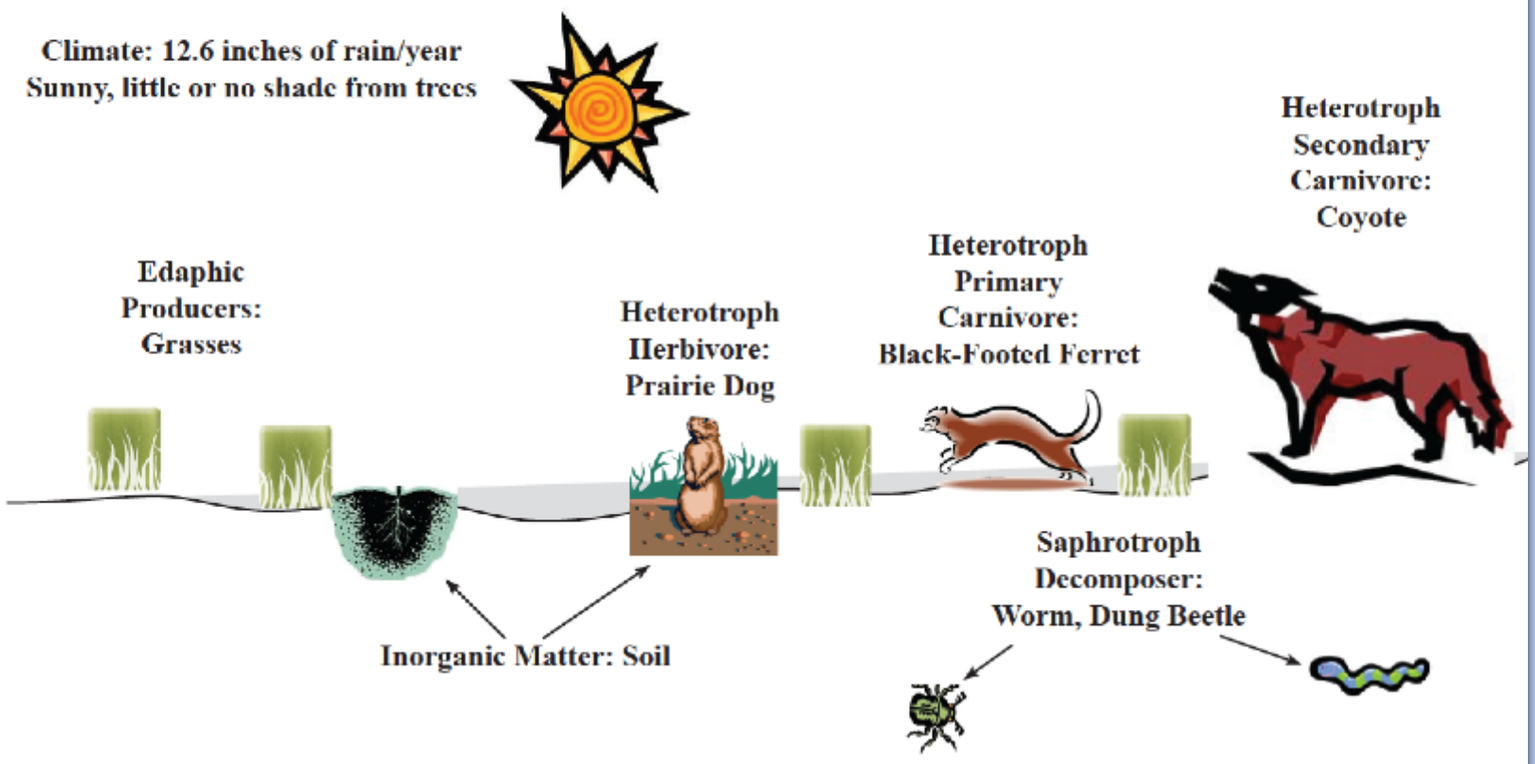
Elements of a system must all function correctly, or the system will break down

When one element of a system is at risk, the entire system is at risk



Sample Prairie Ecosystem Template

Directions: Complete the template with pictures or descriptions of each element of the prairie ecosystem. Include the black-fo
ed ferret and the prairie dog, along with at least one predator and one food source. Label elements using scientific terminolo



Key Questions:

- *What seem to be absolutely essential ecosystem elements for the ferret?*
- *What are absolutely essential ecosystem elements for the prairie dog?*
- *What would happen if **all** of the prairie dogs disappeared?*
- *What would happen if **half** of the prairie dogs disappeared?*
- *What would happen if there was a lengthy drought? A sudden monsoon?*
- *Based on our discussion, what does balance do for an ecosystem? What happens when one part of a system is out of balance?*

Key Questions for Part 3:

- *What threats could disrupt an ongoing supply of food for the ferrets?*
- *What do the prairie dogs need to have in the environment in order to thrive?*
- *What are the environmental or natural threats? Human threats?*
- *Which threats have multiple impacts? What does that tell you about the relative power of the threats?*
- *Which threats, if any, are interrelated? Which, if any, create new or additional threats?*
- *What is the relationship between a threat and an input to a system?*

Investigation

Varying Modes of Information Gathering

Primary Resources

Books

Internet

Video

Interviews with Experts

Published Research

Secondary Resources

Media/Journalists

Biased and Incorrect Resources

Writing

Summarizing/ Writing

Department of the Interior
US Fish and Wildlife Service

Date:
To: All Team Members
From: Mitchell Ladner, US Fish and Wildlife Service
Subject: Ft. Collins Project

By now your work is well underway on this project. I would like to know about your findings, your ideas about the direction we should take to optimize the success of our reintroduction efforts, and a description of any issues you've encountered thus far. Please send me a written response with your thoughts to date. I'll expect your update by tomorrow.

Problem Log

Reflective Moment: A Letter to the Boss

Write a letter to Mitchell Ladner providing him with the requested update.

A quality response includes: 1) a header 2) a salutation, 3) a body of at least two paragraphs, each presenting a major idea that is supported by facts, and 4) a closing.

Inquiry

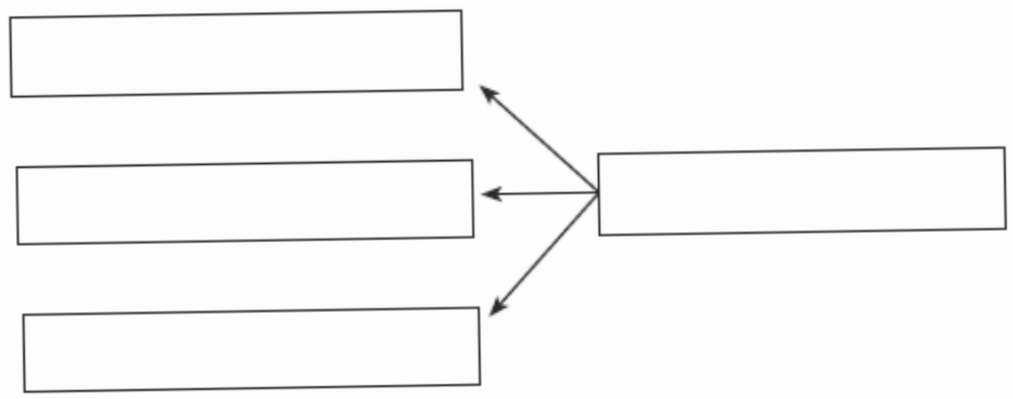
Critical thinking!

