Quality Differentiation: A Status Check

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Carol Ann Tomlinson
William Clay Parrish, Jr. Professor
Curry School of Education
University of Virginia
cat3y@virginia.edu
www.differentiationcentral.com

• A brief look at what differentiation is (or should be)
• An exploration of the key principles and practices that should guide differentiation—so you can run a “status check” on your understanding and implementation of differentiation
Differentiation is not a set of strategies, but rather a way of thinking about teaching & learning.
Differentiation is a sequence of common sense decisions made by teachers with a student-first orientation.

Adam Hoppe, 2010

The Common Sense of Differentiation

Ensuring an environment that actively supports students in the work of learning (mindset, connections, community)

Absolute clarity about a powerful learning destination, (KUDs, engagement, understanding, teaching up),

Persistently knowing where students are in relation to the destination all along the way (pre- & on-going assessment),

Adjusting teaching to make sure each student arrives at the destination (and, when possible, moves beyond it),

Effective leadership & management of flexible classroom routines.
1. Differentiation is rooted in a philosophy of teaching and learning that, itself, is rooted in current understanding of effective teaching and learning.

2. It’s important to have a common definition of differentiation and shared descriptors of what its elements look like in action.

2. Be sure to emphasize the interconnectedness of all of the classroom elements. (Differentiation isn’t an extra. It’s part of the core of effective teaching and learning.)
How are these ideas about differentiation similar to the definitions in your mind? To the ones used in your school?

How are they different? Would it make any difference in practice in your school if the majority of teachers operated from this perspective on differentiation? Where are you in your own practice with the 3 takeaway points?

Please talk with a colleague about these questions—or do a quick write that reflects your thinking.
Ensuring an environment that actively supports students in the work of learning (mindset, connections, community),

Absolute clarity about a powerful learning destination (KUDs, engagement, understanding),

Persistently knowing where students are in relation to the destination all along the way (formative assessment for and as instruction),

Adjusting teaching to make sure each student arrives at the destination and, when possible, moves beyond it (addressing readiness, interest, learning profile),

Effective leadership & management of flexible classroom routines.

The Game Plan For

1. Growth Mindset
   - Teacher
   - Student

2. Teacher-Student Connections

3. Community
Paving the Way

MINDSET ← CONNEXIONS ← COMMUNITY

to Learning

Take a look at this segment from 60 Minutes.
Look for the philosophy and principles that undergird Habrowski’s work.
Think also about how the principles would impact learning for the range of students in your school and classroom.
Thinking about the Video

<table>
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The Mindset Questions

1. What do you think measured intelligence has to do with success?
2. To what degree do you believe the brain is malleable?
3. What do you believe about the role of effort in success?
4. Do you buy the idea that with hard work & good support, almost any student can accomplish what he/she needs to accomplish in school?
5. What do you do to reinforce or challenge your beliefs in these areas in your classroom?

Growth Mindset Message

1. Your effort predicts your success.
2. If you work hard and smart, you will grow in the required knowledge understanding, & skill.
3. If you continue that pattern there is no reason you can’t achieve & even exceed those goals.
4. The way we work in this class will help you see the link between your effort & your success.
5. I believe in you and will work with you to support your success.
Mindset isn’t just about believing.

It’s about enacting those beliefs—living them out—hour by hour, day by day, plan by plan.

Everything else that follows about differentiation has the aim of helping us live out the belief that every student is capable and worthy—

That they can do what’s necessary for success—

And that we can do what’s necessary to support that success.
Teacher-Student Connections Bridge the Risk of Learning

Teachers discover that they need to develop and maintain personal relationships with the students they teach — because for most students, meaningful interaction with a teacher is a precursor to academic learning.

“An average student with a teacher whose teacher-student interactions scored 1 standard deviation below the mean in Emotional Support would, on average, place in the 41st percentile in end-of-year tests.

The same student with a teacher whose interactions scored 1 standard deviation above the mean in emotional Support would, on average, place in the 59th percentile in end-of-year tests.”

Allen, J., Gregory, A., Mikami, J., Hamre, B., & Pianta, R. Predicting Adolescent Achievement with the CLASS-S Observation Tool. A CASTL Research Brief. University of Virginia, Curry School of Education
1. A learning environment that is designed and nurtured to draw each student into learning is one of the most powerful mechanisms we have for boosting student achievement.
2. If we expect robust teaching and learning to take place in the absence of growth mindsets, we’ll be disappointed in outcomes nearly every time.
3. Teacher-student connections are drivers of good instruction—at all grade levels.
4. We’d have much better achievement results if students functioned as teams of learners invested in growth of all members of the team.
With a colleague, talk (or write a reflection, if you’d prefer) about:

The degree to which students in your school would say their teacher(s) has/have a growth vs. fixed mindset—and why they would say that,

Your own mindset and what is most challenging to you about working from a growth mindset consistently,

Your own next steps with mindset, connections, and community.

The Common Sense of Differentiation

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The Game Plan For Curriculum

1. Plan for Engagement
2. Clear KUDs
3. Focus on Understanding & Transfer
4. Teaching Up (A Common Core Imperative--& an Ethical Imperative)

Movie Time....

