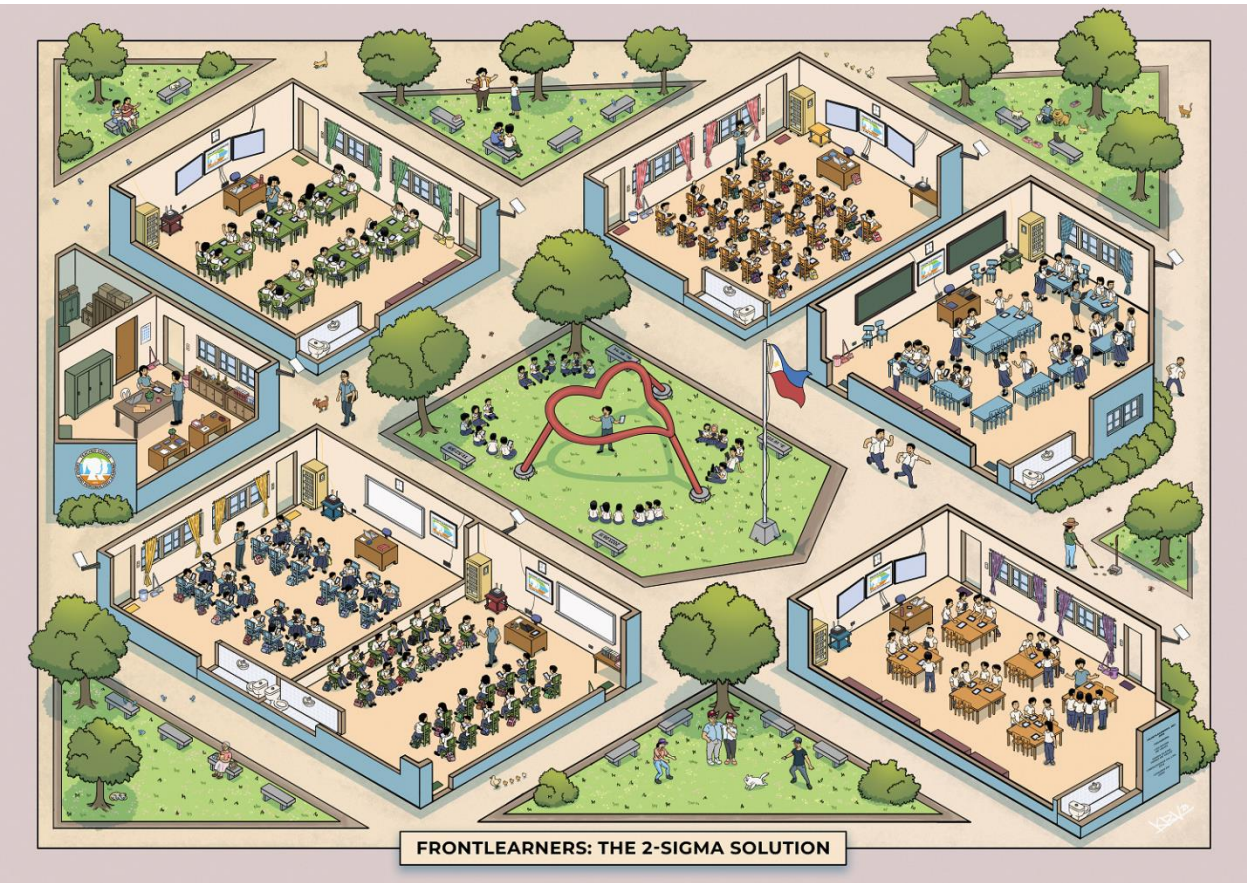
FRONTLEARNERS
MASTERY LEARNING, INTELLIGENT TUTORING

LESSON EXEMPLARS

Adapted PISA Released Items

Mathematics Literacy



LESSON EXEMPLAR: Mathematics Literary - Always, Sometimes, Never
This exemplar provides a structured approach to teaching mathematics literacy through evaluating mathematical statements. Students will categorize statements as always true, sometimes true, or never true, and develop reasoning to support their classifications.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding how to classify mathematical statements by determining conditions under which they hold.
- Developing logical reasoning skills in evaluating statements about divisibility, parity, and basic arithmetic.

2. Performance Standards

- By the end of the lesson, learners will be able to classify statements as always, sometimes, or never true, justify their reasoning with examples, and explain the mathematical principles involved.

3. Learning Competencies and Objectives

- **Identify** conditions that make a mathematical statement true, false, or variable.
    - *Lesson Objective 1*: Recognize statements that are universally true, conditionally true, or universally false.
    - *Lesson Objective 2*: Provide examples to illustrate each classification.
- **Evaluate** the logical structure and mathematical validity of statements.
    - *Lesson Objective 1*: Analyze statements to determine underlying mathematical principles.
    - *Lesson Objective 2*: Use examples or counterexamples to support classifications.
- **Develop Critical Thinking** by testing mathematical statements and examining reasoning.
    - *Lesson Objective 1*: Discuss why certain statements may hold under specific conditions but not universally.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Always, Sometimes, Never* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Classifying Mathematical Statements" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss examples of mathematical statements they know are always, sometimes, or never true.

- **Process Questions**:
    - Can you think of a statement in math that is always true?
    - What about a statement that might be true in some cases but not in others?
- **Instructional Note**: This activity introduces students to thinking critically about conditions under which mathematical statements are valid or invalid.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore statements in mathematics and decide whether each is always, sometimes, or never true. We'll practice using logic and examples to justify our answers."
- **Reading Activity**: Students read example statements such as "A number that is divisible by 4 is also divisible by 2" and "The sum of two odd numbers is odd," analyzing each for validity.
- **Discussion Prompt**: "What makes a statement always true, and what might make it only sometimes or never true?"

C. Developing and Deepening Understanding

1. **Classification Practice**
    - **Activity**: Always, Sometimes, or Never?
    - **Task**: Students classify a list of statements under the categories always true, sometimes true, or never true, providing reasoning for each choice.
    - **Guiding Questions**:
        - What makes this statement universally true?
        - Can you think of an example where the statement doesn't hold?
2. **Using Examples and Counterexamples**
    - **Activity**: Providing Justification with Examples
    - **Task**: For each statement classified as sometimes true, students provide an example showing when the statement is true and a counterexample showing when it is not.
    - **Reflection Question**: "How does providing examples and counterexamples help strengthen our reasoning?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add new insights on classifying mathematical statements and the importance of logical reasoning.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about identifying conditions that affect a statement's truth and a question you still have about mathematical reasoning."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each statement (e.g., "A number divisible by 4 is also divisible by 2") with its classification (always, sometimes, never) and a brief rationale.

