Integrating STEM in the World Language Classroom

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pinterest.com/mrlutz

tiny.cc/STEMWL

Inspiration

"The real essence of STEM is that it is bound together by soft skills, **project-based learning**, **critical thinking**, **collaboration** and **communication**. These are the 21st century tools that all students need to be **successful** right **now** and in the **future**."

- **Katrina Griffin,** 2017 ACTFL Teacher of the Year

Today's Session

- Moving from Topic to Theme
- Content-Related WL
- Methodology
- Examples
- Resources

Learning Targets

- I can state why content-related world language instruction is impactful on student learning.
- I can choose age and level appropriate themes for my students.
- I can plan how to implement STEM-integrated units.
- I can lead a Gouin Series for an experiment or engineering demonstration.
- I can identify sources for leading STEM-integrated world language instruction.

Traditional WL Topics

- DAILY ROUTINE
- CAREERS
- MY BIRTHDAY
- FOOD
- COLORS/NUMBERS
- SCHOOL
- FAMILY
- SHOPPING
- THE HOUSE
- TRAVEL

Moving from Topic to Theme

- In order to move students from one level of proficiency to the next, it is essential to provide opportunities for learning that *go beyond vocabulary lists and topics*.
- Expand your teaching to broaden the experience for your students and enrich their language learning through *meaningful immersion activities based on a more thematic approach*.
- How do we get there from the textbooks and units we have?

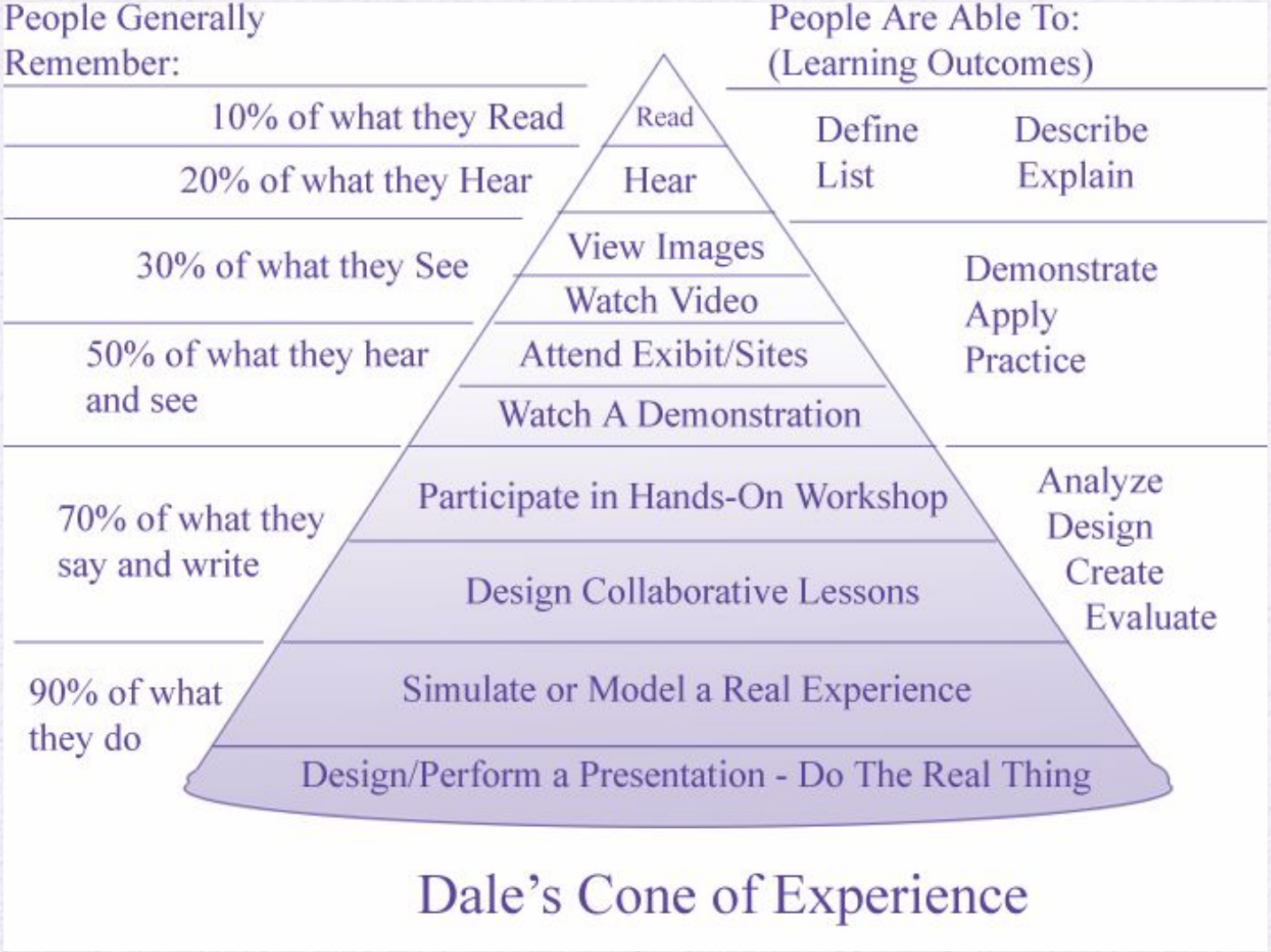
Context - Content

- Start with your vocabulary list and your grammar goals.
- Then broaden the scope.
- Why are they learning this?
- What is the purpose?

Content-Related WL

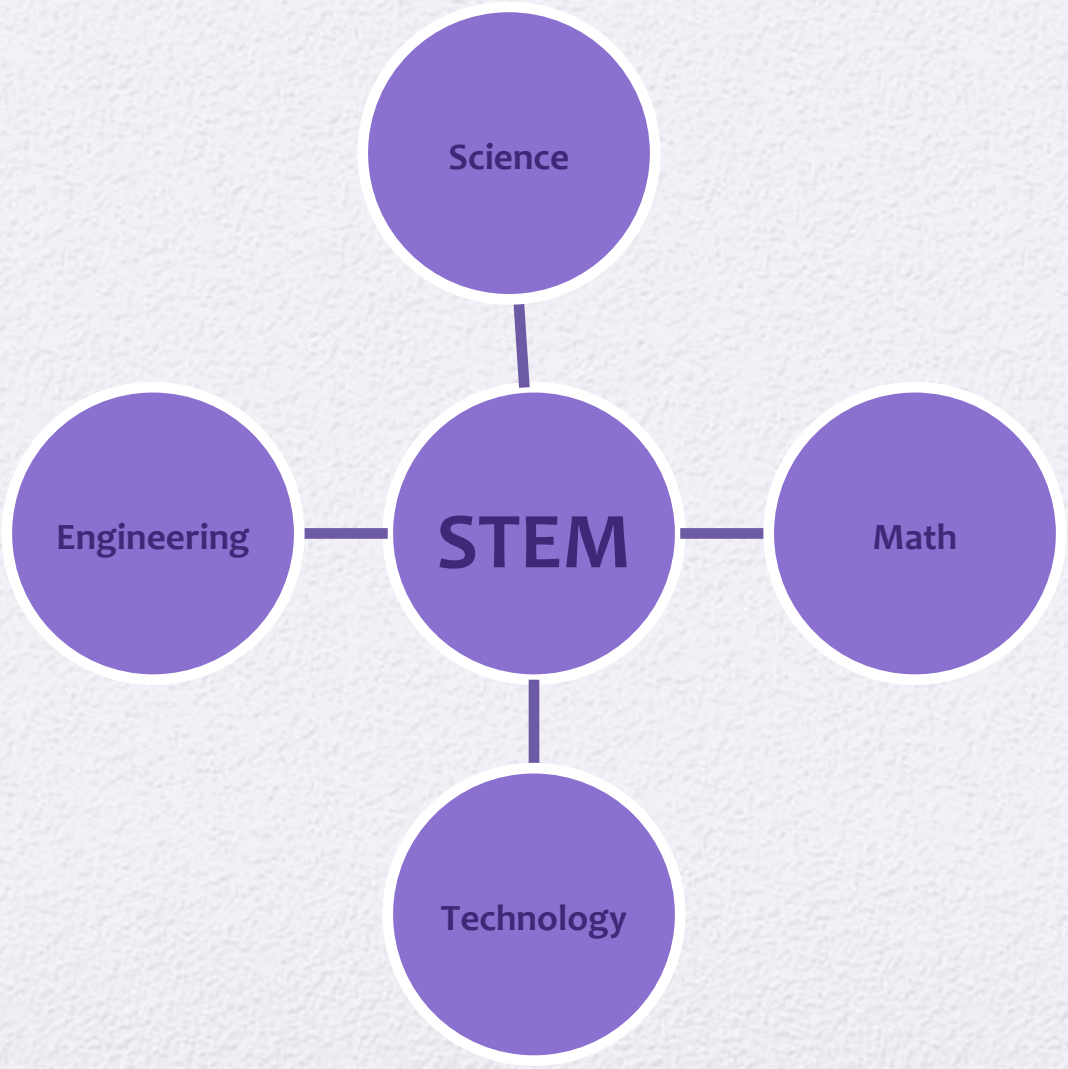
- Meaningful context
- Negotiation of meaning (Long)
- Comprehensible input (Krashen)
- Real communication (Hall)
- Cognitively demanding, intrinsically interesting (Curtain & Pesola)
- Motivation (Pica, Genesee, Johnson, Swain)
- Meaningful repetition and recycling of vocabulary
- Support student understanding of academic and Common Core Standards

Benefits of Content-Related WL



CBI Theme Possibilities

STEM



What is STEM?

- Science
- Technology
- Engineering
- Mathematics

- INTEGRATION OF ONE OR MORE DISCIPLINES TO SOLVE REAL-WORLD CHALLENGES

Turn and Talk

Do you have any interests (outside of the language that you teach) that you'd like to share with your students?

Why STEM?

- Need to prepare graduates skilled in science, technology, engineering, mathematics AND a language other than English.
- STEM provides real-life problem solving skills.
- Fosters critical thinking, science literacy, and innovation.
- Globally connected workforce.