In this Classroom, Look For:

1) The nature of the learning environment
   --mindset
   --connections
   --community
2) Quality of curriculum
   --engagement
   --understanding
3) Examples of how the teacher addresses student variance
4) Your own questions
What Does it Mean to Teach Up?

TASKS:
Clear KUDs
Require careful thought
Focus on understanding
Problems to solve/Issues to address
Use key knowledge & skills to explore, or extend understandings
Authentic
Require support, explanation, application, evaluation, transfer
Criteria at or above “meets expectations”
Require metacognition, reflection, planning, evaluation

QUALITY CURRICULUM:
THE SHORT VERSION

Engagement + Understanding
(sense & meaning) = Success
However we conceive it, every lesson plan should be, at its heart, motivational plan. Young learners are motivated and engaged by a variety of conditions. Among those are:

- novelty
- cultural significance
- personal relevance or passion
- emotional connection
- product focus
- choice
- the potential to make a contribution or link with something greater than self
To Ensure Understanding...

...Work from Clear KUDs!

Students can hit any target that they know about and that stands still for them.

~Rick Stiggins
Planning a Focused Curriculum Means
—At the Very Least—Clarity About
What Students Should ...

**KNOW**
- Facts
- Vocabulary
- Definitions

**UNDERSTAND**
- Principles/generalizations
- Big ideas of the discipline

**BE ABLE TO DO**
- Processes
- Skills

---

**Likely KUDs for the Exxon Valdez Sequence**

**KNOW**
ecosystem, perspective, personal lens, stakeholder lens, system, culture, persuasive writing,....

**UNDERSTAND**
People’s contexts shape their perspectives on events and information. Science is part of a social system and is dependent on that system for its impact.

**DO**
Use scientific data to make decisions
Construct a logical argument using persuasive writing
Work collaboratively to solve problems
Science is built up of facts, as a house is built of stones; but an accumulation of facts is no more a science than a heap of stones is a house.

Jules-Henri Poincare

Crosscutting Concepts for Science and Engineering

1. Patterns.
   • Observed patterns of forms and events guide organization and classification.
   • Observed patterns prompt questions about relationships and the factors that influence them.

2. Cause and effect: Mechanism and explanation.
   • Events have causes, sometimes simple, sometimes multifaceted.
   • A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated.
   • Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.

3. Scale, proportion, and quantity.
   • In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy.
   • It is critical to recognize how changes in scale, proportion, or quantity affect a system’s structure or performance.

4. **Systems and system models.**
   • Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

5. **Energy and matter: Flows, cycles, and conservation.**
   • Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems’ possibilities and limitations.

6. **Structure and function.**
   • The way in which an object or living thing is shaped and its substructure determines many of its properties and functions.

7. **Stability and change.**
   • For natural and built systems alike, conditions of stability and determinants of rates of change or evolution of a system are critical elements of study.
A Concept-Based Framework for Ecology

- Population
- Organization
- Environment
- Technology
Physical Science

I. OBSERVERS
   A. Observe
      1. What?
      2. How much?
   B. Classify
   C. Explain
   D. Verify

II. EVENTS
   A. Matter
      1. Physical aspects
      2. Chemical aspects
   B. Energy
      1. Kinetic
      2. Potential

III. RELATIONSHIPS
   A. Changes
      1. Chemical
      2. Physical
   B. Forces
   C. Applications

Kindergarten Topics

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## Kindergarten Concepts and Topics

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### Diagram

- Appreciation
  - Colors
  - Patterns
  - Self
  - Others
  - Nature
  - The Arts
  - Etc.

- Communication
  - Transportation
  - Art
  - Music
  - Movement
  - Journal
  - Graphs
  - Etc.

- Self
  - 1 basic needs
  - 2 body systems
  - 3 dental
  - 4 senses
  - 5 careers

- Nature
  - Plants
  - a seed
  - b transpiration
  - c lifecycle

- Process Skills
  - Classification
  - Revision
  - Comparison
  - Estimation

- Patterns
  - Cooking
  - Nature
  - Seasons
  - Weather
  - Colors
  - Water/life
  - Self
  - Etc.
A Kindergarten Concept-Based Unit: Patterns and Changes in the Animal Kingdom

Rationale: There are patterns and changes in all animals including humans.

Concept: Patterns

Generalizations:
1. Scientists classify animals by using patterns
2. A category of animals has predictable patterns in it
3. We can classify animals by patterns in their size, movement, body features, habitat, food type, etc.
4. There are patterns in the life cycles of animals
5. There are patterns in animal “families”
6. Weather and habitat determine basic patterns in animals’ bodies and lives
7. There are patterns of interdependence in lives of humans and other animals
8. There are patterns in how and why animals communicate

Concept: Change

Generalizations:
• Animals change as they grow
• Metamorphosis is a complete change
• Ways in which animals move, see, protect themselves, etc. change among classifications of animals
• Animals which do not adapt to change in their environments become extinct
• Some animals change their habits
• Some animals change their coloration to protect themselves
It’s a Mystery!!!
A kindergarten example of quality curriculum: Engagement + Understanding with Standards

When the kindergartners came to school, they saw something unusual. Something or someone had been in their cubbies on the porch outside their classroom. A cookie had been taken out of its wrapper and a juice box was almost eaten!