Problem Log

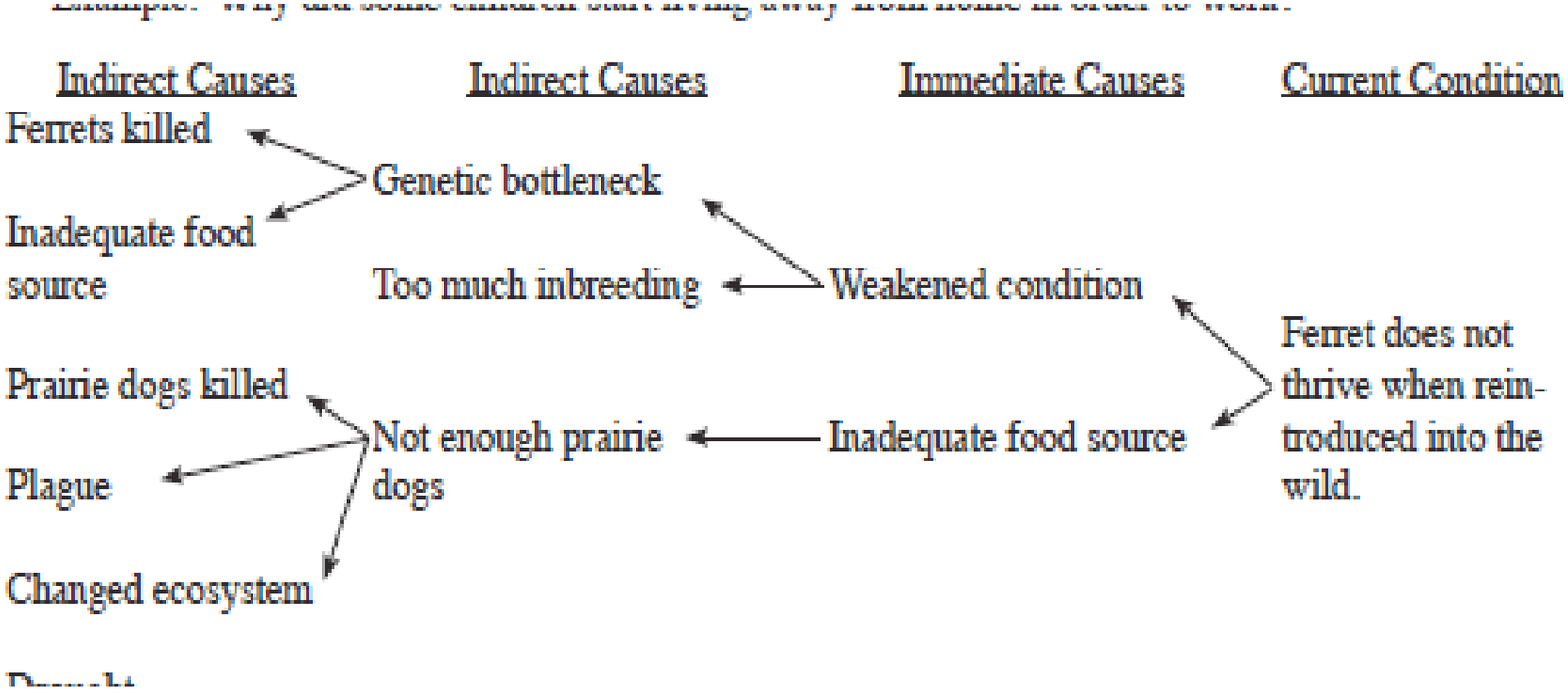
Determining Causes

Directions: Use this space to record the cause-effect relationships among the Critical Components from the Black-Footed Ferrit Habitat Chart. Use arrows to connect each fact to its prior cause. If there is a Critical Component that you think is important, but not directly connected, included in the chart but don't connect it to other Critical Components. Feel free to add boxes as needed.

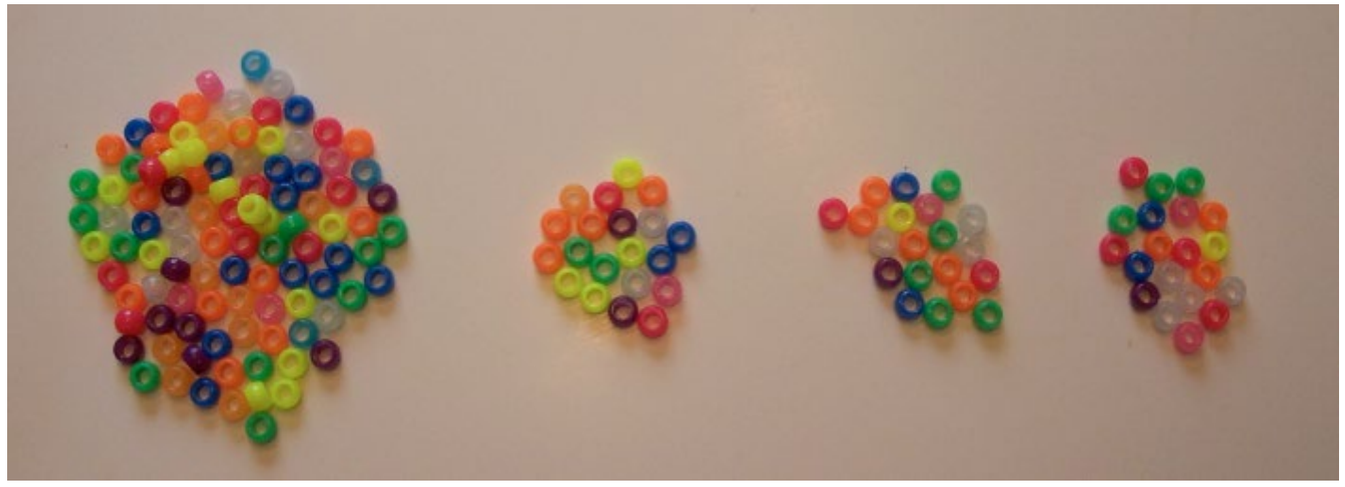
Distant Causes	Prior Causes	Immediate Causes	Current Situation



Critical Thinking!



Genetic Bottleneck Demonstration



Teacher Reference

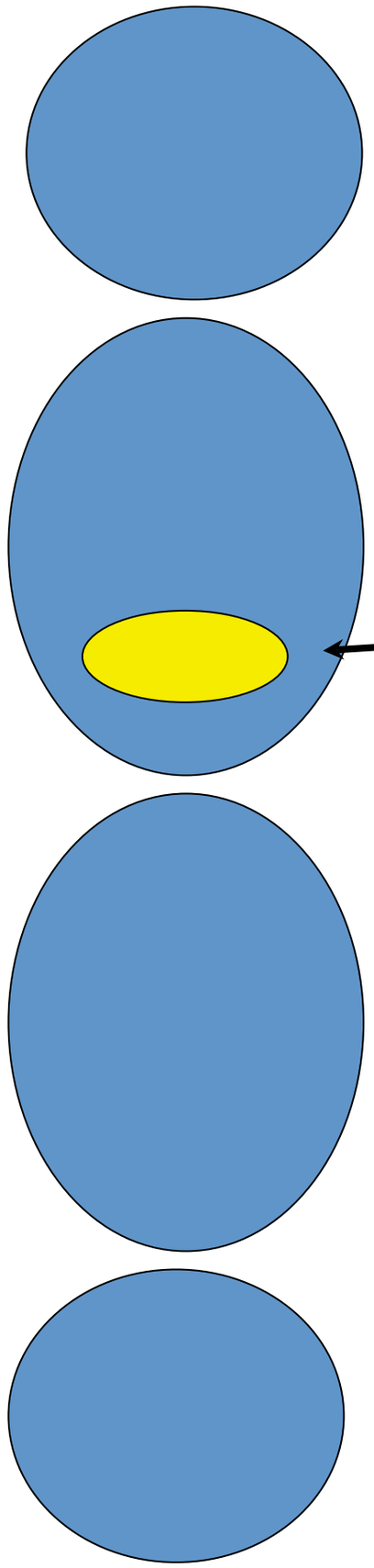
The Genetic Bottleneck Data Sample #1

Directions: Complete this chart to create a model of what happens when there is a dramatic decrease in an animal population. Draw a bead from your bag without looking, mark the color, and then replace the bead before drawing again. Do this 20 times each for Generation 5, Generation 6 and Generation 7. For Generation 8, where the population begine to recover, draw 40 beads, using the same method as described above.