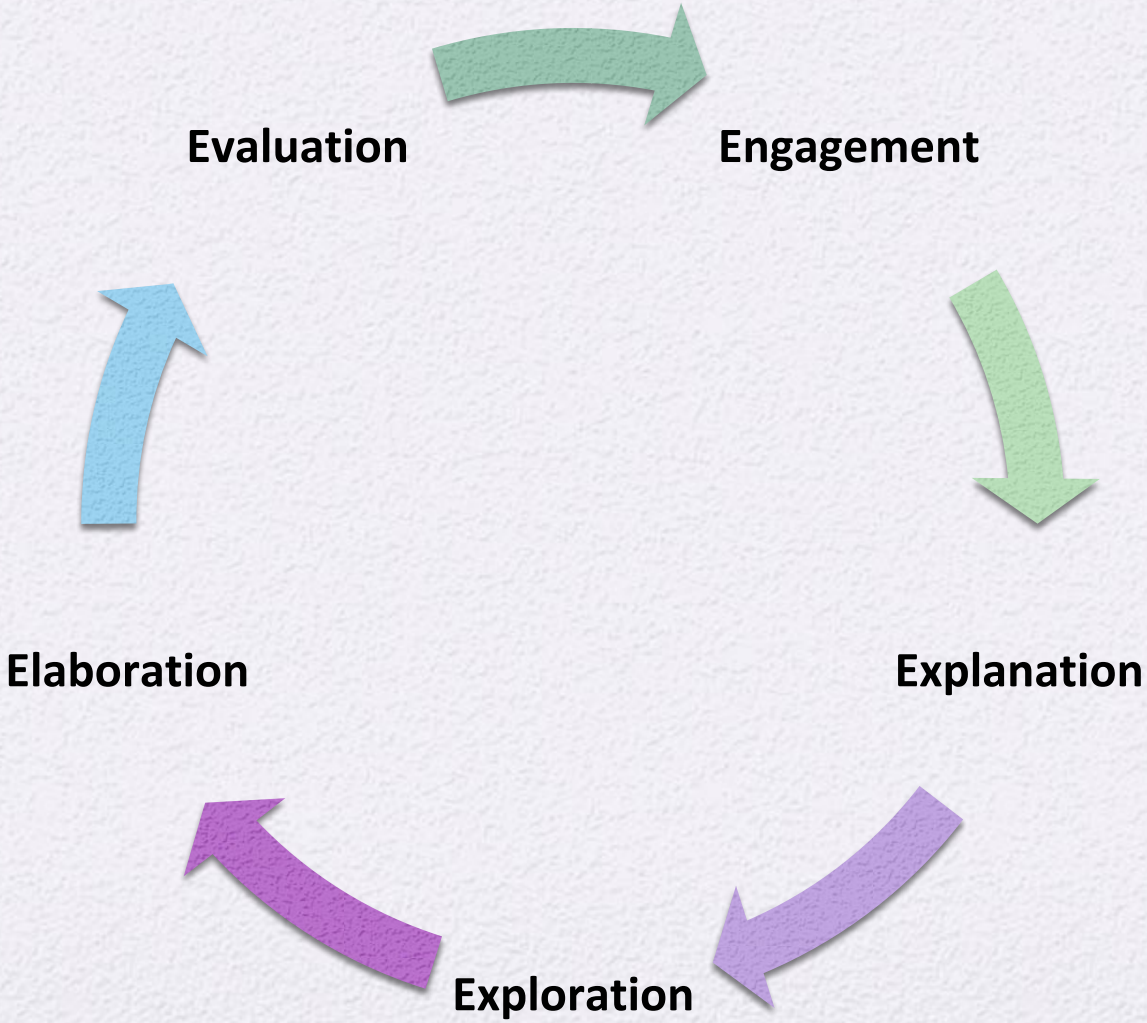
Standards-Based

Connections

Making Connections: Learners build, reinforce, and expand their knowledge of other disciplines while using the language to develop critical thinking and to solve problems creatively.

Acquiring Information and Diverse Perspectives: Learners access and evaluate information and diverse perspectives that are available through the language and its cultures.

The 5 E's of STEM Design



The 5 E's of STEM Design

- **Engagement**: mentally engage the students with an event or question; help students to make connections with what they know and can do.
- **Explanation**: students explain their understanding of the concepts and processes they are learning. Teachers clarify students' understanding and introduce new concepts and skills.
- **Exploration**: students working together with hands-on activities, clarifying their own understanding of major concepts and skills.
- **Elaboration**: challenge students to apply what they have learned and build on their understanding of concepts to extend knowledge and skills.
- **Evaluation**: students assess their own knowledge, skills, and abilities; opportunity for teachers to assess the learners

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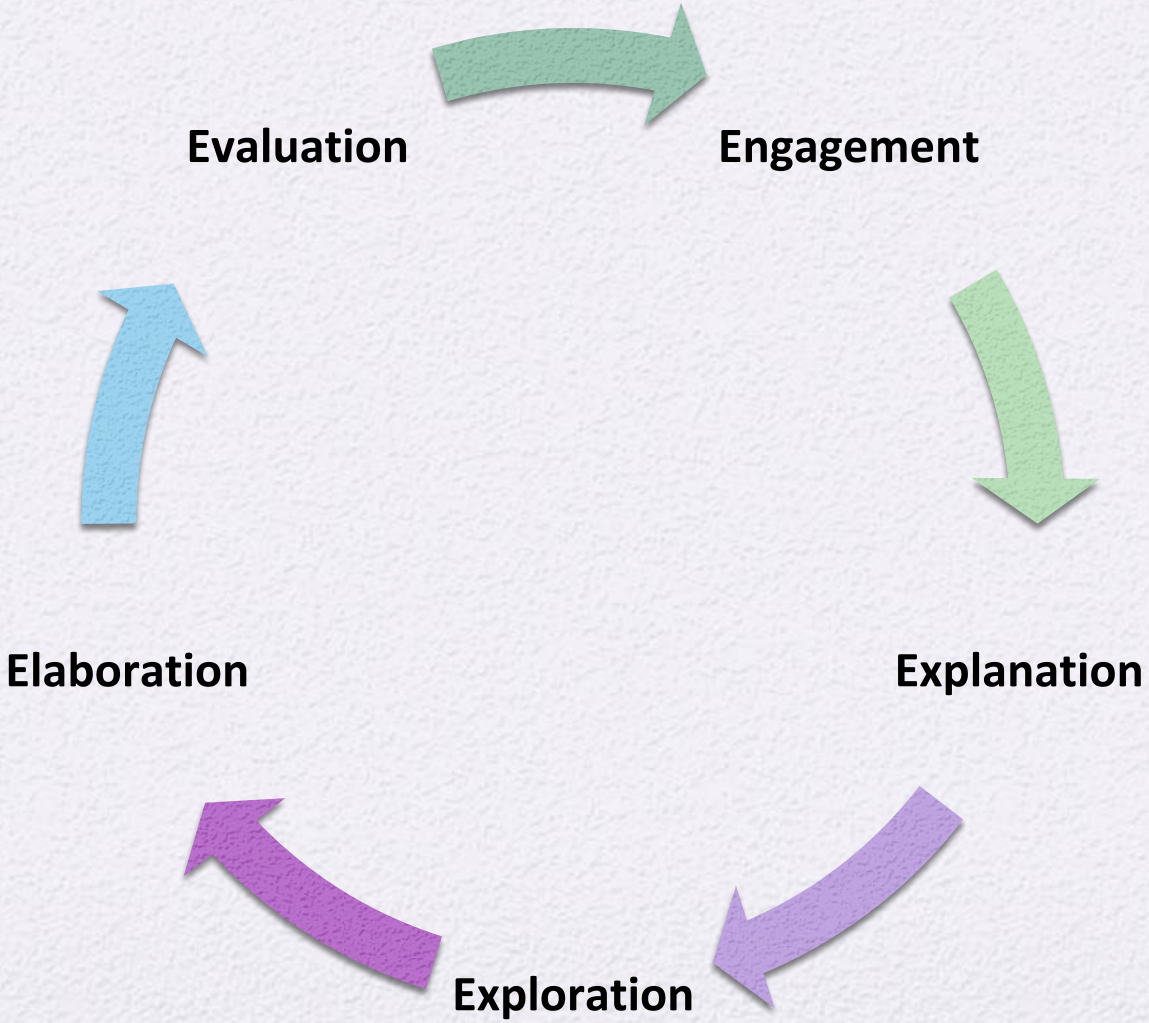
How do these correspond to WL teaching & learning?



