Caroline Anderson

UTeach Maker
TEACHING FELLOW

Welcome to my site!

In each of the pages on this website, I dive into my experiences and appreciation for maker education. It is my hope that while you are here, you will be challenged, gain excitement for what you see, and learn something new (I am a future educator after all!). To learn more about what maker education is and find great resources, please visit http://www.makered.org/.

Philosophy

Learn more about what I believe is important and impactful about teaching through the lens of making.

Education

Learn more about my experiences implementing maker lessons in the classroom.

Community

Learn more about the people and places through which I have found community in making.

Project

Learn more about my exciting and final maker project.

Photo Gallery

Site Map:

Caroline Anderson

UTeach Maker
TEACHING FELLOW

ABOUT ME

Caroline Anderson

B.S. Chemistry from the University of Texas at Austin
Science 7-12 Standard Teacher Certification (Primary Field: Chemistry)
UTeach Maker Micro-Credential

Welcome to my website!
I am a recent graduate of the UTeach program at the University of Texas at Austin, Class of 2020. I studied hard for the past four years to be a chemistry teacher,

and my apprentice teaching semester was such a blast and a fantastic learning experience! I have always considered myself a scientist and a maker, and I hope to inspire countless students to believe that they can be and are scientists and makers as well! You can learn more about my experiences throughout the contents of this website, which includes both my UTeach Maker Showcase and my chemistry lesson plans.

Resume: Download

"We are born makers. We move what we're learning from our heads to our hearts through our hands." *-Brene Brown*

THE CULTURE PROJECT

I am currently serving as a missionary for The Culture Project. I get to spend my days in middle schools and high schools all over the Diocese of Cleveland speaking about the truths of: 1) the dignity of the human person, 2) how healthy relationships should be based on authentic love, not emotional or physical use, and 3) how we can maintain good relationships with social media in our increasingly technological world. These conversations are not always easy to have with students, as they are counter-cultural in comparison to the different pressures students face. During the pandemic, we were able to accommodate the policies of a variety of schools, presenting in many different in-person and virtual settings. I also live in an intentional community with my teammates, growing into the best version of myself with their help. I've learned so much about how to have crucial conversations, conflict resolution, and team dynamics through working with them. A large part of the mission also revolves around support raising our entire living and mission expenses. We spend the summer meeting with donors and inviting them on mission with us, and we year-round invest in donor relationships through monthly newsletters, postcards, personal

them on mission with us, and we year-round invest in donor relationships through monthly newsletters, postcards, personal calls, and more. This time on mission has invited me into a greater balance in life, through human, educational, spiritual and work formation.

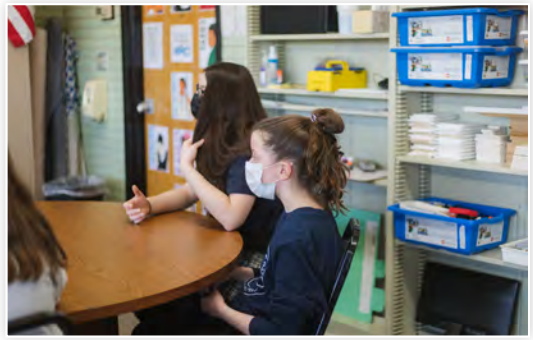
Additional roles on the team included:

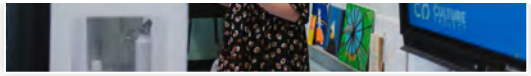
2020-21 Year: Team Cleveland Formation Lead- planned and lead monthly activities for continued formation of teammates.

2021-22 Year: Team and role to be determined.

"The Culture Project is an initiative of young people set out to restore culture through the experience of virtue.We proclaim the dignity of the human person and the richness of living sexual integrity, inviting our culture to become fully alive."



Site Map:

CAROLINE ANDERSON

Cell: 214-620-1882
Email: anderson.caroline@utexas.edu
Website: makercaroline.com

EDUCATION

The University of Texas at Austin, Expected Graduation: May 2020
Candidate for Bachelor of Science in Chemistry
Robert Noyce Scholar, Jane Sanford Beasley Scholarship, AISD Future Teacher Scholarship
Chemistry 301 Course Learning Assistant (Fall 2017 and Fall 2019)
UTeach Austin Teacher Preparation Program
Candidate for Science 7-12 Certification (Primary Field: Chemistry)
Candidate for UTeach Maker Micro-Credential

FIELD EXPERIENCE

Westwood High School, Round Rock ISD, Round Rock, TX **Spring 2020**
Student Teacher, Chemistry, Grade 10
Designed and implemented lesson plans for two classes for the spring semester
Assisted with transitioning to and implementing online instruction during the COVID-19 closures
Manor New Tech High School, Austin ISD, Austin, TX **Fall 2019**
Student Teacher, Chemistry, Grade 10 (6 lessons with a project based instruction emphasis)
Ann Richards School for Young Women Leaders, Austin ISD, Austin, TX **Fall 2018**
Makerspace Intern, Grades 6-12
Assisted in makerspace instruction for student projects; improved the organization and functionality of the makerspace; and contributed to development of maker curriculum
Crockett High School, Austin ISD, Austin, TX **Spring 2018**
Student Teacher, Aquatic Science, Grades 11-12 (3 lessons with an equity and safety emphasis)
Kealing Middle School, Austin ISD, Austin, TX **Fall 2017**
Student Teacher, Science Magnet, Grade 6 (3 lessons with a technology emphasis)
Pillow Elementary School, Austin ISD, Austin, TX **Spring 2017**
Student Teacher, Science, Grade 3 (3 lessons with an inquiry emphasis)

RELATED EXPERIENCE

Sci-Tech Discovery Center, Frisco, TX **Summer 2017**
Summer Camp Intern
Assisted with teaching and classroom management; ensured safety of campers at STEM makerspace
UTeach Maker
Participated in monthly events developing maker projects and maker education activities

EXTRA AND CO-CURRICULAR ACTIVITIES

FOCUS (Fellowship of Catholic University Students), 2016-2020
FOCUS Greek, Bible Study (Leader and Member), Formal Discipleship, FOCUS Pilgrimages to Rome/Assisi and Poland
Kappa Delta Sorority, 2017-2020
Recruitment Team: Logistics Head (2018), Alane Hall Recruitment Award (2018), Academic Excellence Committee (2018-2019)
University Panhellenic Council Recruitment Guide, Spring-Summer 2019
Counseled a group of 60 young women recruits and coordinated event logistics for over 3000 people
Longhorn Awakening Retreat Staff, Fall 2017, Spring 2019, Fall 2019
Prayer Staff, Table Staff (small group leader), Staffhead
Freshman Research Initiative, Nanochemistry Research Stream, Spring 2017

Caroline Anderson

UTeach Maker TEACHING FELLOW

Philosophy

My Teaching and Making Philosophy

"As educators, we must be brave..."

As educators, we must be brave; we cannot leave our students behind. America's education system, while it does possess some good qualities, has remained somewhat stagnant as progress has continued to pass us by. All around us, the world is changing, our country is changing, and even the neighborhoods we live in are changing. I believe that it is up to us, as teachers, to combat the cynics telling us "it can't be done" and try every possible classroom design until our students are reaching their maximum capacity. We do not know what will or will not work until we try. It is my goal to be a dynamic teacher, always testing new strategies as I shape my students' education.

Misconceptions are a good thing!

In my opinion, misconceptions in STEM fields are a good thing! They can be used as a foothold for educational growth, rather than something that must be pushed out of a student's mind completely. I will use responsive teaching a great deal in my classroom, adapting my lesson to the students' thinking. I will use my students' prior knowledge, including misconceptions, to guide future lessons. From their prior knowledge to what they will hopefully learn from my classroom, I will measure what the students know based on growth and formative assessments. I am not as concerned with teaching to the standardized tests as I am with making sure the students understand the most important chemistry concepts. To me, student success is not necessarily dependent on whether they get a correct answer, but focuses more on the process of getting there

not necessarily dependent on whether they get a correct answer, but focuses more on the process of getting there.

Respectful Environment

When my students reach the end of their year in my classroom, it is my hope that they will have done so much more than pass a test. I hope to foster an environment of respect in my classroom—between the students and myself and between the students and each other. Part of what inspired me to become a teacher is the interpersonal relationships I formed with my former high school teachers. These teachers went out on a limb to do everything they could for me, and I hope to return the favor to my future students. I also wish to create a safe space in my classroom where everyone is loved by one another, no matter what their background or experiences may be. All students have the capacity to learn, and if the students do not respect one another, that will hinder their learning. Plus, I have experienced growth myself within the classroom, so it's important for me to see myself as a life-long learner who can make mistakes and humbly learn from my own students.

Joy in Making

Many great classrooms show success in educating students in difficult concepts, but it is my goal to do this while creating a classroom that is joyful and fun. Chemistry has a bad reputation as one of the hardest classes a student will take in high school, but I want my students to love it as much as I do! Science can be for everyone—it may be harder for some students, but everyone can develop an appreciation of it no matter which career field they will decide to enter, expanding science literacy across all disciplines. I want to incorporate the maker education movement into my classroom so that students will have the opportunity to be learning by doing, working with their hands, and seeing chemistry happen in real-time. Making is most commonly associated with physics, mathematics and engineering classrooms, but I believe it can and should be executed in a chemistry classroom as well. The feeling you get after making something yourself lasts as you enjoy a sense of ownership of your work. This is an extremely valuable tool for an educator and their students. As Piaget notes in his constructivist theories, students need ample time to explore concepts and experiment on their own, so making and lab experiments will heavily influence how I plan my lessons. I facilitate the classroom with a constructivist and inquiry-based approach, allowing the classroom to be student-centered, not teacher-centered. I am absolutely thrilled to begin working with students daily, helping to shape them into awesome learners and dilligent explorers.

Inspirational Literature

The Art of Relevance TED Talk by Nina Simon:
All too often teachers are heard complaining about students who "just don't seem to care." How can we address that as educators? How can we inspire students to suddenly care about the material? The answer: make the material relevant to our students' lives. Nina Simon in her TED Talk hits the highlights of her book, *The Art of Relevance*. This TED Talk inspired me to continue to seek out more ways to make chemistry a subject that students can relate to. I believe one way to do this is through maker education. When students create their own product that is in some way related to the

to do this is through maker education. When students create their own product that is in some way related to the chemistry material, students will take ownership over their own product, and further their own learning, because it is now relevant to them!

Manifesto from Big Beacon:
This project from Big Beacon is an incredibly inspiring read. It identifies the problems in education, and it calls on educators to challenge the status quo. They believe that the role of the educator is to foster young engineers because in creating young engineers, we are truly educating the whole person. My favorite part of the manifesto lists qualities of "the whole new engineer" and "a whole new engineering education." These qualities are those I desire to have abundantly present in my future classroom, but they clearly will benefit students in every aspect of their lives, regardless of career choice.

Spacemakers: A Leadership Perspective on Curriculum and the Purpose of K–12 Educational Makerspaces by Harron and Hughes:
One of the conclusions from this research on maker education is that making in the classroom increases the inclusion of all students. I firmly believe that everyone can make and that everyone has the capacity to learn, so using making to increase learning across a diverse classroom is a wonderful idea. The confirmation of that idea in this research is very hopeful to me. However, I think there are some struggles to increase accessibility of making to students of different backgrounds. One way to help maker education to be more accessible is to broaden it from crafting/woodworking projects to also including other art forms, such as writing, composing and choreographing. This is another way to increase relevancy for students who are more artistically inclined because it allows them to simultaneously pursue their passions.