Cris Lozon & colleagues

“Look! The tracks go down to there!”

“Maybe it’s dog prints.”

“It can’t be a big person

It can’t be baby prints because there is some fur sticking out of it.”

It can’t be squirrel prints because they are too small.”

“It looks like it has only four fingers and three toes.”

And that’s how the scientific thinking of the kindergarten students started.

They saw tracks from an animal, but no one knew what made those tracks.
The kids asked the secretary if she knew about different animals on campus that might go into their cubbies at night. They showed her what they found. She knows the campus better than anyone. They looked for more tracks on campus.

They constructed a hypothesis about which animals on campus might have made the prints. They called Miss Amy in the library to see if she could help them find books about raccoons and possums and any other animals that might have four fingers and three toes. She could!
At exploration time, they played with wooden animals and wondered whether any of those animals might make prints like the ones on the porch. They tested their hypothesis about what animal might have made the prints by looking at patterns in the books Miss Amy gave them. They analyzed their data in groups and concluded that a raccoon came and ate the snack in their cubbies.

At the end of the day, Cris taught the students the elements of scientific inquiry that they’d been using.

We talked about how when they were outside, they exhibited behaviors of a group of scientists who asked questions, formed hypothesis, experimented with clues in around the premises, compared and contrasted the tracks, and used tools (some ran back in the classroom and got the magnifying glasses) to help them find the answers

The kindergartners asked for a list of the words so they could tell their parents about their work as scientists.
Kindergarten KUDs for “It’s a Mystery”

**Know:**
scientist, observe, scientific method, inquiry, experiment, hypothesis, tools, clues, compare/contrast

**Understand:**
Scientists try to answer questions about the world around them.
Scientists observe so they can ask and answer important questions.
Scientists use information to get clues about how things work so they can answer important questions.
Scientists test their ideas to see which ones are correct.
Scientists can explain how they work and why they get the answers they get to their questions.

**Be able to Do:**
Compare and contrast
Develop a question to answer through inquiry
Hypothesize
Use information to establish clues
Draw an informed conclusion and explain the conclusion

---

**This I Believe: Science Nourishes the Mind and Soul**
Brian Greene, Professor of Physics & Mathematics, Columbia University

...just as our experience playing baseball is enormously richer if we know the rules of the game, the better we understand the universe's rules -- the laws of physics -- the more deeply we can appreciate our lives within it.

I believe this because I've seen it.
I've seen children's eyes light up when I tell them about black holes and the big bang. I've received letters from young soldiers in Iraq telling me how reading popular accounts of relativity and quantum physics has provided them hope that there is something larger, something universal that binds us together.

Which is why I am distressed when I meet students who approach science and math with drudgery. I know it doesn't have to be that way.

But when science is presented as a collection of facts that need to be memorized, when math is taught as a series of abstract calculations without revealing its power to unravel the mysteries of the universe, it can all seem pointless and boring.
Even more troubling, I've encountered students who've been told they don't have the capacity to grasp math and science.

These are lost opportunities.

I believe we owe our young an education that captures the exhilarating drama of science.

I believe the process of going from confusion to understanding is a precious, even emotional, experience that can be the foundation of self-confidence...
It is the teacher’s job to make explicit that which we hoped was implicit.

1. “Teaching Up” lifts achievement for virtually all students.
2. Planning for engagement is fundamental to successful curriculum and instruction.
3. Clear KUDs are imperatives for planning solid curriculum, for formative assessment, for instruction that aligns with desired outcomes, AND for differentiation.
4. Understanding MUST be in the foreground of teaching and learning to ensure learning.
5. To accomplish the first four goals, teachers need support in learning to make dinner vs. serving ingredients.
What’s Your Status...

With the idea of clear KUDS that support both knowledge & understanding?

With the idea that clear KUDs provide the framework for differentiation?

What’s your next step in the process of developing and teaching from clear KUDs?

Please talk with a colleague about these questions—or do your own written reflection.

The Common Sense of Differentiation

Ensuring an environment that actively supports students in the work of learning (mindset, connections, community),

Absolute clarity about a powerful learning destination (KUDs, engagement, understanding),

Persistently knowing where students are in relation to the destination all along the way (formative assessment for and as instruction),

Adjusting teaching to make sure each student arrives at the destination and, when possible, moves beyond it (addressing readiness, interest, learning profile),

Effective leadership & management of flexible classroom routines.
Formative Assessment: A Definition

An assessment functions as formative to the extent that evidence about student performance is elicited, interpreted, and used by teachers, learners, or their peers to make decisions about next steps in instruction that are likely to be better or better-founded than the decisions they would have made in the absence of that evidence.

The root of the word “assessment” is from the Latin assidere, which means “to sit beside.”
3 elements to consider...

1. Make sure the formative assessment is tightly aligned with KUDs
2. Make the assessment a thoughtful dipstick—not an exhaustive “test”
3. Ensure that the assessment encourages thinking/understanding, as the lessons that follow will.

Pre-Assessment

• Before a unit begins
• Not Graded
Symmetry Pre-Assessment

- Teacher models symmetry/asymmetry once with whole-class using two shapes.
- Teacher conducts individual assessments with a bag of shapes.
- Students tell teacher “yes” or “no” to “Does this have symmetry?” and explain why.

