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دليل المعلم التعلم القائم على المشاريع والتقييم المساران العام والمتقدم باللغة الانجليزية

موقع المناهج ← المناهج الإماراتية ← الصف الخامس ← رياضيات ← الفصل الثاني ← كتب للمعلم ← الملف

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المزيد من مادة رياضيات:

التواصل الاجتماعي بحسب الصف الخامس



صفحة المناهج الإماراتية على فيسبوك

الرياضيات

اللغة الانجليزية

اللغة العربية

التربية الاسلامية

المواد على تلغرام

المزيد من الملفات بحسب الصف الخامس والمادة رياضيات في الفصل الثاني

دليل الطالب التعلم القائم على المشاريع والتقييم

1

توزيع الحصص للمشروع باللغتين العربية والإنجليزية بناء على محتوى ملف PBLA

2

دليل المعلم التعلم القائم على المشاريع والتقييم المساران العام والمتقدم

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دليل الطالب التعلم القائم على المشاريع والتقييم

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أسئلة الامتحان النهائي الورقي بريدج

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UNITED ARAB EMIRATES
MINISTRY OF EDUCATION

Project Based Learning and Assessment

Teacher Guide

2025

2024

TOPIC: A Quest to Conserve Water:
Math with Decimals and Fractions

Grade: 5 General & Advanced

Subject: Mathematics

Term: 2

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Introduction

Project-Based Learning & Assessment (PBLA) is an initiative to diversify the approach to summative assessment in order to focus on a wider range of student skills. It is a step towards a student-led approach which helps students to take ownership of their learning journey. This educational approach aligns learning tasks with Term 2 objectives to support and enhance student achievement.

Considerations for PBLA

1. Focus on both what students **know** and demonstrate what they **can do**, and how they can **apply their skills** in the subject to authentic scenarios
2. Allow students to demonstrate **key capabilities** – specifically, those of creative and critical thinking, problem-solving, communication, and collaboration
3. Provide opportunities for teacher **feedback**, peer feedback and space for **self-assessment** and **reflection on learning**
4. Encourage learners to develop **self-regulation and learning skills** such as goal setting and time management
5. Give students opportunity to transfer their knowledge to **authentic/real-world tasks** and **scenarios**
6. Focus as much on the **process** as the end product

I promise to:

- Reflect the UAE's cultural and moral values
- Showcase individual understanding and effort, discouraging reliance on external help
- Outline project objectives, assessment criteria, and grading expectations
- Accommodate diverse student talents and roles
- Guide ethical collaboration practices
- Value original ideas and recognize each member's contributions
- Teach responsible use of AI tools
- Safeguard student data and intellectual property
- Encourage self-reflection to identify strengths, areas for growth, and authentic achievements
- Model constructive feedback and fair assessment

This document provides Cycle 2 Math teachers with guidelines on the theme, essential question, final product and lesson steps of the project, as well as explaining the associated marking rubrics.

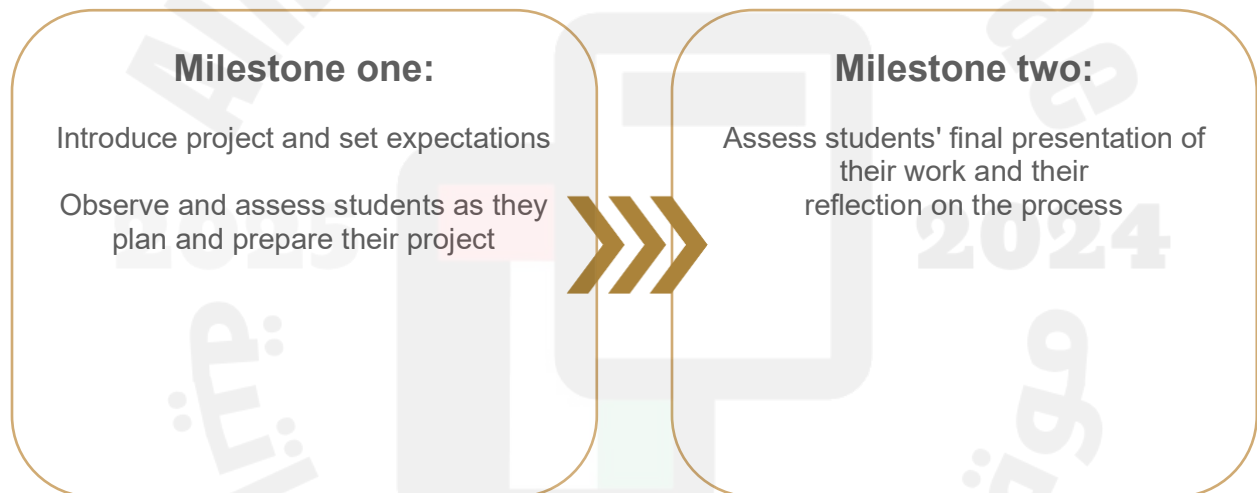
2. Implementation Overview

PBLA lessons will run throughout Term 2 and will involve continual observation and assessment of student performance. Students should be introduced to the project and the expectations for PBLA early in the term. It is important that students understand from the start that they will need to:

