Evaluating Growth of Critical Thinking

Using the Four Cs Framework

Chuck Crawford
Dublin Jerome High School

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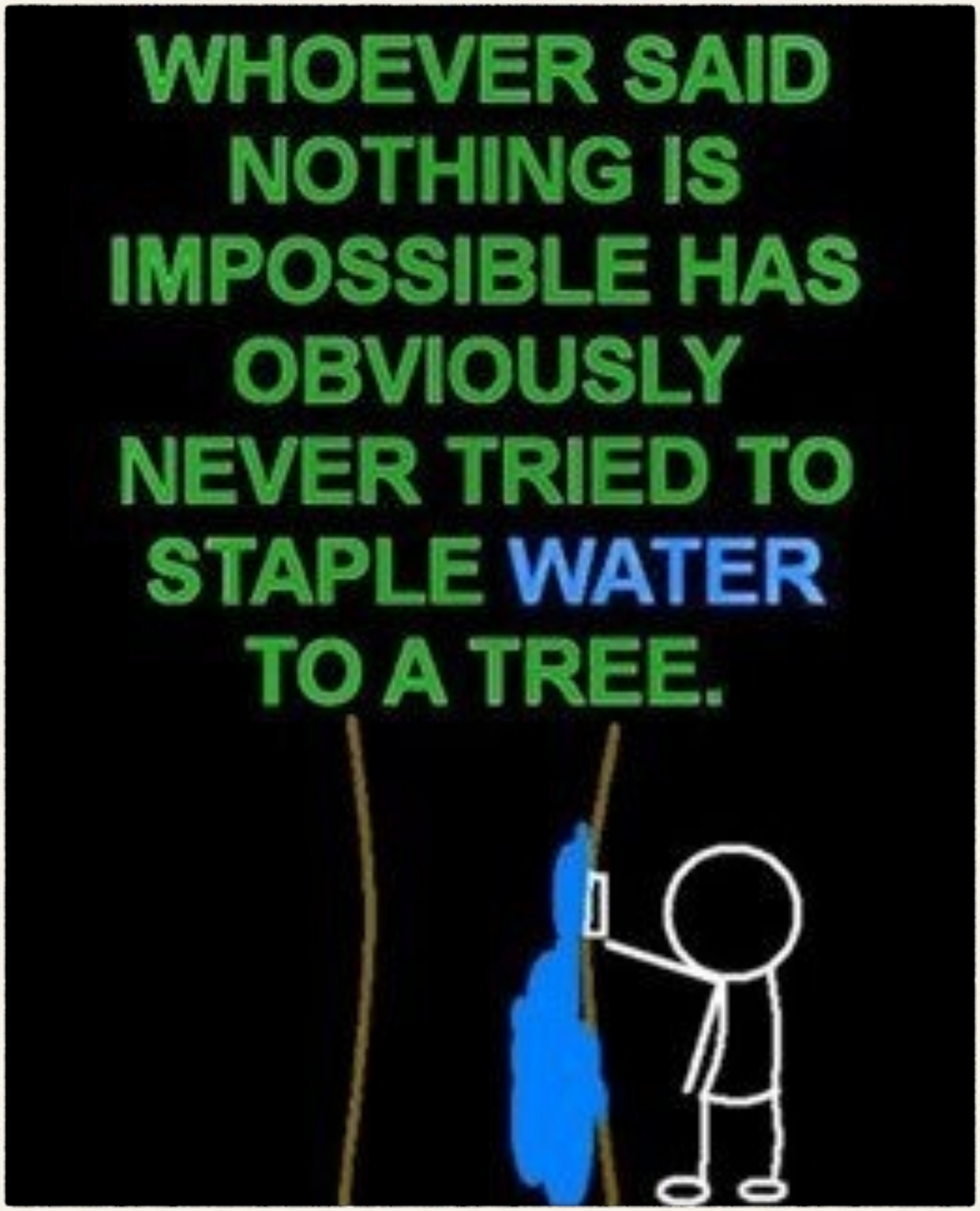
Question that was posed: “Well if the kid doesn’t get an “A” in your class then doesn’t that mean it wasn’t a good learning experience?

Response “ Well how do you know that?”

Quest accepted!

How will I measure the critical thinking skills that students gain in my classroom?



Framework of the Four Cs

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Framework of the Four Cs

1. Must be Correlated to National Standards

2. Must be able to show growth of all students

When presented with a new situation, students will be able to characterize the physical nature of the event. These are based on observation skills in which physical elements are measured using tools and/or one of the five senses.

3. *Scale, Proportion, and Quantity* – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change. (NGSS Cross-cutting Concept)

5. *Energy and Matter: Flows, Cycles, and Conservation* – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior. (NGSS Cross-cutting Concept)

Using the initial characterizations that have been made, students will organize the object or phenomena into a useful classification system based on patterns that are observed and the structure and function of the object.

This allows for students to construct a physical, graphical, or thought model of the object enabling a deeper understanding.

1. *Patterns* – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them. (NGSS Cross-cutting Concept)

6. *Structure and Function* – The way an object is shaped or structured determines many of its properties and functions. (NGSS Cross-cutting Concept)

4. *Systems and System Models* – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems. (NGSS Cross-cutting Concept)

Using classification systems and models allows for the comparison both within the system and outside of it. Understanding the rate of change or stability of the system is what enables scientist to predict what will happen in the future.