"We [the kindergarten team] were ALL amazed by the results of our symmetry pre-assessment. We had made assumptions about kids that were not true! Vocabulary really played a role in the 'tell me why' part of it. We all ran across more than one kid about whom we made assumptions as to which 'group' they would be in, and we were WRONG. So often, we as teachers group kids on the fly and say, 'I know my students'. The pre-assessment made us face the fact that without this [pre-assessment] information we really didn't 'know' our students."

- Kindergarten Teacher,
  Evanston/Skokie District 65
Telling Time KUDs

• Know
  – Vocabulary – analog, digital, clockwise; numbers 1-12, hour hand, minute hand, A.M., P.M., 60 minutes = 1 hour, 30 minutes = 1/2 hour

• Understand that
  – Time helps us organize our lives.
  – Time can be measured in a variety of ways.

• Be Able to Do:
  – Tell time to the nearest hour (half-hour, quarter hour, etc.)
  – Match time on an analog clock to time on a digital clock
  – Make a clock show a particular time (when you go to bed, get up, time get home from school, etc.)
  – Write time in words and numbers

An Example of Pre-assessing Student Readiness in a Primary Classroom
Make your own clock. The numbers vary for 600 AM. Write about clocks and time.
I know time is easy.
It is easy.
So easy time is very special.

Tari  April 13, 1999.
we eat lunch at 11:30
we eat of school
at 3:20 we eat
in school at 1:00

Shaun R. April 13, 1949
6:00 ClockMom's up
5:00 Clock Dad's up
7:15 Shaun up
8:30 Bob
9:00 Clock School
10:30 Snack
11:30 Lunch
4:00 Clock home
A clock helps you tell time. Clocks are fun to minute if I order I can read from the minute hand and my mom was late for work.
Formative (On-Going) Assessment

- Throughout a unit
- Rarely Graded
On your exit card---
List and explain (1) a pattern in nature and (2) a human pattern that are based on natural motions of the earth.

**An Exit Card (Formative Assessment) in Science**

Name:

- Draw the orbit of the earth around the sun.
- What causes the seasons?
- Why is it warmer in the summer than in the winter?
3-2-1 Card

Name________________

3 very important things to understand about the relationship between air, water, and land on Earth.

2 ways in which water can change in nature (Be sure to explain your examples.)

1 misunderstanding you think people may have about the water cycle

A Tiered Formative Assessment

A. A classmate had to leave the room today just as the lab experiment was beginning to come to a conclusion. Please write that student a note explaining what happened in the lab, why it happened, and what practical use there is in the real world for what the experiment shows us. You’re his/her only hope for clarity! Be as much help as possible.

B. Select a key or critical element in the experiment today. Change it in some way. What will happen in the experiment with that change? Why? What principle can you infer? Be sure you go for something useful, insightful, and intellectually or scientifically meaningful at your choice.

Middle School Science
Pick a Way to Show what you Know...

- Explain how temperature can affect the state of matter of a substance.
- Give specific examples of both how and why a substance changes with particular changes in temperature.
- Be sure to use appropriate science wall words in your explanations.
- Create drawings that show how temperature can affect the state of matter of a substance.
- Be sure to label your drawings so we can tell both how the substance changes and why with changes in temperature.
- Be sure to use appropriate science wall words in your labels.

Teaching in the Dark is Questionable Business

Hilda Taba
“Differentiation is making sure that the right students get the right learning tasks at the right time. Once you have a sense of what each student holds as ‘given’ or ‘known’ and what he or she needs in order to learn, differentiation is no longer an option; it is an obvious response.”

Assessment as Learning: Using Classroom Assessment to Maximize Student Learning
Lorna M. Earl
Corwin Press, Inc. – 2003 – pp. 86-87

Think of at least three ways it would change how we think about teaching and learning if we used pre- and formative assessments regularly in all of our classrooms to inform teaching & learning.

Please talk with a colleague to consider this question—or write a reflection, if you’d prefer.
What are your Thoughts about...

The example we just looked at?
In terms of:
clear KUDs
engagement
understanding
alignment between KUDs and the assessment
use of formative assessment info. to address students’ varied learning needs
alignment between KUDs and instruction

What questions do these ideas raise for you?

The Common Sense of Differentiation

Ensuring an environment that actively supports students in the work of learning (mindset, connections, community),

Absolute clarity about a powerful learning destination (KUDs, engagement, understanding),

Persistently knowing where students are in relation to the destination all along the way (formative assessment for and as instruction),

Adjusting teaching to make sure each student arrives at the destination and, when possible, moves beyond it (addressing readiness, interest, learning profile),

Effective leadership & management of flexible classroom routines.
The Game Plan For Instruction

1. Tightly aligned with KUDs
2. Based on Formative Assessment
3. Responsive to Readiness, Interest, Learning Profile
4. Respectful Tasks
5. Flexible Grouping
6. Maximum Growth for Each Learner

What’s the Point?

Readiness

Interest

Learning Profile

Growth

Motivation

Efficiency
Small group instruction can be a powerful way to differentiate instruction!

A Simple & Important Example

Varied Homework

Why'd we ever think the same homework for everyone made sense anyhow??

