Unit 1 Safety in the Lab (Physical Science, Engineering Design)

Content Area: **Science**
Course(s): **Chemistry H/Lab**
Time Period: **Sept-June**
Length: **185 days**
Status: **Published**

Title Section

Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

Honors Chemistry 10-11

Safety and Scientific Method

Belleville Board of Education

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Board Approved: September 23, 2019

Unit Overview

1. *Safety in the Laboratory - Proper laboratory techniques and safety protocols are essential in the high school science laboratory*
2. Introduction to Chemistry and Chemistry as a Physical Science - Chemical reactions, including rates of reactions and energy changes, can be understood by students at this level in terms of the collisions of molecules and the rearrangements of atoms.
3. Introduction to Chemistry and Chemistry as a Physical Science - Students are expected to communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.
4. Data Collection and Analysis - The crosscutting concepts of *structure and function*, *patterns*, *energy and matter*, and *stability and change* are called out as the framework for understanding the disciplinary core ideas. Students use *developing and using models*,*planning and conducting investigations*, *using mathematical thinking*, and *constructing explanations and designing solutions*.
5. Data Collection and Analysis -Students are also expected to use the science and engineering practices to demonstrate proficiency with the core ideas.
6. Data Collection and Analysis -Students analyze major global problems. They begin by breaking these problems into smaller problems that can be tackled with engineering methods. To evaluate potential solutions, students are expected not only to consider a wide range of criteria, but also to recognize that criteria need to be prioritized.

Enduring Understanding

1. In these lessons students learn what the science of chemistry means and how will we approach learning chemistry through a combination of didactic and practical exercises. A learning schedule and procedures are imperative to create a safe, structured, and enthusiastic learning environment. In this first unit students will receive necessary information from instructor regarding applicable classroom and lab policies of the school.
2. If the end product of science, engineering, and design was compared to a great work of literature - the metric system and scientific notation are the language used behind a great work. Strengthening the mathematics and comprehension of our students must take place during the introduction of the coursework in order to allow the students to communicate in the language of science.

Essential Questions

1. What is science and what are the methods that will be utilized in order to solve real world problems?
2. What are classroom expectations and rules? What is safety first?
3. How is data collected and analyzed?
4. What kinds of science are used to create products that we use every day?

Exit Skills

Skills Checklist:

1. know, understand, and practice safety protocols and measures

- read and understand SDS sheets
- understand the selection process of safety equipment
- follow safety procedures and respond during an emergency

2. Identify basic laboratory materials

- select which measurement tools should be used balances, rulers, thermometers, and graduated cylinders

3. Use units and measure in the metric system

- demonstrate the ability to measure using electronic balances, rulers, thermometers, and graduated cylinder
- show proficiency in units of measurement
- identify the differences between accuracy and precision as they pertain to measurement
- use the rules of significant figures in order to perform mathematical operations using significant figure
- use significant notation to express numerical equations
- use dimensional analysis to complete calculations
- preform simple density equation

4. use the scientific method

- collect, organize, and analyze data
    - **identify the independent and dependent variables when given a set of data**
    - **identify the independent and dependent variables in an experiment when given a research question**
    - **identify two or more variables that must be controlled in an experiment.**
    - **write a research question for an experiment stating the independent and dependent variables.**

- transfer learning of scientific method in use of the scientific method to address a specific practice or problem
- organize the data in coordination of the specific problem
- analyze the data and note errors and possible sources of error
- analyze data noting errors
- identification of errors within experimental design and experimental process

New Jersey Student Learning Standards (NJSLS-S)

NextGen Science Standards

HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
9-12.HS-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.
9-12.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
9-12.HS-PS1-1	Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms.
9-12.HS-PS1-6	Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

Interdisciplinary Connections

MA.S-ID.B.6	Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
LA.RL.11-12.10a	By the end of grade 11, read and comprehend literature, including stories, dramas, and poems at grade level text-complexity or above with scaffolding as needed.
LA.RL.9-10.10a	By the end of grade 9, read and comprehend literature, including stories, dramas, and poems at grade level text-complexity or above with scaffolding as needed.
LA.RL.11-12.10b	By the end of grade 12, read and comprehend literature, including stories, dramas, and poems, at grade level or above.
LA.RL.9-10.10b	By the end of grade 10, read and comprehend literature, including stories, dramas, and poems, at grade level or above.
LA.RI.11-12.1	Accurately cite strong and thorough textual evidence, (e.g., via discussion, written response, etc.), to support analysis of what the text says explicitly as well as inferentially, including determining where the text leaves matters uncertain.