These promote deeper comprehension of the classification and characterizations that has been constructed.

2. *Cause and Effect: Mechanism and Prediction* – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering. (NGSS Cross-cutting Concept)

7. *Stability and Change* – For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand. (NGSS Cross-cutting Concept)

The ability to communicate the findings within and outside of the scientific community allows for community members to make informed decisions that have short and long-term effects as well as local and global trade-offs.

College & Career Readiness Anchor Standards for Writing

Text Types and Purposes

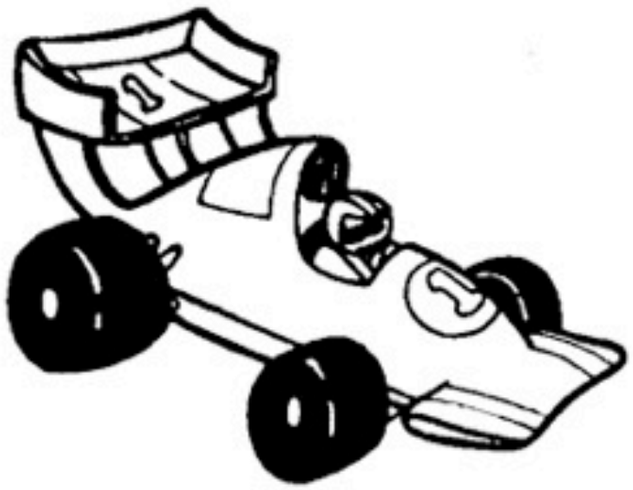
2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

So how does one evaluate growth?

Assessment Strategy...

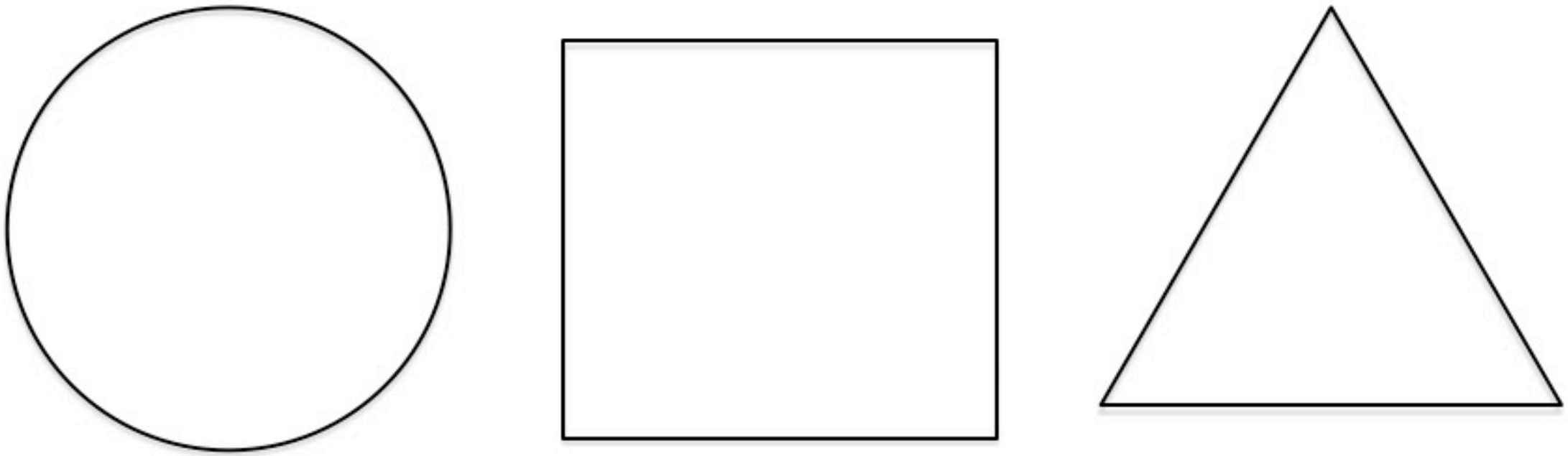
...without content being the driver!

Prompt #1-First Week



CARS

Prompt #2 - Thanksgiving

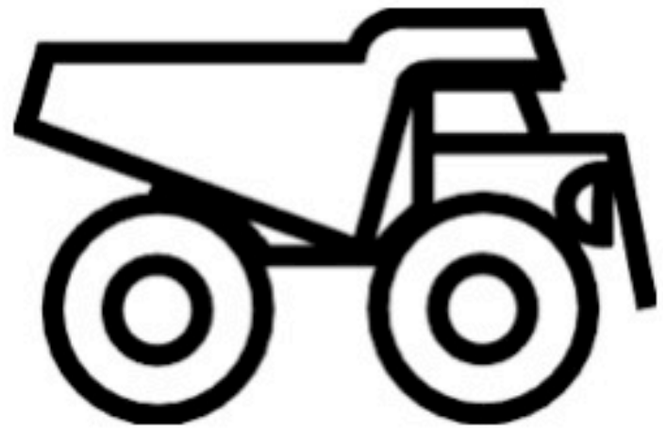


SHAPES

Prompt #3 - President's Day

ECOSYSTEM

Prompt #4 - Spring Break



TRUCKS

So how does this apply to the content standards?