Homework Checkers

Sure you can check homework when kids do varied tasks!!
This is a process for checking multiple homework assignments simultaneously in a classroom so that the teacher feels free to differentiate homework as necessary to address particular student learning needs.

**Steps:**
1. The teacher checks to make sure each student has completed assigned homework
2. Students who have not completed the assignment work in a designated area of the room to complete the assignment (teacher floats to provide guidance/feedback
3. Students who completed the HW work in groups of 4 to check all 4 sets for agreement/disagreement
4. All students mark each answer for agreement/disagreement as well as explanations of why an answer is wrong and how to make it right
5. Students sign indicating agreement, staple set of 4 together, turn in
6. Teacher spot checks, "grades" one per set

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**Front-Loading Vocabulary**

**WHAT?**
- Teach the few vocab words on which the topic pivots (6-8)
- Teach them before the unit begins (to students who need them)
- Keep them in plain sight throughout the unit
- Refer to them often during the unit and afterwards as relevant
- Teach root words and derivatives as possible

**WHO?**
- English language learners
- Students with learning disabilities
- Students who have trouble with words
- Students who benefit from direct instructional contact with the teacher
- Students with generally weak academic vocabulary
- Students who don’t know the words on the pre-assessment
Contemporary Lecture

Background:

Acknowledges both the desire of teachers to use lecture/give notes and the need of adolescents for developmentally appropriate instruction.

Draws on understandings about what adolescents generally need in order to learn.

Steps:

1. Determine goals for lecture (KUDs)
2. Plan flow of lecture to ensure match with KUDs and tight logic
3. Develop one or more graphic organizers that follow the flow of the lecture and scaffold students determining its key points and organization (Use only with students who need the support)
4. Stop during the lecture about every 7-8 minutes to engage students in sense-making (summarizing, reasoning, concluding, projecting, etc.)

REPORTER’S NOTES

<table>
<thead>
<tr>
<th>WHO (is involved or affected)</th>
<th>Most important WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>WHAT (happened or is proposed)</td>
<td>Most important WHAT</td>
</tr>
<tr>
<td>WHEN (it happened—under what circumstances)</td>
<td>Most important WHEN</td>
</tr>
<tr>
<td>HOW (did other people/things respond)</td>
<td>Most important HOW</td>
</tr>
<tr>
<td>WHY (did it happen or happen as it did)</td>
<td>Most important WHY</td>
</tr>
<tr>
<td>SO WHAT (what are the implications) WHAT</td>
<td>Most important SO</td>
</tr>
</tbody>
</table>

Adapted from Jim Burke, Tools for Thought, Heinemann
Journal Prompt tiered for Readiness

Science

A. A classmate had to leave the room today as we were beginning to conclude the lab experiment. Please write the student a note explaining what happened in the lab, why it happened, and what practical use there is for what the experiment shows us. You’re the student’s only hope for clarity! Be as much help as possible.

B. Select a key or critical element in the experiment today and change it in some way. What will happen in the experiment if that change is made? Why? What principle can you infer? Be sure you choose something useful, insightful, and intellectually or scientifically meaningful.

Electricity

<table>
<thead>
<tr>
<th>Description</th>
<th>Kinds of Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity is one kind of energy</td>
<td>There are two kinds of electricity, static and current. Static electricity is on electric charge that does not move. Current electricity is the movement of electrons.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Electric Circuits</th>
<th>Producing Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are two kinds of electric circuits</td>
<td>A generator is a machine that changes mechanical energy into electrical energy.</td>
</tr>
<tr>
<td>A series circuit is one in which current can follow only one path</td>
<td>A dry cell uses a chemical paste, carbon rod, and zinc to produce a flow of electrons.</td>
</tr>
<tr>
<td>A parallel circuit is one in which current can follow more than one path.</td>
<td>A wet cell uses acid and water, which reacts with metal plates, to produce a flow of electrons.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Using Electricity</th>
<th>Measuring Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity is an important source of light and heat. Electrical energy can be changed to mechanical energy. Fuses and circuit breakers are safety devices designed to help use electricity safely.</td>
<td>The amount of electricity used is measured in kilowatt-hours.</td>
</tr>
</tbody>
</table>

Window Forecasting

Learning Profile Science Activity

**Meteorologist:**
You are a meteorologist working for Channel 29 News. The show will “air” in 10 minutes with the weekend’s forecast, but all the equipment is failing. Look out your “windows” and use the clouds to predict the weather forecast for the local community. You can either write your script for the news show explaining your prediction and your reasons for the prediction, create a poster or prop for the news show that shows the audience what you think the weather will do and why, or role-play the part of the meteorologist and verbally present your forecast predictions to the audience.
Look at Sample #_.
You may see small particles of rock and other materials. The particles may look rounded. You may see layers in some rocks.

Look at Sample #_.
You may see large crystals in some of these rocks. Others will not have crystals, but you will see air holes. Some may look like glass. There are no layers.

Look at Sample #_.
These rocks may have crystals or layers. They are formed from other rocks that have been changed by heat and pressure.

The class does the same activity, but more guidance is given for those who may need it.