B. Short Answer

1. Explain why "The sum of two odd numbers is always even" is classified as always true.
2. Provide an example of a statement that is sometimes true and justify your classification.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding the concept of mathematical truth under different conditions?
- **Student Engagement**: Were students able to effectively classify and justify statements using logical reasoning?
- **Next Steps**: What additional resources or adjustments could enhance students' skills in mathematical reasoning and critical thinking?

LESSON EXEMPLAR: Mathematics Literacy – The Beauty of Powers

This exemplar provides a structured approach to teaching mathematics literacy by exploring powers and exponential notation. Students will understand repeated multiplication, identify patterns in powers, and apply power rules to solve mathematical problems.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding exponential notation to represent repeated multiplication.
- Recognizing patterns in powers and using these patterns to solve problems involving powers and large exponents.

2. Performance Standards

- By the end of the lesson, learners will be able to use power notation to simplify expressions, recognize patterns in the last digits of powers, and solve problems involving exponents.

3. Learning Competencies and Objectives

- **Identify** how power notation represents repeated multiplication.
    - *Lesson Objective 1*: Write expressions in exponential form to represent repeated multiplication.
    - *Lesson Objective 2*: Recognize base and exponent notation and interpret it correctly.
- **Evaluate** patterns and properties in powers of numbers.
    - *Lesson Objective 1*: Analyze patterns in the last digits of powers to predict outcomes for large exponents.
    - *Lesson Objective 2*: Apply power rules to simplify and solve exponential expressions.
- **Develop Critical Thinking** in solving problems with exponents and understanding exponential growth.
    - *Lesson Objective 1*: Discuss how exponential growth differs from linear growth and identify situations where exponents are applicable.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – The Beauty of Powers* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Understanding Powers and Exponents" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss examples of repeated multiplication they have encountered and ways they might represent it using simpler notation.
- **Process Questions**:
    - How can you represent the result of multiplying a number by itself multiple times?
    - What situations in math or science might use repeated multiplication?
- **Instructional Note**: This activity introduces students to the concept of powers, helping them see how power notation simplifies expressions of repeated multiplication.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will learn how to use power notation to simplify repeated multiplication, recognize patterns in powers, and solve problems using exponents."
- **Reading Activity**: Students read about power notation, reviewing examples such as 8×8×8×8=848 \times 8 \times 8 \times 8 = 8^48×8×8×8=84 and 7×7×7×7×7×7=767 \times 7 \times 7 \times 7 \times 7 \times 7 = 7^67×7×7×7×7×7=76.
- **Discussion Prompt**: "How does power notation make it easier to work with large products? What patterns can you notice in the powers of a given number?"

C. Developing and Deepening Understanding

1. **Exploring Power Notation**
    - **Activity**: Converting Repeated Multiplication to Powers
    - **Task**: Students practice converting repeated multiplication expressions to power notation and vice versa.
    - **Guiding Questions**:
        - How would you write 5×5×55 \times 5 \times 55×5×5 using power notation?
        - What does the exponent represent in a power notation?
2. **Identifying Patterns in Powers**
    - **Activity**: Last Digit Patterns in Powers
    - **Task**: Students analyze the last digits in the first several powers of a number, identifying any repeating pattern.
    - **Reflection Question**: "How can recognizing a pattern in the last digits of powers help you solve for large exponents?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on power notation, identifying patterns, and simplifying exponential expressions.

- **Reflection Activity**: One-minute paper – "Summarize how power notation helps in simplifying multiplication and describe a real-life scenario where exponential growth applies."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each repeated multiplication expression with its power notation equivalent and explain the meaning of the exponent.

B. Short Answer

1. Explain why the last digit of 71907^{190}7190 can be predicted by analyzing the pattern of last digits in the first nine powers of 7.
2. Describe one advantage of using power notation for simplifying large multiplication.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding exponential notation and pattern recognition?
- **Student Engagement**: Were students able to recognize patterns and simplify expressions using powers effectively?
- **Next Steps**: What additional resources or modifications could further enhance students' skills in mathematics literacy, particularly with exponential growth?

LESSON EXEMPLAR: Mathematics Literacy – Car Purchase

This exemplar provides a structured approach to teaching mathematics literacy by examining depreciation in car value. Students will explore exponential decay, interpret depreciation rates, and apply exponential functions to evaluate financial decisions.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding exponential decay to model real-world depreciation.
- Recognizing how exponential functions represent depreciation and evaluating their implications for long-term financial decisions.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate depreciation using exponential decay formulas, interpret depreciation rates, and evaluate the impact of depreciation on car value over time.

3. Learning Competencies and Objectives

- **Identify** the concept of depreciation and its representation as exponential decay.
    - *Lesson Objective 1*: Define depreciation and interpret how it affects car value over time.
    - *Lesson Objective 2*: Recognize exponential decay as a model for car depreciation.
- **Evaluate** depreciation using exponential decay formulas.
    - *Lesson Objective 1*: Apply the exponential decay formula to calculate car value after a given number of years.
    - *Lesson Objective 2*: Compare linear and exponential models of depreciation and discuss why exponential decay is a more realistic model for car value.
- **Develop Critical Thinking** about financial decisions related to purchasing and owning a car.
    - *Lesson Objective 1*: Discuss the implications of car depreciation on long-term ownership and resale value.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Car Purchase* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Understanding Depreciation and Exponential Decay in Car Value" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss what they know about how a car's value changes over time, specifically focusing on how new and used car values differ.
- **Process Questions**:
    - How do you think the value of a car changes each year?
    - What factors might influence how quickly a car loses value?
- **Instructional Note**: This activity introduces students to the concept of depreciation and helps them recognize factors affecting car value.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore how car values decrease over time due to depreciation, use exponential formulas to calculate this decline, and examine what this means for financial decisions related to car ownership."
- **Reading Activity**: Students review information on how depreciation is calculated, focusing on how exponential decay models real-world asset depreciation better than linear models.
- **Discussion Prompt**: "Why might an exponential model of depreciation more accurately reflect how a car's value decreases over time?"