How can we support the emotional well-being of teachers? TED Talk by Sydney Jensen:
I heard this TED talk on my most recent road trip home to Dallas, and I found myself (alone in my car) saying aloud, "THAT WAS AMAZING." This talk gets to the heart of compassion fatigue commonly experienced by educators and proposes solutions for school disctricts to promote wellness for all teachers, especially those who are experiencing what Jensen calls "secondary trauma." To begin her talk, Jensen explains a maker project she has her students participate in on the first day of class where they create a simple paper chain - each student writes an affirmation for themselves on a strip of paper, the teacher staples the links together to create a chain, and the chain hangs in the classroom all year for students to see. The discussion around this project is extremely important for social-emotional learning. This simple product is a metaphor for the way students must support one another in the classroom. What happens when one of the links in the chain breaks? Jensen takes this further: What happens when the person holding the stapler breaks? This maker project is a launching point for establishing a supportive classroom environment, and her students frequently return to it throughout the year, knowing exactly where their link is and what it says. Maker education is more than helping students to learn about STEM ideas. Making is for the benefit of the whole person - body, mind and soul.

Site Map:

Caroline Anderson

UTeach Maker TEACHING FELLOW

Education

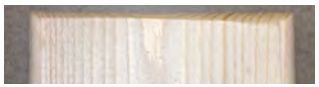
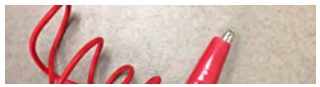
Making a Better Education

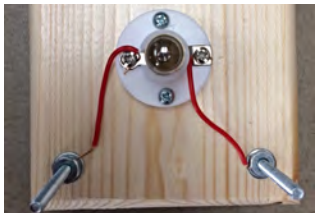
STEP 1

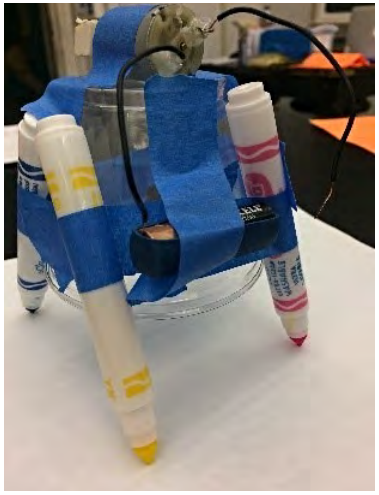
My first experience with Maker Education began in my first UTeach class, Step 1. Teaching circuits in a 3rd grade classroom at Pillow Elementary, I was given the opportunity to experiment with some new Maker Education circuit lessons.

- Lessons 1 and 2: Circuit Maker Kits

The first two lessons revolved around what were called "Circuit Maker Kits" where the students could connect pre-made blocks into one large circuit, including batteries, motors, lights, and buzzers. These maker kits were very user-friendly and safe for the students and their devloping small motor skills because they could easily clamp the insulated wires across the different blocks using the attached metal posts without any exposed electrical wires. These kits were perfect for the students to discover both the elements of a functional circuit (lesson one) and the differences between conductors and insulators when inserted into the circuit (lesson two). This also improved equity since each of the kids had varying fine motor skill abilities, but they were all able to easily use these materials and experience the science in real-time.



- Lesson 3: Scribble Bots

The third lesson with my elementary students put their new-found knowledge of circuits to the test as they engineered machines called "Scribble Bots." Scribble Bots are a vibrating cup-motor system that includes markers as "legs" on the bot. When the markers are uncapped and placed on paper to freely move around, the bots create a colorful design that the students can take home. This lesson was the first time I experienced a lesson plan turn into absolute chaos and disaster due to time misjudgements, so it was a both humbling and a learning experience for me as well! Making in the classroom will always be geared towards problem solving, especially for educators, and I will take the personal lessons of flexibility and perseverance into future executions of maker activities in the classroom.

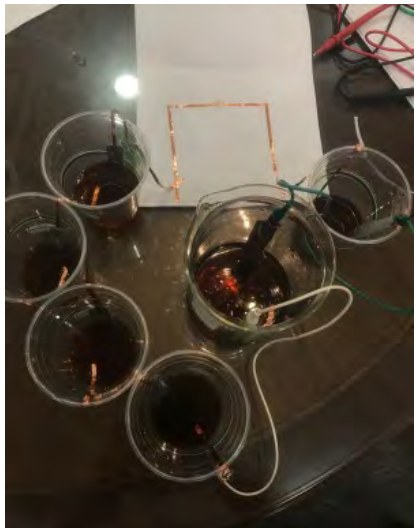
STEP 2

In my science magnet classroom at Kealing Middle School, I was challenged with the task of teaching a personal finance lesson. Determined to put a STEM spin on the subject matter, I developed a lesson where the students could engineer a home as a team using common household items such as popsicle sticks, rubber bands, paper clips, etc. However, there was a catch! Students had a limited "income" that they drew from a hat, and in order to "buy" materials to build their house, they had to create a budget for their expenses. The students were extremely creative with their finished products, and each team successfully engineered a stand-alone house using the materials they bought based on their budgets and incomes.

Physics by Inquiry

One of the classes I took in my fall 2018 semester was Physics by Inquiry with Dr. Jill Marshall. This course focused on two main units: circuits and light/optics. The best part about this course is that there was no direct teaching, but rather constant exploration of concepts that helped us to visualize what we were learning. Every day I had an opportunity to make a circuit (whether in person or through a PhET simulation) or set up different lights and lasers. This class solidified why I believe in both inquiry-based teaching (which aligns with the UTeach model) and maker

education. In high school, I was presented with these topics and there was a heavy emphasis on the mathematics behind it. However, I have a much better understanding of the conceptual concepts behind these two physics units, and I find myself being able to make predictions about the way a circuit or light ray will behave before it is even tested. One of the requirements for this class was creating our very own maker project. I took this challenge one step further by creating two! First, I made a circuit card using copper tape and LED lights on one side with a cute drawing on the other. For my second project, I created an eletrochemical cell (battery) that could be used to power simple circuits much like my circuit card. I developed this idea into a maker lesson plan meant to bridge the gap between a chemistry and physics classroom, either as a transition from one year to the next or as a collaboration between two different grade levels.



Ann Richards Makerspace

As an UTeach intern, I spent the fall 2018 semester in the makerspace at the Ann Richards School for Young Women Leaders. My duties in the makerspace included: improving the organization and functionality of the space, assisting students with their projects, and helping install new maker curriculum in the classroom. For the space, I 3D-printed items that were needed for specific tasks (such as hand hooks to hold aprons and a dixie cup dispenser), laser printed box organizers for small pieces, and created a collection of Safety Data Sheets for the materials in the makerspace. My favorite projects

Data Sheets for the materials in the makerspace. My favorite projects to assist students with were the 6th grade animal enrichment devices. Students in groups built devices for animals at the Austin zoo that were intended to challenge the animals' minds or offer the animals a space to relax, in the case of the pig pens (bottom left image). I also helped install an aquaponics system in a biology classroom, working through ways the curriculum could be developed to best fit the needs of the students. At the end of the semester, the 9th grade physics classes created individual rooms using their knowledge of circuits that were combined in a large parallel circuit with their teammates to create a house. This was an especially fun project because I got to teach students how to solder their circuits, and the students expressed their individual creativity in their room's decorations!




A great video detailing the process and purpose of the animal enrichment project at the Ann Richards School is included below:

Source: https://youtu.be/pIHoY7aOjDs

Apprentice Teaching Semester

The included lesson below was selected for an apprentice teacher **innovative teaching award** in Spring 2020.

For my maker showcase apprentice teaching lesson, I developed a maker lesson that would help my students review for the thermochemistry unit and connect it to prior chemistry concepts, other science disciplines, relevant historical events, and real-world examples. In the lesson, each of these topics would be connected together in the form of a 2-D concept map, then brought to life in the form of a 3-D hanging mobile. The hanging mobile idea is inspired by the kinetic art sculptures created by Alexander Calder. His mobiles utilize the kinetic energy of the air flow to create movement in his art, and since thermochemistry explains so much of chemistry in the context of energy, this artistic representation of the thermochemistry concepts seemed like a match-made-in-heaven. The open-endedness of this project allows a great deal of freedom for how the students organize the concepts, which extra topics they choose to include, and the creative ways they decorate their mobile. At the end of the lesson, there is an opportunity for students to participate in a gallery walk of their peers' creations and give them feedback, as well as reflecting on their own creative process and final products. The lesson plan, rubric, and related handouts can all be accessed in the attached link:

Download

Unfortunately due to the school closures caused by the spread of COVID-19, I did not get a chance to implement this lesson in the school or provide student artifacts. I hope to implement this lesson in a classroom very soon! In discussing this lesson with a former professor, Dr. Marshall, it was suggested that this lesson could actually be implemented during an at-home schooling situation. Common items found around the house could be used to create a hanging mobile. For the structure of the mobile itself: clothes hangers, sticks, rods, rules are a few ideas. For the hanging string: embroiderly floss, dental floss, rope, ribbon, wire, hair ties, and rubber bands come to mind. If a student does not have access to these, it could also be possible for the teacher to create material packs with items like these to mail or safely drop off at a student's home. For a project such as this one, it would likely require more time at home than in the classroom, but it would also be fun to present finished projects for a live virtual class setting.

The COVID-19 crisis has helped to shine light on the areas in which maker education has room to grow. There are many challenges in implementation, like ensuring access to resources, when the students are at home. Educators who are committed to maker education must be creative and conscientious when planning these lessons. Unfortunately, my apprentice teaching district established the curriculum for at-home asynchronous learning, so the chemistry team and I did not get the chance to implement our own ideas. One idea I had for incorporating maker education during this time was to use the already well-known program, Flipgrid, as a video discussion board. When thinking about what the students lost as a result of the stay-at-home order, I realized that students no longer had a collaborative and social aspect to their learning. Making is all about sharing, and while students are connected somewhat through social media, they lack real

opportunities right now to have a conversation. With a discussion board, students could communicate with one another and provide feedback, but with a video discussion board, students could see and hear each other, too. Flipgrid also allows for creativity with editing through the use of filters, stickers, and text features. I would use these discussion boards with big-picture ideas, such as "how to think like a scientist." There are certain qualities of science, the scientific process, and a scientist's mindset that I believe are most important for my students to know when they leave my classroom. This circumstance is a perfect opportunity to spend the majority of our time on big-picture ideas, especially since introducing new chemistry content is both challenging and discouraged at many schools. When an emergency of this scale arises, educators have little time to adjust with no fore-warning, so this idea provides an example of how a teacher could adapt an existing resource in an innovative way to improve the quality of their assignments and well-being of their students.

Reflection on Maker Education

From each of these experiences facilitating maker education in different settings, I have had the opportunity to see a variety of ways making can be made accessible for students. For my Step 1 lessons, I was fortunate to use the maker kits from UTeach. However, in Step 2, the only materials were common household items that are inexpensive in bulk. This is a lesson that would be easy to implement with limited resources. The circuit materials from my Physics by Inquiry projects are common to nearly every physics classroom! The Ann Richards School had by-far the greatest resources, though. Power tools and saws, a laser cutter, multiple 3-D printers, the list goes on... Since a large group of the students at this school come from lower socio-economic backgrounds, having the makerspace in the school made it possible for every student to have access to anything they could need for a school maker project. There are definitely not makerspaces in every high school, but I observed how it was an extremely valuable resource for educators planning lessons around making. In an ideal world, every high school would have a fully-equipped makerspace to be utilized by the students regularly, but if a school is not fortunate enough to have one, I believe there are still many other options for creating a maker classroom (we saw maker fellow Kira's real life classroom makerspace at a Fall 2019 Cohort Meeting!). I also think that teachers sharing maker education resources that they find or create with one another will make it easier for other teachers to start implementing in their own classes. We are better together!