Examples of how one can build critical thinking into the content

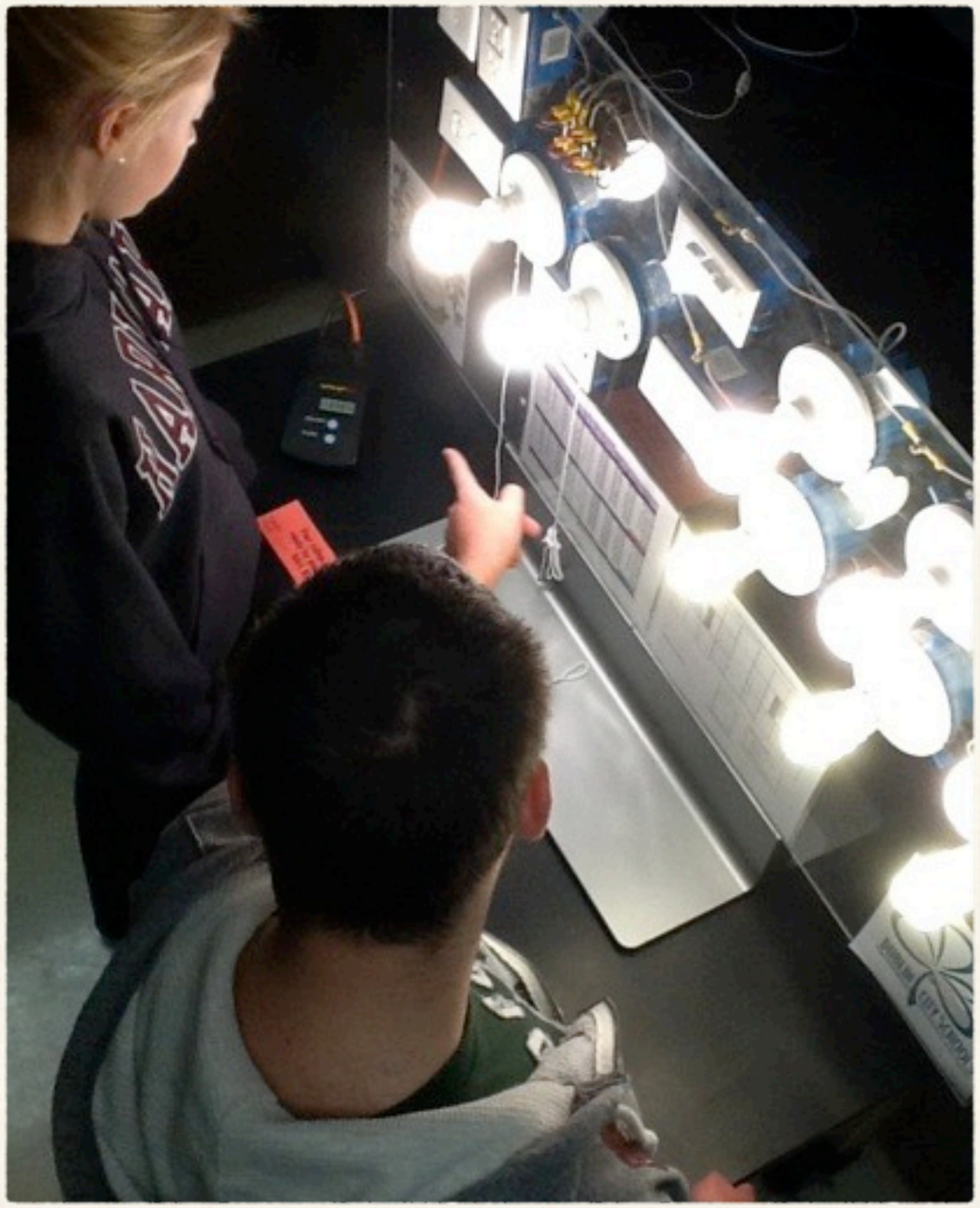
Looking for engagement not just being on task