C. Developing and Deepening Understanding

1. **Applying Exponential Decay Formula**
    - **Activity**: Calculating Depreciation with Exponential Functions
    - **Task**: Students apply the formula V=P×(1−r)tV = P \times (1 - r)^tV=P×(1−r)t to calculate the depreciated value of a car, where PPP is the initial purchase price, rrr is the annual depreciation rate, and ttt is the number of years.
    - **Guiding Questions**:
        - How does the depreciation rate affect the car's value over time?
        - What does the variable ttt represent in the formula?
2. **Comparing Linear vs. Exponential Models**
    - **Activity**: Analyzing Model Differences
    - **Task**: Students compare calculations of car value using both linear and exponential decay models, discussing why exponential decay provides a more realistic assessment of car value.
    - **Reflection Question**: "Why is exponential decay a more appropriate model for depreciation than a straight-line decrease in value?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add new insights on exponential decay and its role in calculating car depreciation.

- **Reflection Activity**: One-minute paper – "Summarize what you learned about calculating depreciation with exponential decay and discuss any factors that might affect your decision to buy a new or used car."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each depreciation scenario with the correct model (exponential or linear) and briefly explain the reasoning behind the model choice.

B. Short Answer

1. Explain why the exponential decay formula is a realistic way to represent car depreciation.
2. Describe one advantage of understanding depreciation when making a car purchase decision.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand exponential decay and its application in real-world financial decisions?
- **Student Engagement**: Were students able to apply the exponential decay formula effectively and discuss the implications for car ownership?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, especially with practical financial models?

LESSON EXEMPLAR: Mathematics Literacy – DVD Sales

This exemplar provides a structured approach to teaching mathematics literacy by analyzing sales trends and interpreting data. Students will use percentages, graphs, and projections to understand and predict sales patterns in a real-world context.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding percentages, growth rates, and data interpretation in sales.
- Recognizing how to interpret and analyze data trends in graphs and tables for decision-making.

2. Performance Standards

- By the end of the lesson, learners will be able to interpret sales data in graphical and tabular form, calculate percentage changes, and predict future sales trends using provided data.

3. Learning Competencies and Objectives

- **Identify** key components of sales data in graphs and tables.
  - *Lesson Objective 1*: Recognize how to interpret sales data from graphical representations.
  - *Lesson Objective 2*: Extract and understand key figures related to sales growth or decline.
- **Evaluate** trends and calculate percentage changes in sales data.
  - *Lesson Objective 1*: Calculate percentage growth or decline in DVD sales over specific time periods.
  - *Lesson Objective 2*: Use trend lines to make predictions about future sales patterns.
- **Develop Critical Thinking** in analyzing sales data and making predictions.
  - *Lesson Objective 1*: Discuss the impact of changes in sales trends on business decisions.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – DVD Sales* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Interpreting Sales Data in Graphs and Tables" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss examples of products they know whose sales have increased or decreased over time and speculate on reasons why.

- **Process Questions**:
    - How do sales of products like DVDs change over time?
    - What factors might influence sales increases or decreases?
- **Instructional Note**: This activity introduces students to real-world applications of data analysis, focusing on sales trends and percentage changes.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will learn how to interpret and analyze DVD sales data, calculate percentage changes, and use trends to make predictions about future sales."
- **Reading Activity**: Students examine a table showing DVD sales over several years, focusing on changes in yearly sales and the impact of external factors like streaming services.
- **Discussion Prompt**: "What does a sales increase or decrease tell us about customer behavior, and how can businesses use this information?"

C. Developing and Deepening Understanding

1. **Calculating Percentage Changes**
    - **Activity**: Sales Growth and Decline Calculation
    - **Task**: Students calculate the percentage change in DVD sales between consecutive years using the formula
      Percentage Change=New Value−Old ValueOld Value×100%\text{Percentage Change} = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \times 100 \%Percentage Change=Old ValueNew Value−Old Value×100%.
    - **Guiding Questions**:
        - How do you calculate the percentage increase or decrease between two years?
        - What does a negative percentage change indicate about sales?
2. **Projecting Future Sales Trends**
    - **Activity**: Trend Analysis and Prediction
    - **Task**: Using the calculated percentage changes, students analyze trends and project DVD sales for the next few years, considering market changes like the growth of digital streaming.
    - **Reflection Question**: "How reliable do you think predictions are based on past sales trends?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on interpreting sales data, calculating percentage changes, and predicting trends.

- **Reflection Activity**: One-minute paper – "Summarize what you learned about analyzing sales data, and describe one factor that might affect future sales predictions."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each time period with the corresponding percentage increase or decrease in sales and interpret what it indicates about consumer behavior.

B. Short Answer

1. Explain why the percentage change formula is helpful in understanding sales trends.
2. Describe one factor that could cause a sudden change in DVD sales.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding data trends and sales projections?
- **Student Engagement**: Were students able to apply percentage change calculations and interpret sales trends effectively?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in analyzing real-world data?

LESSON EXEMPLAR: Mathematics Literacy – Forested Area

This exemplar provides a structured approach to teaching mathematics literacy by analyzing data on forested areas in different countries over time. Students will interpret percentages, analyze trends in land use, and make data-driven predictions.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding how to interpret and analyze percentages in environmental data.
- Recognizing trends in data and using them to make predictions related to land use and conservation.

2. Performance Standards

- By the end of the lesson, learners will be able to interpret percentage data for forested areas, analyze trends over time, and predict changes in forest coverage.