Explore maker education resources here:
https://makered.org/resources/
https://maker.uteach.utexas.edu/uteach-maker-lesson-bank

Site Map:

Thermochemistry Mobile -- Maker Lesson
Caroline Anderson

Westwood High School
Pre-AP/IB Chemistry - 10th Grade
One block: 90 minutes

Overview of Activity: This activity is inspired by Alexander Calder's kinetic art: the mobile. This art has elements hanging in a balance typically with multiple branches. When thinking about concept maps for connecting chemistry topics, I felt like they could be turned into a 3-D version in the form of a chemistry mobile. The idea was born: to review thermochemistry and connect it to other topics and disciplines, students would make a hanging mobile of chemistry concepts that branch out from each other like a concept map. Students would have the ability to be creative with their mobile, determining both how the pieces branch (organization) and how to decorate the mobile. Using notecards, students would write about chemistry concepts, vocabulary and examples. Then, they would outline how that connects to other concepts in the form of a concept map. The trick, however, is how to arrange it so it hangs from a central point at the top of the map. Students would then engineer the mobile using materials such as craft sticks and different colored strings. Students could participate in a gallery walk of the finished mobiles either at the end of class or the next day. The finished mobiles would be used as a tool to study right before the test and as classroom decorations!

Materials:

- Hanging content pieces: notecards, white and colored
- Hanging rods: popsicle craft sticks, pipe cleaners, or other rod-like pieces
- Variety of colored string and ribbon
- Markers, colored pencils, crayons, pens and pencils
- Hot glue guns/hot glue
- Scissors
- Hole punch
- Hanging display stands or garment racks for hanging and testing

Thermochemistry TEKS:

(11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to:

(A) describe energy and its forms, including kinetic, potential, chemical, and thermal energies;

(B) describe the law of conservation of energy and the processes of heat transfer in terms of calorimetry;

(C) classify reactions as exothermic or endothermic and represent energy changes that occur in chemical reactions using

thermochemical equations or graphical analysis; and
(D) perform calculations involving heat, mass, temperature change, and specific heat.

Learning Targets:

6. I can use molar enthalpy to calculate energy changes that occur in various chemical reactions.
   6.1 I can differentiate between q and molar enthalpy (L2)
   6.2 I can solve for moles of reaction, heat, or molar enthalpy if given two of the three (L2)
   6.3 I know the sign of deltaH for endothermic and for exothermic reactions and the corresponding sides for a thermochemical equation (L2)
   6.4 I can use a reaction's molar enthalpy to calculate the amount of heat associated with specific amounts (mass, volume, concentration) of reactants (or of products to be produced) (L3)
   6.5 I can use a reaction's molar enthalpy to calculate the amount of reactants needed to produce/require a specific amount of energy (L3)

7. I can use calorimetry to calculate the heat as well as the molar enthalpy of the process.
   7.1 I can define calorimetry and explain the experimental set up (L2)
   7.2 I can relate the heat lost by the system to the heat gained by the surrounding/solution (L2)
   7.3 I understand why masses are added but moles are not in calorimetry calcs (L2)
   7.4 I can use experimental data to calculate the heat of the SYSTEM (L3)
   7.5 I can use experimental data to determine the moles of reaction that occurred (L2)
   7.6 I can use the heat of the system (determined through calorimetry) as well as moles of reaction (based off given data) to determine molar enthalpy of the reaction (L3)

8. I know the relationship between entropy, enthalpy, and Gibbs Free energy, and how these predict thermodynamic favorability
   8.1 I can define enthalpy, entropy, Free energy, and spontaneity (L1)
   8.2 I can relate spont. to a "thermodynamically favorable" rxn (L2)
   8.3 I can predict the signs (pos or neg) of entropy based off physical evidence such as change in state(L2)
   8.4 I know the two driving forces and their associating sign of a chemical reaction (L2)
   8.5 If given three of the four (deltaH, deltaS, deltaG or temperature) of a reaction, I can solve for the fourth (L3)
   8.6 I can relate the sign of deltaG to thermodynamically favorable reaction (L3)

Rubric: https://docs.google.com/document/d/1LpmZb_w-gzCEwn4u7rsb_hqPjNrLnMlfhZ8vyl3j8_k/edit?usp=sharing

Estimated Time	Overview of Activity	What the Student Does
5 minutes	Engage: Students learn about kinetic art/hanging mobiles.	Students will be shown a picture of a hanging mobile over a baby's crib and asked "did any of you, your siblings, or babies you know have a toy like this hanging over the crib?" Students will share with the class if they've seen a hanging mobile like this before, connecting to their prior experiences, and will be asked to hypothesize how they work, hanging and moving in that special way. Students will then be introduced to kinetic sculptures and hanging mobiles with a focus on Alexander Calder's art, with pictures shown on the board. Students will be given instructions on the activity that day, using Calder's art as inspiration for the way they will be reviewing the chemistry content.
20 minutes	Plan: 2-D version of concept maps	Students sketch out the 2-D version of their hanging mobile as a concept map. They will connect the topics of the thermochemistry unit, as well as previous chemistry contentm science content from other disciplines, historical events, and real-world examples. Students will adjust and reorganize their map based on how they anticipate it to hang from the top. Students will use the handout to assist with brainstorming and sketching. Students may communicate with peers for ideas or assistance in this planning stage. Students will be able to ask clarifying questions about the thermochemistry concepts to further review for their test.
50 minutes	Create: 3-D version of concept maps (hanging mobiles)	Students will create their concept cards on the notecards and decorate them. Students will engineer their hanging mobile using the string, rods and cards, and they can use the display stands or garment racks to test the way the mobile hangs. Students will decorate their mobiles however they wish.
15 minutes	Display: Gallery walk of finished mobiles	Students will complete a gallery walk of their peers' finished mobiles hanging around the classroom at eye-level. Students will complete a handout with notes on their peers' mobiles and reflect on their own mobile and the creation process. After the exam, students may use their reflection to edit and improve their mobile as a way to earn extra credit for the mobile activity grade.

Thermochemistry Review - Hanging Mobiles **Name: _____**

Pre-AP/IB Chemistry **Block: _____**

Background: Alexander Calder revolutionized the way we think about sculptures. His artwork hangs from the top with the attached elements moving with the flow of air. It was the French artist, Marcel Duchamp, that gave his work the title of a "mobile." The delicate balance of each of the branched pieces added a playfulness to the sculpture artistic field. Today, hanging mobiles are used as common decor in modern households, commonly seen as baby toy mobiles hanging above a crib. Pictured left: "Mobile" by Alexander Calder (1941).

Your Task: Create your own hanging mobile based on a thermochemistry concept map. Organize the concepts from this unit (and any other relevant science and real-world topics) so they connect together in a logical way while still being able to hang.

Available Materials:

- Hanging content pieces: notecards, white and colored
- Hanging rods: popsicle craft sticks, pipe cleaners, other sticks
- Variety of colored string and ribbon
- Markers, colored pencils, crayons, pens and pencils
- Hot glue guns/hot glue
- Scissors and hole punch

Some ideas for concepts to include:

Heat	Temperature	Calorimetry	Endothermic	Exothermic	Molar Enthalpy
System	Surroundings	Entropy	Spontaneity	Gibbs Free Energy	

List other ideas (such as other science, historical and real-world examples):

Sketch your 2-D Concept Map (before beginning the 3-D mobile):

Hanging Mobiles - Gallery Walk **Name: _____**

Pre-AP/IB Chemistry **Block: _____**

Instructions: Complete the table with a **positive** (something about your classmate's mobile that is awesome!) and a **delta** (something that could be changed to improve your classmate's mobile) for 4 different people. Then finish the reflection questions at the end.

Classmates' Name	Positive	Delta

Reflection Questions:

1. Explain how you organized your hanging mobile and why.

2. What would you do to improve your hanging mobile?

3. List any other topics or examples that connect to thermochemistry that you didn't include in your mobile.

4. Based on the given rubric, what grade do you think your mobile deserves and why?

Caroline Anderson

UTeach Maker
TEACHING FELLOW

Community

Finding Community in Making

UTeach Maker is composed of many intelligent and hardworking indiviudals with a passion for revolutionizing the typical classroom setup. They believe that making is equitable, something that *all* students can participate in to develop ownership over their learning, all the while challenging their creativity and problem solving. This organization not only brings together college students with similar interests, but it fosters

the growth of fantastic friendships, naturally becoming a support system of like-minded people.

As awesome as our organization is, the Maker Community is much more than UTeach Maker. It extends across disciplines from education, to museums, to crafting, and to everyday life. I first encountered the Maker Community at Sci-Tech Discovery Center in Frisco, TX. I was hired as a day camp counselor for the educational STEM summer camps, but I was shocked when I realized I would be working with middle school aged girls in a makerspace. Each week there was a new group of girls and a new project, ranging from building bowling ball roller coasters to castles to go-karts. As challenging as it was to facilitate a productive and fun environment among the campers, I always enjoyed my time in the makerspace. One week, the girls decided to embrace what brought them all together, Girl Scouts, and build their Rube Goldberg Machine: The Girl Scout Cookie Contraption (picutred above). As a former Girl Scout myself, this week was filled with nostalgia as I helped the campers to create a system of many different components with the goal of delivering a box of cookies to the customer. I witnessed these girls go from complete strangers to fast friends, and this was a clear example of how making fosters an incredible community. I was also impressed by how quickly the girls picked up the power tools and got to work, showing that they belong in the engineering world as young women!

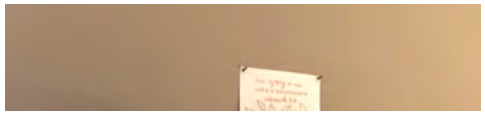
In March of 2018, UTeach Maker attended the SXSW Maker MeetUp at the Magellan School iLab. At this event, we had the opportunity to meet many makers from across the United States and discuss the ways they use making in their fields. I was able to spend a good deal of time with Colleen and Aaron Graves (authors of *20 Makey Makey Projects for the Evil Genius*) to chat about using making as a tool for improving literacy, and further scientific literacy. Pictured left, you can see Dorothy Jones-Davis (the Executive Director of the Nation of Makers) and Joey Ficklin (the Director of Maker Faire Austin). This opportunity provided by SXSW allowed each of us to see making in a diverse array of career fields. The Maker Community is alive and well, and we were able to meet people who enjoy making every day (and they get to do it for a living!).

And of course, who could forget our favorite UTeach Maker mascot, Tater Tot?! He is a beautiful corgi that joined our crazy crew in Fall 2018, always bringing a high level of cuteness to our meetings.

Each semester at the Maker Showcases, we have the opportunity to participate in a Maker

Each semester at the Maker Showcases, we have the opportunity to participate in a Maker Playground. Here, any member of the UTeach Maker community, whether a part of the current cohort, a teaching fellow, or a mentor, can present anything they have made in the past semester. It is always a fun evening full of learning and friendship found in making! The picture on the left is of a project I presented in Spring 2019, my first machine-sewn dress entitled "Marilyn Monroe in Blue." The picture on the right is my friend Kyla explaining her exciting frisbee launcher creation.