	'Typical' Variation				Bottleneck			Rebuilding
Trait/Color	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6	Generation 7	Generation 8
1. Dark Blue	10	10	12	12	4	2	1	0
2. Light Blue	10	8	11	16	0	0	0	0
3. Orange	10	7	8	8	1	1	0	0
4. Red	10	3	4	3	2	3	1	1
5. White	10	7	7	9	5	5	8	11
6. Light Green	10	14	9	4	1	0	0	0
7. Dark Green	10	14	17	14	3	6	8	22
8. Purple	10	18	15	14	1	1	1	3
9. Yellow	10	12	9	11	1	2	1	3
10. Black	10	7	8	9	2	0	0	0

Teacher Reference

Problem Definition



Problem Definition

Issue(s)

Constraint(s)

FORMAT:

How Can We …… in a Way That …….

How can we create a model ecosystem for BFFs in a way that allows ranchers to earn a living?

How can we save the BFF in a way that does not require human involvement?

How can we save the BFF and prairie dogs in a way that is safe for humans?

ISSUES

How can we create a habitat for the Black Footed Ferret

that allows them to thrive independently

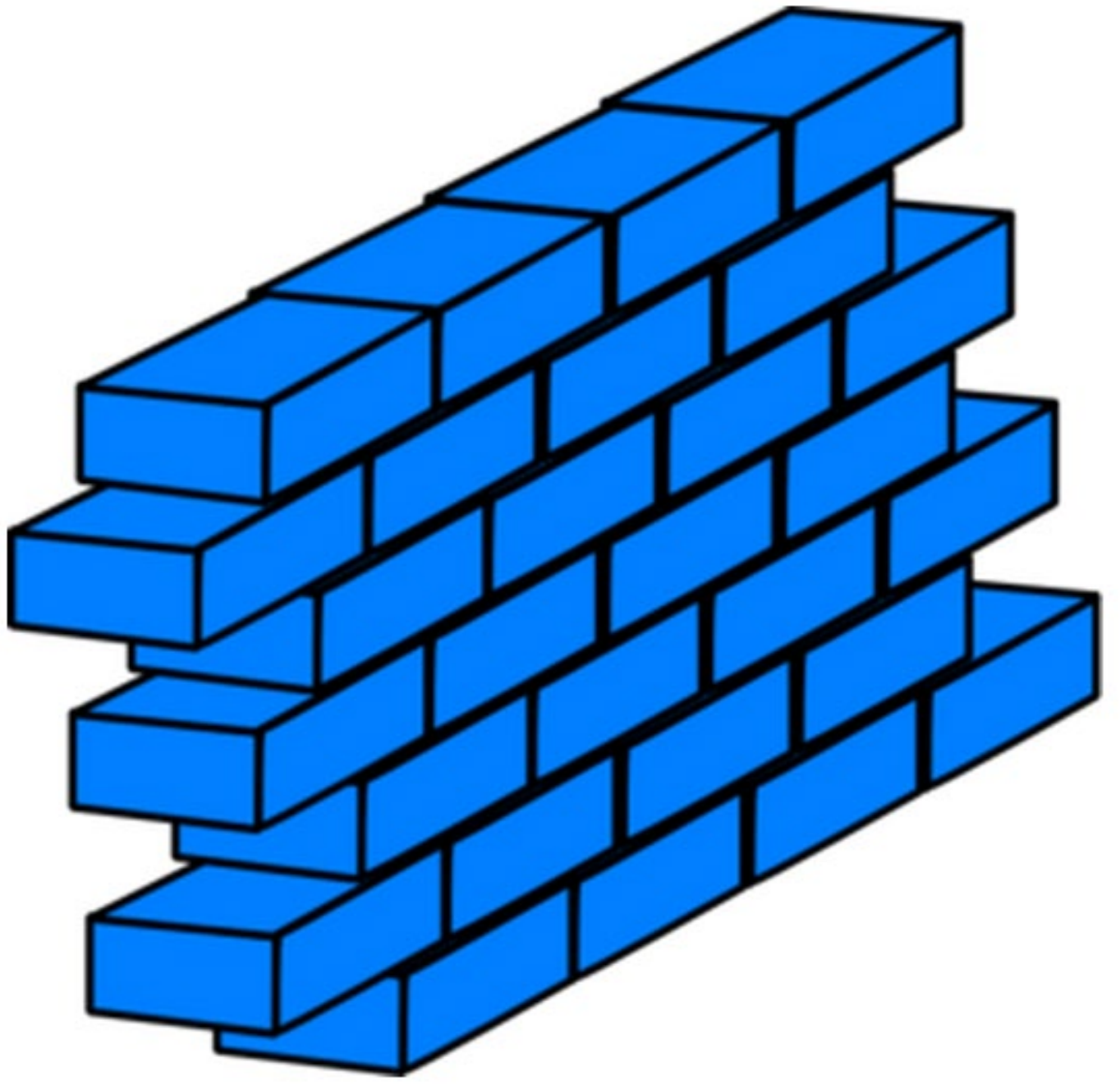
and is acceptable to local ranchers.

Constraint

Constraint

Constraint

Creativity



Constraints

Problem Resolution

Criteria-Based Decision Making

Problem Log _____

Name: _____

Problem Resolution Grid

Problem Definition: _____

_____

PROBLEM RESOLUTION GRID				
Instructions: List the criteria for a good problem solution in the left-hand column. List your options across the top row (only use the number of rows necessary). Next, rate how well each solution option addresses the different criteria using a 3-point scale, in which 1 is *Matches Very Well* and 3 is *Matches Very Poorly*. Total the ratings for each solution option.				
Solution Options → Solution Criteria ↓				

Criteria-Based Decision Making

Sample Problem Resolution Grid

Problem Definition: How can we create a self-sustaining model black-footed ferret habitat in a way that minimizes contact with home owners and helps ranchers?