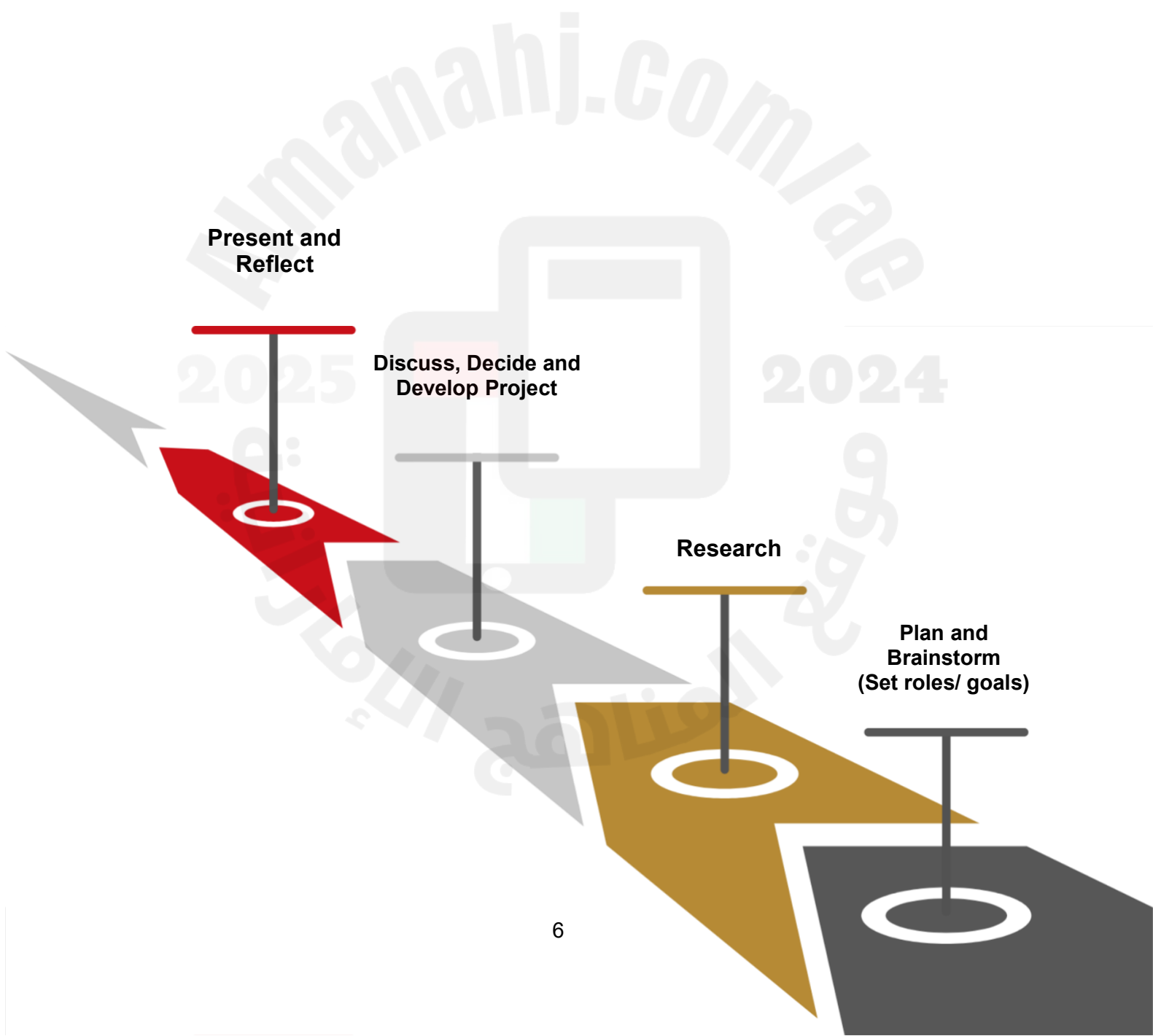
- I. collaborate in groups
- II. take responsibility for their individual contribution
- III. reflect on their work

Setting the expectations for the project initiates **milestone one** in which students will be collaborating, planning and preparing their project. During this milestone, you will observe student behavior in terms of their research, collaboration, goal-setting and problem-solving and award them marks based on the rubric at the end.

The next stage is **milestone two** where students deliver their projects and their reflections on their work, and this is assessed using the milestone two rubric.



The journey of the PBLA process is represented to students in their student guides through the following diagram:



3. Project Overview

This Grade 5 project, titled "A Quest to Conserve Water: Math with Decimals and Fractions", helps students understand and use math skills in real-life water conservation scenarios to support the sustainability of the UAE environment. Students will learn how to calculate water usage and savings using decimals and fractions, applying this knowledge to track and reduce water consumption. Through teamwork and problem-solving, they'll explore practical ways to conserve water and present their findings. This project encourages critical thinking, research, and hands-on math applications, giving students valuable skills in both math and environmental responsibility.

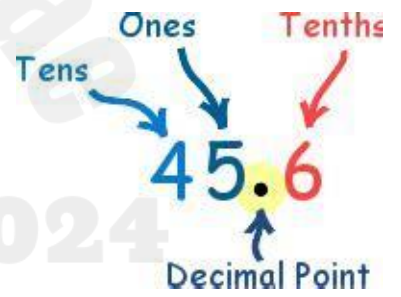
Project Product Guideline: By the end of this project, students will create an illustrative guidebook that compiles all of their research and findings. This guidebook may incorporate various formats such as paper displays, graphs, tables, posters, and digital tools. The final product should directly address our essential question—"How to help reduce water usage in the UAE using our knowledge of decimals and fractions?" and propose concrete, UAE-related solutions and models drawn from the students' investigations and creative exercises.

- Initial reflection (research and planning & personal role) as described in detail on P. 17
- Mathematical investigations for all the problems on P. 18 - 24
- Final Reflection with all 3 parts clearly presented as described on P. 25
 - o Reflection on work (ensure that students show a visual evidence of the project's essential question based on their investigations and calculations)
 - o Demonstrating closed gaps
 - o Reflection on learning (each question should have a clearly elaborated answer)

Project Title: A Quest to Conserve Water:
Math with Decimals and Fractions

Essential Question: How to help reduce water usage in the UAE using our knowledge of decimals and fractions?

Final product: Illustrative Guidebook
(any digital or paper medium)



4. Description of Lessons

Overview	
<p>Students will understand and apply <u>decimals and fractions</u> to water systems. In this project, students will apply their understanding of decimals and fractions within the context of water usage and conservation. The activities are designed to encourage problem-solving and critical thinking by connecting mathematical concepts to real-world challenges. Through collaborative tasks, students will investigate water usage, calculate savings, and explore how small changes can make a big impact. The project promotes active engagement by allowing students to work together, experience productive struggle, and creatively tackle investigation prompts. Ultimately, this hands-on approach helps students deepen their math skills while learning about environmental responsibility.</p>	
Role of the Teacher	Instructions to Guide Student Planning
<p>Mathematics teachers to:</p> <p>Thoughtfully consider the unique strengths, capabilities, and learning styles of each student when assigning project roles and forming collaborative groups. This approach not only promotes balanced participation but also helps ensure that each student’s individual talents are utilized to benefit the team as a whole.</p> <p>Clearly communicate the project’s objectives, requirements, and expectations to all students before they begin. Take time to explain each aspect thoroughly, answering questions and addressing potential challenges to provide students with a solid foundation and understanding of what is expected throughout the project.</p> <p>Encourage students to engage deeply with each problem and investigative questions presented in this document. Prompt them to approach investigations with curiosity, to explore creative solutions, and to complete all designated creativity and inquiry prompts thoughtfully. This will help cultivate critical thinking skills, encourage innovative approaches, and ensure that students explore each element of the project comprehensively.</p>	<p>Student Role:</p> <ul style="list-style-type: none"> - Students will decide on role-setting and collaborative planning and submit their initial reflections. - Students will answer all project Math questions, complete all investigation and creative prompts, and present/submit their project for feedback. - Students will submit revised work and present their final reflection and presentation. <p>Materials/Resources:</p> <ul style="list-style-type: none"> - Graph paper - Rulers - Colored pencils - Reference materials on angles, triangles, scale drawings, and the classification of elements (textbook, internet resources) <p>Schedule:</p> <p>7 support periods in Term 2, starting at week 3.</p>