The best aspect of being a member of the maker community is having the opportunity to share that community with the people you love! On the far left, my friend Taylor's 22nd birthday was Taylor Swift "feelin' 22" themed, and we all were devoted to dressing up as an iconic Taylor from over the years. This party was especially important to Taylor because she got to bring together her college friends and high school friends into one space for the very first time. I've loved inviting my friends to make things with me, including making costumes with my "fam" for our sorority's big/little reveal each year. It's always wonderful to make gifts for friends and family, like the "What would Jesus brew?" mug I embossed for my friend Michael. And since my best friend graduated in May 2019, we painted pottery together as an opportunity to hang out together in Austin one last time!



I'd like to highlight a part of my maker community that illustrated the awesome way that can even be used as outreach in Spring 2020. Pictured left is an image from an "Art Gala" thrown by one of the

ministries of the University Catholic Center in a friend's house. The art for this event was comprised solely of handmade submissions by students, and everyone dressed fancy, ate hors d'oeuvres, and sipped on wine as we enjoyed one another's presence and creations. A variety of mediums was used in each of the art pieces, including sculptures, sketches, paintings, origami, poetry, and even "spoken art," which was really just a funny way of saying stand-up dad joke comedy. Though this event was hilarious in itself, all of the participants took it seriously when it came to the theme. The night before, a large group of women got together to craft and live out fellowship. For the event, everyone involved in our ministry invited friends who were not members at the time, and they got to experience a joyful and loving space. Inviting people in is just the beginning, and the group bonding happening over making made my heart especially full that night!

My two favorite UTeach Maker Workshops were my first and my last: the laser cutting workshop and the holidary string art workshop. The laser cutting workshop was my very first experience with a laser cutter (which soon became one of my favorite tools at Ann Richards), and it was my first opportunity to get to know my fellow makers. At this point, it is so funny to reflect on my own social and technical awkwardness that day. However, I love both the product I created (which is still on display in my family's home!) and the people who I now call friends. The holiday string art workshop was my last workshop, but I didn't know it then. With the arrival of the COVID-19 pandemic, my time in community was unfortunately cut short. However, I look back on this December workshop with happiness, thinking of "Elf" playing in the background with hot chocolate but being completely unable to hear it due the constant hammering! It was such a testament to what UTeach Maker is: a group of goofy people with the very best ideas (that sometimes do not go as planned). I stayed late that workshop to finish my product, and I am so thankful that I had that extra time, especially in light of the time I lost this semester.

Even in quarantine, however, UTeach Maker has still found a way to carry on! We have met over zoom, and although the technology is no replacement for the in-person interactions, it's still great to see everyone. Most recently, we had a "virtual workshop" over zoom that allowed us to craft, make and build with materials found in our own homes, incorporating the "Maker Playbook" and "At-Home Scavenger Hunt" resources from UTeach Maker. The project that stuck out to me was the "permission slip," which has you pick a word that you give yourself permission to experience in daily life. This revolves around mental health and self-care, and I believe it is especially important right now in quarantine. The word I chose was "gentleness" because not only do I need to practice extending gentleness to my family members that I'm quarantined with, but I also need to extend myself gentleness every day. I desire to have a routine, be productive, wake up and go to sleep at normal times, exercise regularly, eat healthily, etc... However, some days are better than others. It is important to keep trying, but I can't expect myself to be perfect. So, I will be gentle with myself. I give myself permission to be gentle with myself. The different patterns doodled around the word itself represent the different scenarios from day-to-day. Some are rigid - representing good practices with discipline. Some are more fluid - representing the ups and the downs that never happen the same way twice. Some show an abrupt interruption to the pattern, which totally throws it off course - representing the unexpected turns that I have to take in quarantine sometimes. This project was awesome. I was able to take the time to slow down and reflect on my new idea of normal, which was perfect timing in my life. Thanks, UTeach Maker!

Site Map:

Caroline Anderson

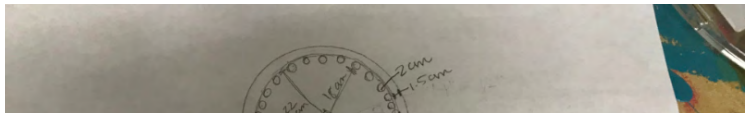
UTeach Maker TEACHING FELLOW

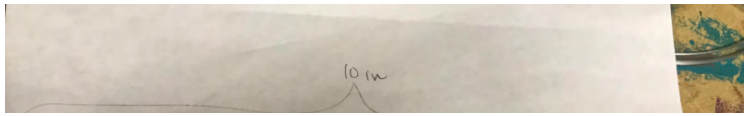
Project

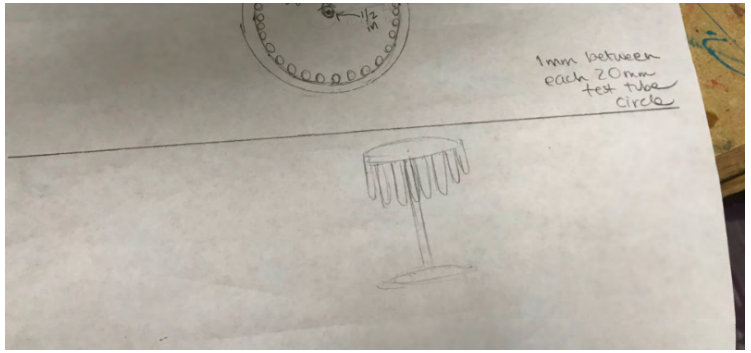
My Maker Project

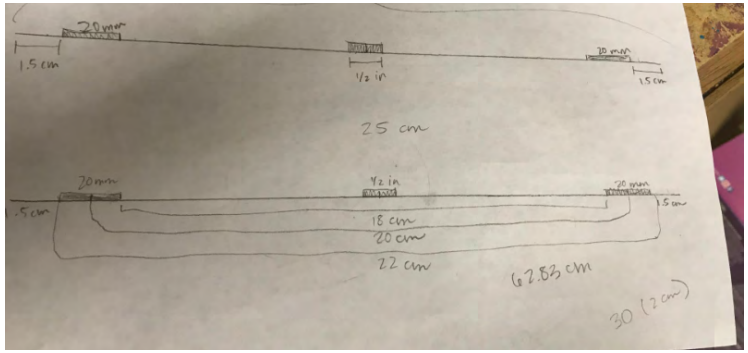
TEST TUBE LAMP

For my maker project, I created a test tube lamp. I wanted to find a way to express my chemistry-nerd side while creating a model that could represent scientific concepts for my future students. It was my goal to create a lamp using test tubes, one of the most basic and plentiful supplies in the laboratory, and to light them up in a rainbow. The rainbow could be a model of both the **visible light portion of the electromagnetic spectrum** and the **pH scale** in a chemistry classroom. Since a lamp's purpose is to light an area so we can see, I decided to relate it to the concept of science that focuses on the type of radiation we can see (visible light). Beginning with some simple sketches, I laser cut a protoype out of plywood designed to hold 24 test tubes that are 20 mm in diameter. After the prototype stand was created, I placed the test tubes in the holes, and they balanced perfectly inside due to the lip at the top of the tubes. Shout out to Oren Connell at the Ann Richards Makerspace for assistance and use of the ARS laser cutter at this stage of the process!









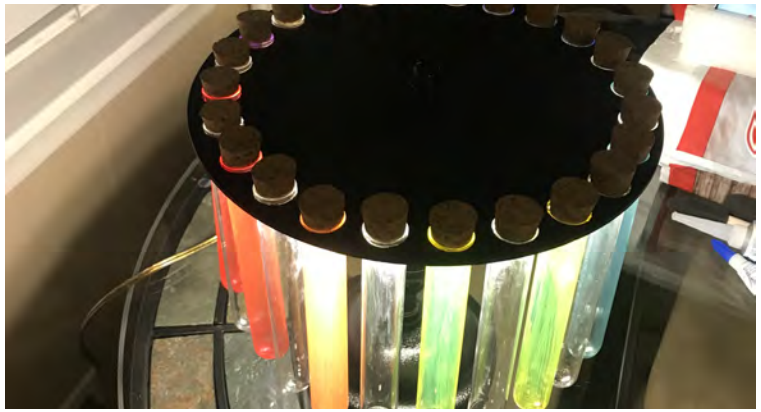
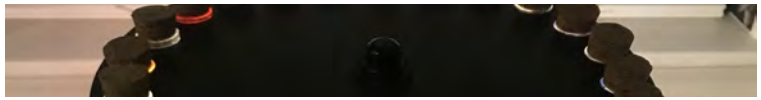
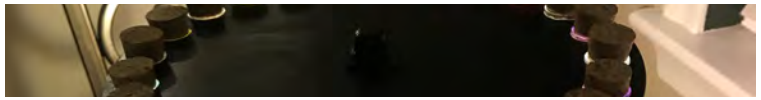
I considered several different methods for creating the rainbow in the test tubes, including color-changing LED lights and colored water inside of the tubes. I recently gained a fascination with stained glass from visiting beautiful churches in Italy and Poland, so I wanted to learn more about the science behind that artistic process and incorporate it into my project somehow. I learned that glass is made of liquid silicates that have been cooled quickly, and through adding different elements and minerals over years of trial and error, different color glasses were formed and put together to be the stunning pieces of art we see in churches around the world today. I discovered an awesome "How it's Made" video that details the process of making the finalized projects by putting the various pieces of colored glass together (https://www.youtube.com/watch?v=ABBDgCNmPvk).

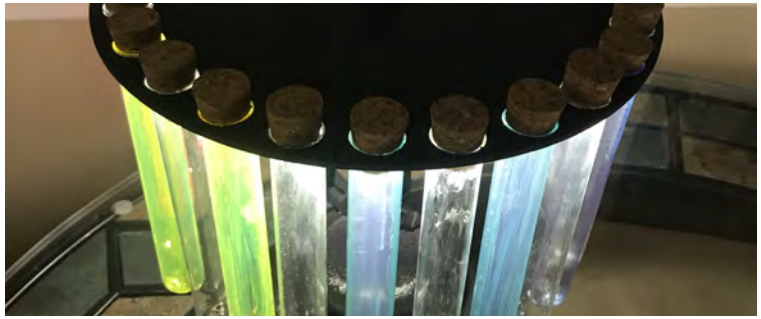
For my own project, I found glass paint that creates a stained glass effect, so I decided to mix colors to create the colors of the rainbow, **ROYGBIV (red, orange, yellow, green, blue, indigo, and purple)** and paint the interiors of the test tubes. For my first attempt at painting the test tubes, I tried painting the outside of one test tube, and the inside of another. It was very difficult to paint the inside of the test tube and used a lot of the paint, but I liked the darker color. I decided to stick with the technique of painting the outsides, but I wanted to add extra coats as needed until the desired opaqueness was reached. This biggest obstacle in painting the test tubes was giving them time to dry without touching the freshly-painted surfaces upon moving them. I also painted the second coat on the orange tubes too soon, so there are several small spots where the paint chipped or particles got caught in the tubes. Eventually, I painted all 24 test tubes in the ROYGBIV colors, and they were ready to add to the lampshade holder.

I liked the look of the natural plywood holder, but I felt like the lampshade would appear more put-together if the wood were a darker color. So, after painting the lampshade holder black, I added the beautiful rainbow test tubes, and I super-glued them at the tops to make sure they wouldn't fall through holes accidentally one day. Unfortunately, half of the test tubes stuck to the styrofoam protective container they were being stored in, so the paint was peeled off and I did not have any more to rectify the issue. So, I decided to alternate the rainbow test tubes with clear test tubes. Another issue that arose was the wax paper underneath the holder while gluing stuck to the top of the holder. I had to sand this down and repaint those areas. The contrast of the black holder with the colored tubes was still very beautiful, so I decided to make the entire lamp base black as well.