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### Biology – A Differentiated Lesson Using Sternberg’s Intelligences

**Learning Goals:**

**Know** - Names of cell parts, functions of cell parts

**Understand** - A cell is a system with interrelated parts

**Do** – Analyze the interrelationships of cell parts/functions

  Present understandings in a clear, useful, interesting and fresh way.

*After whole class study of a cell, students choose one of the following sense-making activities.*

**Analytical:** Use a cause/effect chain or some other format you develop to show how each part of a cell affects other parts as well as the whole. Use labels, directional markers, and other symbols as appropriate to ensure that someone who is pretty clueless about how a cell works will be enlightened after they study your work.
**Practical:** Look around you in your world or the broader world for systems that could serve as analogies for the cell.

Select your best analogy (“best” most clearly matched, most explanatory or enlightening).

Devise a way to make the analogy clear and visible to an audience of peers, ensuring that they will develop clearer and richer insights about how a cell works by sharing in your work.

Be sure to emphasize both the individual functions of cell parts and the interrelationships among the parts.

**Creative:** Use unlikely stuff to depict the structure and function of the cell, with emphasis on interrelationships among each of the parts. You should select your materials carefully to reveal something important about the cell, its parts, and their interrelationships your ahas should trigger ours.

or

Tell a story that helps us understand a cell as a system with interdependent actors or characters, a plot to carry out, a setting, and even a potential conflict. Use your own imagination and narrative preferences to help us gain insights into this remarkable system.

Students share their work in a 3x format – first triads of students who completed the same option, then triads with each of the 3 categories represented.

*This is then followed by a teacher-led, whole class discussion of cells as systems, then a “Teacher Challenge” in which the teacher asks students to make analogies or other sorts of comparisons between cells, cell parts, or interrelationships and objects, photos, or examples produced by the teacher.*
Science Agenda on
Chemical Problems in the Environment

**IMPERATIVES** *(You must do these…)*

1) Select a chemical problem in the environment and
   • Define and describe the difficulties it presents
   • Be sure to discuss why, where, and to whom/what

   Your choices are:
   • Global Warming/Greenhouse Effect
   • Ozone Depletion
   • Acid Rain
   • Air Pollution
   • Water Pollution (including thermal pollution and land/ground pollution)

2) Complete a map showing where the problem exists, what/who is affected by it, and the degree of impact

3) Develop a talking paper that describes present and future solutions, as well as your recommendations.

**NEGOTIABLES** *(You must do at least one of these…)*

1) Determine the approximate costs of the problem of one badly affected region and develop a graphic that shows total costs and what makes the costs (for example: Health costs, clean-up costs, lost revenues from land, etc.)

2) Develop a timeline of the evolution of the problem over the last 100 years, including significant dates, and factors that contributed to the change. Take the timeline into the future based on your current understanding of trends associated with the problem.

**OPTIONS** *(You may do one or more of these…)*

1) Create a Gary Larson-type cartoon or an editorial cartoon that makes a commentary on the problem.

2) Prepare a fictionalized account, but based on scientific fact, of a person who lives in a badly affected area. Your goal is to put a human face on the problem.

3) Develop a 60-second public service announcement (taped) to raise audience awareness of the problem and introduce positive actions citizens might take to improve the prognosis for the future.
**Imperatives (you must do these...)**

1. Select a chemical problem in the environment, define/describe the difficulties it presents, why, where, and to whom/what.

   Your choices are: global warming/greenhouse effect, ozone depletion, acid rain, air pollution, and land/ground pollution.

2. Complete a map showing where the problem exists, what/who is affected by it, and degree of impact.

3. Develop a talking paper that describes present and future solutions, as well as your recommendations.

**Negotiables (You must do at least one of these)**

1. Determine approximate costs of the problem in one badly affected region and develop a graphic that show total costs and what makes the costs (for example: health costs, clean-up costs, lost revenues from land, etc.

2. Develop a time line of the evolution of the problem over the last 100 years, including significant dates, and factors that contributed to the change. Take the timeline into the future based on your current understanding of trends associated with the problem.

**Options (You may do 1 or more of these)**

1. Create a Gary Larsen-type cartoon or an editorial cartoon that makes a commentary on the problem.

2. Prepare a fictionalized account, but based on scientific fact, of a person who lives in a badly affected area. Your goal is to put a human face on the problem.

3. Develop a 60 second public service announcement (taped) to raise audience awareness of the problem and introduce positive actions citizens might take to improve the prognosis for the future.

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Based on work of Ellyn Shaw
Les Bois Junior High—Boise, Idaho

To be an effective citizen, it is necessary to know how to deal with problems related to science and technology.
RAFTs can...