The 5 E's & WL Lessons

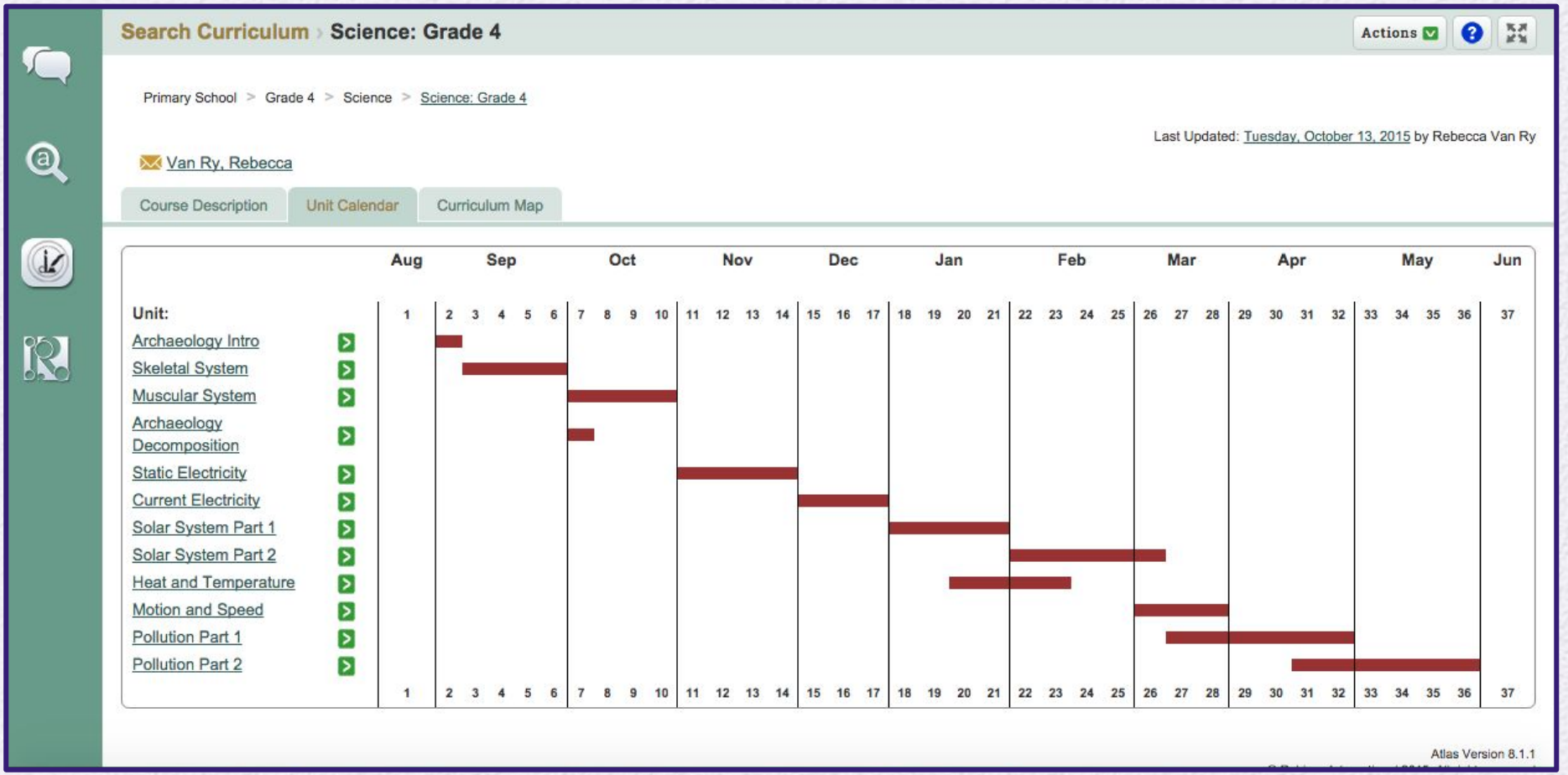
STEM 5E	Student WL Learning	WL Instruction	Language Acquisition
Engagement	Teaser/Activation/ Anticipatory Set	Beginning	Input
Exploration	Learning via exploration	Beginning/ Middle	Input-intake
Explanation	Demo understanding	Middle	Intake-output
Elaboration	Application/Transfer	Middle/ Ending	Output
Evaluation	Evaluation/Assessment/ Student reflection	Ending/ Teacher reflection	Output-assess ment

Next Generation Science Standards

2.Structure and Properties of Matter

2.Structure and Properties of Matter
Students who demonstrate understanding can:
2-PS1-1. Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]
2-PS1-2. Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.* [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]
2-PS1-3. Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]
2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot. [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

Methodology



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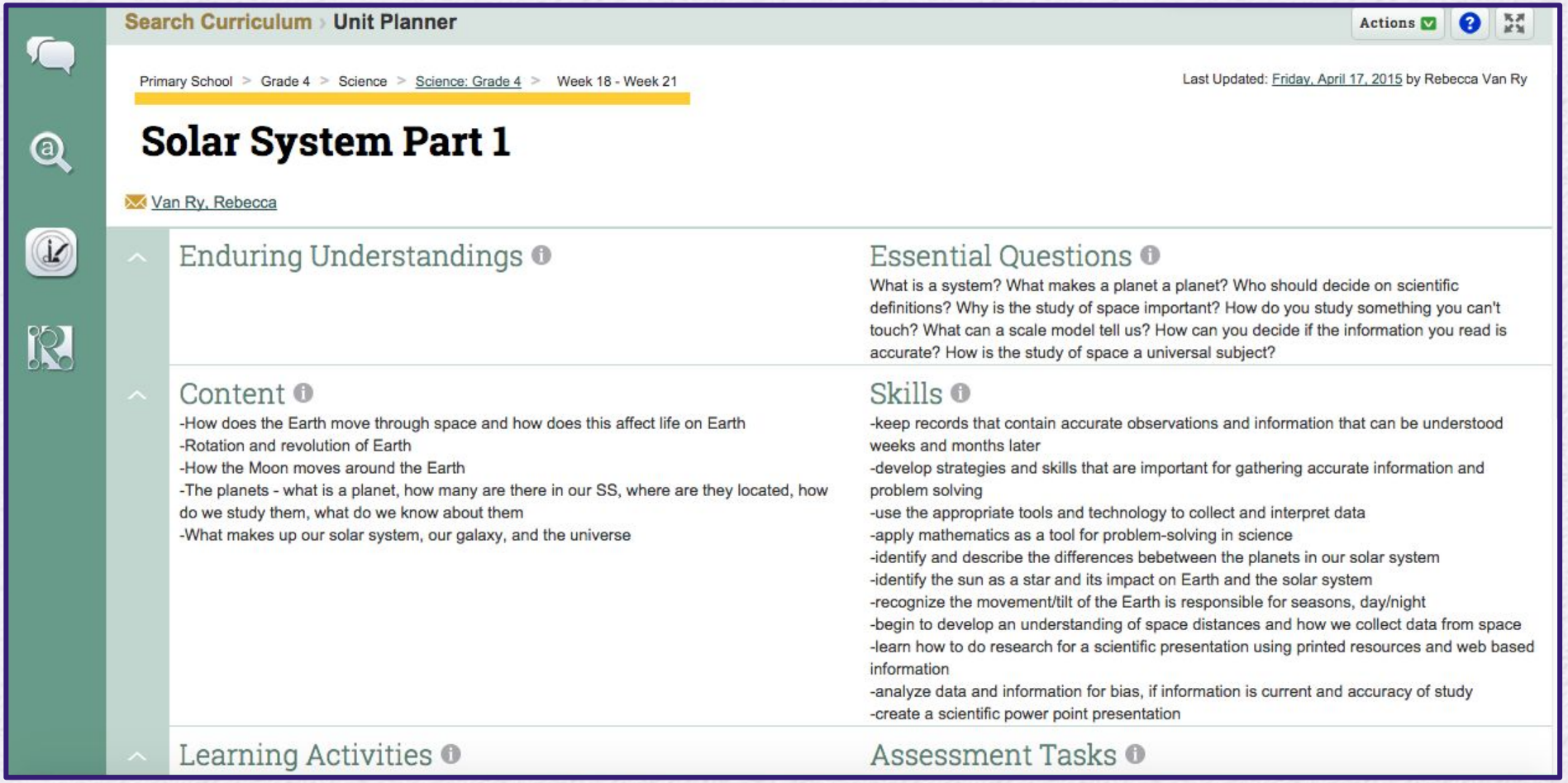


Search Curriculum › Unit Planner

Actions

Primary School > Grade 4 > Science > Science: Grade 4 > Week 18 - Week 21

Last Updated: Friday, April 17, 2015 by Rebecca Van Ry

Solar System Part 1

Van Ry, Rebecca

Enduring Understandings

Essential Questions

What is a system? What makes a planet a planet? Who should decide on scientific definitions? Why is the study of space important? How do you study something you can't touch? What can a scale model tell us? How can you decide if the information you read is accurate? How is the study of space a universal subject?

Content

-How does the Earth move through space and how does this affect life on Earth
-Rotation and revolution of Earth
-How the Moon moves around the Earth
-The planets - what is a planet, how many are there in our SS, where are they located, how do we study them, what do we know about them
-What makes up our solar system, our galaxy, and the universe

Skills

-keep records that contain accurate observations and information that can be understood weeks and months later
-develop strategies and skills that are important for gathering accurate information and problem solving
-use the appropriate tools and technology to collect and interpret data
-apply mathematics as a tool for problem-solving in science
-identify and describe the differences bebetween the planets in our solar system
-identify the sun as a star and its impact on Earth and the solar system
-recognize the movement/tilt of the Earth is responsible for seasons, day/night
-begin to develop an understanding of space distances and how we collect data from space
-learn how to do research for a scientific presentation using printed resources and web based information
-analyze data and information for bias, if information is current and accuracy of study
-create a scientific power point presentation

Learning Activities

Assessment Tasks

Methodology

Pre-K

Month	Topic
September	Five Senses
October	What is Fall?
November	Food Pyramid
December	Winter Animals
January	Ice
February	Shadows
March	Wind
April	Spring
May	Color

Methodology

Overview of Elementary Content Standards

Science

Overarching skills

- Inquiry
- Hypothesis
- Prediction
- Problem/Solution

Study areas

Life Science
Earth Science
Physical Science
Personal Perspective
Technology
Science as Inquiry

Social Studies

Overarching Skills

- Culture
- Time, Continuity, and Change
- People, Places, and Environment
- Individual Development and Identity
- Individuals, Groups, and Institutions
- Power, Authority, and Governance
- Production, Distribution, and Consumption
- Science, Technology, and Society
- Global Connections
- Civic Ideals and Practices

Areas of Study

Civics
Economics
Geography
U.S. History
World History

Language Arts

Overarching Skills

- Word Analysis, Fluency, Vocabulary Development
- Reading Comprehension
- Literary Response and Analysis
- Written and Oral Language Conventions
- Listening and Speaking

Areas of Study

Concepts of Print
Phonemic Awareness
Literary Genres
Story Parts
Sentence Structure
Organizing Ideas
Oral Presentation