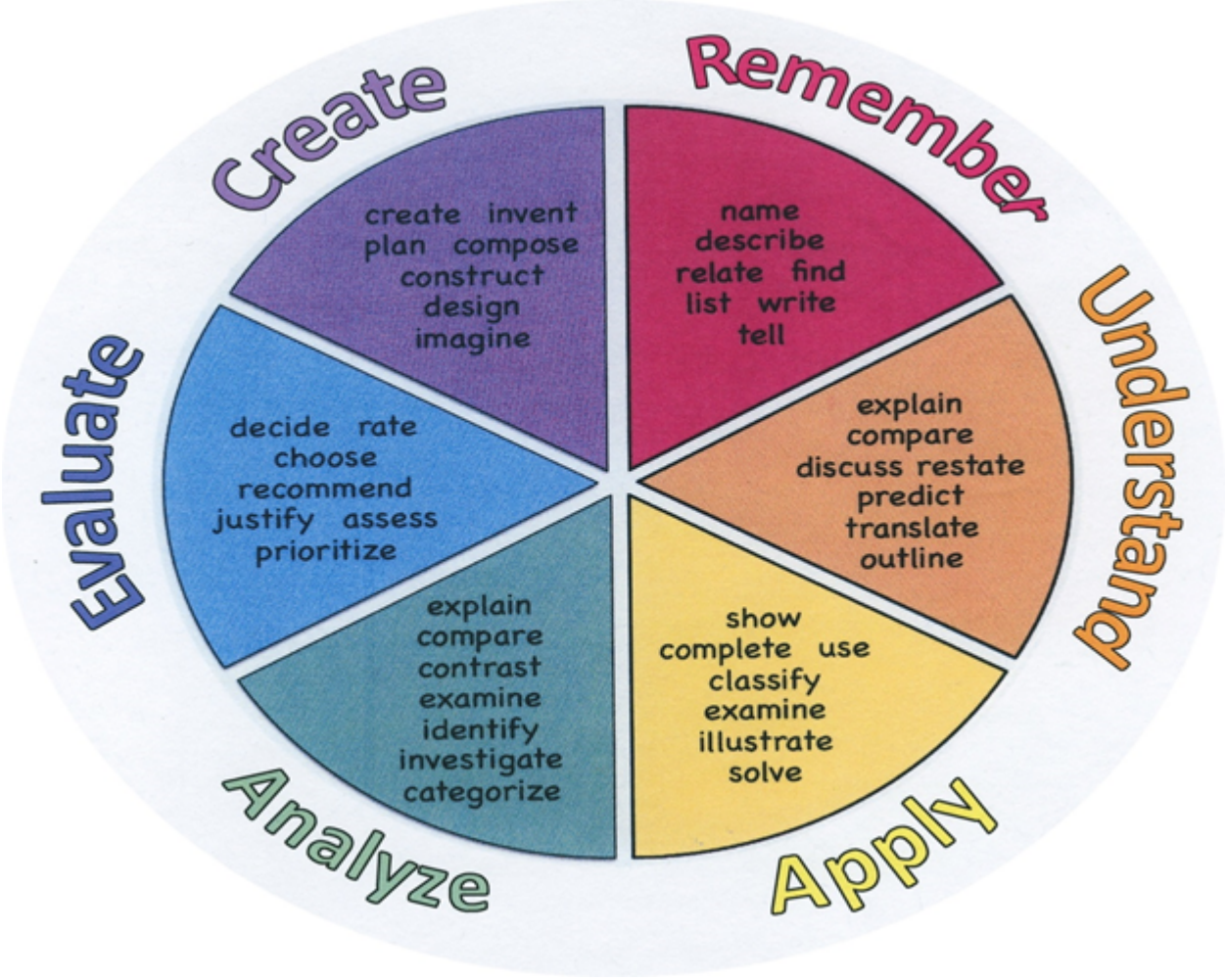
LA.RI.11-12.2	Determine two or more central ideas of a text, and analyze their development and how they interact to provide a complex analysis; provide an objective summary of the text.
LA.RI.11-12.3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
MA.S-MD.A.1	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
MA.S-MD.A.2	Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
MA.S-MD.A.3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
MA.S-MD.A.4	Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
MA.S-MD.B.5	Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

Learning Objectives

- Define and distinguish between a hypothesis, a scientific law, and a theory.
- Understand the role of experiments in testing hypotheses.
- State and understand the law of mass conservation as an example of scientific law.
- Understand that scientific theories are built from strong experimental evidence and that the term "theory" in science is used much differently than in pop culture.
- Compare and contrast pure research, applied research, and technology.
- Apply knowledge of laboratory safety.