PROBLEM RESOLUTION GRID				
Instructions: List the criteria for a good problem solution in the left-hand column. List your options across the top row (only use the number of rows necessary). Next, rate how well each solution option addresses the different criteria using a 3-point scale, in which 1 is *Matches Very Well* and 3 is *Matches Very Poorly*. Total the ratings for each solution option.				
Solution Options → Solution Criteria ↓	**Provide Protected Area for Prairie Dogs**	**Vaccinate Black-Footed Ferrets**	**Relocate Prairie Dogs to National Park Area**	
Self-Sustaining Model	**1**	**2**	**1**	

Culminating Activities

Present their Model

Newspaper Editorial

From: Mitchell Ladner, Fish and Wildlife (mladner@email.us.fwl.gov)
Subject: Reintroduction Effort—Letter to Editor for The Coloradoan
Date:
To: Black-Footed Ferret Recovery Reintroduction Team (bffrrt@email.us.fwl.gov)

I have recently learned about your efforts to preserve the black-footed ferret, and I understand you are working on creating a reintroduction site model based on the Fort

Problem Debriefing

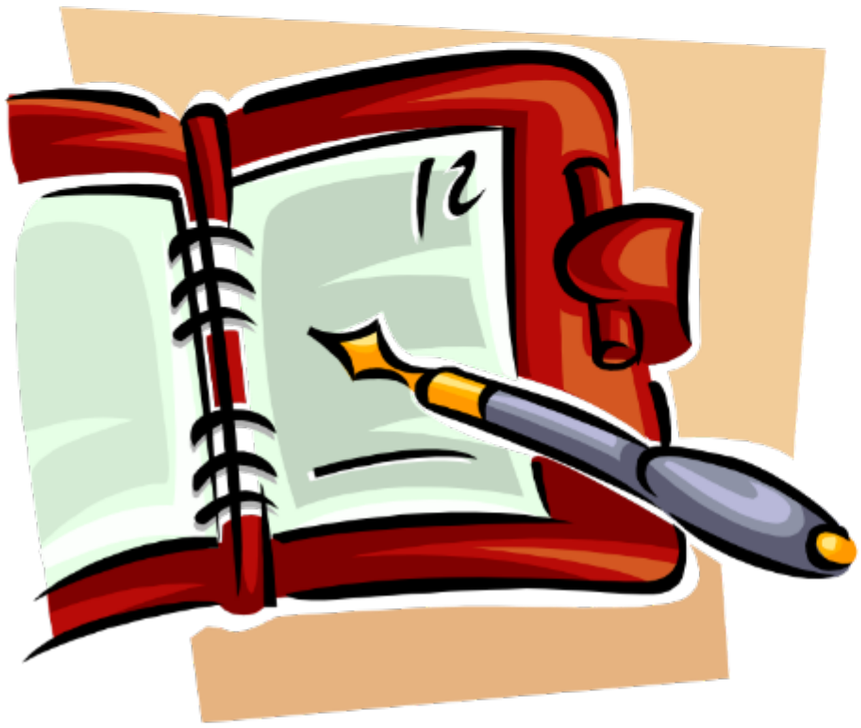
Key Questions:

- *How were the issues raised in the town council meeting the same or different from the issues we discussed?*
- *Why didn't some of their issues emerge in our discussion? How do you think the differing roles (BFFRRT, town council members) affect the issues each group considers important?*
- *What did you learn about systems during this unit? What happens when a system malfunctions? What are the different ways in which a system can get out of balance? Why is balance important to a system?*
- *Are all inputs to a system good for a system? What happens when a negative input enters a system? What about output? Are all outputs positive? What's the relationship between negative input and negative output? How often do you think this rule holds true?*
- *What about our problem-solving process was surprising to you? What do you think went particularly well? What didn't? What do you think we could do as a class to improve how we collaborate? How we solve problems?*

Assessment

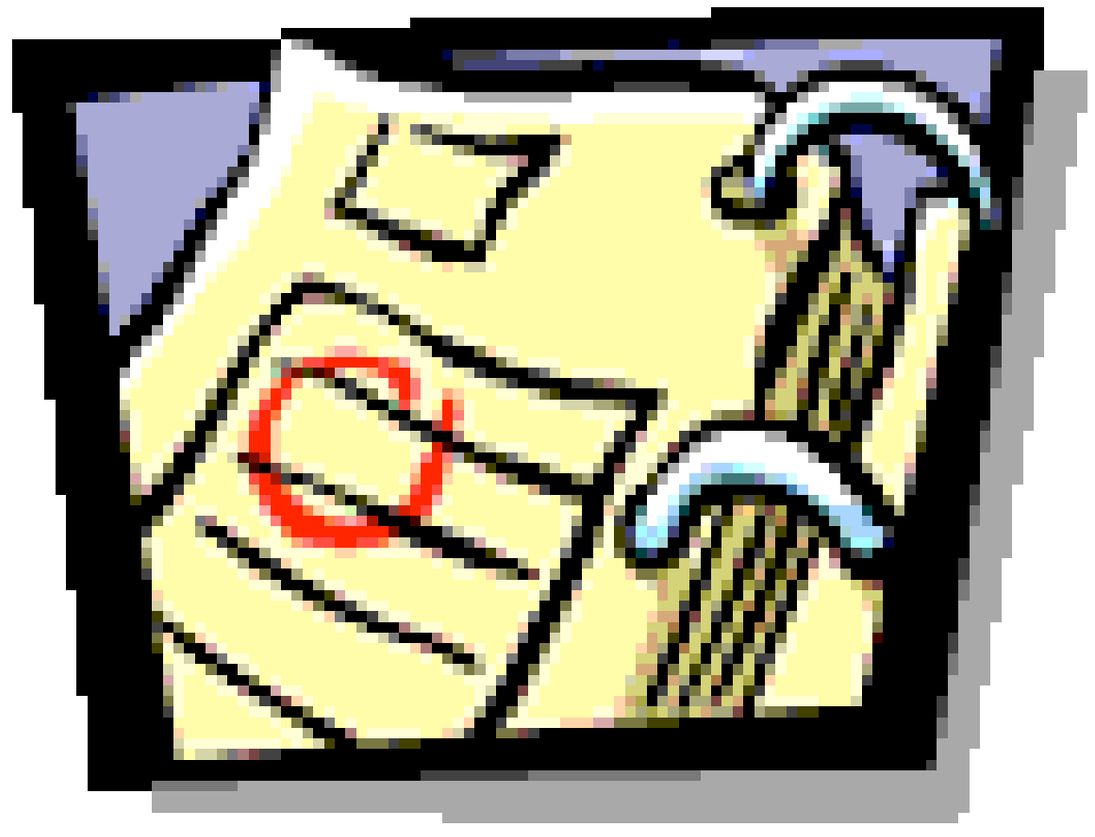
The Problem Log

Classroom Rubrics



Four Components of the Problem Log

- Content
- Process
- Analysis
- Reflection



Presentation Rubric

Name:_____ Date: _____ Self-Rating: _____ Teacher Rating: _____

Dimension	Exemplary	At Standard	In Progress
Visuals	___ Visuals are relevant and add to the viewer's understanding of the topic	___ Visuals are related to the topic	___ Visuals are not relevant or nonexistent
Use of Information	___ Information is accurate, and detail shows understanding of complex ideas ___ Information is relevant to assignment and is of high quality	___ Information is accurate and is sufficiently detailed ___ Information is sufficient and generally relevant	___ Information is inaccurate or vague ___ Information is insufficient and/or irrelevant
Use of Sources	___ Information is relevant to assignment and is of high quality ___ Identifies and discusses bias in own data	___ Gets information from correct number of relevant sources ___ Identifies bias at the most basic level	___ Gets information from irrelevant, low-quality sources ___ Does not discuss possible bias
Presenter Quality	___ Uses conversational tone and obviously understand material thoroughly ___ Poised and confident ___ Answers questions clearly and thoroughly	___ Speaks from notes or memory using a comfortable tone; shows basic understanding ___ Generally poised and confident ___ Responds to most questions with clarity	___ Reads from notes and shows little or no understanding ___ Appears indifferent, anxious, or nervous ___ Does not know answers to questions
Collaboration (If applicable)	___ Shares time equitably with colleagues ___ Listens respectfully when not speaking	___ Shares time but runs over or takes others' points ___ Listens most of the time	___ Runs over time and/or makes other presenters' points ___ Does not listen, whispers during other presentations
Overall Presentation Quality	___ Presentation is well-organized and is structured to be interesting	___ Presentation is organized and fulfills all aspects of the assignment; organization is logical	___ Presentation is not organized and does not fulfill all aspects of the assignment

Classroom Engagement Rubric

For each row, check the descriptor that best matches your work or classroom behavior.