Milestone	Lesson No. and Title	Guiding Question	Project Objectives	Teaching Objectives	Student Learning Outcomes (SLOs)
Milestone 1 Allocate 1 lesson in 1 week for this initial section	Lesson 1: Setting the Foundation & Understanding PBL.	How can we apply mathematical concepts and skills to solve real-world problems effectively, and what strategies will help us approach these problems?	Students will understand and apply decimals and fractions to water systems.	This project will help students apply their knowledge of fractions and decimals to a water system context; therefore, enhancing their understanding of both mathematical and scientific concepts.	CCSS: 5.NBT.B.5, 5.NBT.B.6, 5.NBT.B.7, 5.NF.B.3 MoE: MAT.1.05.02.017, MAT.1.05.02.022, MAT.1.05.06.006, MAT.1.05.02.018 Refer to the mathematics questions in this document.
Group Work	Students will collaborate in small groups to: <ul style="list-style-type: none"> - Research, investigate, and discuss the PBL essential question. - Reflect on their initial understanding of the project topic. - Identify and share efficient mathematical operations, strategies, and tools relevant to the project. Support each other in identifying personal learning goals and potential knowledge gaps.				
Literacy Development:	Students will enhance their mathematical literacy by: <ul style="list-style-type: none"> - Articulating their thought processes and reasoning during discussions. - Using appropriate mathematical vocabulary and terminology in both oral and written reflections. - Reading and interpreting mathematical problems and scenarios. Writing clear and concise reflections on their learning objectives and strategies.				
<u>Wrap-Up: Discussion and Reflection</u>					
Students will engage in a class-wide discussion to: <ul style="list-style-type: none"> - Share insights gained from group discussions about the PBL essential question. - Reflect on their understanding of project-based learning and its benefits. - Identify personal strengths and areas for improvement in mathematical skills. - Set specific, achievable goals for their learning journey throughout the project. - Individually, students will complete a reflection exercise to document their initial thoughts and plans, using the rubric. 					

<p>Milestone 1</p> <p>Separate the lessons in this section along a 2-week span</p>	<p>Lesson 2:</p> <p>Perform operations with multi-digit whole numbers and with decimals to hundredths</p> <p>Lesson 3:</p> <p>Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value</p>	<p>How can we fluently multiply multi-digit whole numbers using the standard algorithm?</p> <p>How can we find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division?</p>	<p>To Fluently multiply multi-digit whole numbers using the standard algorithm.</p> <p>To Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>	<p>Students will illustrate and explain the calculations for the project problems 1 to 4 by using equations, rectangular arrays, and/or area models.</p> <p>Students will further extend their understanding to real-life contexts through investigation and exploration.</p>	<p>CCSS: 5.NBT.B.5, 5.NBT.B.6, 5.NBT.B.7, 5.NF.B.3</p> <p>MoE: MAT.1.05.02.017, MAT.1.05.02.022, MAT.1.05.06.006, MAT.1.05.02.018</p> <p>Refer to the mathematics questions in this document.</p>
<p>Group Work</p>	<ul style="list-style-type: none"> - In groups, students solve problems 1 to 4 by illustrating and explaining their calculations using equations, rectangular arrays, and/or area models - Students will collaborate to record water consumption at their individual homes for washing dishes for 2 consecutive weeks. Students will determine if there are any amount of water saved between week 1 and week 2? 				

**Literacy
Development:**

- Using precise mathematical vocabulary related to decimals and fractions.
- Articulating problem-solving processes and reasoning in both oral presentations and written work.
- Interpreting complex mathematical and scientific texts while conducting research.
- Engaging in collaborative discussions, providing and receiving constructive feedback.

Wrap-Up: Discussion and Reflection

- **Lesson 2:** The teacher will initiate a discussion on decimals and fractions as they relate to water systems.
- Students will share prior knowledge about decimals and fractions and how they apply to real-world contexts.
- **Lesson 3:** The teacher will review decimals and fractions by demonstrating how to represent them with area models and rectangular arrays.
- Students will discuss previous experiences with decimals and fractions and their importance in representing real-world objects.
- The teacher will facilitate a reflection session where students discuss the strategies used to solve decimal and fraction problems, challenges faced, and how creating their own problems deepened their understanding.
- The teacher will lead a reflection on the process of solving equations with decimals and fractions while discussing the mathematical principles involved and the relevance to water systems.
- Students will reflect on the importance of precision and accuracy in mathematical representations and how this impacts their understanding of decimals and fractions as they apply to water systems.

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<p>Milestone 2</p> <p>Separate the lessons in this section along a 2-week span</p>	<p>Lesson 4: Communicating Mathematical Understanding through Effective Presentations</p>	<p>In what ways does reflecting on feedback enhance our mathematical understanding and help us apply knowledge to authentic real-world scenarios?</p>	<p>To develop students' ability to communicate mathematical reasoning and solutions effectively through presentations, showcasing their ability to link knowledge, representations, and procedures.</p>	<p>Guide students in preparing and delivering clear, accurate presentations of their mathematical projects using the assigned medium (poster, PowerPoint, etc.), emphasizing the use of appropriate mathematical vocabulary and concepts.</p>	<p>CCSS: 5.NBT.B.5, 5.NBT.B.6, 5.NBT.B.7, 5.NF.B.3</p> <p>MoE: MAT.1.05.02.017, MAT.1.05.02.022, MAT.1.05.06.006, MAT.1.05.02.018</p> <p>Refer to the mathematics questions in this document.</p>
<p>Group Work</p>	<p>Lesson 5: Reflective Learning: Enhancing Mathematical Skills through Feedback</p> <p>To encourage students to utilize feedback constructively, fostering growth in mathematical understanding and the ability to apply skills to real-world problems.</p> <p>Facilitate reflective practices by providing constructive feedback, encouraging peer feedback, and supporting students in setting actionable goals for continuous improvement in their mathematical abilities.</p> <p>Students collaborate to finalize and rehearse their presentations, ensuring all group members understand every aspect of the project. They provide constructive peer feedback, refine their presentations based on input, and prepare to answer questions on the entire project during their individual presentations.</p>				

**Literacy
Development:**

Students enhance mathematical literacy by articulating their problem-solving processes, employing precise mathematical vocabulary, interpreting and incorporating feedback, and engaging in reflective writing to assess their learning and set future goals.