Remember	Understand	Apply	Analyze	Evaluate	Create
Choose	Classify	Choose	Categorize	Appraise	Combine
Describe	Defend	Dramatize	Classify	Judge	Compose
Define	Demonstrate	Explain	Compare	Criticize	Construct
Label	Distinguish	Generalize	Differentiate	Defend	Design
List	Explain	Judge	Distinguish	Compare	Develop
Locate	Express	Organize	Identify	Assess	Formulate
Match	Extend	Paint	Infer	Conclude	Hypothesize
Memorize	Give Examples	Prepare	Point out	Contrast	Invent
Name	Illustrate	Produce	Select	Critique	Make
Omit	Indicate	Select	Subdivide	Determine	Originate
Recite	Interrelate	Show	Survey	Grade	Organize
Select	Interpret	Sketch	Arrange	Justify	Plan
State	Infer	Solve	Breakdown	Measure	Produce
Count	Match	Use	Combine	Rank	Role Play
Draw	Paraphrase	Add	Detect	Rate	Drive
Outline	Represent	Calculate	Diagram	Support	Devise
Point	Restate	Change	Discriminate	Test	Generate
Quote	Rewrite	Classify	Illustrate		Integrate
Recall	Select	Complete	Outline		Prescribe
Recognize	Show	Compute	Point out		Propose
Repeat	Summarize	Discover	Separate		Reconstruct
Reproduce	Tell	Divide			Revise
	Translate	Examine			Rewrite
	Associate	Graph			Transform
	Compute	Interpolate			
	Convert	Manipulate			
	Discuss	Modify			
	Estimate	Operate			

	Extrapolate Generalize Predict	Subtract			



Suggested Activities & Best Practices

Assessment Evidence - Checking for Understanding (CFU)

Test I - Algebraic Manipulation (Summative)

Scientific Notebook - laboratory data (Alternate)

KWL of articles (Formative)

Unit Test/Quiz (Summative)

"Do Now/Exit Ticket" Activity (Formative)

- Admit Tickets
- Anticipation Guide
- Common Benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- DBQ's
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Learning Center Activities
- Multimedia Reports
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Surveys
- Teacher Observation Checklist

- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit review/Test prep
- Unit tests
- Web-Based Assessments
- Written Reports

Primary Resources & Materials

Chemistry – Matter and Change; McGraw Hill Buthelezi, Dingrando, Hainen, Wistrom, and Zike

Tro (2013) Chemistry - a molecular approach

Ancillary Resources

1. Teacher and Publisher supplied powerpoints, notes, laboratory guides, and worksheets
2. Textbooks
3. Resource Manuals
4. Internet Resources
5. Computer and smartboard Activities