Examples of how one can build critical thinking into the content

Efficiency - Physics

Identify

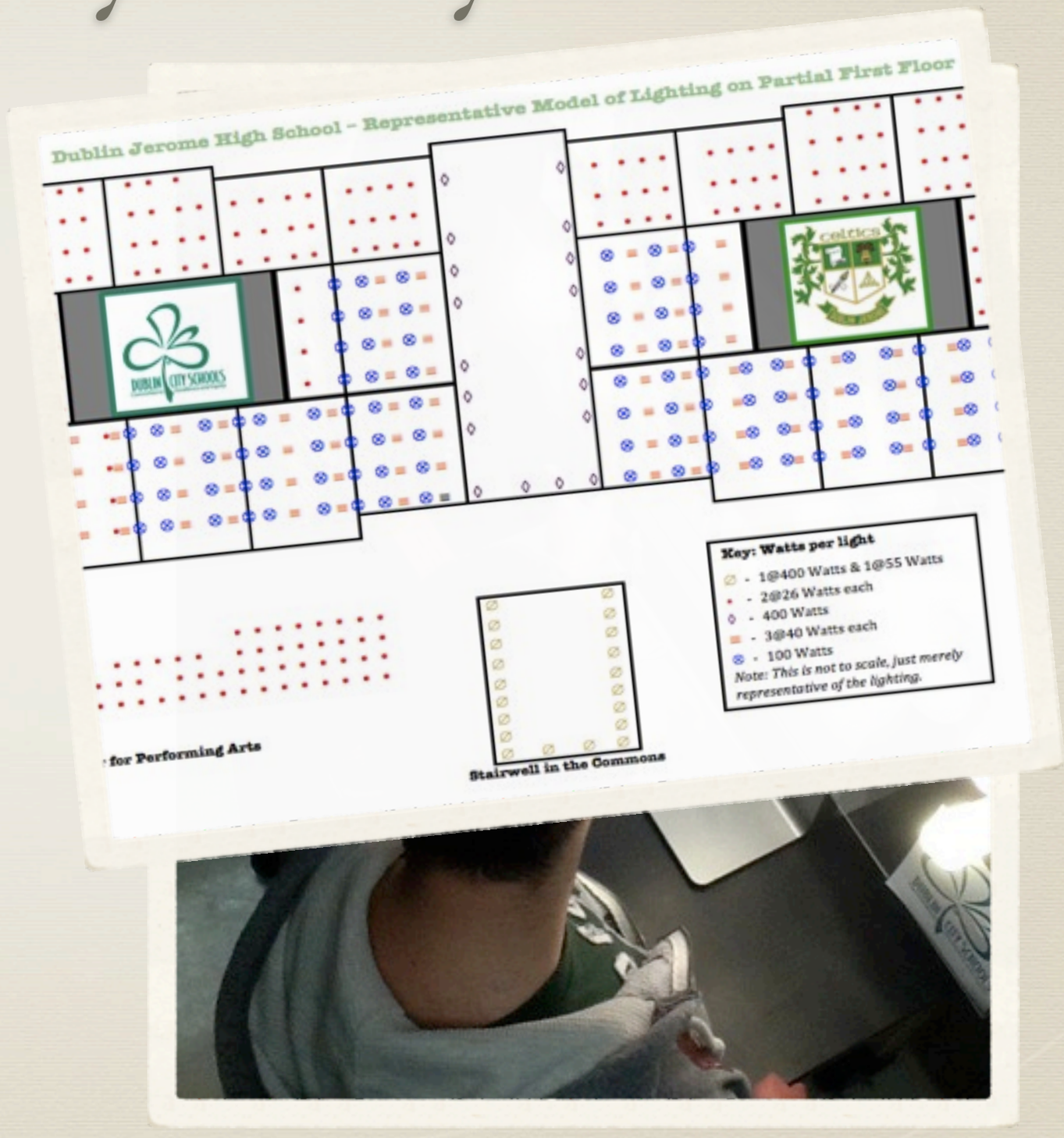
Economic, over use, consumption, effective



Efficiency - Physics

Identify

Economic, over use, consumption, effective



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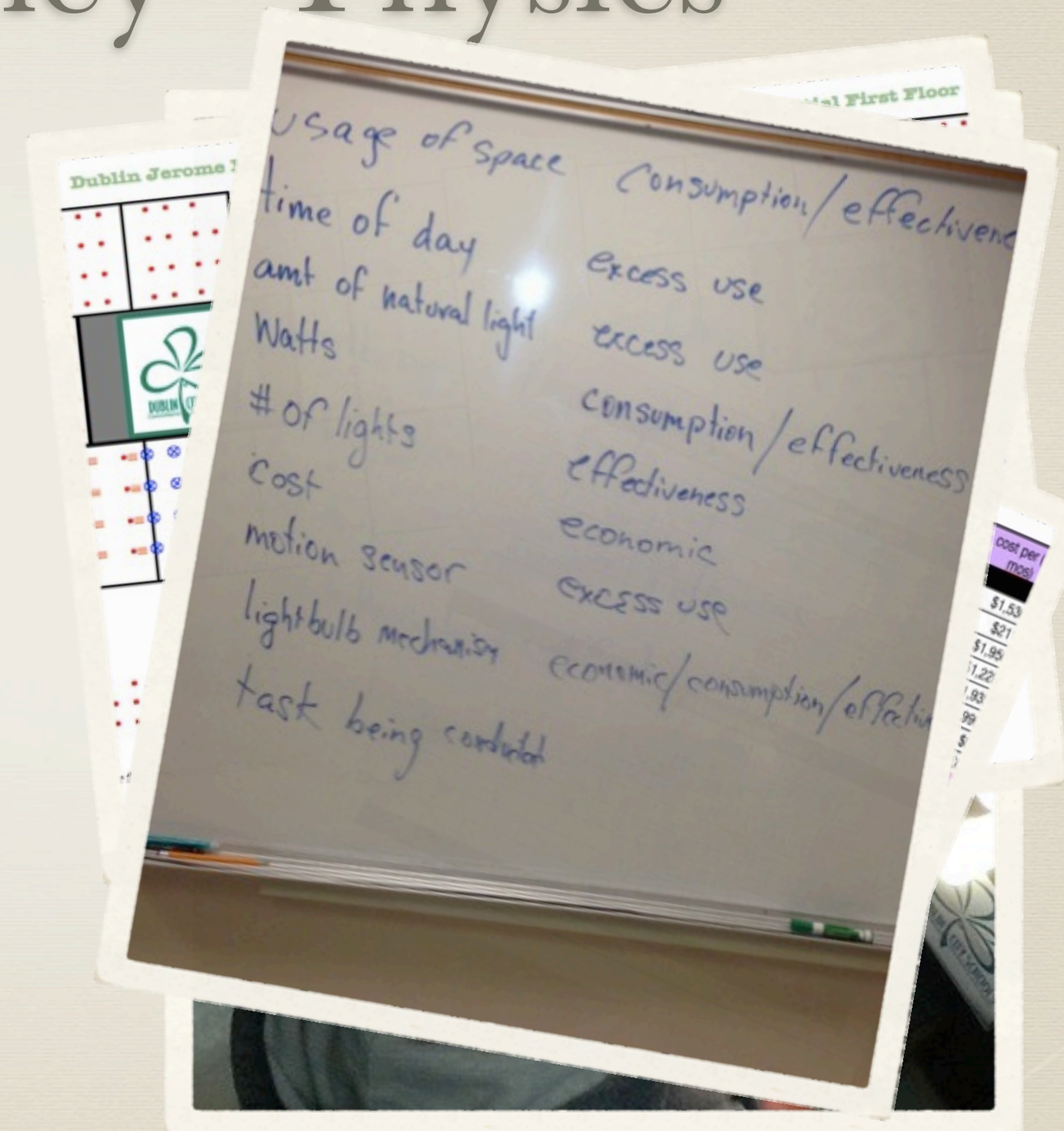