Mathematics

Overarching Skills

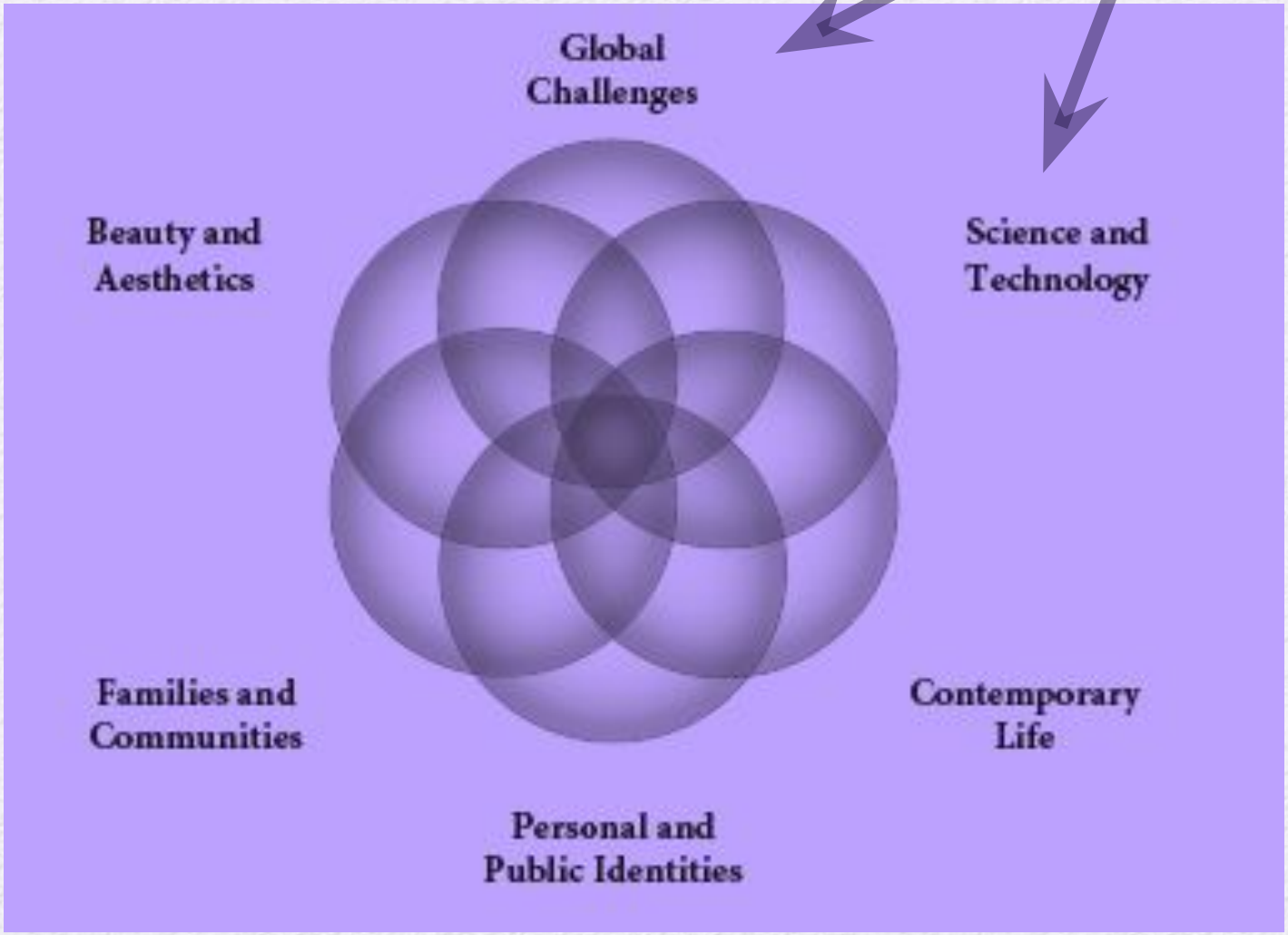
Problem Solving
Reasoning and Proof
Communication
Connections
Representations

www.nctm.org

Areas of Study

Numbers and Operations
Geometry
Measurement
Probability

Methodology



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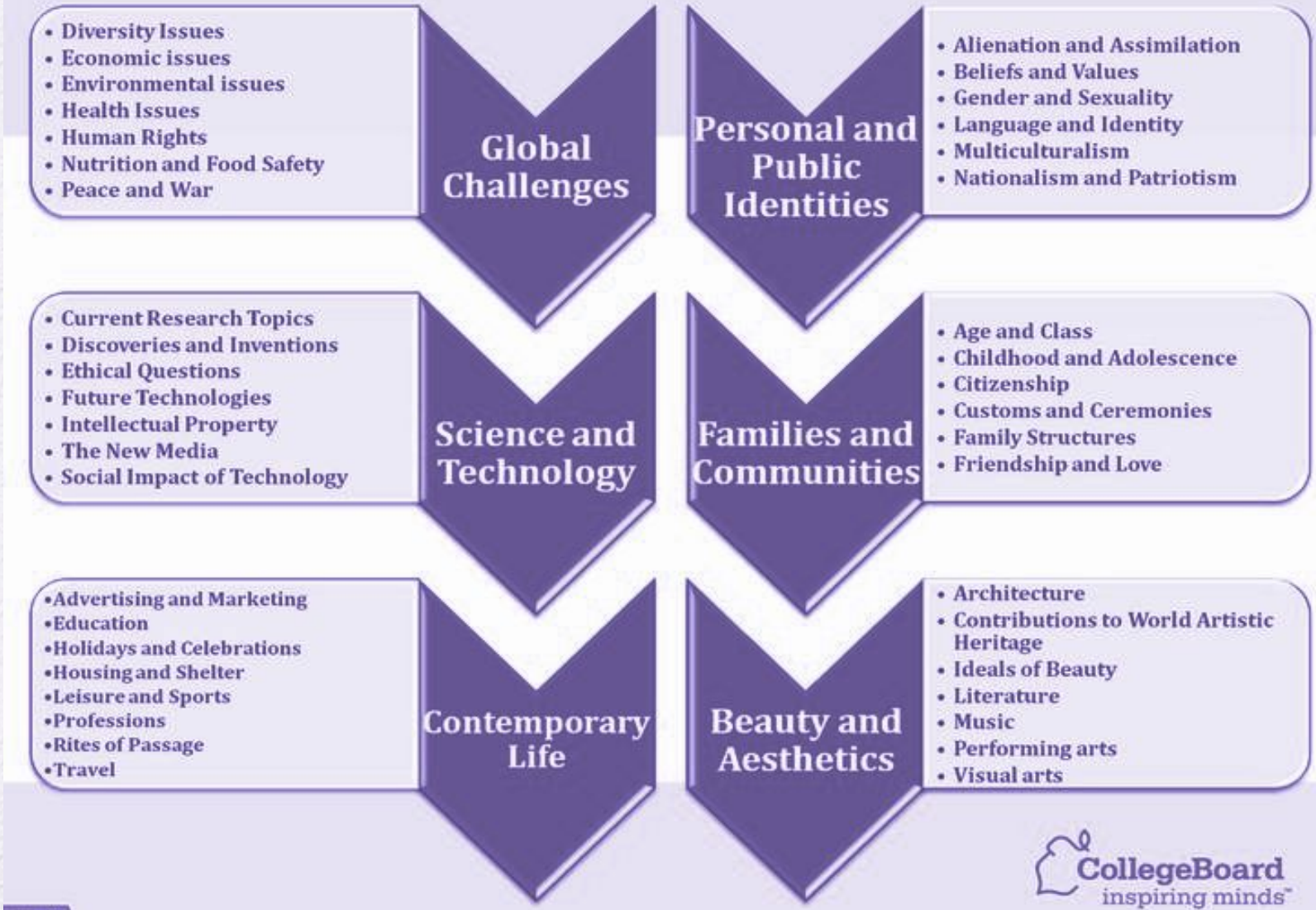

Methodology

Turn and Talk

How might you go about planning for using STEM topics in your school setting?

Methodology

Unit Plan Format

Enduring Understanding
Essential Questions
Can-Do Statements
Targeted Standards
Grammatical Expressions
Vocabulary
Materials
Lesson Plans
Performance Assessment

Turn and Talk

What are some barriers to teaching STEM topics in the TL?

Connecting to the real world

- TAKE WHAT YOU HAVE
- DECIDE HOW IT CONNECTS TO CONTENT AND GLOBAL STRANDS
- CREATE BROADER QUESTIONS TO GIVE A BROADER FOCUS
- CONSTRUCT INTERACTIVE RESPONSIVE ACTIVITIES

Challenges

- Training
- Content Knowledge
- Materials
- Space
- “Turf Wars”
- Planning Time

All that is great, but…

Strategies for Keeping Language and Content Comprehensible

- **Linguistic strategies:** paraphrase, familiar language, slow rate, tone of voice, re-entering of new language
- **Extra-linguistic strategies:** visuals, props, gestures, context, informing students of objective
- **Interaction:** clarification requests, verbal and non-verbal comprehension checks, question sequences

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- Hold students **accountable** for using the target language in class
- Teach **functional chunks**
- Establish an **environment** where students feel comfortable to speak