- Be differentiated in a variety of ways: readiness level, learning profile, and/or student interest
- Be created by the students or incorporate a blank row for that option
- Be used as introductory “hooks” into a unit of study
- Keep one column consistent while varying the other columns in the RAFT grid
### Biology: Cell Structure and Function

**Know:** Parts of cell & functions of each part  
**Understand:** Cells contain specialized structures necessary for life.  
**Do:** Explain function of each structure and relate to the organism as a whole

<table>
<thead>
<tr>
<th>Role</th>
<th>Audience</th>
<th>Format</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talk Show Host</td>
<td>TV Viewers</td>
<td>Interview with a cell</td>
<td>So, what makes you tick?</td>
</tr>
<tr>
<td>Artist</td>
<td>Art Gallery Owner</td>
<td>Exhibit Poster</td>
<td>What's worth looking for in here?</td>
</tr>
<tr>
<td>Head Coach</td>
<td>Team Members</td>
<td>Starting Lineup</td>
<td>Positions and their role in the game plan</td>
</tr>
<tr>
<td>Principal</td>
<td>Department Heads</td>
<td>List of Duties</td>
<td>This department is going to work!</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Cell</td>
<td>Staff Meeting Top 10 List</td>
<td>What matters most to us?</td>
</tr>
</tbody>
</table>
High School Biology RAFT

Know: (See terms below the RAFT)

Understand:

Plants and animals have a symbiotic relationship with photosynthesis and respiration. Photosynthesis and respiration are essential to human life.

Be Able to Do:

Explain the relationship between photosynthesis in plants and respiration in humans
Explain and connect the equations for photosynthesis and respiration
Explain the nature of human dependence on plants

<table>
<thead>
<tr>
<th>ROLE</th>
<th>AUDIENCE</th>
<th>FORMAT</th>
<th>TOPIC</th>
</tr>
</thead>
<tbody>
<tr>
<td>An animal of your choice</td>
<td>A plant of your choice</td>
<td>Song</td>
<td>Why I am grateful to you</td>
</tr>
<tr>
<td>Trees &amp; shrubs in the local park</td>
<td>Real Estate Developer</td>
<td>Numbered List</td>
<td>Our needs, why you should care, and what you should do about them</td>
</tr>
<tr>
<td>Athlete</td>
<td>Coach</td>
<td>Letter (with sketches, if you’d like)</td>
<td>For better or worse: What plants have to do with my performance this year</td>
</tr>
<tr>
<td>High school biology student</td>
<td>3rd Grader</td>
<td>Annotated diagram</td>
<td>What plants have to do with you</td>
</tr>
<tr>
<td>Scientist preparing for a Mars mission</td>
<td>Financial backers for the trip</td>
<td>Presentation</td>
<td>Plants—and plant substitutes: The unsung heroes of the mission</td>
</tr>
<tr>
<td>A kid</td>
<td>Mom</td>
<td>Conversation</td>
<td>The lettuce is turning yellow! Are we threatening the balance of nature?!</td>
</tr>
</tbody>
</table>

Important Terms: photosynthesis, respiration, carbon dioxide, sunlight, blue light or green light (or other colors), sugar, water, mitochondria, chloroplast, stoma (stomata), lactic acid, aerobic respiration, anaerobic respiration, autotroph, heterotroph, sunny, cloudy, cool, warm, long sunny days, short days, lungs, light energy, food energy

Annette Hanson, Timberline High School, Boise, Idaho
HIGH SCHOOL TIERD LESSON:
PHYSICS

KNOW: Basic Vocabulary (e.g., efficiency, force, velocity, mass, friction)

UNDERSTAND: Aerodynamics are improved by proper manipulation of area, mass, & friction.

DO: Construct objects that project themselves through space in the different directions as a demonstration of effective manipulation of the objects' area, mass, & friction

♦ Paper Airplanes
  ♦ That fly for distance
  ♦ That fly for hang time
  ♦ That fly for tricks

♦ Kites
  ♦ Box
  ♦ Diamonds
  ♦ Triangle
  ♦ Layered

♦ Pin Wheel: Tilt propellers different ways to create:
  ♦ Forward motion
  ♦ Backward Motion
  ♦ Upward Motion

Great opportunity to make teams of theoreticians, scholars, designers and builders.

George Murphy’s Biology Class
Key Concepts: Energy, Action, Reaction

1. Introductory demonstration on key concepts
2. Students develop a hypothesis about the reaction they saw
3. Choices of ways to test their hypotheses:
   * Body Mass Index, *Computer activity,
   * Complete additional experiments
   Study guide w/ on-line resources
4. In end, all students develop and demonstrate an experiment that tests their hypotheses about how energy works
   Students can work alone or with a partner
   4 question guides available for scaffolding

“This is the study of life. If my students can’t see the connection between what we study and their own lives, I tell them to come to me and we’ll figure it out together. If we can’t, we probably shouldn’t be studying it. It’s not the standards that makes science relevant & vital for the students.”

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1. Be sure instructional plans align with KUDs.
2. Base instructional plans on formal and informal formative assessment information.
3. Use respectful tasks and flexible grouping (no bluebirds, buzzards, and wombats).
4. Select instructional strategies for differentiation that address both the nature of the content/goals and the needs of students (in terms of readiness, interest, and approach to learning).
5. Address students’ variance in readiness, interest, and learning profile.
The Game Plan For Management

1. Teacher leadership for a shared vision of a classroom that works for everyone

2. Routines developed by teacher and students to support the vision

3. A balance between structure and flexibility

4. A planned flow of whole class and small group/individual instruction with a focus on learning

Defensible Differentiation Requires Flexible Classroom Routines

It requires an “orderly, enabling environment.”

These are found in smoothly run classrooms, with an often looser (though not loose) structure, and a wider range of routines and instructional strategies in evidence. These classrooms were most likely to focus on meaning and understanding.