Identify

Economic, over use, consumption, effective

Mammalian Study - Inclusion

How do you know an animal is here? - feel, hear, smell, see (SCAT, bones&remains, field markings, rubbing & scratches, house & den, footprints)

Species research

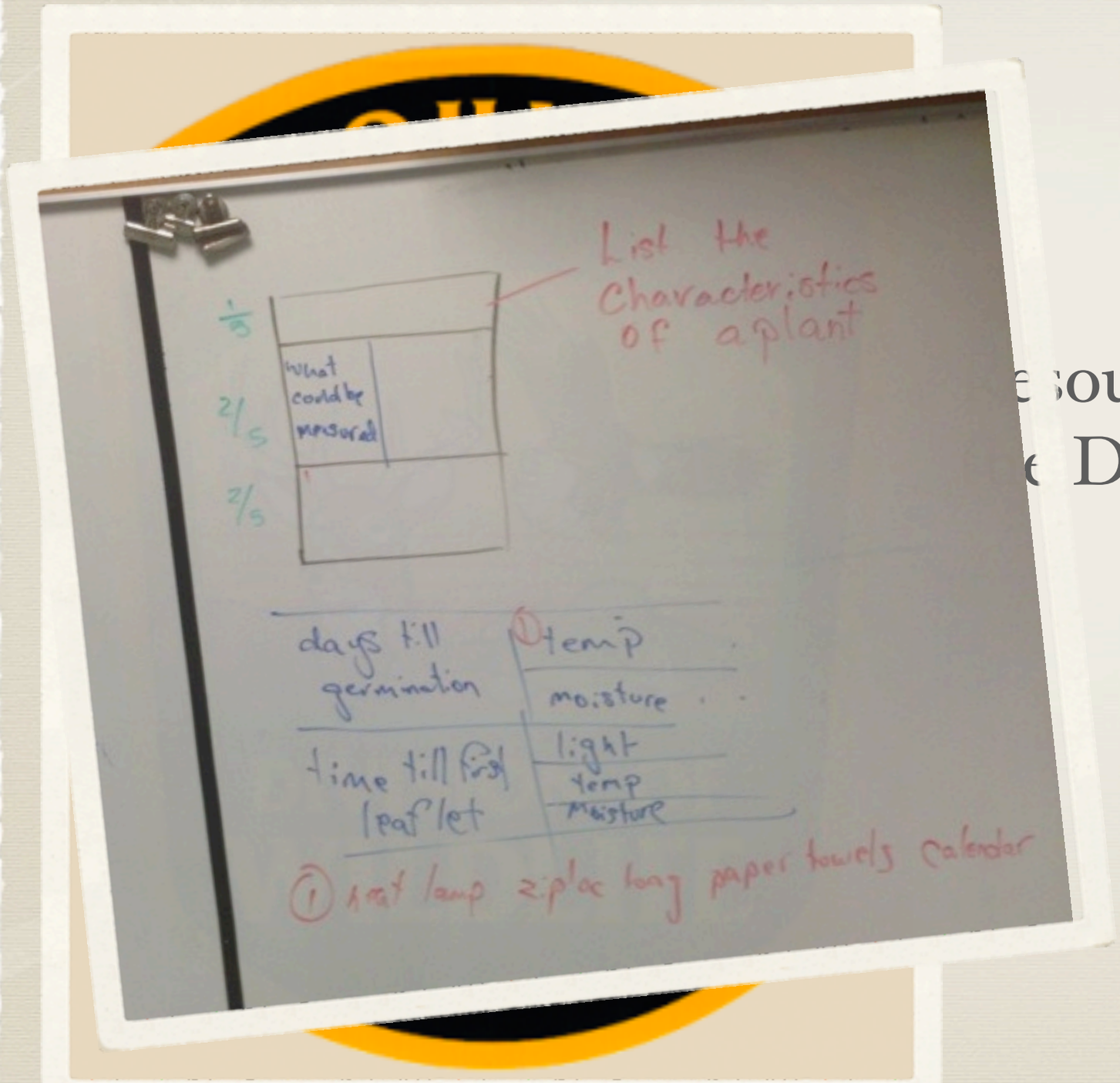
Activity - Nocturnal, Diurnal, Crepuscular

Not Possible, Possible, Not Likely

Mammalian Study

Resources are available from the Division of Wildlife

Developing an Investigation



sources are available from
Division of Wildlife

Assessment #2 Activity

read and follow directions

So how does one evaluate these things?