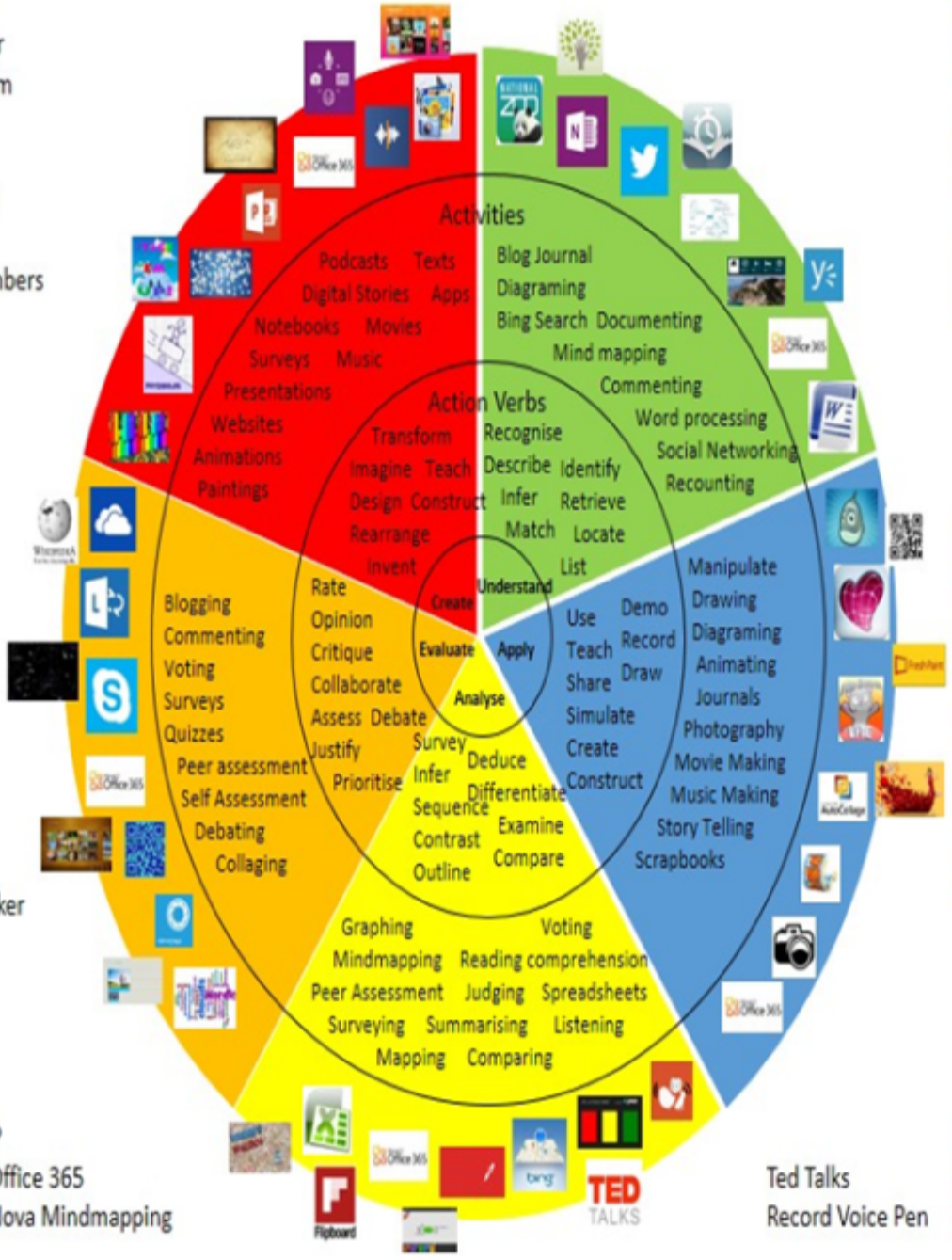
Technology Infusion

Phet, online notebook, quia, oncourse testing etc

Win 8.1 Apps/Tools Pedagogy Wheel

Podcasts
Photostory 3
Kid Story Builder
Music Maker Jam
Paint A Story
Office 365
MS PowerPoint
Stack 'Em Up
NqSquared Numbers
Physamajig
Xylophone 8

Wikipedia
Skydrive
Lync
SkyMap
Skype
Office 365
Puzzle Touch
Easy QR
Memorylage
Life Moments
Word Cloud Maker



Where's Waldo?
MS Excel Office 365
Flipboard Nova Mindmapping

Ted Talks
Record Voice Pen

Originally taken from http://www.coetail.com/vzimmer/files/2013/02/iPadagogy-Wheel.001.jpg
And adapted for Windows 8.1 devices by Charlotte Beckhurst @CharBeckhurst

TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.5	Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.C.CS2	Communicate information and ideas to multiple audiences using a variety of media and formats.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.1.12.F.CS4	Use multiple processes and diverse perspectives to explore alternative solutions.
TECH.8.2.12.B.CS2	The effects of technology on the environment.

Alignment to 21st Century Skills & Technology

Mastery and infusion of **21st Century Skills & Technology** and their Alignment to the core content areas is essential to student learning. The core content areas include:

- English Language Arts;
- Mathematics;
- Science and Scientific Inquiry (Next Generation);
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics;
- World languages;
- Technology;
- Visual and Performing Arts.

CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace

	with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP5.1	Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.
CAEP.9.2.8.B.2	Develop a Personalized Student Learning Plan with the assistance of an adult mentor that includes information about career areas of interest, goals and an educational plan.

21st Century Skills/Interdisciplinary Themes

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

21st Century Skills

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

Differentiation

Content

1. **1. Using reading materials at varying readability levels;**
2. **2. Using spelling or vocabulary lists**
3. **3. Presenting ideas through both auditory and visual means;**
4. **4. Using small groups and share pairs; and**
5. **5. Meeting with small groups to re-teach an idea or skill for struggling learners, or to extend the thinking or skills of advanced learners.**

Process

1. **1. Using tiered activities through which all learners work with the same important understandings and skills, but proceed with different levels of support, challenge, or complexity;**
2. **2. Developing personal agendas**
3. **3. Offering manipulatives or other hands-on supports**
4. **4. Varying the length of time a student may take to complete a task in order to provide additional support for a struggling learner or to encourage an advanced learner to pursue a topic in greater depth.**

Products

1. **1. Giving students options of how to express required learning**
2. **2. Using rubrics that match and extend students' varied skills levels;**
3. **3. Allowing students to work alone or in small groups on their products; and**
4. **4. Encouraging students to create their own product assignments as long as the assignments contain required elements.**

Learning environment

1. **1. Making sure there are places in the room to work quietly and without distraction, as well as places that invite student collaboration;**
2. **2. Providing materials that reflect a variety of cultures and home settings;**
3. **3. Setting out clear guidelines for independent work that matches individual needs;**
4. **4. Developing routines that allow students to get help when teachers are busy with other students and cannot help them immediately; and**
5. **5. Helping students understand that some learners need to move around to learn, while others**

do better sitting quietly (Tomlinson, 1995, 1999; Winebrenner, 1992, 1996).