Wrap-Up: Discussion and Reflection

- **Warm-Up Activity:**

- The teacher will begin by showcasing examples of effective mathematical presentations, highlighting key elements such as clarity, logical flow, accurate use of mathematical vocabulary, and visual aids.
- The teacher will prompt students to identify what makes these presentations effective and how they can incorporate similar strategies.

- **Discussion and Reflection:**

- The teacher will facilitate a post-presentation reflection where students discuss the feedback they received, celebrate their successes, and identify areas for improvement.
- The teacher will encourage students to reflect on how incorporating feedback can enhance their understanding and application of mathematical concepts.
- Students will be guided to set specific, measurable goals for their future learning based on this reflection.

<p>Milestone 2</p> <p>Separate the lessons in this section along a 2-week span</p>	<p>Lesson 6 & 7:</p> <p>Final Submissions and Reflecting on Mathematical Growth through Productive Struggle</p>	<p>How does reflecting on our learning journey, including the challenges we faced and overcame, enhance our mathematical understanding and ability to support our strategies and solutions with strong arguments?</p>	<p>To encourage students to thoughtfully reflect on their individual learning experiences, recognizing how overcoming difficulties and engaging in productive struggle have contributed to their mathematical growth.</p> <p>To enable students to consolidate their understanding by providing coherent mathematical arguments that support their strategies and solutions, demonstrating mastery of the concepts learned.</p>	<p>Guide students in completing their final reflections (Page 16), helping them articulate how challenges, feedback, and productive struggle have impacted their learning process and problem-solving abilities.</p> <p>Support students in refining their ability to construct and communicate strong mathematical arguments, ensuring they can effectively justify their strategies and solutions with logical reasoning and evidence.</p>	<p>Refer to the mathematics questions in this document.</p>
<p>Group Work</p>	<p>Students will collaborate in small groups to discuss their reflections on the project. Each student will share specific challenges they encountered, strategies they used to overcome them, and how these experiences contributed to their understanding of mathematical concepts.</p> <p>Group members will provide constructive feedback to one another, offering insights and suggestions to deepen each other's reflections.</p> <p>Through discussion, students will collectively explore different approaches to problem-solving and the value of perseverance, enhancing their ability to articulate mathematical arguments.</p>				

**Literacy
Development:**

Students will develop their written communication skills by composing detailed reflections that use precise mathematical language and vocabulary. They will improve oral communication skills through group discussions, expressing their thoughts clearly and listening actively to peers. The process will enhance their ability to construct logical, coherent arguments to support their mathematical strategies and solutions. Engaging in reflective writing and discussion promotes critical thinking and self-assessment, key components of mathematical literacy.

Wrap-Up: Discussion and Reflection

The teacher will facilitate a class-wide discussion where students share key insights from their reflections and group discussions. Focus will be placed on the role of productive struggle in learning mathematics and how overcoming obstacles has led to personal growth and a deeper understanding of the material. Students will be encouraged to identify specific skills and strategies they have developed and consider how these can be applied to future mathematical challenges. The teacher will guide students in setting personal learning goals moving forward, emphasizing continuous improvement and lifelong learning.



The Project Questions

Milestone One

Research and Planning:

We need to think about the question: **How to help reduce water usage in the UAE using our knowledge of decimals and fractions?**

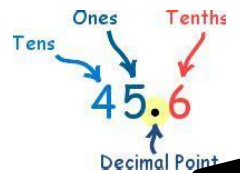
I will write about my research and the resources I use, like books, websites, or videos, and explain what I learn about decimals, fractions, and water systems. We will share ideas as a group and come up with a solution to the question. Then, we will create a timeline to make sure we finish the problems on the next pages before the project is due: _____.

Personal Role:

Our Group Members: _____

In our group, I will explain what my role is and how it will help us succeed as a team. I'll write about how my work connects to what my teammates are doing. I will also make a plan for myself to meet my goals, stay organized, and give my best effort. If I run into challenges, I'll think of ways to solve them so I can keep helping our group.

Answers:



CCSS.5.NBT.B.5 1. Perform operations with multi-digit whole numbers and with decimals to hundredths.

Fluently multiply multi-digit whole numbers using the standard algorithm.

(Equivalent to MAT.1.05.02.017)

Illustrative Guidebook Section 1: *(Note: The teacher can change the numbers in this problem so that each group of students has its own unique problem)*

The Water Savers Challenge

One sunny day, some friends were excited about a new sustainability project at their school. Their teacher had an important announcement:

"Our school will make a guidebook called *The Ultimate Water Savers Handbook!* This book will help families learn how to save water and take care of our planet. You will be the authors, and we'll start with a challenge about your own homes!"

The teacher explained, "First, you'll work out how much water your family uses in one week. Then, you'll see how small changes can save a lot of water. Let's try an example first."

The Challenge: Let's Practice!

Ali's family uses water for these activities each week:

- Showering: 245 liters
- Washing dishes: 180 liters
- Laundry: 312 liters
- Cooking: 95 liters

"If Ali's family uses 15% less water for each activity, how much water can they save in a week?"

The friends got excited. "Can we be the investigators?" asked Sara. The teacher smiled and said, "Of course! Let's break it into steps."

Step 1: Investigate and Calculate

"Imagine helping Ali's family. Here's what to do:"

1. Find 15% of the water used for each activity.
2. Subtract that amount to see the new water use for each activity.
3. Add up the water saved from all activities to find the total savings.

"Now, most importantly, let's make it personal. Compare Ali's family's water use to your own family's," the teacher said.

Step 2: Be the Water Detective

The friends got timers, notebooks, and tools to track their families' water use. Each person had a special job:

- **Time Keeper:** Measured how long family members spent showering and washing dishes.
- **Data Collector:** Noted how often the washing machine was used and how much water it used.
- **Chef's Assistant:** Checked how much water was used for cooking and cleaning.

At the end of the week, they shared their findings. They compared their water use to Ali's family and noticed some big differences. "Wow, my family uses more water for dishes because we wash by hand!" said one friend.

Step 3: Create and Share

With their notes ready, the teacher gave the next task:

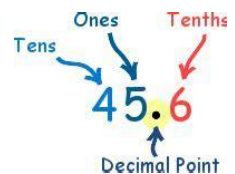
"Now, write the *Water Savers Handbook*. Here's what to include:"

1. **Tips for Families:** Ideas like taking shorter showers or using water-saving appliances.
2. **Infographics and Charts:** Show how much water small changes can save.
3. **Your Reflections:** Write what surprised you and how your family's habits affect water use.