Scoring Guide that is used

Scoring Guide

Scoring Guide

I. Characterizes:

Identification of physical traits that are known from the picture:

Appropriate identification of a trait for each of the objects (1 point)
Appropriate identification of 2 traits for each of the objects (2 point)
Appropriate identification of 3 traits for each of the objects (3 point)

…continue for more traits

Marked each characteristic with a 1,2, or 3

II. Classifies:

Clearly identifies and articulates a classification system that represents:

All of the objects classified as a whole – showing the interconnections of the objects (1 point) ***Marked with a C3***

Each additional sub-classification made for two of the objects (1 point for each sub-classification) ***Marked with a C2***

III. Compares:

Clearly explains comparisons that exist between the objects:

Explains the similarities and differences based on classification between all three objects (1 points) ***Marked with a SD3***

Explains the similarities and differences based on classification between pairs of the object (1 point) ***Marked with a SD2***

IV. Communicates:

(Based on College & Career Readiness Anchor Standards for Writing: Text Types and Purposes #2)

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Introduce topic and organize ideas, concepts, and information so that each new element builds on that which was precedes it to create a unified whole (1 point) ***Marked with a I***

Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
(1 point for each appropriate transition) ***Marked with a T***

Use techniques such as metaphor, simile, and analogy to manage the complexity of the topic
(1 point for each occurrence) ***Marked with a MSA***

Provide a concluding statement or section that follows from and supports the information or explanation provided. (1 point) ***Marked with a C***

At no point did students see the scoring criteria.

Will never do it like that again!

At no point did students see the scoring criteria.

Sample #1

All three of these objects come from nature. one of them is a bird of some kind and the other two objects are a pine tree and a flower. The objects seem to have no direct correlation with each other as proposed on the paper. Overall the correlation of these objects with one another is that they all come from nature and that object #1 and #2 are both plants

What can we see in the data?

Image Source: http://zapt0.staticworld.net/images/article/2012/12/privacy-goes-public-100018807-gallery.jpg

Traditional View

Traditional View

Measure success if students scored a 5

Achieved a Score of ≥ 5		
38	of	46
83%		

Growth View

Measure success based on growth targets

Achieved growth measurement target			
btwn	1&2	2&3	1&3
target	1.7	1.3	3
actual	2.2	1.0	3
n=46	75%	58%	70%

Initial Assessment Score =1

	1st	2nd	3rd	1&2	2&3	1&3
01	1	6	7	5	1	6
02	1	2	5	1	3	4
03	1	5	5	4	0	4
04	1	5	5	4	0	4
05	1	3	4	2	1	3
06	1	2	5	1	3	4
07	1	4	5	3	1	4
08	1	7	8	6	1	7
09	1	4	5	3	1	4
10	1	3	3	2	0	2
11	1	3	9	2	6	8
12	1	3	5	2	2	4
13	1	6	3	5	-3	2
14	1	4	7	3	3	6
expected growth 1				2	2	4
average				3	1	4
			n=	14		

Conditional Formatting			
between			
≤ 1	2	3	≥ 4

Expected Growth 1 - Bins

	1&2		2&3		1&3	
	1	2	1	9	3	1
exp	2	4	2	1	4	3
	3	3	3	3	5	0
		5		1		1
reached		86	%	36	%	80 %

Initial Assessment Score = 2,3

	1st	2nd	3rd	1&2	2&3	1&3
15	2	4	5	2	1	3
16	2	5	8	3	3	6
17	2	3	5	1	2	3
18	2	6	7	4	1	5
19	2	5	6	3	1	4
20	2	4	5	2	1	3
21	2	8	8	6	0	6
22	2	3	4	1	1	2
23	2	3	6	1	3	4
24	2	4	6	2	2	4
25	2	3	3	1	0	1
26	2	4	6	2	2	4
27	2	4	6	2	2	4
28	2	6	7	4	1	5
29	2	6	7	4	1	5
30	3	5	7	2	2	4
31	3	5	6	2	1	3
32	3	5	4	2	-1	1
33	3	5	6	2	1	3
expected growth 2				2	1	3
average				2	1	4
			n=	19		

Conditional Formatting			
between			
≤ 1	2	3	≥ 4

Expected Growth 2 - Bins

	1&2		2&3		1&3		
	1	4	0	3	2	3	
exp	2	9	1	9	3	5	
	3	2	2	5	4	6	
		4		2		5	
reached		79	%	84	%	84	%