	Exemplary	At Standard	In Progress
Quality of Work	____ Produces timely, high-quality work; consciously meets or exceeds standards ____ Uses language of discipline frequently and comfortably ____ Self-motivated—takes an active, inquisitive role in learning ____ Work is original	____ Completes work on time; meets standards established for assignments ____ Uses language of discipline when instructed ____ Takes responsibility for work and grades ____ Work is good replica of teacher's model	____ Turns in insufficient or incomplete work ____ Does not use language of discipline ____ Avoids responsibility for work and grades ____ Work lacks structure or organization
Class Participation	____ Asks questions to extend the discussion, and clarifies when needed ____ Consistently offers point of view, and is open to the views of others ____ Uses class time well—uses classroom resources	____ Asks questions to clarify instruction and information when needed ____ Answers questions and participates when called upon; respects the views of others ____ Uses class time well; stays on task	____ Does not ask questions when needed ____ Rarely participates in any way ____ Does not use class time well
Group Work/ Behavior	____ Consistently in class—does not fall behind as a result of absences ____ Helps others learn ____ Takes excellent notes in class ____ Takes leadership role in group work	____ Consistently in class; catches up when absent ____ Does not disrupt others in class ____ Takes useful notes in class ____ Is a positive, productive group member	____ Truancies, tardies, and/or absences are a problem; falls behind in work ____ Disrupts class ____ Takes useless notes or no notes ____ Does not contribute to group work; whines and complains; sleeps in class

Reflective Moment: Metacognition

- Scientists tend to be devoted to the areas they study. Why would some degree of passion or devotion be necessary to the recovery of the black-footed ferret?...What happens when passion gets in the way of seeing all perspectives on the problem?

Reflective Moment: Thinking about Systems

- **What are some negative consequences of an unbalanced system? What are some possible consequences of having the system go out of balance.?**

Assessments for Different Lessons

- Problem Engagement

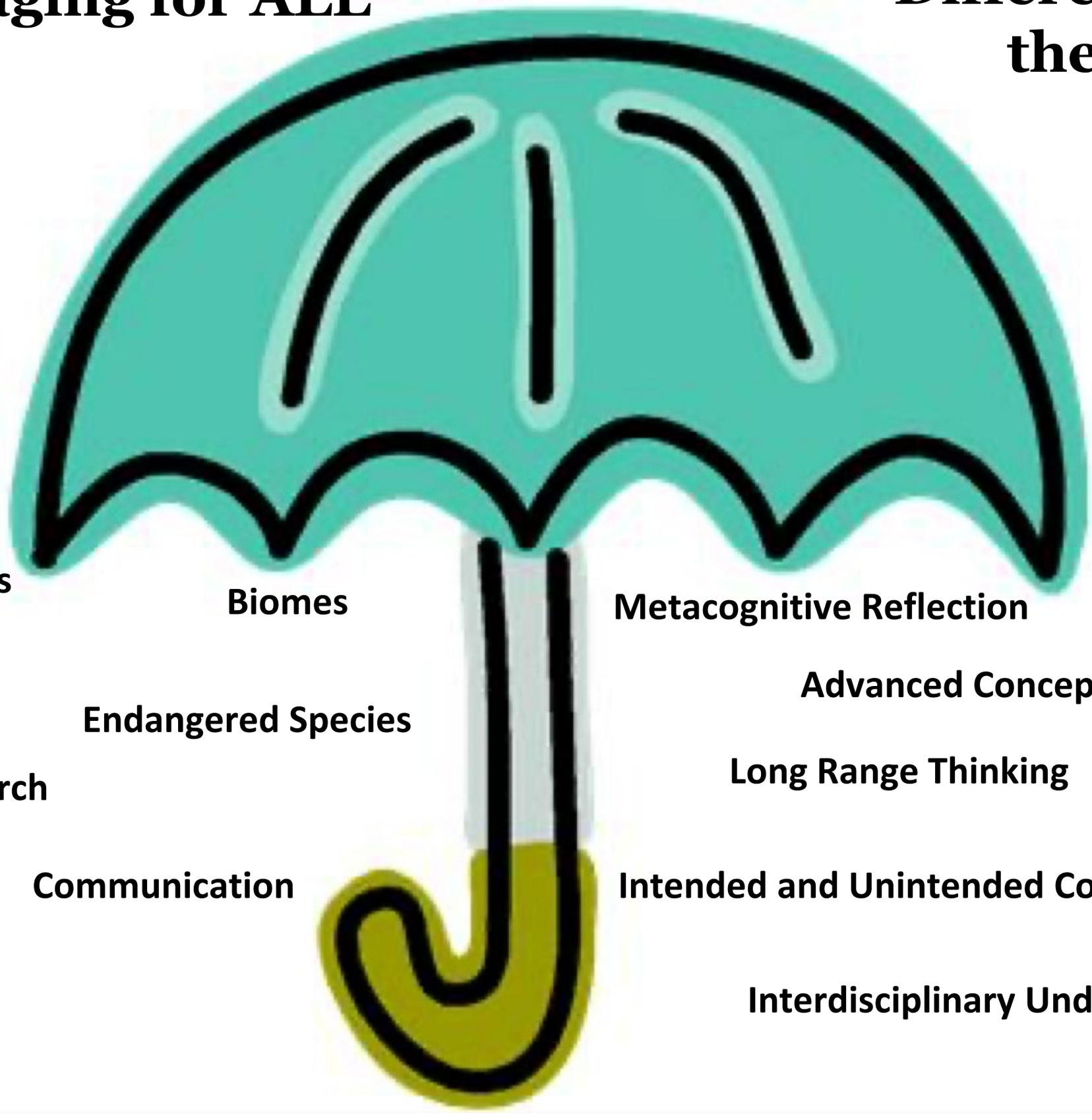
- Inquiry and Investigation
  - Research
  - Genetic Bottleneck
  - Analysis/Synthesis

- Notes Page
- Reflection
- Research Notes
- ‘Top 5 Facts’
- Experimental Design
- Data Chart
- Graphic Organizer

Organic and Authentic

Engaging for ALL

Differentiated for the Gifted



Habitats

Biomes

Metacognitive Reflection

Advanced Conceptual Reasoning

Endangered Species

Long Range Thinking

Research

Communication

Intended and Unintended Consequences

Interdisciplinary Understanding

PBL Research: Content Acquisition

- Short term acquisition significantly lower but levels out over time (MC tests)

- Short term acquisition is no different, or better than, traditional instruction (medical boards, high school studies, clinical reasoning)

- Adding lectures does not increase student achievement in PBL (Van Berkel & Schmidt, 2005)

Gallagher & Stepien, 1997

- 167 Gifted Students
- Traditional or PBL Post-Hole Classroom
- Standardized test Pre- and Post-
- PBL Students Significantly Higher

- 80% of time on task and productive (Visschers-Pleijers, et al., 2004)

- Students in PBL tutorials more engaged than students in other collaborative groups (Wun et al., 2007)

- Increasing self-regulation leads to increased mutual reliance, critical thinking and concept formation (Cooper, et al., 2008)

- Student achievement is higher in effective PBL groups (Van den Hurk, 2006)

"…no sample was found in which the students' attitudes did not favor PBL to some degree."