The friends used math, science, and creativity to make a colorful guidebook. It was filled with charts, reflections, and smart tips.

The teacher was proud. "You're not just students—you're leaders helping others save water and care for our world!"

Answer: (Draw all relevant diagrams and show all your work!)



CCSS.5.NBT.B.6

Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

(Equivalent to MAT.1.05.02.022)

Illustrative Guidebook Section 2: *(Note: The teacher can change the numbers in this problem so that each group of students has its own unique problem)*

The Local Park Water Challenge

The friends were excited to take their water-saving project to the next level. Their teacher gave them a new task:

“Now, let’s investigate how much water the Local Park uses. This park uses 7,560 liters of water each month. The water is spread evenly across 28 zones. Can you find out how much water each zone uses? After that, think of ways to save water at the park and at home.”

The students were ready to solve the challenge by following these steps:

Step 1: Divide and Conquer

- Find how much water each zone uses. To do this, divide the total (7,560 liters) by 28 zones.

Step 2: Illustrate and Explain

- Show how you solved the problem with:
 - Equations (writing out the division).
 - Rectangular arrays (drawing a grid to show the water divided into zones).
 - Area models (using a visual way to divide the total water).

Step 3: Connect and Reflect

- Think of one way to save water at home from what you learned before.
- Explain how this idea can also work at the park.

The friends were excited to solve the math and share ideas for making the park—and their community—better at saving water!

Answer: *(Draw all relevant diagrams and show all your work!)*



CCSS.5.NBT.B.7

Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

(Equivalent to MAT.1.05.06.006)

Illustrative Guidebook Section 3: *(Note: The teacher can change the numbers in this problem so that each group of students has its own unique problem)*

The Water-Saving Experiment

The students wanted to learn more ways to save water for their guidebook. The teacher began with a big question:

"Do you think small changes in your daily habits can save water? Let's test it! Start by investigating at home and then explore how simple tools can help save even more."

Step 1: Investigate at Home

- Over two weeks, track how much water your family uses to wash dishes.
- Use a timer to measure water usage for Week 1 and Week 2.
- In Week 2, try new strategies, like washing dishes faster or using less water.
- Compare the two weeks: Did you save water in Week 2? What changes helped?

Step 2: Explore Water-Saving Methods

The teacher shared this data and explained:

"Here's how much water was saved each day using two simple methods: low-flow showerheads and fixing leaks. Look at the numbers to see how well these methods work!"

Day	Low-Flow Showerhead (liters)	Fixing Leaks (liters)
Monday	2.35	1.15
Tuesday	2.50	1.20
Wednesday	2.45	1.30
Thursday	2.60	1.25
Friday	2.55	1.40

Step 3: Analyze Daily Savings

- Add the water saved by both methods for each day to find the total daily savings.

Step 4: Calculate Weekly Savings

1. Find the total amount of water saved in the week for each method (low-flow showerheads and fixing leaks).
2. Add the totals for both methods to find the overall weekly savings.

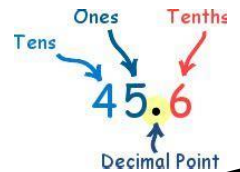
Guidebook Contribution

Create a chapter called *"Saving Water at Home and Beyond"* with these sections:

1. Investigation Results: Share what you learned in your two-week dishwashing experiment. What strategies helped save water?
2. Data Insights: Use the provided numbers to explain how tools like low-flow showerheads and fixing leaks can reduce water use.
3. Tips and Reflections: Add practical tips, colorful charts, and personal thoughts to inspire families to save water at home.

By combining math, science, and creativity, the students worked hard to encourage others to protect our precious water resources!

Answer: *(Draw all relevant diagrams and show all your work!)*



Illustrative Guidebook Section 4 For Advanced Students Only
(Advanced students should complete all the problems above and this extension problem)

CCSS.5.NF.B.3 Apply and extend previous understandings of multiplication and division.

Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
(Equivalent to MAT.1.05.02.018)

The Rainwater Distribution Challenge:

The students, now eager to make a bigger impact, gathered for their next challenge. Their teacher handed them the data and posed a question:

"You've done great work so far! Now, imagine you've collected 84 liters of rainwater over 7 days to help water the school garden. Your mission is to distribute it into smaller containers while exploring different possibilities and sharing your discoveries creatively."

Step 1: Daily Average Collection

- Calculate the average amount of rainwater collected each day by dividing the total water (84 liters) by the number of days (7).

Step 2: Fill Containers

- If each container can hold 3 liters of water, how many containers can be filled completely, and how much water will be left over?

Step 3: Explore Variations in Container Sizes

1. Different Capacity (5 liters): How many containers can be filled completely, and how much water will be left over if the containers hold 5 liters each?
2. Alternative Capacity (4 liters): How does the solution change if each container holds 4 liters?

Extension Activity: Design a Rainwater Allocation Strategy

Challenge, Let's Sharpen Our Skills to Be Ready!:

Develop a Rainwater Allocation Strategy for the school garden and propose creative solutions for efficient water use.

1. Garden Mapping:

- Create a simple map or diagram of the school garden, marking sections where water is needed (e.g., flowerbeds, vegetable patches, or shaded areas).

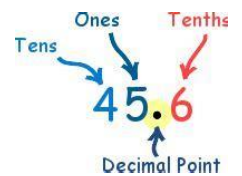
2. Rainwater Distribution Plan:

- Calculate how much rainwater each section should receive based on its needs using proportional division (e.g., flowerbeds get 40%, vegetables get 30%, etc.).

3. Visual Representation:

- Present your allocation strategy using a chart, graph, or infographic to illustrate your distribution plan and creative ideas.

Answer: *(Draw all relevant diagrams and show all your work!)*



Milestone Two: (For All Students)

Reflection on Work:

I need to reflect on our completed project on **A Quest to Conserve Water:**

Math with Decimals and Fractions. I will think about the project we worked on and what we did well. What were the best parts of our work? I'll give examples of things we're proud of and why they were successful. I'll also think about areas where we can improve and explain how our planning and teamwork helped make our project strong. What part of the project am I most proud of, and why?

Demonstrating Closed Gaps:

I'll think about challenges we faced or areas where we needed to learn more. How did I work to improve during the project? I'll give specific examples of strategies I used, like trying new methods or asking for help. I'll also explain how fixing these gaps helped make our project better.

Reflection on Learning:

I'll reflect on what I learned during this project. What new skills or ideas did we gain? How has this project helped me or us understand the topic better? I'll also think about new learning goals for the future and why they are important.