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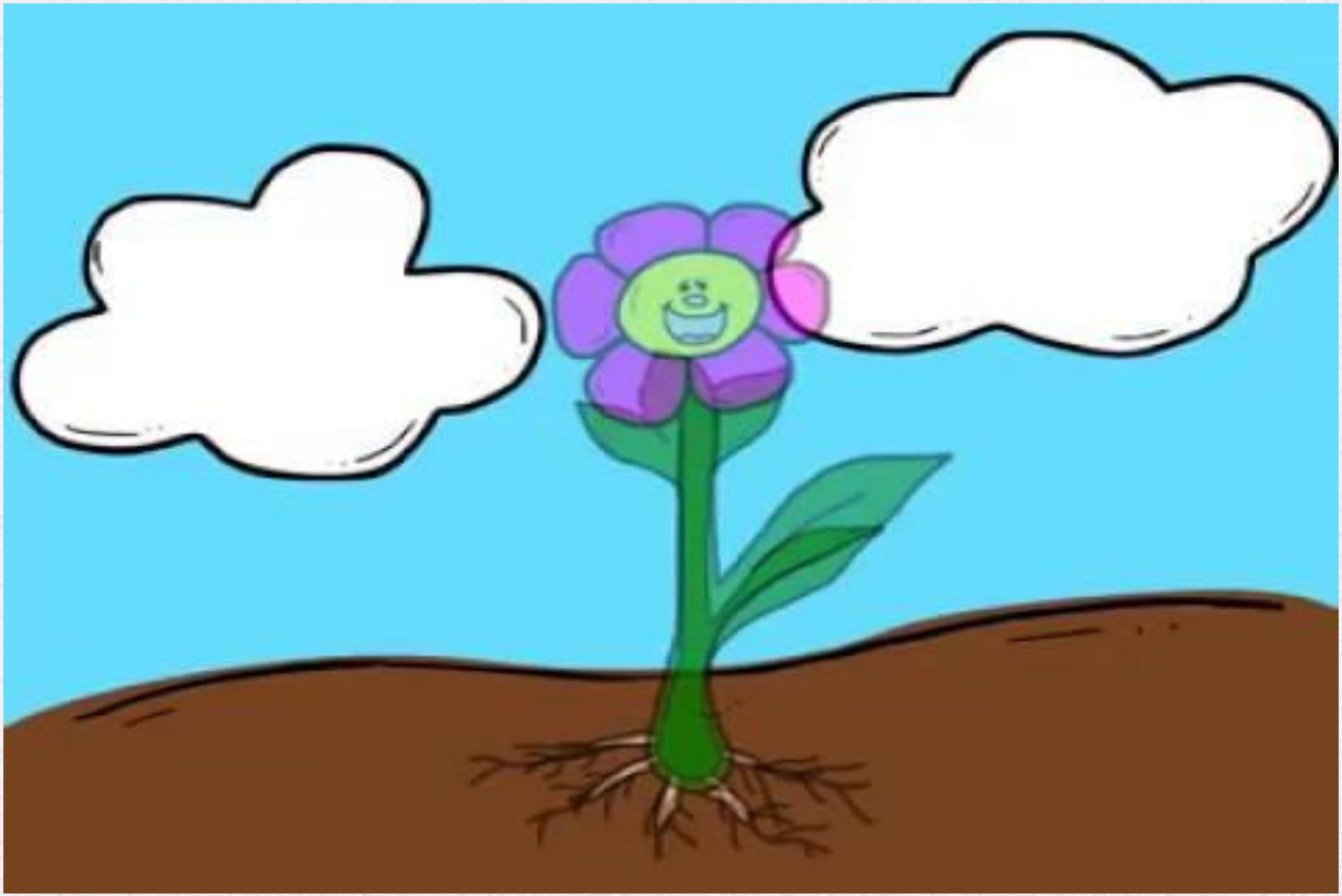
Strategies for Keeping Language and Content Comprehensible

- Provide **linguistic scaffolding**
  - Word walls
  - Word banks
  - Sentence starters
  - Forced choice questions
  - Modeling

How Do Plants Grow?

How Do Plants Grow?



AINSLIE

La croissance de ma plante

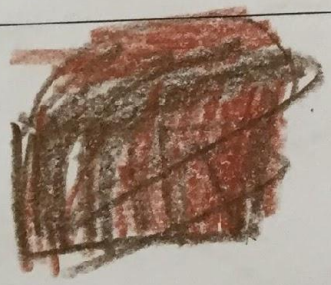
Ainslie #21

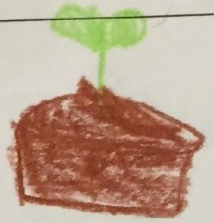
la date	activité / je vois	la taille
7 avril		0cm
9 avril		1 cm
10 avril		1 cm

la date	activité / je vois	la taille
16 avril		
21 avril		
23 avril		

La croissance de ma plante

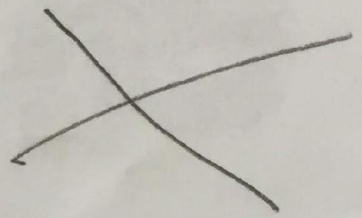
Annabelle #35

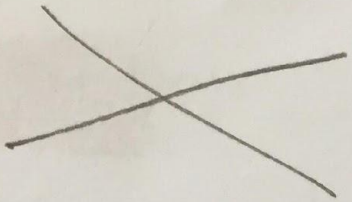
la date	activité / je vois	la taille
7 avril		0 cm
9 avril		0cm
10 avril		0cm

la date	activité / je vois	la taille
16 avril		5cm
21 avril		5cm
23 avril		

La croissance de ma plante

Annabelle

la date	activité / je vois	la taille
24 avril		6cm
28 avril		7cm
30 avril		

la date	activité / je vois	la taille
1 mai		
5 mai		9cm
7 mai		10cm

Annabelle

How Do Plants Grow?

How Do Plants Grow?

How Do Plants Grow?

How Do Plants Grow?

How Do Plants Grow?

Challenges

Share

How could a garden unit support your target language?

Share

Russian Class

Mandarin Class

Spanish Class

Japanese Class

Portuguese Class

French Class

Italian Class

Urdu Class

Arabic Class

German Class

Hindi Class

Latin Class

Life Cycles

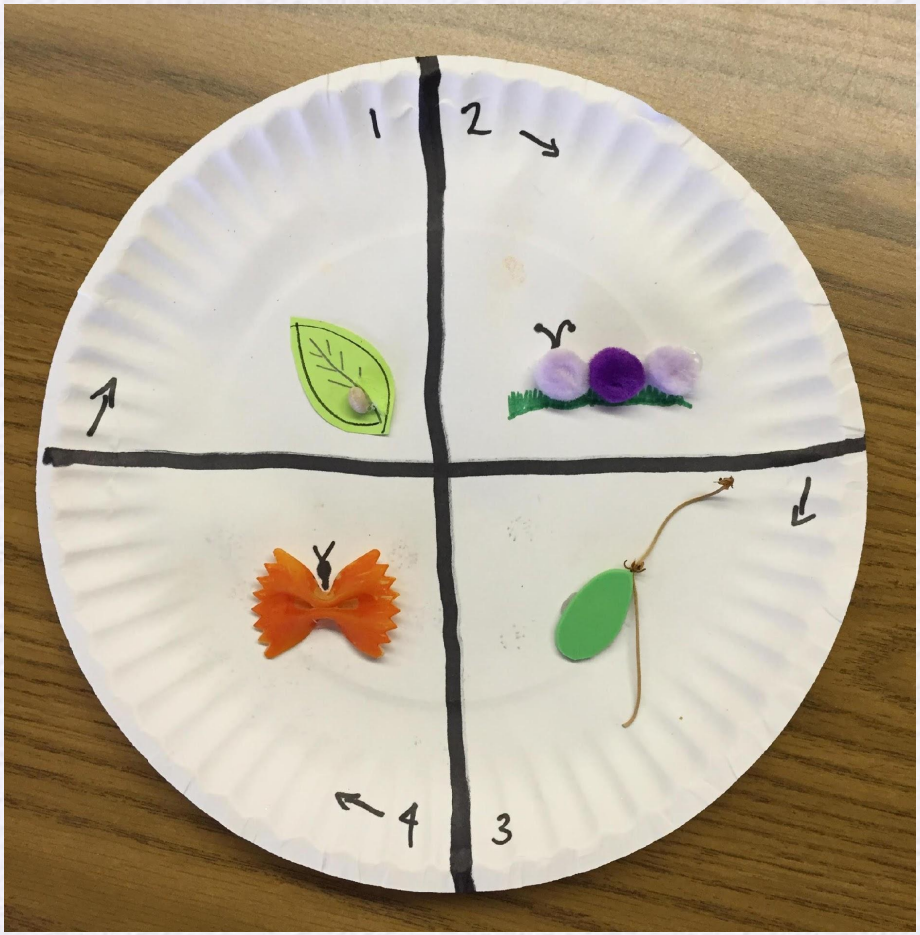
El Ciclo de Vida del Pollito

1	2	3	4	5
				

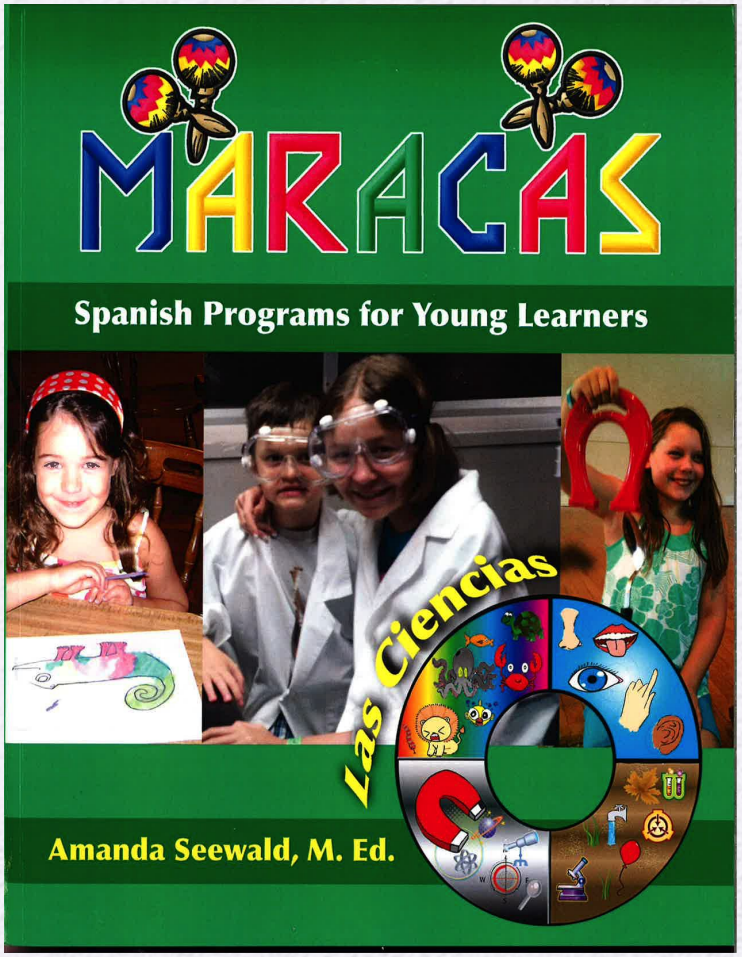
Life Cycles

Life Cycles

Life Cycles



Matter



MARACAS

El Espacio

¿Dibuja tres cosas y explica a un amigo(a)?