Vernon & Blake, 1993, p. 554

- Enjoyment from their learning
- A more meaningful learning environment
- More nurturance
- More and better student-to-student interactions
- Stimulation of a greater breadth of interest in subject matter

Dysfunctional Classes

- Unprepared: Assignments weren't chunked or clear
- Non-participation: Discussion questions
- Conflicts between students because of unclear expectations
- Students present information that is unrelated to the problem
- Unproductive class discussions
- *Emphasis on research instead of thinking about the problem*

Research

	TI vs. GE			TI vs. AAP			GE vs. AAP		
Variable	Mean	SD	d	Mean	SD	d	Mean	SD	d
End of Grade English	5.55***	1.49	0.79	3.64*	1.72	0.52	-1.91	0.99	0.27
End of Grade Math	3.10	1.45	0.38	1.93	1.68	0.24	-1.17	0.96	0.14
Insights PBL Understanding	1.46*	0.58	0.61	0.90	0.65	0.38	-0.56	0.37	0.23
Insights Science	0.61	0.64	0.25	-0.65	0.74	0.26	-1.26**	0.44	0.51
Insights Social Studies	0.84	0.53	0.36	0.08	0.6	0.03	-0.76*	0.34	0.32
Insights Teacher Ratings	0.02	0.25	0.01	-1.21***	0.28	1.11	1.22***	0.16	1.12

Table 7. Adjusted pairwise mean differences obtained from generalized linear model with classroom as dummy variable

Note: Negative values indicate direction and favor AAP students in all instances. Positive values in TI vs. GE comparison favor TI students.

Using Problem -based Learning to Explore Unseen Academic Potential

http://docs.lib.purdue.edu/ijpbl/vol7/iss1/9

Students: Comprehension

- It was **deeper** than just learning from the textbook. It **helped me understand** interactions in ecosystems better. I also liked how the problem led to learning about other things, like niches.
- We were **learning two things** without knowing it. Everything we learned was connected and easy to understand.
- I learned how there are many **different points of view,** it got me to think.

Students Self-Directed Learning

- It was fun to be able to have control of a solution and **think for myself.** Learning about the human side of it all helped me **think deeply.**

- You don’t feel like you are learning but you are, you also **remember** the important parts **better** than by just studying. We didn’t have to purposely memorize everything we learned but **soaked up the information** so we could solve the problem.

Horak & Pryde-Haskins, 2012

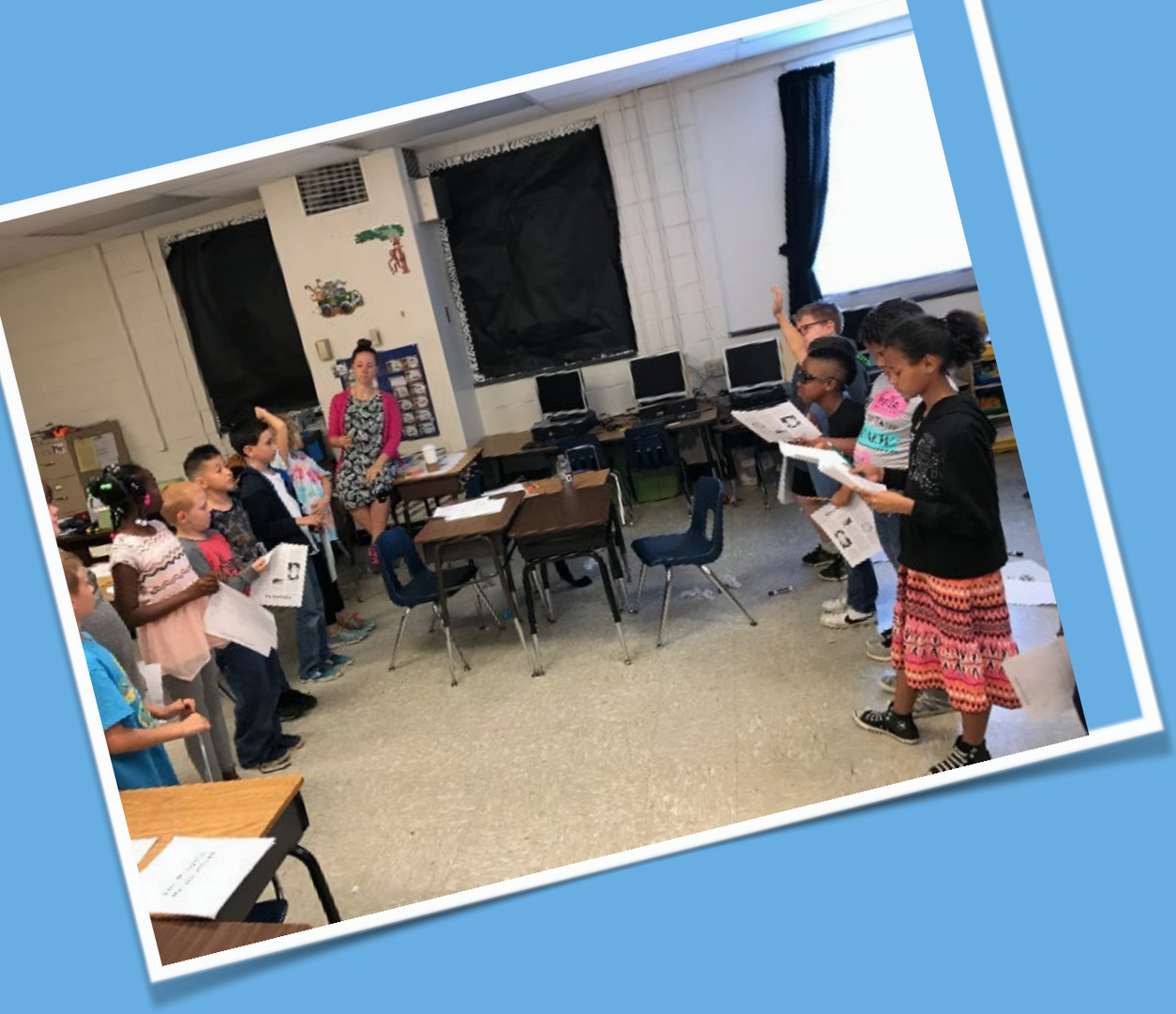
Students: Authentic Learning

- This was **something real** people are working on and some of us got pretty passionate about it.
- Gave us a modern, real-life topic, allowed us to find **realistic solutions** that could **make a difference.**
- It was an **actual problem** to solve. You couldn't just turn on the computer and find the answer.
- Helped me realize how we **solve problems today**/in the adult world. I learned that not everything can be fixed with **duct tape.**
- It actually **challenged** us **to *think*** and solve problems.

Horak & Pryde-Haskins, 2012

Teachers

- I can't even imagine doing this with out the training. I was scared to death to do this and I had the **training twice**.
- I've been afraid of this unit for a long time, once I did it and saw you **can tie in the content** and you can make it fit because you **don't need to spend that much time** teaching.
- Overall, we were **pretty pleased** with how the unit went, I think even more so after we read our students' comments.



Wellington Daily News

It waddles, it flaps, and it flops. It's an emperor penguin, and it was found by a little gal playing at Paraparaumu Beach. According to experts, the penguin swam into a strong ocean current that carried it far from its native home of Antarctica.