3. Learning Competencies and Objectives

- **Identify** key data points in environmental statistics related to forested area.
    - *Lesson Objective 1*: Recognize and interpret forest area percentages for different years.
    - *Lesson Objective 2*: Compare data across countries to identify patterns in forested land coverage.
- **Evaluate** trends and calculate changes in forest coverage.
    - *Lesson Objective 1*: Calculate the percentage increase or decrease in forested area over specified time periods.
    - *Lesson Objective 2*: Use trend analysis to predict future changes in forest area coverage.
- **Develop Critical Thinking** in making environmental predictions and understanding land use trends.
    - *Lesson Objective 1*: Discuss the environmental impact of changes in forest area and the factors that may influence these changes.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Forested Area* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Understanding Environmental Data: Forested Area and Land Use Trends" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss what they know about forested areas in their country and any trends they've noticed or heard about regarding deforestation or reforestation.
- **Process Questions**:
  - Why might the amount of forested land change over time?
  - What are some factors that could lead to an increase or decrease in forest coverage?
- **Instructional Note**: This activity introduces students to environmental data analysis, focusing on understanding factors that influence land use changes.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will analyze data on forested land in different countries, calculate changes in forest coverage over time, and discuss the implications of these trends for the environment."
- **Reading Activity**: Students review a table showing the percentage of forested land in 15 countries for the years 2005, 2010, and 2015, focusing on changes and potential environmental impacts.
- **Discussion Prompt**: "What does an increase or decrease in forested area suggest about a country's environmental policies or land use practices?"

C. Developing and Deepening Understanding

1. **Calculating Percentage Changes in Forest Coverage**
   - **Activity**: Analyzing Data for Forest Area Trends
   - **Task**: Students calculate the percentage change in forest area between 2005 and 2015 for selected countries using the formula:
     Percentage Change=New Value−Old ValueOld Value×100%\text{Percentage Change} = \frac{\text{New Value} - \text{Old Value}}{\text{Old Value}} \times 100 \%Percentage Change=Old ValueNew Value−Old Value×100%
   - **Guiding Questions**:
     - How do you interpret a positive or negative percentage change in forest area?
     - Which countries show the largest changes, and what might be the reasons?
2. **Predicting Future Forest Coverage Trends**
   - **Activity**: Projecting Changes in Forest Area
   - **Task**: Using the calculated changes, students predict potential forested area percentages for the year 2025 and discuss possible influences on these trends.
   - **Reflection Question**: "What external factors might influence whether forest coverage continues to increase or decrease?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on environmental data interpretation, calculating changes, and predicting trends.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about analyzing forested area data, and list one question you have about using data for environmental predictions."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each country's data with the correct classification (e.g., increase or decrease in forested area) and interpret the meaning behind these trends.

B. Short Answer

1. Explain why tracking changes in forested area over time is essential for environmental planning.
2. Describe one factor that could significantly influence future changes in a country's forest coverage.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand data analysis and its applications in environmental science?
- **Student Engagement**: Were students able to effectively analyze data trends and predict future changes in forest coverage?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in interpreting environmental data?

LESSON EXEMPLAR: Mathematics Literacy – Moving Truck

This exemplar provides a structured approach to teaching mathematics literacy by examining the costs associated with renting a moving truck. Students will interpret and calculate costs based on rates, apply proportional reasoning, and evaluate scenarios for cost efficiency.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding proportional reasoning and linear relationships in real-world contexts.
- Recognizing how to calculate costs based on rates and use these calculations to make informed financial decisions.

2. Performance Standards

- By the end of the lesson, learners will be able to interpret rates, calculate total costs based on truck rental conditions, and analyze scenarios to determine the most cost-effective rental options.

3. Learning Competencies and Objectives

- **Identify** rental rate structures and interpret the components of cost calculations.
    - *Lesson Objective 1*: Recognize the base cost and per-mile charge in a rental rate.
    - *Lesson Objective 2*: Distinguish between fixed and variable costs in the total rental cost.
- **Evaluate** rental scenarios using proportional reasoning.
    - *Lesson Objective 1*: Calculate the total cost for a given rental scenario based on distance and rental time.
    - *Lesson Objective 2*: Compare scenarios to identify the most economical option.
- **Develop Critical Thinking** in analyzing cost-effectiveness in real-life situations.
    - *Lesson Objective 1*: Discuss factors that impact the total rental cost and explore strategies to minimize expenses.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Moving Truck* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Calculating Cost-Effective Solutions in Real-Life Scenarios" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss experiences with rental services and situations where they have needed to estimate costs, such as car rentals or event planning.
- **Process Questions**:
    - How do you estimate costs when renting something?

    - What factors might increase or decrease the total rental cost?
- **Instructional Note**: This activity introduces students to cost estimation, focusing on interpreting and calculating costs based on variable factors.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will learn how to interpret rental rates, calculate total costs based on travel distance, and analyze different scenarios to determine the most cost-effective choice."
- **Reading Activity**: Students review rental information for a moving truck, including a fixed base rate and a per-mile charge, to understand how costs are structured.
- **Discussion Prompt**: "What elements contribute to the overall cost of renting a moving truck, and how can knowing these elements help you make a better decision?"

C. Developing and Deepening Understanding

1. **Calculating Total Rental Costs**
    - **Activity**: Cost Calculation Practice
    - **Task**: Students use provided base rate and per-mile rate to calculate total costs for various travel distances and rental scenarios.
    - **Guiding Questions**:
        - How does the distance traveled affect the total cost?
        - What is the formula to calculate the overall rental cost?
2. **Comparing Scenarios for Cost Efficiency**
    - **Activity**: Cost-Effectiveness Analysis
    - **Task**: Students compare scenarios where they adjust either distance or base rate to determine the most cost-effective option.
    - **Reflection Question**: "How does adjusting distance or time impact the total cost, and what strategy might minimize costs?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on cost calculations and strategies for evaluating rental expenses.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about calculating rental costs, and describe a situation where this knowledge might be useful in daily life."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each rental scenario with its calculated total cost and explain why one scenario might be more economical than another.

B. Short Answer

1. Explain how the per-mile charge influences the total rental cost.

2. Describe one way to minimize costs when renting a truck for a long-distance move.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding the relationship between distance and cost?
- **Student Engagement**: Were students able to apply proportional reasoning effectively to calculate and compare rental costs?
- **Next Steps**: What additional resources or modifications could further enhance students' skills in mathematics literacy, particularly in real-life financial calculations?

LESSON EXEMPLAR: Mathematics Literacy – Navigation

This exemplar provides a structured approach to teaching mathematics literacy by analyzing navigation strategies on a grid map. Students will explore different routes, apply spatial reasoning, and calculate distances to determine optimal paths.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding spatial reasoning and pathfinding on a coordinate grid.
- Recognizing how different navigation strategies affect route choices and lengths.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate distances between points on a grid, analyze route efficiency, and justify why various strategies produce routes of the same or different lengths.