Next, I had to construct the lamp base using a lamp kit. I made sure to choose a lamp harp that was short enough to be proportional to the test tubes. The orignal lamp harp I found was far too tall, and it made my lampshade look awkward. After measuring the lamp shade to be 5 inches long, I decided to get a 6 inch lamp harp and create a 3 inch base. This way, the lamp would be 9 inches total. After constructing the base out of a PVC pipe (with a notch for the wire to come out of) and connecting it to the hardware of the lamp kit, I spray painted the base entirely black to match the test tube holder. I realized that the normal bulb size was not going to fit in the smaller lamp harp though, so I had to find a bulb that would fit. The appliance bulb I found was the perfect fit, but it was so hot that the lampshade got hotter too. Eventually I found a 40 watt, soft white appliance bulb that was perfect in size, temperature and brightness for my lamp. I then connected all of the circuitry to make sure that it worked, and the resulting lamp was absolutely stunning!

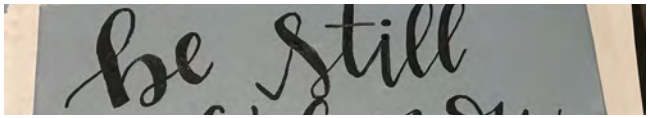


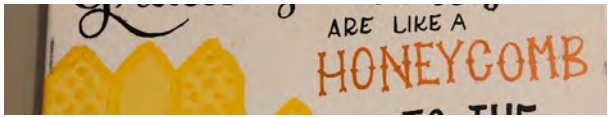

To finalize my lamp, I would love to add little sprigs of greenery in the newly-cleaned clear test tubes to add a natural accent and uplift the dark industrial aesthetic. However, I will wait until the stay-at-home orders are lifted to add this finishing touch. Despite this, I am so excited by the lamp I created. I look forward to using it to light all of the papers that will cross my teacher desk for years to come, and I also can't wait to demonstrate the visible light spectrum for my future students in a more tangible way!

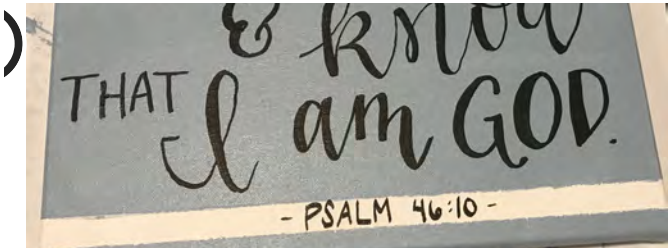
Smaller Maker Projects

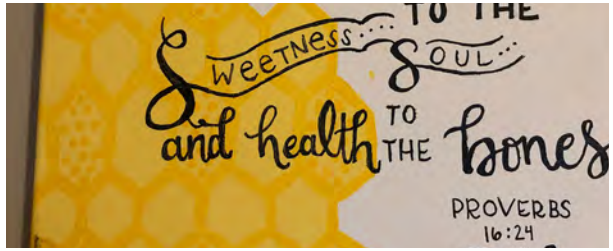
The beauty of being a member in UTeach Maker is the constant encouragement to continue making year-round. We are supported by the UTeach program through both the Maker organization and UTeach internships with a maker component. These fabulous resources have resulted in a number of smaller maker projects that I have greatly enjoyed creating. Scroll through my gallery to see some of the fun things I've made!

I also love to create canvases with quotes as a quick and easy gift for friends and family. Here are a few of those I've remembered to take pictures of!



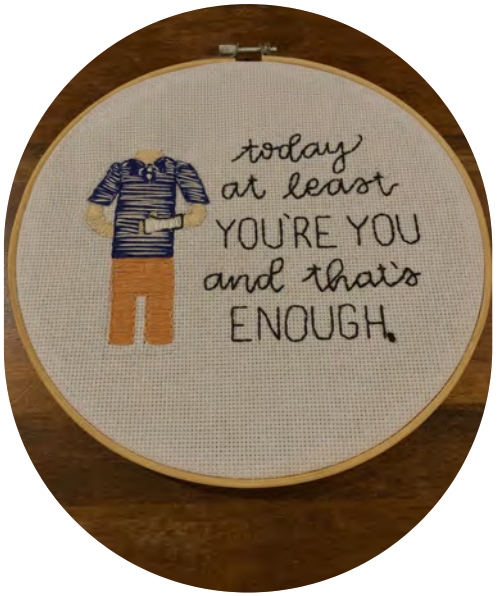






Making in Quarantine

During quarantine over the past 6 months, I've taken up a new hobby: embroidery. It started out of boredom, but quickly evolved into something more for me. It is so easy to forget about or neglect our well-being when isolated at home for weeks and months at a time, but having a life-giving activity can be both theraputic and enjoyable. I think it is extremely important for everyone during this time to find what activity brings them joy and to plan out time to do that thing. It is not selfish, but rather, it is a part of taking care of yourself. Please join me in doing what we need to do to stay healthy, in every iteration of the word!



Future Project Ideas
- Embroidered face masks
- Mini monogram embroidered keychains, as gifts for friends
- Embroidery on tulle, which is a sheer fabric (this would require great attention to detail for how the string is tied and positioned on the back of the fabric)

fabric)

Site Map:

Home

About Me

Philosophy

Education

Community

Project

Lesson Plans

Caroline Anderson

UTeach Maker
TEACHING FELLOW

Apprentice Teaching Lesson Plans

Chemistry at Westwood HS in RRISD

Week of:

February 3rd: Gas Laws, Gas Law Stoichiometry Download

February 10th: Gas Laws Conclusion, Solutions Intro Download

February 17th (17th-18th STAFF DEVELOPMENT): Solutions Intro, Saturation, Solubility Rules Download

February 24th: Net Ionic Equations, Molarity/Dilutions Download

March 2nd: Solutions Stoichiometry, Solutions Conclusion Download

March 9th: Thermochemistry Intro, Specific Heat, Calorimetry, Enthalpy Download

March 16th (SPRING BREAK)

March 23-May 4 (SCHOOL CLOSURE)

- Worked with the chemistry team on implementing online review curriculum for our classes during the COVID-19 closures.

Apprentice Teaching Showcase Lesson – Blended Learning Download

Site Map:

AGENDAS FOR THE WEEK: *February 3 – February 7*

	MONDAY (WHITE) 1:28-2:51 PM	**TUESDAY (ORANGE)** 2:57-4:20 PM	**WEDNESDAY (WHITE)** 1:28-2:51 PM	**THURSDAY (ORANGE)** 2:57-4:20 PM	**FRIDAY (WHITE)** 1:28-2:51 PM
	Objective(s): SWBAT CT finishes teaching Ideal Gas Law and Avogadro's Law	**Objective(s): SWBAT** * Solve stoichiometric relationships for reactions of gases at STP or non-standard conditions	**Objective(s): SWBAT** * Solve stoichiometric relationships for reactions of gases at STP or non-standard conditions	**Objective(s): SWBAT** * Interpret given conditions to solve a variety of gas law calculations * Design and construct a model airbag based on stoichiometric and gas law calculations	Objective(s): SWBAT * Interpret given conditions to solve a variety of gas law calculations * Design and construct a model airbag based on stoichiometric and gas law calculations
P	**Engage**	**Engage** Warm-up: Students will complete google form with their interests. Students will learn about the apprentice teacher's interests from a brief "about me" ppt.	**Engage** Warm-up: Students will complete google form with their interests. Students will learn about the apprentice teacher's interests from a brief "about me" ppt.	**Engage** Warm-up: Students will anonymously write one question they have about gas laws on a notecard. Students will participate in class discussion about select questions.	**Engage** Warm-up: Students will anonymously write one question they have about gas laws on a notecard. Students will participate in class discussion about select questions.
L **A**	**Explore** **Explain** **Elaborate**	**Explore** What do you think we do when the conditions are not at STP? Students will participate in a think-pair-share/discussion. Students will attempt to discover the process on the first problem of the gas stoichiometry notes sheet. **Explain** Students will complete the gas stoichiometry notes sheet. **Elaborate** Students will complete foldable with gas laws and example problems.	**Explore** What do you think we do when the conditions are not at STP? Students will participate in a think-pair-share/discussion. Students will attempt to discover the process on the first problem of the gas stoichiometry notes sheet. **Explain** Students will complete the gas stoichiometry notes sheet. **Elaborate** Students will complete foldable with gas laws and example problems.	Students will take the gas laws quiz. **Explore** Students will work through the Air Bag Lab in their lab groups.	Students will take the gas laws quiz. **Explore** Students will work through the Air Bag Lab in their lab groups.
N	**Evaluate and Summary**	**Evaluate and Summary** Students will complete practice problems HW.	**Evaluate and Summary** Students will complete practice problems HW.	**Evaluate and Summary** Students will complete lab worksheet with remaining time.	**Evaluate and Summary** Students will complete lab worksheet with remaining time.

AGENDAS FOR THE WEEK: *February 10 – February 14*

	MONDAY (ORANGE) 2:57-4:20 PM	**TUESDAY (WHITE)** 1:28-2:51 PM	**WEDNESDAY (ORANGE)** 2:57-4:20 PM	**THURSDAY (WHITE)** 1:28-2:51 PM	**FRIDAY (ORANGE)** 2:57-4:20 PM
	Objective(s): SWBAT * Explore several real-world stations of gas laws in action. * Connect experimental observations with gas law relationships.	**Objective(s): SWBAT** * Explore several real-world stations of gas laws in action. * Connect experimental observations with gas law relationships.	**Objective(s): SWBAT** * Demonstrate understanding of both mathematical and conceptual gas law concepts.	**Objective(s): SWBAT** * Demonstrate understanding of both mathematical and conceptual gas law concepts.	**Objective(s): SWBAT** * List three factors that determine how fast a soluble substance will dissolve. * Describe the dissolving process at the molecular level. * Differentiate between an electrolyte and nonelectrolyte solutions.
P	**Engage** Warm-up: Students will work as a group to think of a real-world scenario where gas laws would be important. One student from each group will share with the class.	**Engage** Warm-up: Students will work as a group to think of a real-world scenario where gas laws would be important. One student from each group will share with the class.	**Engage** Students will go over the Gas Laws Review handout.	**Engage** Students will go over the Gas Laws Review handout.	**Engage** Happy Valentine's Day! After receiving a definition of solubility, students will choose a question (from several options) about factors affecting solubility to investigate.
L **A**	**Explore** Students will explore the "Gas Law Extravaganza" stations in their lab group. **Explain** Students will complete the "Gas Law Extravaganza" worksheet. **Elaborate** Students will observe the vacuum chamber demonstrations. Students will work on the Gas Laws Review handout.	**Explore** Students will explore the "Gas Law Extravaganza" stations in their lab group. **Explain** Students will complete the "Gas Law Extravaganza" worksheet. **Elaborate** Students will observe the vacuum chamber demonstrations. Students will work on the Gas Laws Review handout.	**Explain** Students will take the Gas Laws test.	**Explain** Students will take the Gas Laws test.	**Explore** Students will choose from a list of materials and create and perform a procedure to answer their question. **Explain** One student from each group will summarize their group's findings in a class discussion. Students will take notes on the introduction to solutions and solubility power point. **Elaborate** Students will observe the electrolyte demonstration.
N	**Evaluate and Summary** Exit ticket: students will complete the google form with what they feel most/least confident about for the test. HW: students will complete the Gas Laws Review handout.	**Evaluate and Summary** Exit ticket: students will complete the google form with what they feel most/least confident about for the test. HW: students will complete the Gas Laws Review handout.	**Evaluate and Summary** Students will be evaluated by their Gas Laws test free response and multiple-choice sections.	**Evaluate and Summary** Students will be evaluated by their Gas Laws test free response and multiple-choice sections.	**Evaluate and Summary** HW: Students will complete the day #1 homework.