Experimento

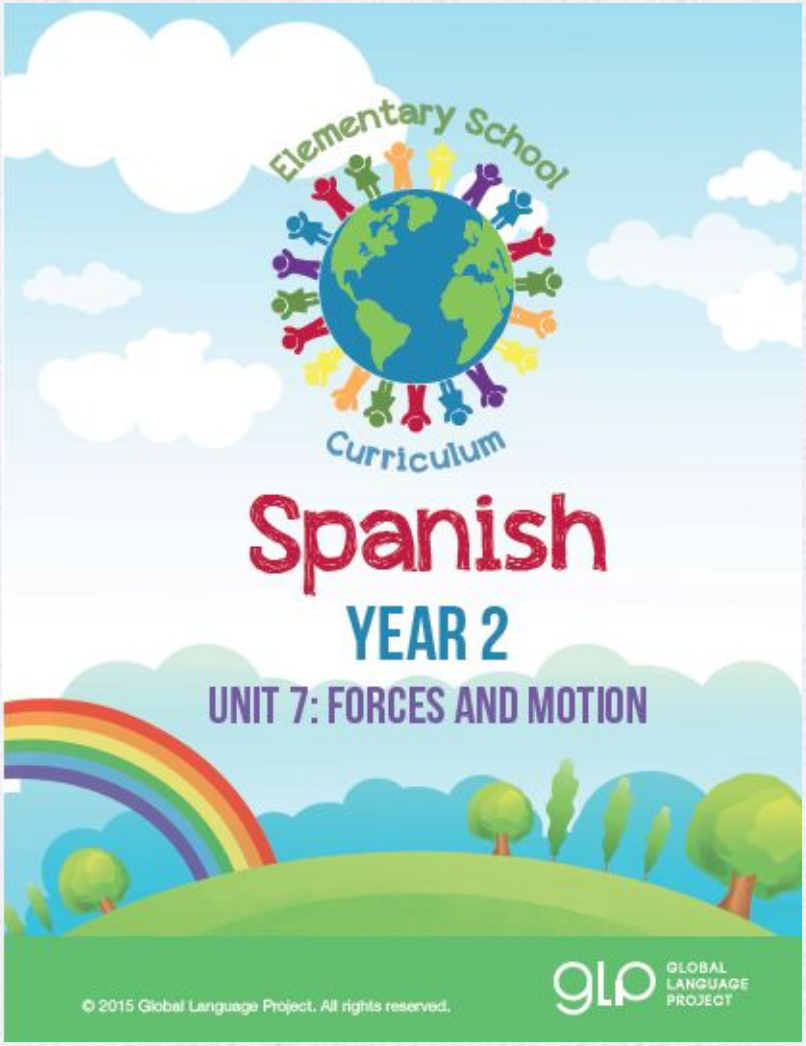
1. ¿Qué cae más rápido?


el lápiz el papel

2. ¿Qué cae más rápido?


el lápiz la bola de papel

Physics



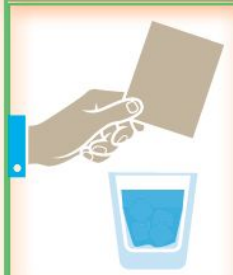
glp

Conducting the Experiment Worksheet

LESSON 6/ ACTIVITY E

Realización de un experimento

Yo me llamo: ---------- Fecha: ----------

Primera etapa	Segunda etapa	Tercera etapa	Cuarta etapa
			

Escribe la letra que corresponda en los círculos de arriba.

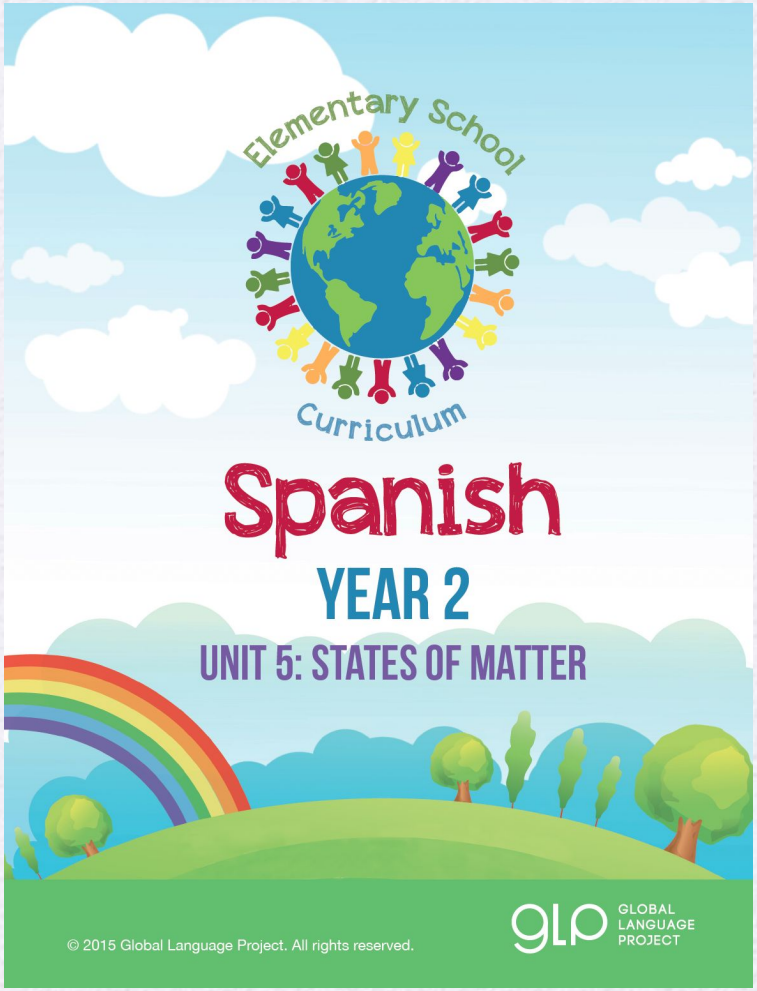
A. Pongo el pedazo de cartón sobre la boca del vaso.
B. Muevo mi mano poco a poco sobre el pedazo de cartón que esta en la boca del vaso.
C. Mientras la mano empuja suavemente el cartón, el vaso se tapa poco a poco impidiendo que se derrame el agua por la presión del aire.
D. Lleno el vaso con agua y tomo un pedazo de cartón.

Explica.

¿Qué pasó? _____

¿Porqué? _____

Matter



Changes in States of Matter Worksheet

LESSON 7/ ACTIVITY E

Los cambios de la materia

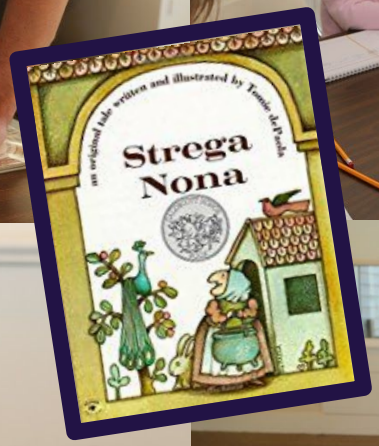
Yo me llamo: ..... Fecha: .....

Corta las imágenes de abajo y pégalas en el espacio correcto. Explica tu respuesta en cada caso.

1. el hielo + calor = ____
2. el agua + calor = ____
3. el agua + frio = ____
4. el vapor + frio = ____