Initial Assessment Score = 4,5

	1st	2nd	3rd	1&2	2&3	1&3
34	4	6	7	2	1	3
35	4	5	5	1	0	1
36	4	4	5	0	1	1
37	4	4	6	0	2	2
38	4	6	6	2	0	2
39	4	5	6	1	1	2
40	4	5	6	1	1	2
41	4	5	8	1	3	4
42	4	8	4	4	-4	0
43	4	4	5	0	1	1
44	4	5	5	1	0	1
45	4	4	4	0	0	0
46	5	5	5	0	0	0
expected growth 3				1	1	2
average				1	0	1
			n=	13		

Conditional Formatting			
between			
≤ 1	2	3	≥ 4

Expected Growth 3 - Bins

	1&2		2&3		1&3	
	0	5	0	6	1	7
exp	1	5	1	5	2	4
	2	2	2	1	3	1
		1		1		1
reached	62	%	54	%	46	%

Overall Growth from Baseline

Expected Growth 1 - Bins

	1&2		2&3		1&3		
	1	2	1	9	3	1	
exp	2	4	2	1	4	3	
	3	3	3	3	5	0	
		5		1		1	
reached		86	%	36	%	80	%

Expected Growth 2 - Bins

	1&2		2&3		1&3		
	1	4	0	3	2	3	
exp	2	9	1	9	3	5	
	3	2	2	5	4	6	
		4		2		5	
reached		79	%	84	%	84	%

Expected Growth 3 - Bins

	1&2		2&3		1&3		
	0	5	0	6	1	7	
exp	1	5	1	5	2	4	
	2	2	2	1	3	1	
		1		1		1	
reached		62	%	54	%	46	%

Overall Growth from Baseline

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	1&2		2&3		1&3	
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		5		1		1
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Expected Growth 2 - Bins

	1&2		2&3		1&3	
	1	4	0	3	2	3
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	3	2	2	5	4	6
		4		2		5
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Expected Growth 3 - Bins

	1&2		2&3		1&3	
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	2	2	2	1	3	1
		1		1		1
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		1		1		1
reached	62	%	54	%	46	%

Achieved Score			
≥ 5	38	of	46
	83	%	

Achieved Growth Measurement Target

n= 46

	1&2	2&3	1&3
exp	1.7	1.3	3
act	2.2	1.0	3
	75 %	58 %	70 %

How does this rate?

Achieved Growth Measurement Target			
	n= 46		
	1&2	2&3	1&3
exp	1.7	1.3	3
act	2.2	1.0	3
	75 %	58 %	70 %

SLO Scoring Matrix		
Met or exceeded	Descriptive Rating	Numerical Rating
90-100	Most Effective	5
80-89	Above Average	4
70-79	Average	3
60-69	Approaching Average	2
59 or less	Least Effective	1

How does this rate?

Achieved Growth Measurement Target			
	n= 46		
	1&2	2&3	1&3
exp	1.7	1.3	3
act	2.2	1.0	3
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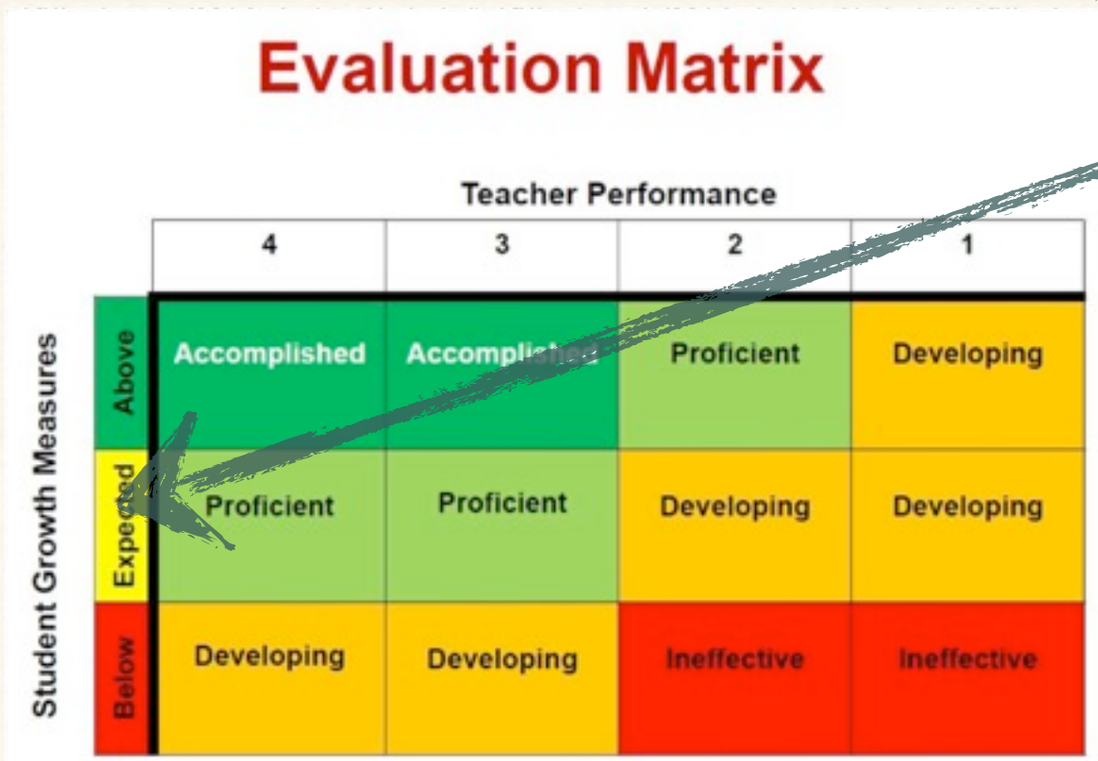