3. Learning Competencies and Objectives

- **Identify** components of grid-based navigation and interpret distances.
  - *Lesson Objective 1*: Recognize points, lines, and paths on a coordinate grid.
  - *Lesson Objective 2*: Interpret the implications of route choices on distance traveled.
- **Evaluate** different navigation strategies and their outcomes.
  - *Lesson Objective 1*: Analyze Ann, Bob, and Corey's navigation strategies and compare distances.
  - *Lesson Objective 2*: Calculate and justify why routes with identical distances may have different paths.
- **Develop Critical Thinking** by exploring factors that affect route selection and efficiency.
  - *Lesson Objective 1*: Discuss the effects of adding diagonal paths on route efficiency.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Navigation* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Understanding Grid Navigation and Distance Calculation" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss navigation experiences, such as using maps or GPS, and consider how route choices can impact travel time.
- **Process Questions**:
  - What factors might make one route shorter or longer than another?

    - How might a diagonal shortcut affect the total distance traveled?
- **Instructional Note**: This activity introduces students to spatial reasoning on a grid and helps them think critically about route efficiency.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore different navigation strategies on a grid, analyze distances for various routes, and examine the effects of diagonal shortcuts on route efficiency."
- **Reading Activity**: Students read about Ann, Bob, and Corey's strategies, each involving different paths from Point A to Point B, and analyze why each route, despite differences, can result in the same distance.
- **Discussion Prompt**: "Why might different routes have the same total distance, even if they take different paths?"

C. Developing and Deepening Understanding

1. **Calculating Route Distances**
    - **Activity**: Path Distance Calculation
    - **Task**: Students calculate distances for Ann, Bob, and Corey's routes on the grid, comparing the lengths and noting patterns.
    - **Guiding Questions**:
        - What factors keep the distances identical even when routes differ?
        - How does calculating these distances on a grid compare to real-life navigation?
2. **Evaluating the Impact of Diagonal Paths**
    - **Activity**: Analyzing Diagonal Shortcuts
    - **Task**: Students evaluate new routes that include diagonal paths, calculating if they shorten the distance compared to routes without diagonals.
    - **Reflection Question**: "How do diagonal paths influence route length, and when might they be useful in real-world navigation?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on distance calculation, route efficiency, and the impact of adding diagonal paths.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about calculating routes on a grid, and describe a situation where choosing an optimal path is essential."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each strategy (Ann's, Bob's, Corey's) with its respective distance and path characteristics, explaining why each route may have the same length despite different paths.

B. Short Answer

1. Explain why diagonal paths can change the distance between two points on a grid.
2. Describe one advantage of understanding grid navigation for real-life applications.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand grid navigation and spatial reasoning?
- **Student Engagement**: Were students able to apply distance calculations and analyze the effect of different navigation paths effectively?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, especially in spatial problem-solving?

LESSON EXEMPLAR: Mathematics Literacy – Points

This exemplar provides a structured approach to teaching mathematics literacy through the analysis of points on a graph. Students will use coordinate points, understand the relationships between plotted points, and apply spatial reasoning.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding coordinate plane concepts, interpreting points, and analyzing spatial relationships.
- Recognizing how to use coordinates to determine distances and relationships between points.

2. Performance Standards

- By the end of the lesson, learners will be able to identify coordinates, interpret points on a graph, and analyze relationships between plotted points.

3. Learning Competencies and Objectives

- **Identify** coordinates and their positions on a coordinate plane.
  - *Lesson Objective 1*: Recognize and interpret the coordinates of points on a graph.
  - *Lesson Objective 2*: Plot points accurately and understand their locations in relation to the axes.
- **Evaluate** distances and relationships between points.
  - *Lesson Objective 1*: Calculate distances between points with the same x or y values.
  - *Lesson Objective 2*: Compare points to determine their relative positions.
- **Develop Critical Thinking** in analyzing spatial relationships and the implications of point positioning.
  - *Lesson Objective 1*: Discuss how the placement of points affects interpretations of distance and location.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Points* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Understanding Coordinates and Spatial Relationships" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss what they know about coordinates, maps, and how locations are determined by specific points.
- **Process Questions**:

    - How do you think coordinates help in locating positions?
    - What are some ways you've used points or maps in real life?
- **Instructional Note**: This activity introduces students to the coordinate system, focusing on spatial reasoning and the practical application of point plotting.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore how to identify points on a coordinate plane, understand the relationships between points, and calculate distances between specific points."
- **Reading Activity**: Students review examples of coordinates, discussing how the x- and y-coordinates determine point locations on a graph.
- **Discussion Prompt**: "What do the x- and y-coordinates tell us about a point's location, and how can we use this information to understand distances?"

C. Developing and Deepening Understanding

1. **Plotting and Identifying Coordinates**
    - **Activity**: Coordinate Identification and Plotting
    - **Task**: Students practice plotting points on a graph, identifying each point's coordinates, and verifying accuracy.
    - **Guiding Questions**:
        - How does changing the x-coordinate or y-coordinate affect the location of a point?
        - What is the relationship between points with the same x- or y-coordinates?
2. **Calculating Distances Between Points**
    - **Activity**: Distance Calculation Between Points
    - **Task**: Students calculate distances between points that share the same x- or y-coordinate and analyze patterns in distance changes.
    - **Reflection Question**: "How does the distance formula simplify when points share the same x or y value?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on plotting points, interpreting coordinates, and calculating distances.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about plotting and interpreting points, and mention one way this knowledge might be useful outside of math."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each set of coordinates with its plotted position on a graph and describe its location in relation to other points.

B. Short Answer

1. Explain why points with the same x or y coordinate are aligned along a straight line.
2. Describe one real-life application of understanding coordinates and points.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding coordinate points and spatial reasoning?
- **Student Engagement**: Were students able to plot and interpret points accurately and analyze their relationships effectively?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in understanding spatial relationships?

LESSON EXEMPLAR: Mathematics Literacy – Purchasing Decision

This exemplar provides a structured approach to teaching mathematics literacy by analyzing online product reviews and interpreting ratings. Students will use percentages, evaluate data from reviews, and make informed purchasing decisions based on quantitative data.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding percentages and interpreting data in the context of product reviews.
- Recognizing how to evaluate information from various sources to make informed decisions.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate percentages, interpret review data, and make an informed purchasing decision based on ratings and feedback.