vAGENDAS FOR THE WEEK: *February 17 – February 21*

	MONDAY STAFF DEVELOPMENT	TUESDAY STAFF DEVELOPMENT	WEDNESDAY (WHITE) 1:28-2:51 PM	THURSDAY (ORANGE) 2:57-4:20 PM	FRIDAY (WHITE) 1:28-2:51 PM
	Objective(s): SWBAT	**Objective(s): SWBAT**	**Objective(s): SWBAT** * List three factors that determine how fast a soluble substance will dissolve. * Describe the dissolving process at the molecular level. * Differentiate between an electrolyte and nonelectrolyte solutions.	**Objective(s): SWBAT** * Explain the difference between saturated, unsaturated, and supersaturated solutions at the molecular level. * Use a solubility curve to determine the degree of saturation.	**Objective(s): SWBAT** *Explain the difference between saturated, unsaturated, and supersaturated solutions at the molecular level. * Use a solubility curve to determine the degree of saturation.
P	**Engage**	**Engage**	**Engage** After receiving a definition of solubility, students will choose a question (from several options) about factors affecting solubility to investigate.	**Engage/Explore** Students will observe and make predictions during the sweet tea saturation demonstration.	**Engage/Explore** Students will observe and make predictions during the sweet tea saturation demonstration.
L **A**	**Explore** **Explain** **Elaborate**	**Explore** **Explain** **Elaborate**	**Explore** Students will choose from a list of materials and create and perform a procedure to answer their question. **Explain** One student from each group will summarize their group's findings in a class discussion. Students will take notes on the introduction to solutions and solubility power point. **Elaborate** Students will observe the electrolyte demonstration.	**Explain** Students will take notes on the solubility, saturation, and saturation curves power point. **Elaborate** Students will begin to work on the day #2 homework practice problems. Students will get to taste a sample of each of the teas.	**Explain** Students will take notes on the solubility, saturation, and saturation curves power point. **Elaborate** Students will begin to work on the day #2 homework practice problems. Students will get to taste a sample of each of the teas.
N	**Evaluate and Summary**	**Evaluate and Summary**	**Evaluate and Summary** HW: Formative/stamping assessments throughout the explore activity.	**Evaluate and Summary** Exit ticket: students will complete a google form explaining the sweet tea demo in terms of solubility and saturation. HW: Students will complete the homework.	**Evaluate and Summary** Exit ticket: students will complete a google form explaining the sweet tea demo in terms of solubility and saturation. HW: Students will complete the homework.

AGENDAS FOR THE WEEK: *February 24 – February 28*

	MONDAY (ORANGE) 2:57-4:20 PM	TUESDAY (WHITE) 1:28-2:51 PM	WEDNESDAY (ORANGE) 2:57-4:20 PM	THURSDAY (WHITE) 1:28-2:51 PM	FRIDAY OUT OF TOWN
	Objective(s): SWBAT ***** Predict the formation of precipitate using the solubility rules and write the net ionic equation showing the formation of the precipitate.	**Objective(s): SWBAT** ***** Predict the formation of precipitate using the solubility rules and write the net ionic equation showing the formation of the precipitate.	**Objective(s): SWBAT** * Describe how to prepare dilute solutions from concentrated soln. of known molarity. * Describe how to and prepare a solution of known molarity given the solid compound. ***** Perform calculations involving percent solutions, molarity and density.	**Objective(s): SWBAT** * Describe how to prepare dilute solutions from concentrated soln. of known molarity. * Describe how to and prepare a solution of known molarity given the solid compound. ***** Perform calculations involving percent solutions, molarity and density.	
P	**Engage** Warm up: Students will complete the "solubility basics" handout.	**Engage** Warm up: Students will complete the "solubility basics" handout.	**Engage** Warm up: Students will complete the saturation curves practice handout to review.	**Engage** Warm up: Students will complete the saturation curves practice handout to review.	
L **A**	**Explore** Students will work through the net ionic equations guided learning handout. **Explain** Students will have checkpoints periodically in the guided learning handout to check understanding and be given new vocabulary. Students will take final notes on net ionic equation steps. **Elaborate** Students will complete the "sweet 16 tournament" handout.	**Explore** Students will work through the net ionic equations guided learning handout. **Explain** Students will have checkpoints periodically in the guided learning handout to check understanding and be given new vocabulary. Students will take final notes on net ionic equation steps. **Elaborate** Students will complete the "sweet 16 tournament" handout.	Students will take the solutions quiz. **Explain** Students will take notes on the molarity/dilutions power point. **Elaborate** Students will practice molarity and dilutions problems.	Students will take the solutions quiz. **Explain** Students will take notes on the molarity/dilutions power point. **Elaborate** Students will practice molarity and dilutions problems.	
N	**Evaluate and Summary** HW: students will complete the net ionic equations practice.	**Evaluate and Summary** HW: students will complete the net ionic equations practice.	**Evaluate and Summary** Exit Ticket: students will complete google form with vocabulary definitions in their own words. HW: students will complete the molarity and dilutions problems.	**Evaluate and Summary** Exit Ticket: students will complete google form with vocabulary definitions in their own words. HW: students will complete the molarity and dilutions problems.	

AGENDAS FOR THE WEEK: *March 2 – March 6*

	MONDAY (WHITE) 1:28-2:51 PM	TUESDAY (ORANGE) 2:57-4:20 PM	WEDNESDAY (WHITE) 1:28-2:51 PM	THURSDAY (ORANGE) 2:57-4:20 PM	FRIDAY (WHITE) 1:28-2:51 PM
	Objective(s): SWBAT * Describe how to and prepare dilute solutions from concentrated soln. of known molarity. * Differentiate stoichiometry calculations for solids, gas laws, liquids and solutions.	**Objective(s): SWBAT** * Describe how to and prepare dilute solutions from concentrated soln. of known molarity. * Differentiate stoichiometry calculations for solids, gas laws, liquids and solutions.	**Objective(s): SWBAT** * Describe how to and prepare dilute solutions from concentrated soln. of known molarity. * Differentiate stoichiometry calculations for solids, gas laws, liquids and solutions.	**Objective(s): SWBAT** * Demonstrate understanding of both mathematical and conceptual solutions concepts.	**Objective(s): SWBAT** * Demonstrate understanding of both mathematical and conceptual solutions concepts.
P	**Engage** Warm up: Students will begin reading the Dilutions lab and answering the prelab questions.	**Engage** Warm up: Students will begin reading the Kool Aid lab and answering the prelab questions.	**Engage** Warm up: Students will begin reading the Kool Aid lab and answering the prelab questions.	**Engage** Students will go over the Solutions Review handout.	**Engage** Students will go over the Solutions Review handout.
L **A**	**Explore** Students will complete the Dilutions lab. **Explain** Students will take notes on solution stoichiometry. Students will match stoich types with different situations. **Elaborate** Students will practice solution stoichiometry problems or take the quiz retake.	**Explore** Students will participate in the Kool Aid lab. **Explain/Elaborate** Students will work on the Solutions menu choice review activities.	**Explore** Students will participate in the Kool Aid lab. **Explain/Elaborate** Students will work on the Solutions menu choice review activities.	**Explain** Students will take the Solutions Test.	**Explain** Students will take the Solutions Test.
N	**Evaluate and Summary** HW: students will complete the Solution Stoichiometry Problems and Dilutions lab handout.	**Evaluate and Summary** Students will turn in Solutions menu choice review handout. HW: students will complete the Kool Aid lab report Solutions review at home.	**Evaluate and Summary** Students will turn in Solutions menu choice review handout. HW: students will complete the Kool Aid lab report Solutions review at home.	**Evaluate and Summary** Students will be evaluated by their Solutions test free response and multiple-choice sections.	**Evaluate and Summary** Students will be evaluated by their Solutions test free response and multiple-choice sections.

AGENDAS FOR THE WEEK: *March 9 – March 13*

	MONDAY (ORANGE) 2:57-4:20 PM	TUESDAY (WHITE) 1:28-2:51 PM	WEDNESDAY TAKING TExES EXAM	THURSDAY (WHITE) 1:28-2:51 PM	FRIDAY (ORANGE) 2:57-4:20 PM
	Objective(s): SWBAT ***** Perform calculations involving heat, mass, temperature change and specific heat. * Apply Calorimetry concepts to calculate the heat of a chemical process.	**Objective(s): SWBAT** ***** Perform calculations involving heat, mass, temperature change and specific heat. * Apply Calorimetry concepts to calculate the heat of a chemical process.	**Objective(s): SWBAT** * Use molar enthalpy to calculate energy changes that occur in various chemical reactions.	**Objective(s): SWBAT** * Use molar enthalpy to calculate energy changes that occur in various chemical reactions.	**Objective(s): SWBAT** * Use molar enthalpy to calculate energy changes that occur in various chemical reactions. * Generate and defend arguments about molar enthalpy based on experimental results.
P	**Engage** Students will participate in a discussion: "Have you ever been to the beach before?" exploring heat of sand vs water.	**Engage** Students will participate in a discussion: "Have you ever been to the beach before?" exploring heat of sand vs water.	**Engage** Warm up: Students will complete the calorimetry review handout.	**Engage** Warm up: Students will complete the calorimetry review handout.	**Engage** Warm up: Students will complete a google form sharing their spring break plans.
L **A**	**Explore** Students will interact with the Heat Capacity Virtual Lab. **Explain** Students will take notes on heat capacity, specific heat and calorimetry. **Elaborate** Students will begin working on the specific heat/calorimetry practice problems.	**Explore** Students will interact with the Heat Capacity Virtual Lab. **Explain** Students will take notes on heat capacity, specific heat and calorimetry. **Elaborate** Students will begin working on the specific heat/calorimetry practice problems.	**Explore** Students will begin the Molar Enthalpy ADI.	**Explore** Students will begin the Molar Enthalpy ADI.	**Explore** Students who need to finish collecting data will do so. **Explain** Students will form their argument posters. Groups will share their arguments with the class and participate in a discussion. **Elaborate** Students will take notes on molar enthalpy. Students will complete the molar enthalpy practice.
N	**Evaluate and Summary** HW: Students will complete the specific heat/calorimetry practice problems.	**Evaluate and Summary** HW: Students will complete the specific heat/calorimetry practice problems.	**Evaluate and Summary** Students will be evaluated on their participation in the ADI.	**Evaluate and Summary** Students will be evaluated on their participation in the ADI.	**Evaluate and Summary** Students will be evaluated on their participation in the ADI and understanding demonstrated the presentations. HW: students will complete the molar enthalpy practice problems.