Answers:



5. Assessment

MILESTONE 1 - Rubric for PBLA

Milestone 1 (Preparation/ Process)

This initial rubric has four criteria and will be used while observing student behavior in all of the planning and preparation lessons leading up to the final presentation. Please use the following rubric, with the illustrations and guiding questions, **to determine the ‘best fit’ judgement:** Beginning/Developing/Acquired.

Within the band is a range of possible scores. You may use the lower score if they just barely meet the descriptions of the band, or the higher score if they clearly meet the requirements well but the above band doesn't fit. You may also use the score range to help you differentiate and rank student performance within the same band. **Reserve 0 scores for where there is cheating/malpractice which is not remedied, even when given opportunity to, or where there has been zero work done to any aspect of the project.**



Criterion	Beginning: 1 - 4	Developing: 5 - 7	Acquired: 8 - 10
Research and Inquiry	<ul style="list-style-type: none"> Shows minimal evidence of basic research Struggles to formulate inquiry questions or adopt inquiry-based learning approaches Sources may lack credibility or relevance Little use of learning technologies Relies on basic approaches without much originality 	<ul style="list-style-type: none"> Demonstrates some basic but systematic research capabilities and inquiry Utilizes credible sources: uses learning technologies to support, but the depth of investigation is limited Attempts to formulate questions with teacher guidance Attempts creative solutions but needs more depth and risk-taking 	<ul style="list-style-type: none"> Conducts thorough research using a range of credible sources: uses learning technologies to support learning effectively. Student articulates sophisticated inquiry questions, and effectively contributes to advancing the depth of understanding within the project Proposes original solutions, takes risks, and adapts to changing project dynamics with unique idea
Collaboration, Communication & Contribution	<ul style="list-style-type: none"> Contributes minimally to group processes, often requiring frequent prompts to engage actively Little engagement in planning of project. Some difficulty and limited clarity in interacting, discussing and communicating their learning No real evidence of leadership within group 	<ul style="list-style-type: none"> Participates consistently, albeit not uniformly, in group discussions and activities Shares ideas and listens to peers but needs to balance contributions more effectively Some contribution in driving group progress and planning of project Adequate when interacting, discussing and shows emerging skills when communicating their learning Some evidence of minimal leadership within group 	<ul style="list-style-type: none"> Fully engages in group work, taking on clear leadership roles, providing support to peers, and demonstrating proactive collaboration to achieve group objectives Consistently drives group progress and ensures project planning tasks are completed effectively Clear when interacting, discussing and consistently communicating their learning effectively
Self-Regulation & Engagement	<ul style="list-style-type: none"> Exhibits a lack of self-regulation, requiring consistent prompting to remain focused Demonstrates minimal motivation or engagement Unsure how to set goals to improve their work 	<ul style="list-style-type: none"> Shows emerging self-regulation capabilities; sets basic learning goals and generally maintains focus, although occasional reminders are needed Demonstrates some motivation and engagement when managing subject-specific activities 	<ul style="list-style-type: none"> Demonstrates strong self-regulation, independently establishing meaningful learning goals Actively manages personal progress with a high level of engagement Demonstrates high level of motivation and engagement when managing subject-specific activities
Problem-Solving & Critical Thinking	<ul style="list-style-type: none"> Relies heavily on teacher support for problem-solving Critical skills are not developed or apparent Shows difficulty in evaluating options, making decisions and finding solutions 	<ul style="list-style-type: none"> Identifies problems and attempts solutions but requires occasional guidance Demonstrates some critical thinking but lacks depth Overall problem-solving and critical thinking are developing features with some solutions proposed 	<ul style="list-style-type: none"> Independently solves problems by evaluating multiple solutions Shows creativity and well-developed critical thinking skills

Milestone 1 (Preparation/ Process)

Research and Inquiry

Acquired: The student conducts thorough research, using a variety of credible sources (from reputable sites/sources, that include citations, etc.) and effectively incorporates learning technologies. They articulate sophisticated inquiry questions to help systematically explore the topic in depth. The student demonstrates the ability to synthesize information, uncovering new insights and advancing understanding within the project. Their research process reflects innovation and a strong grasp of inquiry-based learning.

Developing: The student demonstrates basic research abilities, using credible sources but with limited depth in investigation. They make some use of learning technologies to support their research and begin to formulate questions with teacher guidance. There is evidence of emerging systematic inquiry, though conclusions may lack depth and synthesis across sources.

Beginning: The student shows minimal effort in research, either using no resources or only ones lacking credibility/relevance. They struggle to formulate meaningful questions or adopt inquiry-based learning. There is little evidence of using learning technologies to support research. The student's work shows limited understanding of how to deepen inquiry or explore beyond surface-level facts.

Collaboration, Communication & Contribution

Acquired: The student is fully engaged in group activities, frequently contributing original ideas and taking a proactive role in planning and organizing. They demonstrate strong listening skills, actively offering constructive feedback and encouragement to peers, and using negotiation and conflict resolution to resolve disagreements. The student is comfortable assuming leadership roles, actively supporting group tasks, and driving project progress. Their positive and proactive involvement enhances the group dynamic, creating a productive and supportive team environment.

Developing: The student participates in group activities with some prompting and occasionally shares ideas, though these may lack originality or depth. They listen to peers and sometimes provide constructive feedback, but their engagement can be inconsistent. The student occasionally helps with group tasks but rarely assumes a leadership role, offering limited support to peers. Their impact on group dynamics is neutral, without significantly advancing or hindering group progress.

Beginning: The student rarely participates in group activities, even with prompting. They barely contribute to planning, struggle with effective communication, and show limited interaction or discussion with peers. The student does not take on leadership roles, and

their involvement generally has little to no positive impact on advancing the group's objectives.

Self-Regulation & Engagement

Acquired: The student demonstrates strong self-regulation, setting meaningful goals and actively tracking personal progress. They stay engaged throughout activities, being consistently motivated and focused. The student independently manages their time effectively, takes initiative in their learning, and seeks additional resources or help when needed to overcome challenges.

Developing: The student shows emerging self-regulation skills, generally staying focused with occasional reminders. They set basic learning goals and display some motivation and engagement, especially in subject-specific activities. The student is beginning to manage their time independently, though focus and persistence may vary.

Beginning: The student exhibits minimal self-regulation and often needs frequent prompting to stay on task. They demonstrate little motivation or enthusiasm and may struggle to set meaningful goals to improve their work. Engagement in activities is inconsistent and typically requires teacher intervention to maintain focus.