3. Learning Competencies and Objectives

- **Identify** relevant data points from online product reviews.
  - *Lesson Objective 1*: Recognize the implications of 1- and 2-star reviews on product quality.
  - *Lesson Objective 2*: Interpret the distribution of review ratings.
- **Evaluate** product information using percentages and review analysis.
  - *Lesson Objective 1*: Calculate the percentage of positive, neutral, and negative reviews for a product.
  - *Lesson Objective 2*: Analyze review patterns to determine whether the product meets quality expectations.
- **Develop Critical Thinking** in making data-driven purchasing decisions.
  - *Lesson Objective 1*: Discuss the impact of review distribution on consumer decisions and assess when to consider a product reliable.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Purchasing Decision* (Adapted from OECD PISA 2021 Mathematics Framework)
- **Multimedia Resources**
  - Video: "Interpreting Online Product Reviews for Informed Decisions" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss experiences with online shopping and how they use reviews to help make purchasing decisions.
- **Process Questions**:
  - How do you decide whether an online product is worth buying?

    - What rating or type of feedback might make you avoid a product?
- **Instructional Note**: This activity introduces students to using data in real-life contexts, focusing on interpreting review information for informed choices.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will analyze product review data, calculate the percentage of positive and negative reviews, and discuss how these figures help us make purchasing decisions."
- **Reading Activity**: Students examine the product review summary, noting that 25% of reviews are 1- or 2-star, and interpret how this percentage impacts the perception of product quality.
- **Discussion Prompt**: "What does it mean if a product has a high percentage of low ratings, and how does it affect your decision to buy?"

C. Developing and Deepening Understanding

1. **Calculating Review Percentages**
    - **Activity**: Percentage Calculation Practice
    - **Task**: Students calculate the percentage of 1- and 2-star ratings compared to total reviews, interpreting these figures for potential purchasing decisions.
    - **Guiding Questions**:
        - How does the percentage of low ratings influence trust in a product?
        - What percentage would make you feel comfortable purchasing?
2. **Evaluating Overall Review Data**
    - **Activity**: Analyzing Patterns in Reviews
    - **Task**: Students analyze review distribution to determine patterns in feedback, identifying common concerns in negative reviews and positive attributes in higher ratings.
    - **Reflection Question**: "How do recurring themes in reviews impact your confidence in the product's quality?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on using review data, interpreting percentages, and assessing purchasing options.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about interpreting review data, and list one factor that might change your decision to purchase a product."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each product with its review rating distribution and discuss why certain products may appear more reliable based on review patterns.

B. Short Answer

1. Explain why a high percentage of negative reviews could deter you from purchasing a product.
2. Describe one strategy for using review data to make better purchasing decisions.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand the use of data in real-life decisions?
- **Student Engagement**: Were students able to apply percentages and interpret review patterns effectively?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in consumer decision-making?

LESSON EXEMPLAR: Mathematics Literacy – Savings Simulation

This exemplar provides a structured approach to teaching mathematics literacy by using a savings simulation to explore financial concepts like monthly deposits, interest rates, and savings goals. Students will perform calculations, interpret the effects of different variables, and make informed decisions based on their findings.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding the relationship between deposits, interest rates, and total savings.
- Recognizing how financial simulations can aid in decision-making for future savings goals.

2. Performance Standards

- By the end of the lesson, learners will be able to use a financial simulator to calculate total savings, determine necessary monthly deposits, and predict savings periods, given various interest rates and deposit amounts.

3. Learning Competencies and Objectives

- **Identify** financial terms and their effects on a savings plan.
    - *Lesson Objective 1*: Define monthly deposit, savings period, and annual interest rate in the context of a savings simulation.
    - *Lesson Objective 2*: Recognize how each variable affects total savings.
- **Evaluate** savings strategies by altering variables in the simulation.
    - *Lesson Objective 1*: Calculate the impact of different interest rates and deposit amounts on total savings.
    - *Lesson Objective 2*: Analyze how varying monthly deposits change the time required to reach a savings goal.
- **Develop Critical Thinking** in assessing the most efficient way to achieve a financial target.
    - *Lesson Objective 1*: Discuss the impact of compound interest on long-term savings and how increasing deposits affects the outcome.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Savings Simulation* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Using Savings Simulations for Financial Planning" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students share any savings plans or goals they have and discuss factors that affect their ability to save, such as income, expenses, and interest rates.
- **Process Questions**:
  - How might interest affect the amount of time it takes to reach a savings goal?
  - What factors make it easier or harder to save for large expenses like college?
- **Instructional Note**: This activity introduces students to financial planning concepts and prepares them to use simulations for savings predictions.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore how different monthly deposits, savings periods, and interest rates affect total savings using a simulation tool."
- **Reading Activity**: Students review the savings simulation setup, understanding how each input (monthly deposit, savings period, and interest rate) impacts total savings and identifying which simulations meet specific financial goals.
- **Discussion Prompt**: "How does changing the monthly deposit or interest rate affect the total savings, and what might that mean for your financial planning?"

C. Developing and Deepening Understanding

1. **Using the Simulation to Calculate Savings**
   - **Activity**: Savings Calculation Practice
   - **Task**: Students use the simulation to calculate the total amount saved when given specific values for monthly deposits, interest rates, and savings periods.
   - **Guiding Questions**:
     - What happens to the total savings when you increase the monthly deposit?
     - How does a higher interest rate affect your savings over the same period?
2. **Comparing Scenarios for Efficient Savings**
   - **Activity**: Scenario Analysis
   - **Task**: Students simulate different scenarios, such as fixed monthly deposits or varying interest rates, and compare which scenario reaches the savings goal most efficiently.
   - **Reflection Question**: "Which factors have the greatest impact on reaching a savings target faster?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on savings strategies, the role of interest rates, and the importance of consistent deposits.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about how monthly deposits and interest affect total savings, and describe a savings strategy that you might use in real life."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each savings goal with the best scenario (e.g., increased monthly deposit or longer savings period) and explain why it meets the goal efficiently.

B. Short Answer

1. Explain why increasing the interest rate can shorten the time to reach a savings goal.
2. Describe one way you could adjust your savings plan to reach a financial target more quickly.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand financial simulations and savings strategies?
- **Student Engagement**: Were students able to apply different variables effectively in the simulation to achieve specific savings goals?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, especially in financial planning?