Leadership

• Has a vision for something good
• Has the capacity to share the vision & enlist others in it
• Builds a team for achieving the vision
• Renews commitment to the vision
• Celebrates successes
• ABOUT PEOPLE

First be a leader

Management

• Plans schedules
• Handles details
• Prepares materials
• Arranges furniture
• Orchestrates movement
• Practices routines
• Troubleshoots
• ABOUT MECHANICS

Then be a manager

SAMPLE ROUTINE

Introduce and teach concept [idea, skill] → Provide examples to illustrate → Allow for in-class practice → Assign homework

What subject does this look like?

What students might experience the most success within the structure of this routine?

What students might experience the least success within the structure of this routine?
A flexible learning environment includes opportunities to focus on individual needs and opportunities for group conversation and collaboration.

Teaching and learning in a differentiated classroom form a rhythm of “breaking apart” and “coming together.” Goals that are specific to individuals or small groups are best achieved in times of breaking apart. Goals that are shared by the class as a whole are best achieved in times of coming together.

### An Example of Planned Time for Addressing Skill Development

<table>
<thead>
<tr>
<th>WHOLE CLASS</th>
<th>DIFFERENTIATED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Middle Ages &amp; feudal system</td>
<td>Background jigsaw on castles or life in the various positions in the feudal system—readings assigned by reading level, roles by interest/accessibility and using pictures, maps, videos, recordings, articles, websites, and books</td>
</tr>
<tr>
<td>Additional whole class investigation of life in the middle ages using music, stories, images, dance</td>
<td>Complex Instruction task on castles and castle defense using Jigsaw knowledge. Roles reflect multiple backgrounds/strengths</td>
</tr>
<tr>
<td>Skills work by station and small group on writing skills for current unit as well as writing needs from past in preparation for upcoming performance task. Teacher meets with small groups for targeted work throughout the work time.</td>
<td></td>
</tr>
<tr>
<td>Whole Class</td>
<td>Differentiated</td>
</tr>
<tr>
<td>-------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Administer pre-assessment</td>
<td>Tiered lesson on writing a persuasive paragraph (Big Mac &amp; Quarter Pounder lesson)</td>
</tr>
<tr>
<td>Review prompt, introduce elements of persuasive writing, analyze a persuasive paragraph</td>
<td>Re-teaching for students who need additional support, small group instruction for students whose paragraphs are solid and need to stretch</td>
</tr>
<tr>
<td>Tiered lesson on writing a persuasive paragraph</td>
<td>Practice based on interest (topic choice), &amp; readiness (skills of persuasive writing) in centers</td>
</tr>
<tr>
<td>Instruction on using supporting details to make an argument</td>
<td>Peer review of writing based on whole-class and individual criteria—purposeful grouping</td>
</tr>
</tbody>
</table>

ETC.

<table>
<thead>
<tr>
<th>Whole Class</th>
<th>Differentiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discussion on elements in our lives and how they interact.</td>
<td>Students work in quads or triads to analyze a story to identify story elements and analyze how they work together. Group size, story choice, and graphic organizer used to guide work will vary based on pre-assessment results. Teacher will meet with small groups throughout the class period.</td>
</tr>
<tr>
<td>Introduction to unit. Review of elements of literature using matching exercise in which some students have cards w/ element names, some have definitions, some have examples from stories students have read in common. Discussion of things we analyze in our daily lives and how we go about it—create a set of steps in analysis.</td>
<td>Practice with themes in brief “stories” –Stories vary Identify and support your conclusion Identify and demonstrate how the elements contribute to understanding a theme. Develop a story in which elements interact to point to a theme.</td>
</tr>
<tr>
<td>Whole class review of theme, proposing themes in lives of famous people, analyzing how they arrived at those themes.</td>
<td></td>
</tr>
</tbody>
</table>

**Flow of 3rd grade lesson sequence in a unit on persuasive writing**

**Whole Class Differentiated**

- Administer pre-assessment
- Review prompt, introduce elements of persuasive writing, analyze a persuasive paragraph
- Tiered lesson on writing a persuasive paragraph (Big Mac & Quarter Pounder lesson)
- Re-teaching for students who need additional support, small group instruction for students whose paragraphs are solid and need to stretch
- Practice based on interest (topic choice), & readiness (skills of persuasive writing) in centers
- Peer review of writing based on whole-class and individual criteria—purposeful grouping

**Early Learning Sequence in an “Interaction of Elements in Fiction” Unit**

- Discussion on elements in our lives and how they interact.
- Students work in quads or triads to analyze a story to identify story elements and analyze how they work together. Group size, story choice, and graphic organizer used to guide work will vary based on pre-assessment results. Teacher will meet with small groups throughout the class period.
- Whole class review of theme, proposing themes in lives of famous people, analyzing how they arrived at those themes.
- Practice with themes in brief “stories” –Stories vary Identify and support your conclusion Identify and demonstrate how the elements contribute to understanding a theme. Develop a story in which elements interact to point to a theme.

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1. Lead people first—then manage routines and processes that support success.
2. Make students allies in understanding and enacting differentiation.
3. Think about “come together” “break-apart” lesson flow.
4. Try a two-column planning format to make visual the logic of differentiation.