el agua | el hielo | el vapor | el agua

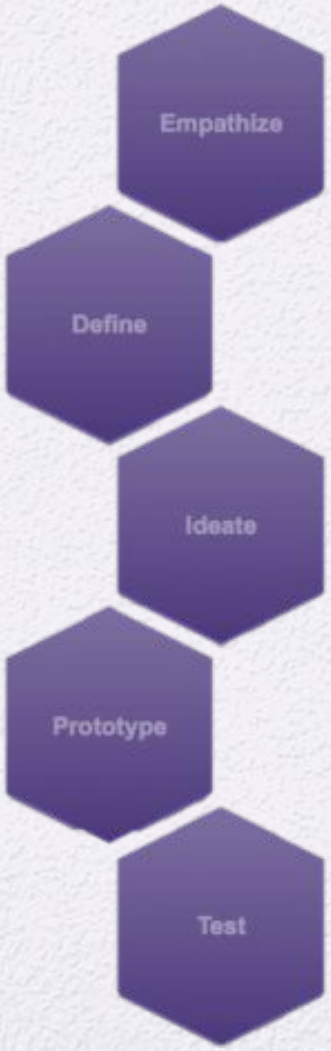
Engineering



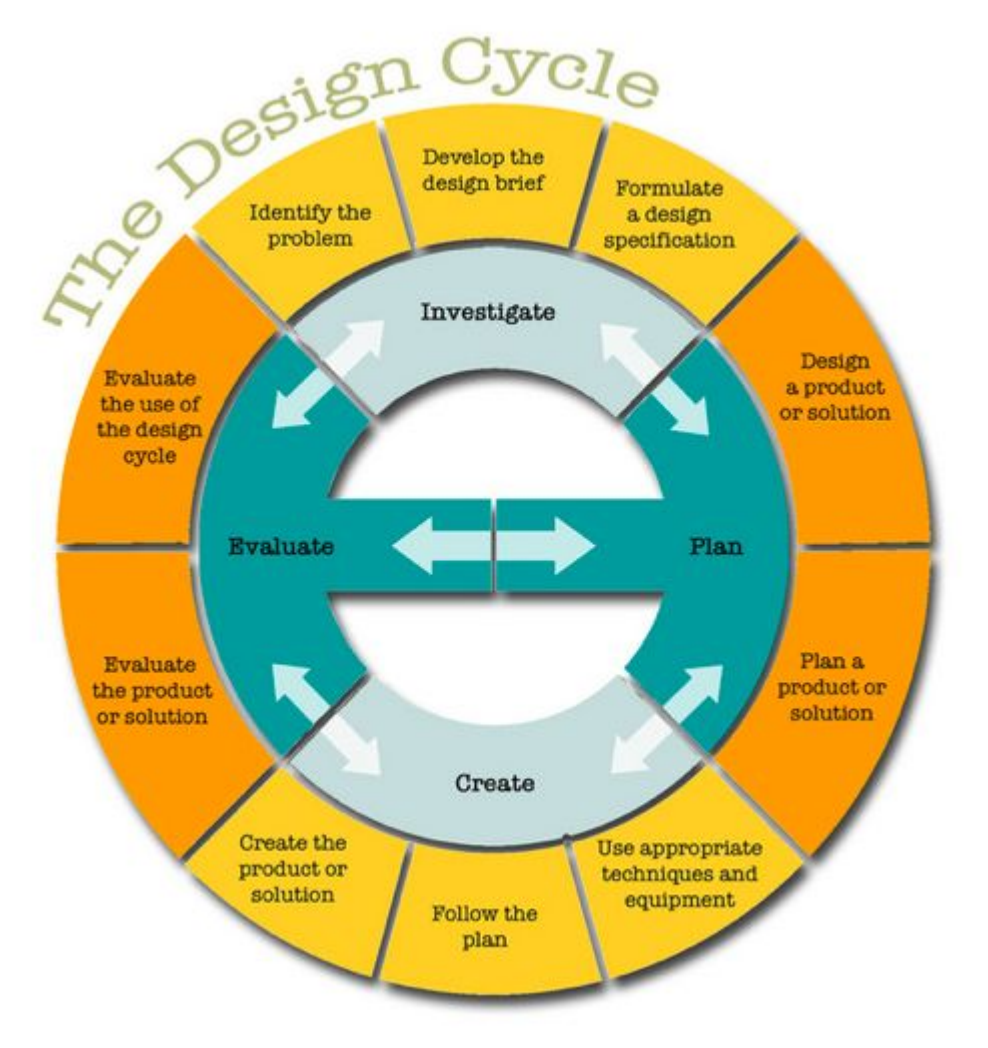
Engineering

Design Thinking

Empathy with an audience
Definition of the problem
Ideate a solution
Build a prototype
Test the prototype



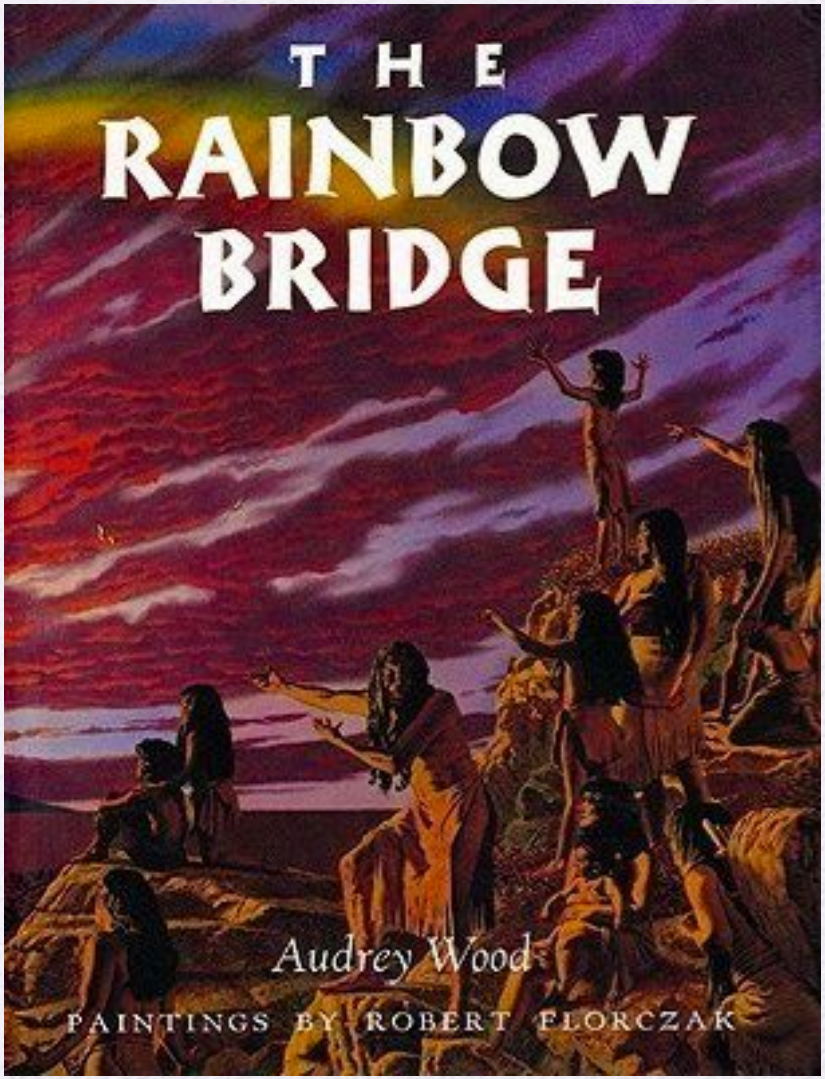
Design Thinking



Engineering

- Start with a compelling tale
- Define the problem
- Give learners the supplies/constraints
- Allow students time to ideate, design, build, and test
- Return to the drawing board if needed

Engineering



Setting
Characters
Plot
Problem
Solution

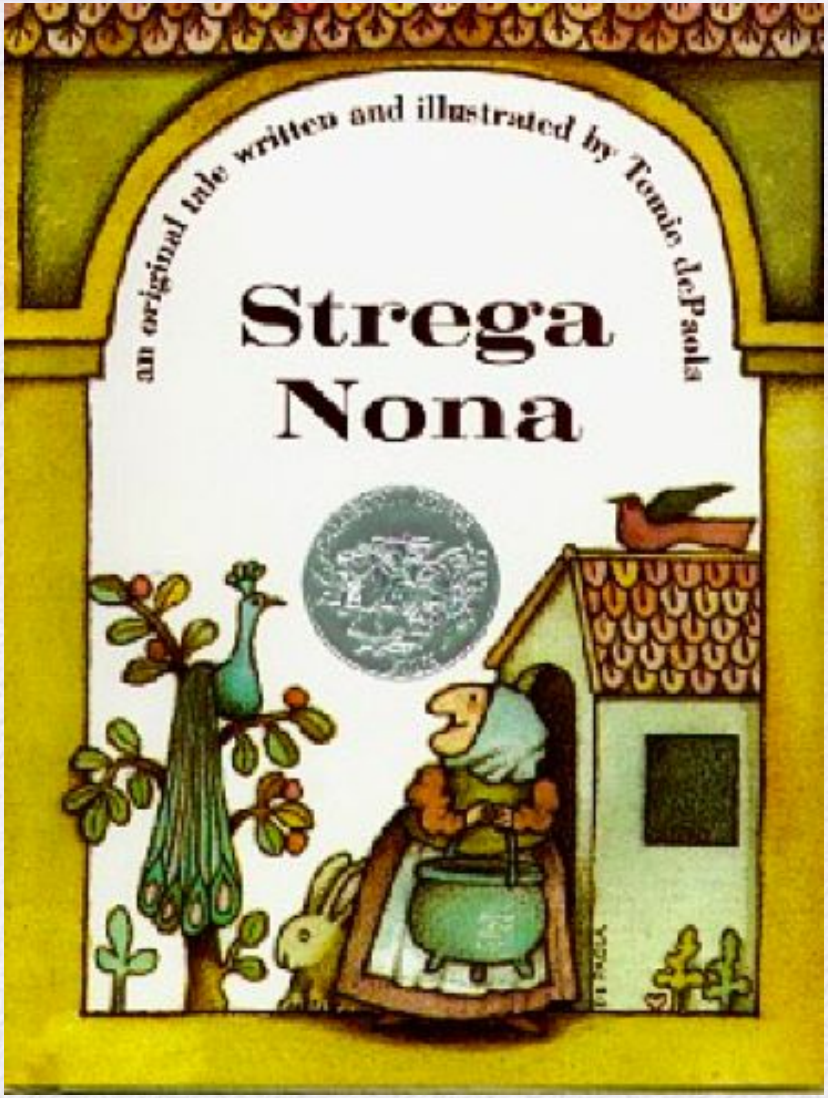
Engineering

Challenge:
Design a bridge that the people can safely cross

Constraints:
Popsicle sticks
Masking Tape
Paper

Must span 12 inches

Engineering



Engineering

Engineering

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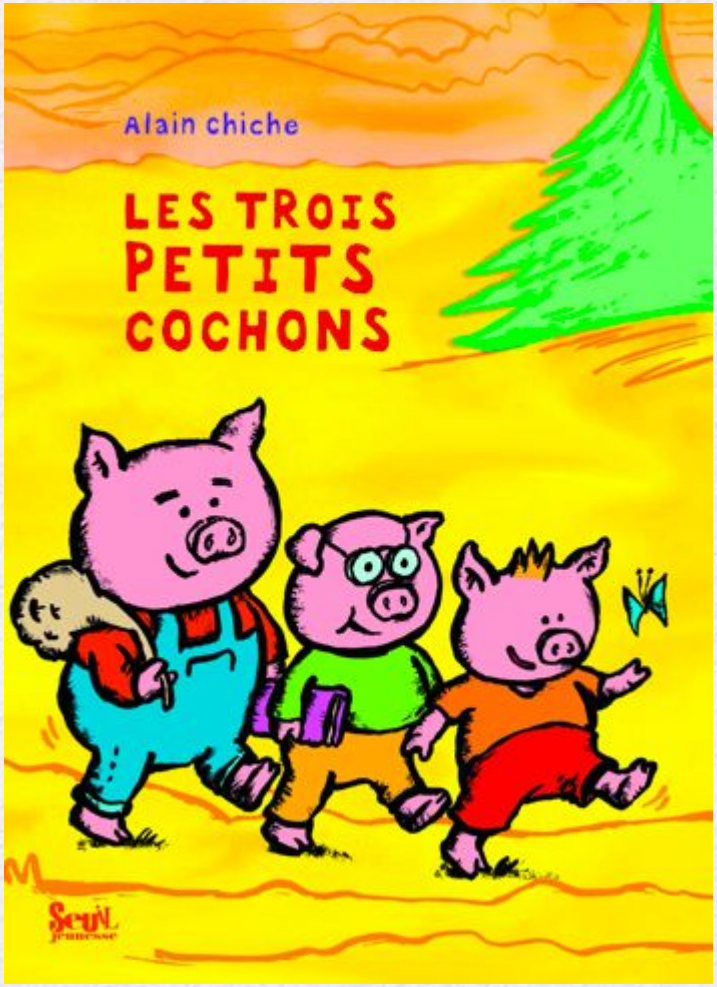

Engineering

Engineering

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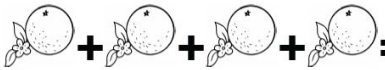
Math

Les Maths

1.  = _____

2.  = _____

3.  = _____

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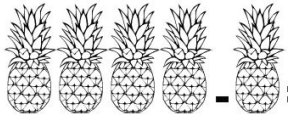
5.  = _____

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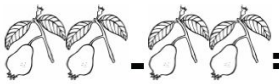
8.  = _____

Math

¿Cuántas patas tienen?