Problem-Solving & Critical Thinking

Acquired: The student independently identifies problems and evaluates multiple solutions, showing creativity and well-developed critical thinking skills. They make decisions based on structured reasoning, effectively handling unexpected challenges and adapting to changes in the project. The student demonstrates a proactive approach to problem-solving, proposing thoughtful, innovative solutions and justifying their choices.

Developing: The student can identify problems and attempts to solve them with occasional guidance. They demonstrate emerging critical thinking skills, though their problem-solving approach may lack thorough evaluation. While their solutions show some independent thought, they rely on teacher input for more complex issues and may not fully analyze options.

Beginning: The student relies heavily on teacher support, showing limited problem-solving and critical thinking abilities. They struggle to evaluate options, make decisions, or find solutions independently. Their approach lacks depth, and they are often unsure how to proceed when faced with challenges.

MILESTONE 1 - Guiding Questions

- **Research and Inquiry:**

- Is there evidence of systematic research, including relevant data and facts?
- Are the sources used credible, reliable, and relevant to the topic?
- Did the student formulate meaningful, open-ended questions that guided their inquiry?
- Did the research include a range of perspectives or viewpoints?
- Was the student able to synthesize information from multiple sources to draw conclusions?
- Did the student identify gaps in existing information or propose areas for further investigation?
- Was the inquiry process documented, with notes and reflections showing how research evolved?

- **Collaboration & Contribution:**

- Did the student participate actively in group activities without needing excessive prompting?
- Did the student contribute original ideas during group work?
- Did the student listen actively and respond constructively to peers?
- Did the student help organize group tasks or assume leadership when necessary?
- Was the student consistent in their engagement throughout all stages of the project?
- Did the student provide support or assistance to peers when needed?
- Was the group dynamic improved due to the student's contribution?

- **Self-Regulation & Engagement:**

- Did the student stay focused and on task without frequent prompting or reminders?
- Did the student set clear learning goals and plan how to achieve them?
- Was the student motivated and enthusiastic about the topic and activities?
- Did the student take initiative to overcome challenges or obstacles in their learning?
- Did the student reflect on their learning progress and adjust goals as necessary?
- Did the student manage their time effectively during both independent and group activities?
- Was there evidence of proactive behavior, such as seeking additional resources or help when needed?

- **Problem-Solving & Critical Thinking:**

- Did the student effectively identify the core problem or challenge relevant to the subject matter (e.g., developing and evaluating different scientific hypotheses in science, using data analysis software in Math, exploring thematic elements in English, evaluating literary elements in Arabic)?
- Was the student able to propose multiple well-considered solutions to the identified problem?
- Did the student assess the strengths and weaknesses (pros and cons) of each proposed solution?
- Did the student demonstrate creativity or innovation in their problem-solving approach?
- Was there clear evidence of logical reasoning and structured thinking behind decision-

making processes?

- Did the student work independently to solve problems, showing minimal reliance on teacher assistance?
 - How effectively did the student handle unexpected challenges or adapt to changes during the project?
 - Did the student demonstrate a willingness to take risks in their approach to problem-solving?
 - Was the student able to justify their choice of solution and reflect on its potential effectiveness?
 - Did the student ask probing questions to deepen understanding of the problem or challenge?



MILESTONE 2 - Rubric for PBLA

Milestone 2 (Product)

This rubric will be applied when the students present (in whatever format decided) their final project work. It evaluates the product. There should be opportunity for students to demonstrate their reflection on the project during this phase. Please use the following rubric supported by the illustrations and guiding questions, to determine the 'best fit' judgement: Beginning/Developing/Acquired.

Within the band is a range of possible scores. You may use the lower score if they just barely meet the descriptions of the band, or the higher score if they clearly meet the requirements well but the above band doesn't fit. You may also use the score range to help you differentiate and rank student performance within the same band. **Reserve 0 scores for where there is cheating/malpractice which is not remedied, even when given opportunity to, or where there has been zero work done to any aspect of the project.**

Criterion	Beginning: 1 - 4	Developing: 5 - 7	Acquired: 8 - 10
Presentation Skills	<ul style="list-style-type: none"> • Demonstrates significant difficulty in communicating ideas • Exhibits limited confidence • Minimal or ineffective use of visual aids • Presentation lacks clarity and engagement • Limited reflection on the challenges faced and how they overcame or unclear 	<ul style="list-style-type: none"> • Communicates ideas adequately with moderate confidence • Employing some visuals to support the presentation; however, further refinement in structure and delivery is necessary • Presentation has some clarity and uses some subject-relevant vocabulary to engage the audience • Sufficient reflection on the challenges faced and how they overcame, with some examples 	<ul style="list-style-type: none"> • Articulates ideas clearly with confidence • Utilizes visuals effectively and strategically to enhance understanding and impact • Presentation has clarity and demonstrates appropriate use of subject-specific vocabulary • Adapts communication style effectively based on audience needs • Clear reflection on the challenges faced and how they overcame, with detailed examples
Innovation and Enterprise	<ul style="list-style-type: none"> • Little if no innovation and enterprise evident • Lack of creativity in the presentation 	<ul style="list-style-type: none"> • Evidence of some innovation and enterprise with creativity • Some experimentation in the presentation. 	<ul style="list-style-type: none"> • Clear evidence of innovation and enterprise with originality • Some risk taking within the presentation
Content/Topic Mastery	<ul style="list-style-type: none"> • Demonstrates limited understanding of subject content/topic • Struggles to articulate key concepts 	<ul style="list-style-type: none"> • Shows understanding of content/topic • Begins to articulate concepts but requires more depth and clarity 	<ul style="list-style-type: none"> • Demonstrates in-depth understanding of subject content • Clearly articulates complex ideas clearly
Application of Knowledge/Skills	<ul style="list-style-type: none"> • Struggles to apply learned concepts in real-world contexts • Makes limited or no connections between areas of learning and authentic scenarios 	<ul style="list-style-type: none"> • Applies subject-specific knowledge with some relevance to real-world contexts • Makes connections between areas of learning and authentic scenarios 	<ul style="list-style-type: none"> • Effectively applies relevant subject knowledge to authentic real-world contexts • Makes meaningful and practical connections between areas of learning and authentic scenarios

Milestone 2 - Illustrations

Presentation Skills Assessment

Acquired: Students articulate ideas clearly and confidently, employing visuals effectively to enhance understanding and impact. Their presentations are well-structured, demonstrate clarity, and use appropriate subject-specific vocabulary, while adapting their communication style to suit the audience's needs. The students are able to clearly explain their own reflections on their work, the challenges they faced, and they can demonstrate using detailed examples.