Showcase Lesson

Caroline Anderson
Apprentice Teaching 2020
Blended Learning

01
General Lesson Overview

Kool-Aid Lab and Menu Choice Sheet Activity

02
Engagement

How I encouraged student excitement and maintained their engagement

03
Connectedness

Connecting the content to past, future, and relevant topics

04
Assessments

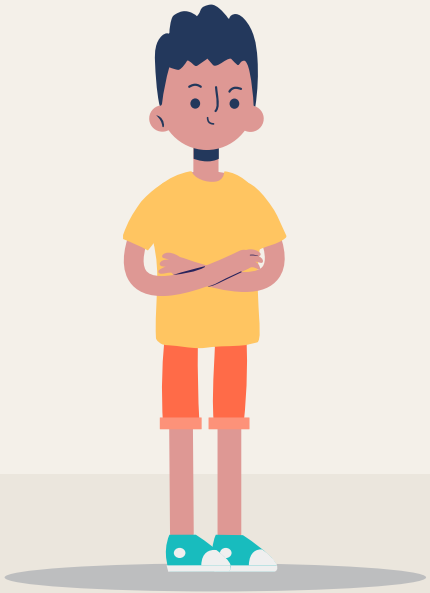
How students were formally assessed and the content summarized

05
Differentiation

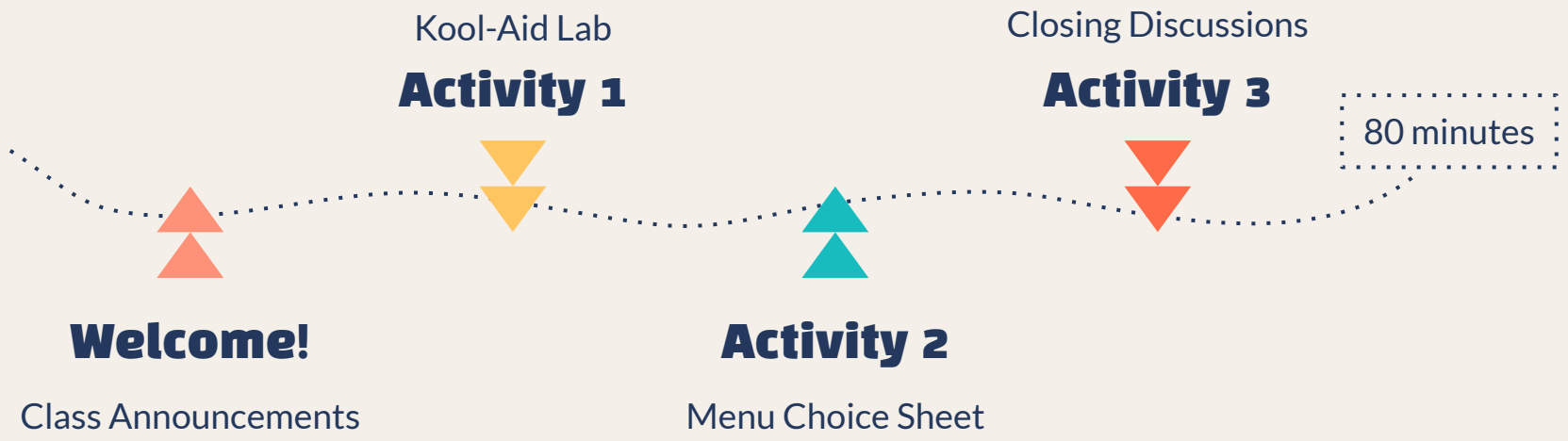
Differentiated instruction for the students through blended learning

01

General Lesson Overview



Solutions Unit Review Lesson: Pre-AP/IB Chemistry



Activity 1: Kool-Aid Lab

The first activity for this lesson was the Kool-Aid lab, which had students practice creating dilutions of a Kool-Aid solution from prior known concentrations. Students first calculated the "molar mass" of the Kool-Aid (K= 18 g/mol, O= 6 g/mol, L =25 g/mol, A = 7 g/mol, I= 19 g/mol, D=13 g/mol), then created a 2.0 M solution. They used the 2.0 M solution to create 1.0 M solution, and the 1.0 M solution to create a 0.45 M solution. Students used their knowledge of how to *calculate molarity and dilution* to determine quantities, but they also had to *discover proper lab procedures* and watch for misconceptions (ex. adding the solute, Kool-Aid powder, first, then filling up to the line with solvent, water - instead of filling the water to the line then adding the powder, making the final volume too high).

This lab was a great way for students to practice these lab techniques using *safe* substances. It is good to solidify the techniques early on, so that when they reach the acids and bases unit, they already know what to do, just with chemicals that are more dangerous than Kool-Aid.

This lab was *self-paced in groups*. When completed, students could move onto the menu choice sheet activity. Students also had the opportunity to try their Kool-Aid solutions, should they desire to, and evaluate the taste of each concentration. There was a visible timer on the board along with verbal time cues for the total 30 minutes of time allotted to this activity.

Activity 2: Menu Choice Sheet

The first activity for this lesson was the menu choice sheet activity. Students had several options of activities that each reviewed concepts from the solutions unit. The materials for the activities were spread out on carts at the front of the table, with handouts, games, and class sets of readings. Students had access to their phones or class computers for any activities requiring technology.

Some activities were pointed towards specific content that students could choose if they felt like they needed more help with those learning targets. For example, there was a "Solutions Stoichiometry Day 2" handout, a video to watch on net ionic equations, and a "Color by Solubility Rules" activity. Other activities acted as general review, such as the bingo game and index cards matching activity. As students were observed working on activities, I would stamp the respective box on their menu choice sheet. To facilitate this activity, I would start by asking students: "What are you working on?" and then fielded content questions from them. I also pursued persistent issues on certain topics, provided positive encouragement, and welcomed conversation about extra-curricular interests that spurred their activity choices.

This activity was *self-paced for individuals*, who could choose to work in small groups as well. When one activity was completed, students could move onto the next activity of their choice. Students were expected to work on a minimum of two activities. There was a visible timer on the board along with verbal time cues for the total 30 minutes of time allotted to this activity.

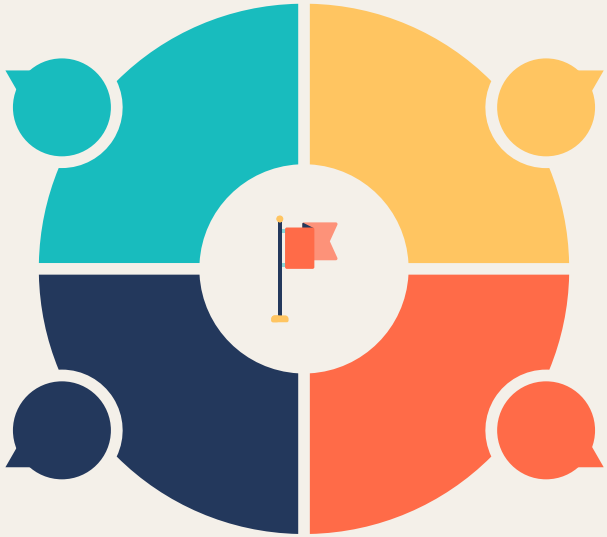
Student Choice Based on Preferences

Visual and Auditory

- Read: Article on Paintball Color by Solubility Rules
- Listen: Video on Net Ionic Equations/Solubility

Kinesthetic and Expressive

- Create: Graphic Organizer or Model
- Create: Flipgrid Video about a Solutions Topic



Group

- Task Cards Challenge
- Index Card Matching Game
- Play Solutions Bingo

Individual

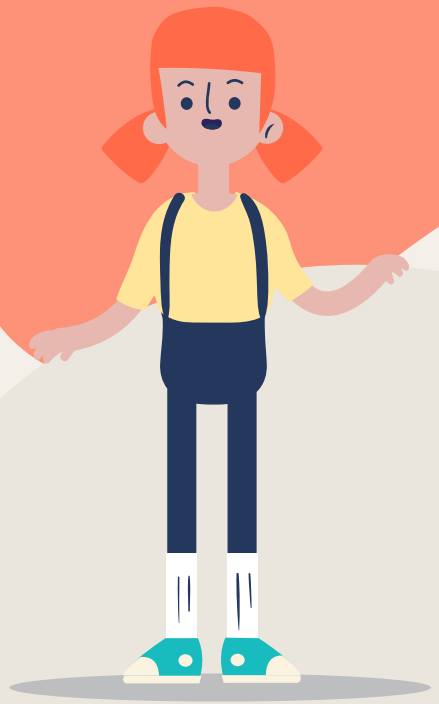
- Solutions Stoichiometry Day 2 Handout
- Test Review Handout

Students were asked to complete a *minimum of two activities of their choice*, based on what they desired to focus on for review. These categories were *flexible* - an activity listed under "group" could also be "kinesthetic," and a pair/small group of students could work on one of the handouts under the "individual" category.

Activity 3: Small Group→Class Discussion

Students participated in a *reflective* discussion after the completion of these two activities. They shared insights they had learned and enjoyed, and concepts that would need additional study for the upcoming test.

The discussion took place first in their small table groups (3-4 students) then was opened up to the entire class.

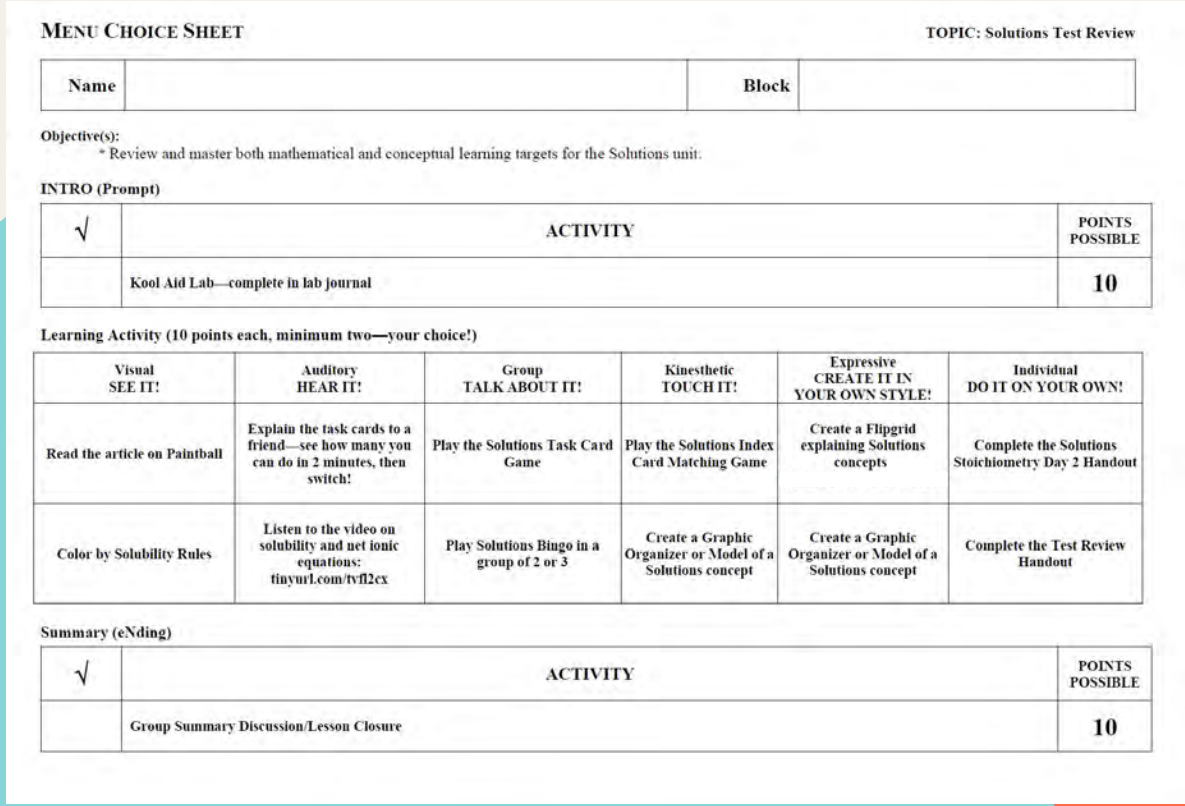


02

Engagement

Anchoring Handout

With so many moving pieces during this lesson, the anchoring handout offered documentation of student participation on one page. Students could receive **stamps** for participating in the lab, working on the menu choice activities, and participating in the final discussion. Students could also receive supplemental stamps for asking good questions or making great points about chemistry, as well as helping their peers and going the extra mile. The students were not limited to one stamp in each box, though the boxes helped the students to *understand my expectations* for their participation.