	0	1	2	3	4	5	6	7	8
									
									
									
									
									
									
									
									

Math

lundi

Continue la suite:

mardi

Tim a fait 14 .

Il a lancé 4 .

Maintenant, il a _____ .

mercredi

Dans la salle de classe, il y a 10 bleus et 6 rouges.

Il y a ____ en tout.

jeudi

Dessine un cercle et divise le cercle en 2. Colorie ½ en bleu et ½ en violet.

vendredi

Utilise les trois nombres. Écris deux phrases d'addition et deux phrases de soustraction.

Math

lundi

Tim a 3 dizaines et 8 unités.
Lucy a 8 dizaines et 3 unités.
Qui a le plus de blocs?

mardi

Dans le chocolat chaud de Hannah, il y a 8 guimauves. Noah a 7 et Olivia a 9. Combien y a-t-il de guimauves en tout?

mercredi

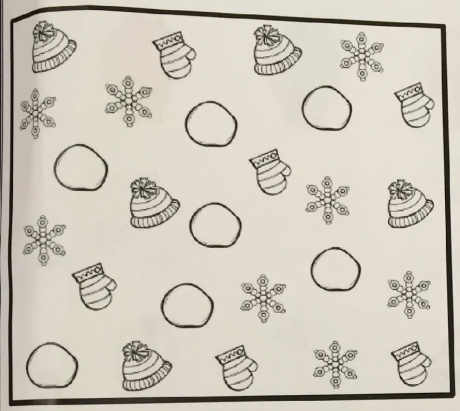
Dessine 18 mitaines. Colorie la quinzième en violet, la neuvième en rouge et la deuxième en jaune.

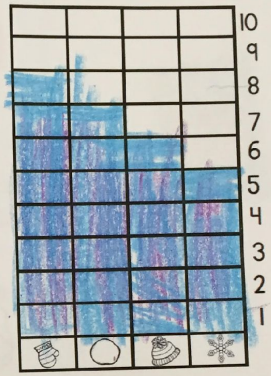
jeudi

Les enfants ont bâti 22 bonhommes de neige. 15 bonhommes ont fondu. Combien y a-t-il de bonhommes maintenant?

Math

Combien y a-t-il?





Il y a 8 flocons de neige.
Il y a F boules de neige.
Il y a 6 moufles.
Il y a 5 bonnets.

Putting it all Together

Sustainable Development Goals

Sustainable Development Goals

Sustainable Development Goals

Sustainable Development Goals

Gouin Series Experiments

Elements of a Gouin Series:

An introduction to set the scene
Concrete action verbs
One specific context
One tense
One person
6-8 statements
Props or visuals
Logical sequence

Gouin Series Experiments

How to Teach a Gouin Series:

Teacher presents orally, with pantomime and props
Teacher repeats orally, class pantomimes with teacher
Teacher repeats orally without pantomime, class pantomimes,
Teacher repeats orally, individuals pantomime
Class repeats orally and pantomimes
Individuals lead the series
Possible reading, writing activities as extrensions

Gouin Series Experiments

Pasos para plantar una flor

Pongo la tierra
Hago un hoyo
Tapo la tierra
Pongo mucha agua
Espero, Espero, Espero.....
Veo una hoja verde!!!!!!

Gouin Series Experiments

Ça flotte ou ça coule?

- Je verse de l'eau dans le bac.
- Je prends des choses diverses: une pièce d'argent, un bouchon, une pierre, etc.
- Je prévois que ____ va flotter.
- Je prévois que ___ va couler.
- Je mets ____ dans l'eau.
- ____ coule.
- _____ flotte.

Does it sink or does it float?

- I pour water into a bin.
- I take a variety of things: a coin, a cork, a rock, etc.
- I predict that ____ will float.
- I predict that ____ will sink.
- I place ____ in the water.
- The ____ sinks.
- The _____ floats.

Gouin Series Experiments

How could a Gouin Series be implemented in your teaching environment/ grade level/language?

Work Time


Typical Topic
Food
School
Family
Shopping
Make it a Theme
Connect to a
Context/Content/
Bigger Question
ACTIVITIES &
RESOURCES
gather and
design what
you need

As you are working:

As you develop performance tasks and instructional strategies, be sure to maintain focus on your learners:

- What do you want them to be able to learn and demonstrate?
- Why do they need to reach each goal linguistically (what comes next?)
- How can you be sure that your activities or instructions yield the results you want?

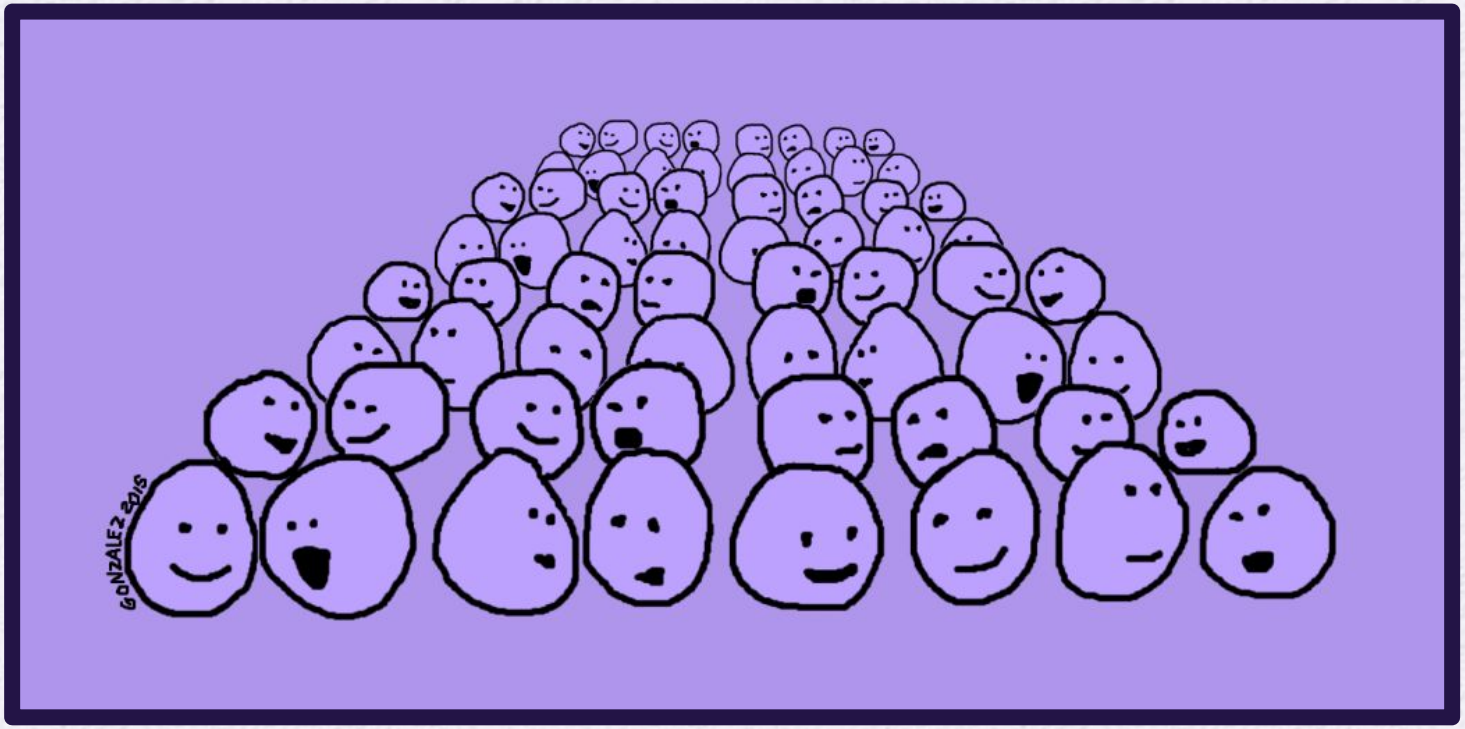
Resources

- On my website
- On my Pinterest Page
- MARACAS' Las Ciencias
- Global Language Project
- Curtain/Pesola's Languages and Learners

So How Did We Do?

- I can state why content-related world language instruction is impactful on student learning.
- I can choose age and level appropriate themes for my students.
- I can plan how to implement STEM-integrated units
- I can lead a Gouin Series for an experiment or engineering demonstration.
- I can identify sources for leading STEM-integrated world language instruction.

Questions?



Parting Words

- Take it slow – try one unit with one class.
- Remember to keep language comprehensible by using all the great language teaching techniques.
- Foster connections.
- Be a lifelong learner yourself.

Nathan Lutz

tiny.cc/STEMWL