Our Foreign Visitor

Fatima Vasquez, the girl who found the penguin, has become fond of the animal. "It's so cute," she says. "I hope I can keep it as a pet!" She has sent an email to zoologists at the Wellington Zoo to ask if the penguin can live with her. The girl's mother seems unsure. "I don't want my little girl hurt," she says, "but if it can live in our swimming pool, then perhaps it will be okay."

Paraparaumu Beach

Little Fatima knows what she wants. "My class took a vote," she says, "and my classmates all said that I should keep the penguin so it would be safe and so they could come see it."

But word of the penguin has spread to the town, and people have different ideas about what to do with the penguin. The animal rights group called Nature Is Best posted a statement on its Facebook page saying, "Of course the little girl wants a penguin. Who wouldn't? But that doesn't mean that keeping the penguin is the right thing to do. The penguin has a home, and it should go home. We think the animal should do more than just survive; it should thrive."

John Shaw, a local veterinarian, raised a different concern: "The penguin could go home and rejoin its flock, but it might take diseases back to the penguins in Antarctica and make them sick. Sending it home could be dangerous. The penguin should go to the zoo. Many animals both survive and thrive in zoos, as long as the human-made habitat meets their needs."

Everyone is waiting for the final decision from the Wellington zoologists to see what will happen to the misdirected emperor of the ocean. Who knows? They may choose one of these solutions, or they may have ideas that no one else has considered yet!

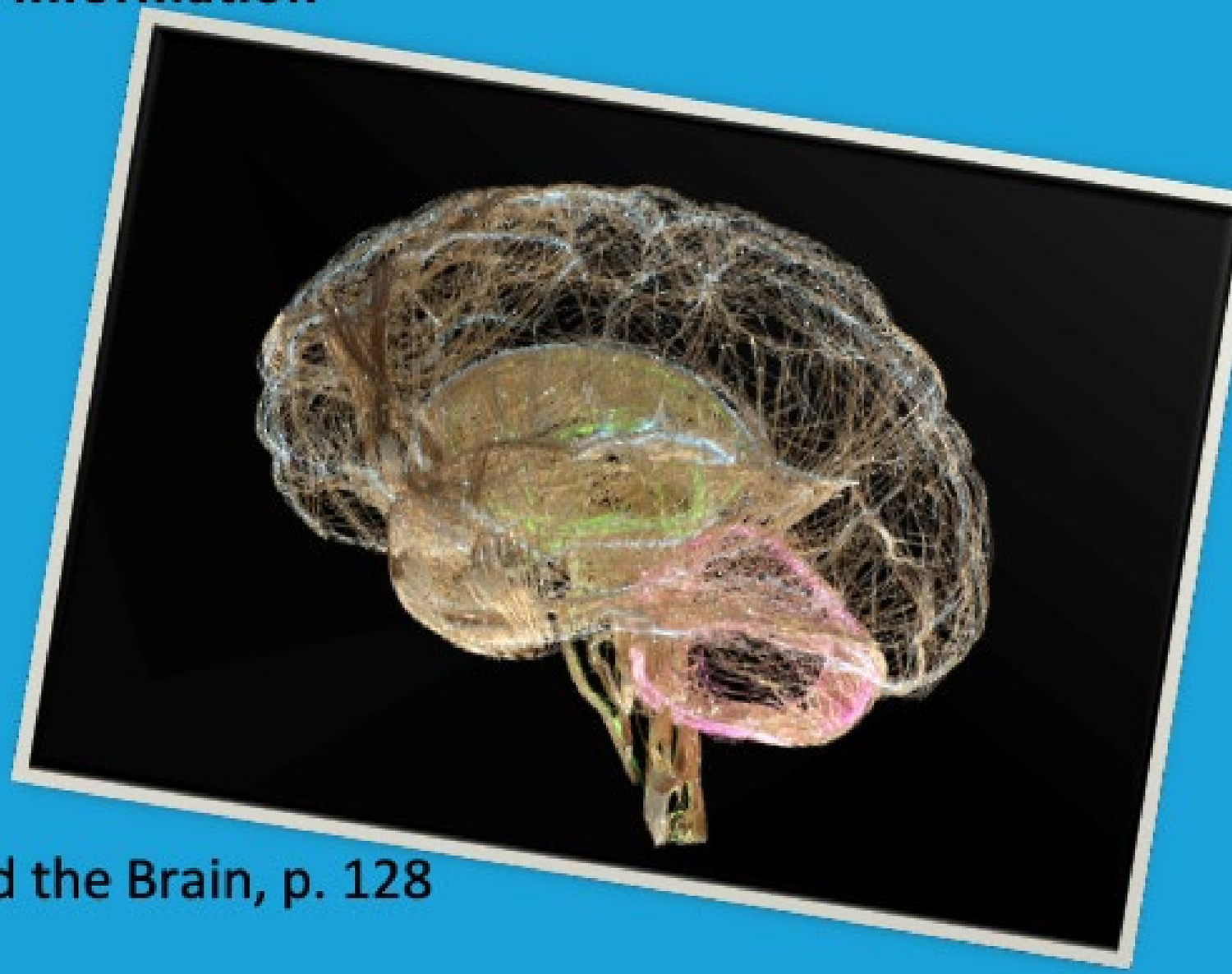
Oh my goodness, I have to tell you the sweetest thing. We have a student in this class …who tends to have an attitude and struggle academically. He came up to us at the end of today's lesson and asked who's idea it was for us to do this 'whole penguin thing'. When we said I was the one who came across it, he squeezed me with a big hug and just walked away. Thank you so much for letting us pilot this! The kids love it!

4.

A Foundation for Culturally Relevant Curriculum

Build Intellective Capacity

Ignite: Get the brain's attention
Chunk: Make information digestible
Chew: Actively processing new information
Review: Apply new learning



Culturally Responsive teaching and the Brain, p. 128

5.

Musicians and Composers

Composer


Musician

The Four Cornerstones: Essential Instructional Skills for Teaching Gifted Students