LESSON EXEMPLAR: Mathematics Literacy – Solar System

This exemplar provides a structured approach to teaching mathematics literacy by analyzing data related to distances, sizes, and orbital paths of planets in the Solar System. Students will interpret astronomical data, use scale, and calculate relative distances.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding measurement, scaling, and proportional reasoning in the context of astronomical data.
- Recognizing how to interpret data and represent large distances in a scaled manner for easier comprehension.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate scaled distances, interpret relative sizes of planets, and use proportional reasoning to understand spatial relationships within the Solar System.

3. Learning Competencies and Objectives

- **Identify** measurements and scaling factors in astronomical data.
  - *Lesson Objective 1*: Define terms such as astronomical unit (AU), scale, and orbit radius.
  - *Lesson Objective 2*: Recognize how scaling simplifies complex data for understanding planetary distances.
- **Evaluate** distances and sizes using scale and proportion.
  - *Lesson Objective 1*: Calculate scaled distances between planets and the Sun.
  - *Lesson Objective 2*: Compare planet sizes relative to Earth and interpret the implications of these sizes.
- **Develop Critical Thinking** in assessing the vastness of space through scaled models.
  - *Lesson Objective 1*: Discuss the challenges of representing large astronomical distances and the importance of scale in understanding space.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Solar System* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Understanding Scale and Distance in the Solar System" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss what they know about the Solar System, the planets, and the vast distances between them.

- **Process Questions**:
    - How far do you think Earth is from the Sun compared to other planets?
    - Why might it be useful to scale down these distances for better understanding?
- **Instructional Note**: This activity introduces students to the concept of astronomical measurements and scaling, preparing them to analyze Solar System data.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore the distances and sizes of planets in the Solar System, use scaling to make sense of these vast distances, and analyze how the planets are positioned relative to each other."
- **Reading Activity**: Students examine a table showing distances from the Sun to each planet in astronomical units (AUs) and note the relative sizes of each planet compared to Earth.
- **Discussion Prompt**: "How does using a scale help us better understand the size and distance of planets in the Solar System?"

C. Developing and Deepening Understanding

1. **Applying Scale to Planetary Distances**
    - **Activity**: Calculating Scaled Distances
    - **Task**: Students use a selected scale to convert astronomical units to manageable distances, such as millimeters or meters, and visualize the Solar System in a scaled model.
    - **Guiding Questions**:
        - How does scaling make it easier to compare distances?
        - What challenges might arise when working with such vast numbers?
2. **Comparing Planet Sizes Using Scale**
    - **Activity**: Relative Size Comparison
    - **Task**: Students calculate scaled diameters of planets using Earth as a reference and interpret the resulting model sizes to understand relative planetary sizes.
    - **Reflection Question**: "How does Earth's size compare to that of other planets, and what does this tell us about our place in the Solar System?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on scaling, calculating distances, and comparing planetary sizes.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about using scale for understanding Solar System distances, and discuss how scaling could help in other large-scale topics."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each planet with its scaled distance from the Sun and interpret the significance of its position in the Solar System.

B. Short Answer

1. Explain why using astronomical units and scale is necessary for understanding planetary distances.
2. Describe one benefit of representing the Solar System with a scaled model.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding scale and proportional reasoning with astronomical data?
- **Student Engagement**: Were students able to apply scaling effectively and interpret data on distances and sizes in the Solar System?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in understanding large distances and proportions?

LESSON EXEMPLAR: Mathematics Literacy – Spinners

This exemplar provides a structured approach to teaching mathematics literacy through probability concepts using spinners. Students will calculate probabilities, interpret outcomes, and explore likelihood scenarios based on spinner divisions.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding basic probability and calculating likelihood in different scenarios.
- Recognizing how to interpret spinner divisions to determine the probability of landing on specific outcomes.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate the probability of outcomes on spinners, analyze different probability scenarios, and explain their reasoning.

3. Learning Competencies and Objectives

- **Identify** probability terms and concepts in the context of spinner outcomes.
  - *Lesson Objective 1*: Recognize terms such as outcome, probability, and likelihood.
  - *Lesson Objective 2*: Understand how each spinner section contributes to the overall probability.
- **Evaluate** probability in different spinner scenarios.
  - *Lesson Objective 1*: Calculate the probability of landing on specific sections of the spinner.
  - *Lesson Objective 2*: Compare scenarios with different spinner divisions and evaluate the most likely outcomes.
- **Develop Critical Thinking** by exploring the factors affecting probability on spinners.
  - *Lesson Objective 1*: Discuss how changing the size or number of sections impacts the probability of landing on specific sections.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Spinners* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Introduction to Probability with Spinners" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss their previous experiences with games of chance, such as using spinners or dice, and how they determine the likelihood of winning.
- **Process Questions**:

    - What does it mean for something to be "likely" or "unlikely"?
    - How can the design of a spinner affect the chances of landing on certain sections?
- **Instructional Note**: This activity introduces students to probability concepts in the context of spinners and prepares them to calculate outcomes.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will calculate probabilities using spinners, explore different scenarios based on spinner divisions, and analyze how these probabilities affect outcomes."
- **Reading Activity**: Students review spinner diagrams showing divisions with different outcomes and discuss how the layout affects the probability of landing on each section.
- **Discussion Prompt**: "How does the number and size of spinner sections affect the probability of landing on a particular section?"

C. Developing and Deepening Understanding

1. **Calculating Probabilities**
    - **Activity**: Probability Calculation Practice
    - **Task**: Students calculate the probability of landing on specific sections of spinners with various divisions (e.g., a spinner with four equal sections vs. a spinner with unequal sections).
    - **Guiding Questions**:
        - How do you calculate the probability of landing on a specific section?
        - What happens to probability if the sections are not equal in size?
2. **Comparing Different Spinner Scenarios**
    - **Activity**: Scenario Analysis
    - **Task**: Students evaluate scenarios with spinners that have different numbers of sections and calculate the probability for each, discussing the likelihood of each outcome.
    - **Reflection Question**: "How does changing the number of sections or their size impact the probability of landing on certain outcomes?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on calculating probabilities, interpreting spinner divisions, and understanding probability impact.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about calculating probabilities with spinners and describe one example of probability in real life."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each spinner scenario with its probability calculations and explain why certain outcomes are more or less likely.