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70-79	Average	3
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59 or less	Least Effective	1

Evaluation Matrix

Student Growth Measures	Teacher Performance 4	3	2	1
Above	Accomplished	Accomplished	Proficient	Developing
Expected	Proficient	Proficient	Developing	Developing
Below	Developing	Developing	Ineffective	Ineffective

Evaluation Framework

Evaluation =

Accomplished | Proficient | Developing | Ineffective

Student Growth Measures
50%

Teacher Performance
50%

- Student
- Learning Environment
- Content
- Assessment
- Collaboration/Communication
- Instruction
- Professional Responsibility and Growth

Ohio Teacher Evaluation System (OTES)

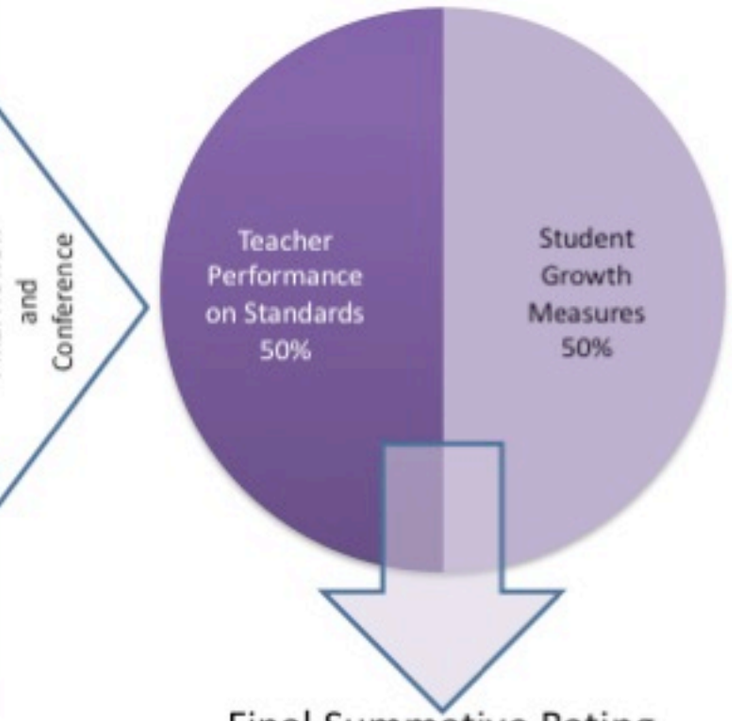
Teacher Performance on Standards

Above Expected Growth → **Professional Growth Plan**

Expected Growth → **Professional Growth Plan**

Below Expected Growth → **Improvement Plan**

	Mid-Year Review and Conference	Final Review and Conference
Professional Growth Plan	Formal Observation and Classroom Walkthroughs/ Informal Observations Pre-conference Observation Post-conference	Formal Observation and Classroom Walkthroughs/ Informal Observations Pre-conference Observation (both completed by May 1) Post-conference
Improvement Plan	Complete Performance Rubric	Complete Performance Rubric Written Report (by May 10)



Final Summative Rating

Accomplished | Proficient | Developing | Ineffective

*Student Growth Measures

**A1: Teacher Instructs Value-Added Subjects Exclusively

Teacher Level Value-Added 50%

A2: Teacher Instructs Value-Added Courses, But Not Exclusively

Teacher Level Value-Added Proportionate to teacher's Schedule 10-50%

0-40% LEA Measures Proportionate

-OR-

B: Approved Vendor Assessment teacher-level data available

Vendor Assessment 10-50%

LEA Measures 0-40%

-OR-

C: No Teacher-level Value-Added or Approved Vendor Assessment data available

LEA Measures 50%

*The student growth measure progress dimension shall be used in proportion to the part of a teacher's schedule of courses or subjects for which the dimension is applicable.

**A1- If a teacher's schedule is comprised only of courses or subjects for which value-added progress dimension is applicable:
Until June 30, 2014, the majority (>25%) of the student academic growth factor of the evaluation shall be based on the value-added progress dimension. On or after July 1, 2014, the entire student academic growth factor of the evaluation shall be based on the value-added progress dimension.

What I have learned

- Reaffirmed - Professional discourse is paramount!
- Reaffirmed - It is powerful to let students tell you to what they have learned
- Students' writing skills need more attention
- The data really does help when it comes to conversations with students in the classroom
- Although there is a lot of data - if it is not at your fingertips it is difficult to use to inform your instruction

Take Aways

- Professional discourse is paramount!
- Create a framework that applies throughout the year in order for students to see the connections to critical thinking
- Emphasize articulation of thoughts in their writing
- Let students show you what they know
- Insist on engagement by the questions that you ask in class, not merely is the student on task
- Use data to help inform instruction

Evaluating Growth of Critical Thinking

Using the Four Cs Framework

Chuck Crawford
Dublin Jerome High School