Questioning

Sophisticated Thinking

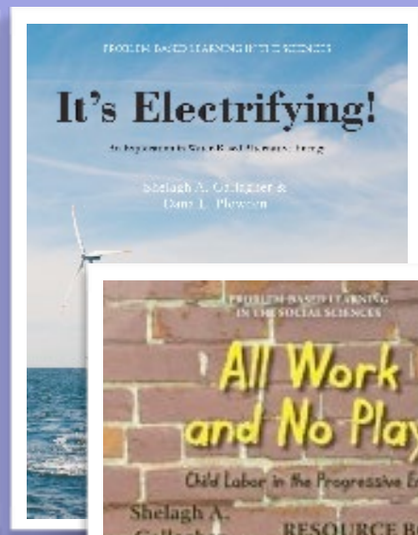
Conceptual Reasoning

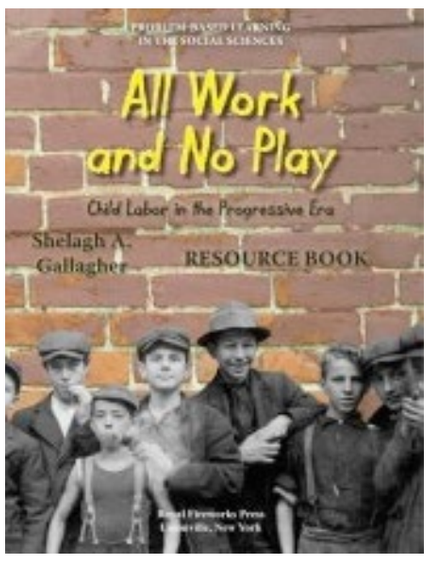
Independent Learning

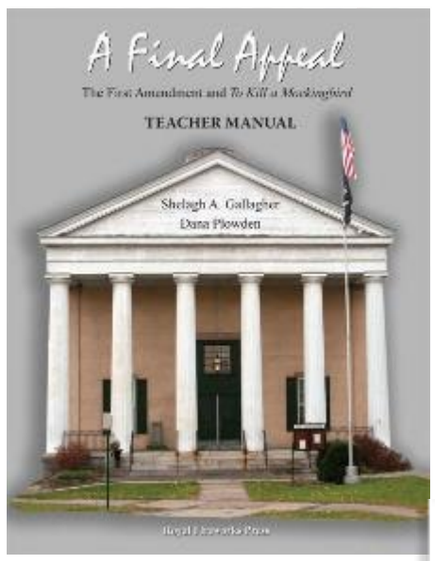
First, Be A Musician

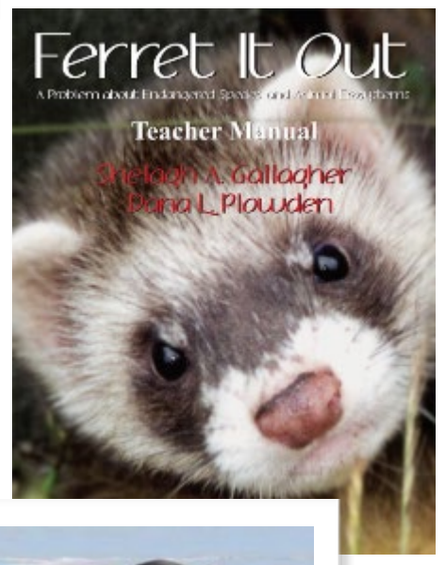
PBL Resources

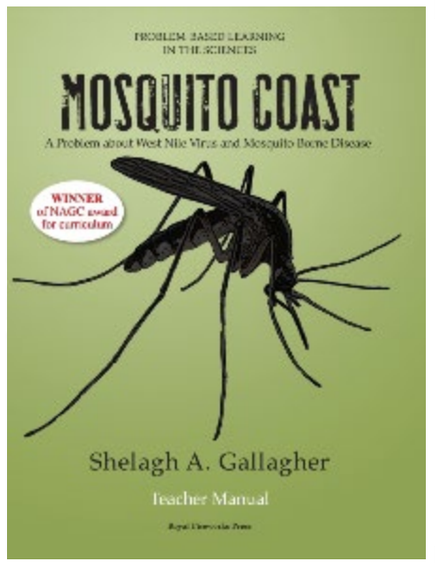
Curriculum Units



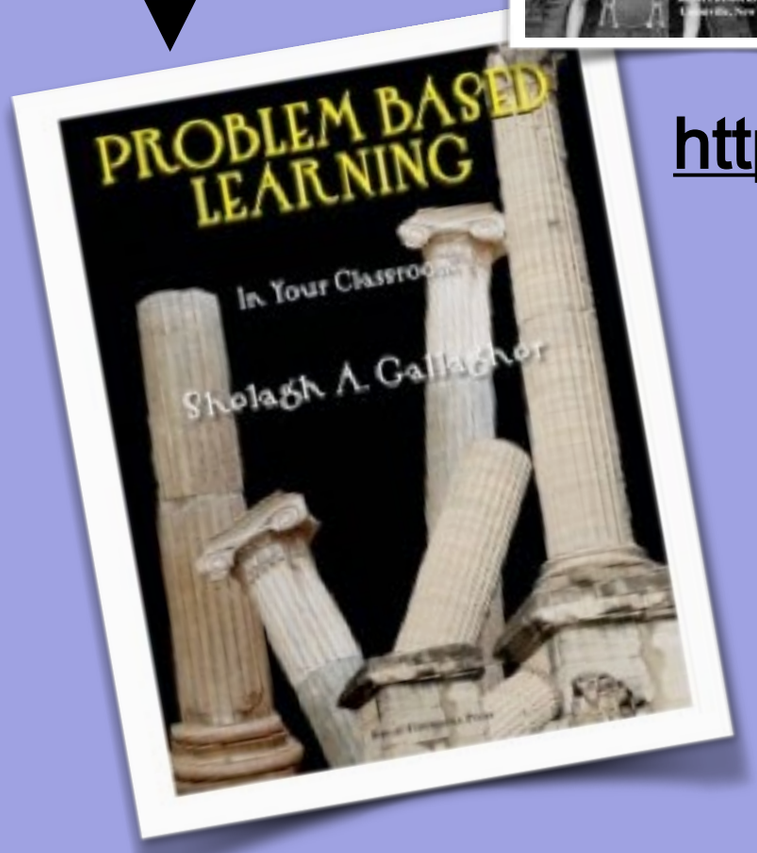




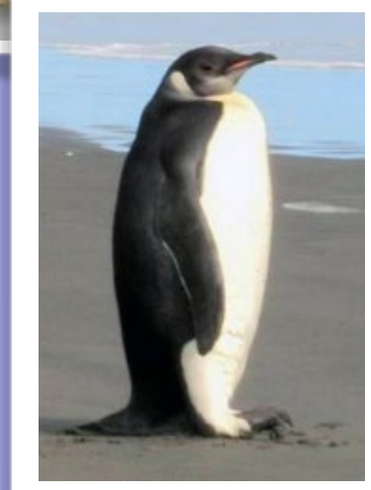


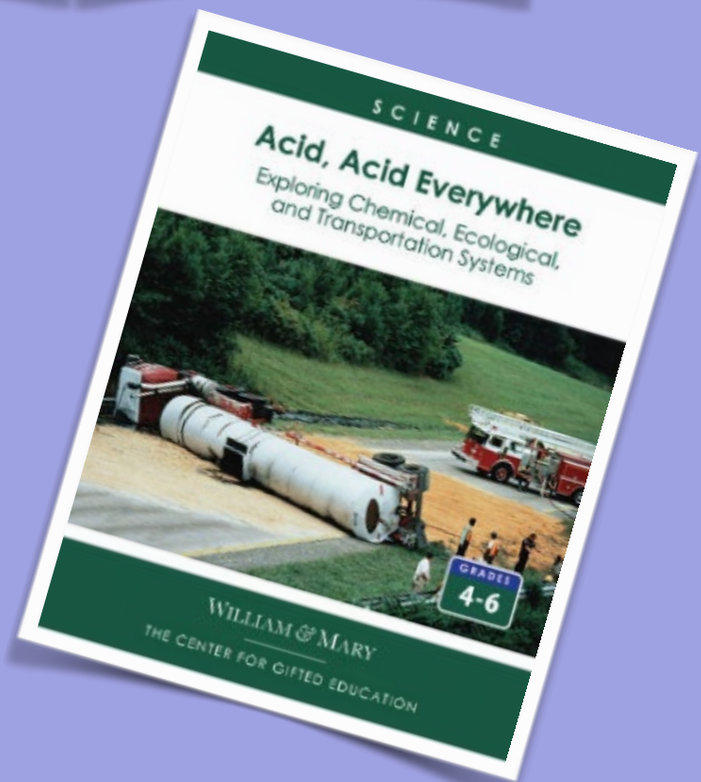


How to Teach PBL



http://www.rfwp.com





https://k12.kendallhunt.com/

What you have been obliged to
discover by yourself leaves a path in your mind
which you can use again when the need arises.
G. C. Lichtenberg