Developing: Students communicate ideas adequately with moderate confidence and utilize some visuals to support their presentations. However, there is room for improvement in structure and delivery. Their presentations show some clarity and use of relevant vocabulary to engage the audience. The students are able to explain their own reflections of their work, the challenges they faced, and they can demonstrate using examples.

Beginning: Students demonstrate significant difficulty in conveying ideas, exhibiting limited confidence. Their use of visual aids is minimal or ineffective, resulting in presentations that lack clarity and engagement. The students are limited in explanations and not clear with their own reflections of their work and the challenges they faced.

Innovation and Enterprise

Acquired: Students showcase a strong sense of innovation and enterprise, presenting original ideas and taking thoughtful risks that enhance their work. Their presentations captivate the audience and reflect a high level of creativity and an original perspective to the issue at hand.

Developing: Students demonstrate some innovation and enterprise by incorporating creative elements and experimenting with different approaches in their presentations. While there is a budding sense of originality, it may still lack a cohesive execution.

Beginning: Students exhibit minimal to no signs of innovation and enterprise, resulting in presentations that lack creativity and originality. Ideas presented feel generic and do not engage the audience.

Content Mastery

Acquired: Students exhibit a profound understanding of the subject matter, articulating complex ideas with clarity and confidence. Their presentations are insightful and provide deep analysis, clearly demonstrating mastery of the content.

Developing: Students demonstrate a foundational understanding of the content and show some ability to articulate concepts though their explanations may lack depth and clarity. They convey some understanding, but their ideas require further development to enhance comprehension.

Beginning: Students show a limited understanding of the subject matter, often struggling to articulate key concepts. Their grasp of the material is basic, leading to vague explanations that leave the audience confused.

Application of Knowledge

Acquired: Students effectively apply relevant subject knowledge to authentic real-world contexts, creating meaningful and practical connections between their learning and real-life situations. Their presentations illustrate how theoretical concepts can be applied in everyday scenarios, showcasing a comprehensive understanding of the material.

Developing: Students apply subject-specific knowledge with some relevance to real-world contexts, making initial connections between different areas of learning and authentic scenarios. They begin to demonstrate how the concepts can be relevant outside of the classroom.

Beginning: Students struggle to apply learned concepts to real-world situations, making few or no connections between academic content and authentic scenarios. Their presentations may feel disconnected from practical applications.

Milestone 2 – Guiding Questions

Guiding Questions

- **Presentation Skills:**

- Did the student convey ideas clearly and logically?
- Did the student make effective use of visual aids (e.g., diagrams, slides, props) to support the key points?
- Was the student confident, making appropriate eye contact with the audience?
- Did the presentation have a clear introduction, body, and conclusion?
- Did the student effectively engage the audience, using questions, examples, or anecdotes?
- Did the student use appropriate body language and vocal variety to enhance the message?
- Was the pace of the presentation suitable, and were there appropriate pauses to allow understanding?

- **Innovation and Enterprise**

- What original ideas did the student include in the presentation? How did these ideas enhance the overall message?
- What creative risks did the student take in the presentation, and what impact did these have on the audience?
- What different approaches did the student experiment with to convey ideas? What was learned from trying these new approaches?
- Can the student identify areas where their ideas could be more cohesive or focused?
- What specific strategies were used to effectively engage the audience?
- How could creative elements in the presentation be further developed to make it more unique?
- What innovative presentations inspired the student, and how did they incorporate these strategies into their own work?

- **Content Mastery:**

- **Theoretical Understanding:**

- Does the student demonstrate a clear understanding of key subject content and core concepts?
- Was subject-specific terminology used correctly and consistently throughout the presentation?
- Can the student articulate complex ideas and explain them clearly to an audience?

- **Practical Application:**

- Can the student relate theoretical content to practical examples, case studies, or real-life scenarios effectively?
- Did the student incorporate supporting evidence from their research to reinforce

key concepts?

Does the student demonstrate an ability to predict outcomes or propose extensions to the key concepts presented?

Are the connections between different concepts made explicit, logical, and well-integrated?

Did the student show depth in understanding, exploring beyond surface-level explanations?

Can the student articulate complex ideas and explain them clearly to an audience?

Are the connections between different concepts made explicit, logical, and well-integrated?

Did the student show depth in understanding, exploring beyond surface-level explanations?

Was subject-specific terminology used correctly and consistently throughout the presentation?

Can the student relate theoretical content to practical examples, case studies, or real-life scenarios effectively?

Did the student incorporate supporting evidence from their research to reinforce key concepts?

Does the student demonstrate an ability to predict outcomes or propose extensions to the key concepts presented?

- **Application of Knowledge:**

Did the student effectively apply theoretical knowledge to real-world scenarios or problems?

Are there meaningful connections between the theory discussed and practical applications?

Did the student demonstrate awareness of how the applied knowledge could have broader impacts in practical or social contexts?

Did the student effectively use examples to illustrate the practical value of the knowledge?

Was there evidence that the student adapted theoretical content to suit the specific real-world situation being discussed?

Did the student make insightful observations about the significance of the applied knowledge in solving the problem or addressing the scenario?

Was the student able to evaluate the effectiveness of their application and suggest improvements or alternative approaches?

Additional Considerations

Assessing Frequent/Prolonged Absence

Frequent/prolonged absences limit observation opportunities, making evaluation challenging. Students should know that frequent absence will affect their marks due to limited observed work.

Students should be given the opportunity to still demonstrate the skills for the assessed criteria:

- **Missed Milestone Lessons:** Attend intervention sessions for planning, research, and solution discovery.
- **Presentation Evidence:** Integrate missed milestone criteria into presentations.
- **Missed Presentation Period:** Complete a presentation during the exam period.

If absence prevents *any* evaluation on one part of the gradebook (e.g. milestone two):

- award zero scores if the absence is unexcused
- consult school administration for guidance if the absence is excused

Students of Determination

- **IEP Adherence:** Follow accommodations in Individual Education Plans (IEPs) for task planning and assessment.
- **Role Identification:** Use IEP guidance to assign appropriate roles. For instance, students with intellectual disabilities may contribute creatively rather than academically.
- **Alternative Formats:** Where writing is required, allow oral submissions or assistive technology for students with reading/writing challenges.
- **Evaluation Adjustments (for those with “modified curriculum” IEPs):**
Apply IEP-based criteria with simplified rubrics focused on growth, effort, and participation - using a “beginning,” “developing,” “acquired” scale as defined by IEP expectations.

Gifted and Talented Students

- **Encourage Innovation:** Allow freedom for more independent projects aligned within learning domains.
- **Role Adaptation:** Assign roles that leverage identified talents, emphasizing critical thinking and original problem-solving.