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products

- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Special Education Learning (IEP's & 504's)

- Textbook for at-home use Tro
- Additional time for assignments - Safety First, Organizing Data, Significant Digits and Measurement, Significant Zeroes, Classification of Matter, Algebraic Manipulations Practice, Lab 2a specific heat, Conservation of Mass,
- Provision of notes or outlines - Chapter 1 and 2
- Hands-on activities - POGIL Assignments and LAB
- Choice of test format (multiple-choice, essay, true-false) - Test 1 - Significant Figures, Test 2 Matter and Mass
- Pace long-term projects - Lab 1 and 2

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation

- modified assignment format
- modified test content
- modified test format
- modified test length
- multi-sensory presentation
- multiple test sessions
- preferential seating
- preview of content, concepts, and vocabulary
- Provide modifications as dictated in the student's IEP/504 plan
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning (ELL)

Use flexible grouping; deliberately pair students heterogeneously by proficiency level.

ELP Level 2: Define vocabulary concepts from illustrations and word/ phrase banks. Vocabulary List Chapter 1 and 2

ELP Level 3: Give examples of vocabulary concepts from illustrations and word/phrase banks. - Vocabulary 1 and 2

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student’s learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing

- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

At Risk

Student defined interest - student finds interest or experiment that can be carried out in the lab

Student persues their own carreer aspirations through chemistry

Share Pair student group

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Talented and Gifted Learning (T&G)

Student Reteach - student lead problem solving stradegy -

Student research - student creates experimental design and carries out independent research

- Above grade level placement option for qualified students
- Advanced problem-solving
- Allow students to work at a faster pace
- Cluster grouping
- Complete activities aligned with above grade level text using Benchmark results
- Create a blog or social media page about their unit
- Create a plan to solve an issue presented in the class or in a text
- Debate issues with research to support arguments
- Flexible skill grouping within a class or across grade level for rigor
- Higher order, critical & creative thinking skills, and discovery
- Multi-disciplinary unit and/or project
- Teacher-selected instructional strategies that are focused to provide challenge, engagement, and growth opportunities
- Utilize exploratory connections to higher-grade concepts
- Utilize project-based learning for greater depth of knowledge

Sample Lesson

Enduring Understandings: Scientific Measurement is used during experimentation to collect data. Students must learn to express and evaluate measurements in a scientific way. The metric system is the system in which scientist's measure length, mass, and volume. Students will become familiar with the system of unites used for scientific measurement and apply dimensional analysis to solve conversion problems.

Lesson Rational: Scientists use research techniques to explore, examine, and extrapolate knowledge. Students must experience conduction experiments, collect data, examine data, and analyze data along with expressing their finding in writing in a clear and well developed report.

Essential Questions: How do scientists use, express, and evaluate measurements in experiments?

Objectives: Students will be able to

1. Convert measurements to scientific notation
2. Distinguish among accuracy, precision, and give examples
3. Define the error of measurement
4. Determine the number of significant figures in a measurement and summarize rules
5. Determine the number of significant figures in a calculation and summarize the rules fro addition and

subtraction

Anticipatory Set: What is the difference between accuracy and precision

Student Centered Inquiry-based Learning Procedure/Method:

1.) Anticipatory Set

2.) Didactic Presentation - Power Point

3.) Sample Problems

4.) Concept Check

Meaningful Closure: Socratic Questioning

Differentiation: Use of didactic and practical exercises are used in this lesson

Accommodations: Accommodations will be made as specified by IEP.

Pre, Formative and/or Summative Assessment Strategies Evaluations: Students will complete learning and concept checks with an accuracy of 100%.

Report, Reflect, Discuss:
Independent Practice/Upcoming Tasks: Reaction in a Bag
Integrated Cross Disciplinary Lesson: Mathmatics

SCI.HS-ETS1-1	Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.
SCI.HS-ETS1-3	Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They

	make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
SCI.HS-ETS1-4	Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.
CRP.K-12.CRP1.1	Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.
CRP.K-12.CRP7.1	Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.
SCI.HS-ETS1-2	Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.