MENU CHOICE SHEET — **TOPIC: Solutions Test Review**

Name		Block	

Objective(s):
* Review and master both mathematical and conceptual learning targets for the Solutions unit.

INTRO (Prompt)

√	ACTIVITY	POINTS POSSIBLE
	Kool Aid Lab—complete in lab journal	10

Learning Activity (10 points each, minimum two—your choice!)

Visual SEE IT!	Auditory HEAR IT!	Group TALK ABOUT IT!	Kinesthetic TOUCH IT!	Expressive CREATE IT IN YOUR OWN STYLE!	Individual DO IT ON YOUR OWN!
Read the article on Paintball	Explain the task cards to a friend—see how many you can do in 2 minutes, then switch!	Play the Solutions Task Card Game	Play the Solutions Index Card Matching Game	Create a Flipgrid explaining Solutions concepts	Complete the Solutions Stoichiometry Day 2 Handout
Color by Solubility Rules	Listen to the video on solubility and net ionic equations: tinyurl.com/tvfl2cx	Play Solutions Bingo in a group of 2 or 3	Create a Graphic Organizer or Model of a Solutions concept	Create a Graphic Organizer or Model of a Solutions concept	Complete the Test Review Handout

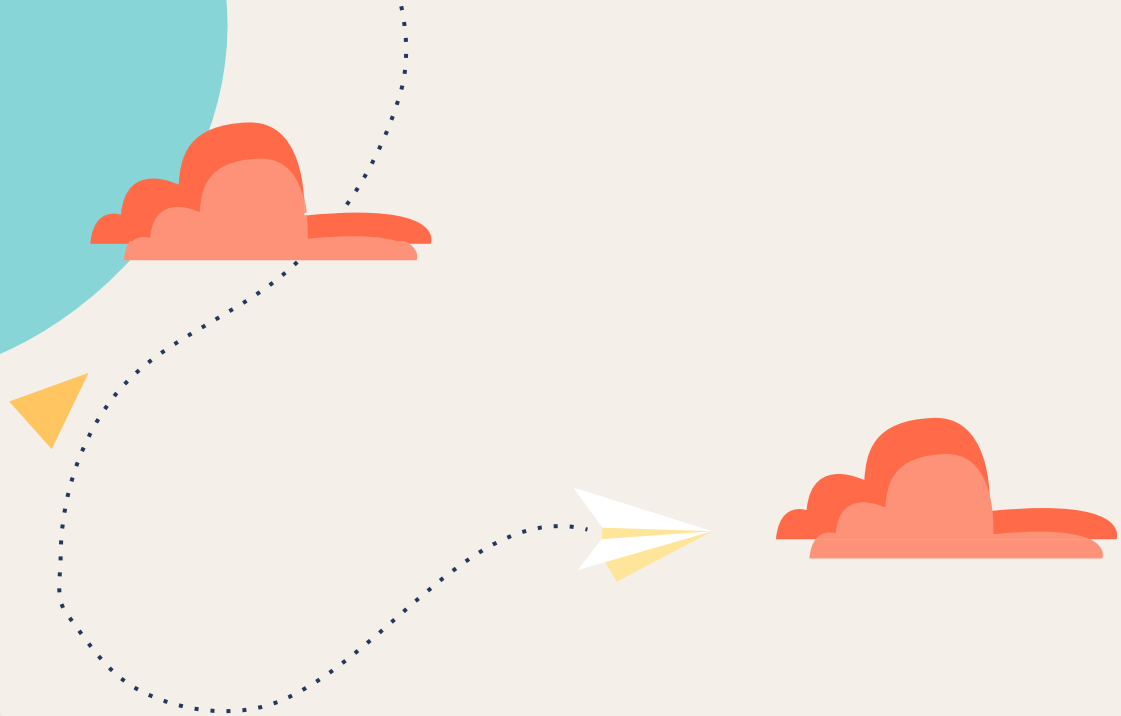
Summary (eNding)

√	ACTIVITY	POINTS POSSIBLE
	Group Summary Discussion/Lesson Closure	10

Why Stamps? And other fun aspects…

1) The students knew that the stamps were important for receiving a good participation grade for this lesson, but *they weren't told how many they needed*, keeping the students **constantly striving** to earn stamps by participating in every aspect of the lesson.
2) Having *several shorter activities* on the menu choice sheet **kept their attention better** than one long activity.
3) *Student choice was especially effective* because students choosing their type of learning is essentially them **choosing to learn**!
4) The prospect of *taste testing the Kool-Aid samples* created an **excitement** among the students. They were even asked on their lab handout to share which concentration tasted the best to them and why, and they could *apply this* in creating drinks at home!

To start of the lesson:
"This is your day, you get to choose how you practice, learn and review today!"



03

Connectedness

Kool-Aid Lab

Real-World Example

Creating solutions of a specific molarity and subsequent dilutions in daily life.

Building on Scaffolds

Using previous skills from topics such as: calculating molar mass, stoichiometry and identifying the parts of a solution.

Menu Choice Sheet

Paintball Article: "What does paintball have to do with chemistry?"

Sparked conversations with peers around the general sentiment: “Wow, chemistry really is everywhere!” Students sought out other examples of chemistry in their favorite activities.

Forward-Thinking

Task cards, index card matching, and bingo quizzed students on conceptions while also asking application questions looking towards future chemistry concepts (such as acids and bases).

Putting it All Together

Graphic organizer activity inherently encourages connectedness: between prior and future learning topics, among science disciplines, and to real-world applications.

04

Assessments

Formative Assessments

The facilitation of the lesson using stamps and constant movement around the classroom allowed me to:

- Check student understanding
- Answer questions
- Uncover persisting misconceptions
- Ensure safe lab practices
- Ask “what are you working on?” to redirect attention
- Learn more about the students’ interests
- Encourage students in their learning (positive feedback)
- Provide individualized or small group instruction
- Note improvement in mastery from previous lessons
- Check-in on student well-being

I returned to each student multiple times throughout the lesson, so I was constantly giving feedback and observing how students applied that feedback with each concept and activity.

To Summarize the Learning Goals:

During the small group → large class discussion, students reflected on:

1) What did you work on? What did you enjoy most?
2) What is something new you learned?
3) What is a question(s) you still have about solutions?

Since students had chosen which activities they worked on, they were more inclined to share as they had taken *ownership over their own learning*.

This also allowed me to take note of any outstanding questions one last time before their upcoming test, in addition to *reading the general expectant attitude of the class*. I answered questions with any remaining time, but also *used their responses* to guide what I spent more time on when going over the test review handout immediately before testing. The solutions test during the next block was the common Pre-AP/IB summative assessment for the unit.

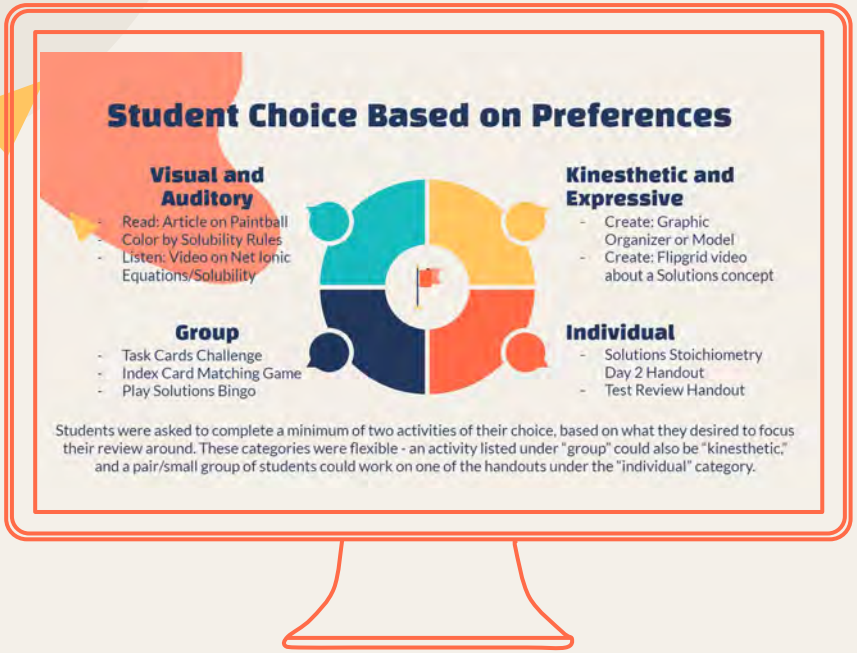
05

Differentiation

Differentiation Overview

	Differentiation
Kool-Aid Lab	Lab Experiment: Hands-On Science Collaborative (Small Groups of 3-4) Real World Application
Menu Choice Sheet	Wide Variety of Activities - Blended Learning Small Groups, Pairs, or Individual Encouraged Creativity and Making
Closing Discussion	Small Group → Large Class Reflective and Introspective

Student Choice Drives Blended Learning



Students are EMPOWERED to choose but still work towards MASTERY of learning targets.

Each of the menu choice activities was carefully selected or created to ensure alignment to the solutions content. Given these activities, the students had control over their choices from what appealed to them mostly based on their interests or what they felt they needed to study. Students had freedom, but they were constantly being held accountable throughout the lesson and with the upcoming exam.

Creativity and Maker Education

A quote from my teaching philosophy about the importance of creating a space for creativity and maker education in the classroom:

"The feeling you get after making something yourself *lasts* as you enjoy a *sense of ownership* of your work. This is an **extremely valuable tool** for an educator and their students."

The expressive, visual, and kinesthetic categories of the menu choice sheet lends themselves to open-ended maker activities, and the majority of my students chose at least one of these activities in the implementation of this lesson. They all loved creating with science.

Creativity and Maker Education

Activity Spotlight:

1) **Color by Solubility Rules**: students colored a butterfly labeled like a “paint by number” activity based on the solubility rules. Many students felt as if this activity was somewhat therapeutic, helping them to practice mindfulness and experience peace before their upcoming exam.
2) **Making a Graphic Organizer/Model**: this activity had seemingly unlimited freedom, encouraging students to connect multiple topics together or create models and analogies. Students had complete control over the aesthetics and format of their product.
3) **Flipgrid Video about a Solutions Topic**: students had the opportunity to create an instructional video about anything from the unit, and this tool has fun editing techniques (filters, text and stamps) and the ability to reply to their peers’ video creations.

Future Improvements

This was the first time these students participated in a menu choice sheet, so I will establish **consistent procedures** to aid in classroom management for future implementations, such as raising hands for help during menu choice activities (instead of calling aloud). In my own classroom, I will create a **makerspace**. With this, the students will be *more comfortable* with the materials of frequent use, and I will include more maker activities in the future.

Teacher Reflections

I had a blast teaching and facilitating this lesson. I've often said that "I thrive in chaos" when it comes to the classroom. My ideal classroom is not one where the students are all in their seats, working quietly, but rather there is movement, collaboration, and joy. It was wonderful to learn about each of the **students' interests** in the activities they chose. Each time I stamped a paper, I assisted the students however they needed, but I also shared a **positive encouragement**:

"You're doing great! Keep going!"

The students were having fun (as was I) in addition to participating in great chemistry and mastering the content I love for them to love. What a gift!

“Teachers are the guardians of spaces that allow students to breathe and be curious and explore the world and be who they are without suffocation.”

—Brene Brown

Thanks!

Graphics and Images for Slides:
youremail@freepik.com
+91 620 421 838
yourcompany.com

CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon, and infographics & images by Freepik.