B. Short Answer

1. Explain why a spinner with equal-sized sections has equal probabilities for each outcome.
2. Describe one real-life situation where probability could influence decision-making.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding probability using visual spinner models?
- **Student Engagement**: Were students able to calculate and compare probabilities effectively across different spinner scenarios?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in probability and chance?

LESSON EXEMPLAR: Mathematics Literacy – Tiling

This exemplar provides a structured approach to teaching mathematics literacy by analyzing tiling patterns and interpreting rules for pattern construction. Students will explore symmetry, use spatial reasoning, and apply logical rules to complete tiling patterns.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding spatial reasoning, symmetry, and patterns in tiling.
- Recognizing how to interpret pattern rules and apply them to create repeating structures.

2. Performance Standards

- By the end of the lesson, learners will be able to apply pattern rules to complete tiling arrangements, interpret symmetry in patterns, and construct repeating tiling sections based on given instructions.

3. Learning Competencies and Objectives

- **Identify** components of tiling patterns and interpret pattern rules.
    - *Lesson Objective 1*: Recognize the rules that dictate the placement of different tiles.
    - *Lesson Objective 2*: Interpret instructions to correctly arrange tiles in a pattern.
- **Evaluate** patterns and complete missing sections using logical rules.
    - *Lesson Objective 1*: Apply pattern rules to extend or complete a tiling design.
    - *Lesson Objective 2*: Analyze how symmetry and repetition affect pattern construction.
- **Develop Critical Thinking** by exploring logical structures and repetition in tiling.
    - *Lesson Objective 1*: Discuss how understanding pattern rules can help predict missing parts of a tiling arrangement.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Tiling* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Creating and Understanding Patterns in Tiling" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss examples of patterns they've seen in tiles, wallpapers, or textiles and how these designs repeat or use symmetry.
- **Process Questions**:
    - What are some examples of patterns you've noticed in floors or walls?
    - How do you think the arrangement of tiles is decided?

- **Instructional Note**: This activity introduces students to pattern recognition in everyday contexts, preparing them to analyze structured tiling arrangements.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore tiling patterns, interpret the rules that create these designs, and apply logical thinking to complete or extend tiling arrangements."
- **Reading Activity**: Students examine a tiling pattern with instructions detailing how tiles A and B are arranged, noting how the pattern changes across rows and columns.
- **Discussion Prompt**: "What rules do you think are followed to ensure the pattern looks consistent throughout the entire tiling?"

C. Developing and Deepening Understanding

1. **Applying Pattern Rules to Tiling**
    - **Activity**: Completing Tiling Patterns
    - **Task**: Students use given rules to complete tiling patterns by arranging tiles in specified sequences, ensuring they follow the logical order presented in the instructions.
    - **Guiding Questions**:
        - What rule determines the placement of tiles in each row?
        - How does changing one tile affect the overall pattern?
2. **Analyzing Symmetry and Repetition**
    - **Activity**: Symmetry and Pattern Extension
    - **Task**: Students explore how symmetry can be used to predict missing tiles in patterns, identifying sections that can repeat to create an extended tiling design.
    - **Reflection Question**: "How can recognizing symmetry help simplify the process of completing a complex tiling pattern?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on using symmetry, applying logical rules, and completing tiling arrangements.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about creating and completing tiling patterns, and discuss how patterns might appear in other areas, such as art or architecture."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each tiling rule with the corresponding pattern it creates, explaining why certain tiles follow specific placements.

B. Short Answer

1. Explain why understanding pattern rules is essential for completing tiling designs.
2. Describe one advantage of using symmetry in constructing large tiling areas.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand the application of rules and symmetry in pattern design?
- **Student Engagement**: Were students able to identify and apply pattern rules effectively to complete tiling arrangements?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in spatial reasoning and pattern recognition?

LESSON EXEMPLAR: Mathematics Literacy – Triangular Pattern

This exemplar provides a structured approach to teaching mathematics literacy through analyzing triangular patterns and exploring number sequences. Students will use patterns, apply sequence rules, and calculate values in triangular arrangements.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding sequence rules and pattern recognition in mathematical contexts.
- Recognizing how triangular numbers develop in structured patterns and applying these concepts to solve problems.

2. Performance Standards

- By the end of the lesson, learners will be able to identify triangular patterns, interpret sequences, and calculate values within these patterns based on sequence rules.

3. Learning Competencies and Objectives

- **Identify** components and patterns within triangular arrangements.
  - *Lesson Objective 1*: Recognize how triangular numbers form a sequence in an increasing pattern.
  - *Lesson Objective 2*: Understand the relationship between position in the sequence and triangular number value.
- **Evaluate** sequence rules and calculate further values in the triangular pattern.
  - *Lesson Objective 1*: Apply sequence rules to calculate the next numbers in a triangular pattern.
  - *Lesson Objective 2*: Analyze relationships between sequence position and triangular number.
- **Develop Critical Thinking** by exploring and predicting elements within triangular patterns.
  - *Lesson Objective 1*: Discuss how identifying rules in a pattern aids in predicting future values.

II. Learning Resources

- **Source Material**
  - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Triangular Pattern* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
  - Video: "Understanding Triangular Number Sequences" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss any familiar patterns or sequences in shapes, such as squares or triangles, and how these patterns grow.

- **Process Questions**:
  - What do you notice about patterns that repeat or increase in a structured way?
  - How do you think a triangular pattern might develop if we keep adding more layers?
- **Instructional Note**: This activity introduces students to sequence rules and pattern structures, preparing them for triangular number calculations.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will explore triangular number sequences, calculate their values, and analyze how these numbers form through a predictable pattern."
- **Reading Activity**: Students examine a triangular pattern showing a sequence of numbers, analyzing how each level in the triangle adds a specific amount to form a new total.
- **Discussion Prompt**: "How does each additional row in a triangular pattern change the total number of items?"

C. Developing and Deepening Understanding

1. **Calculating Values in Triangular Sequences**
   - **Activity**: Calculating Triangular Numbers
   - **Task**: Students calculate the first few triangular numbers by applying the sequence rule Tn=n(n+1)2T_n = \frac{n(n+1)}{2}Tn=2n(n+1), where nnn is the position in the sequence.
   - **Guiding Questions**:
     - How does each new level or row affect the total number in the triangle?
     - What pattern do you notice as the sequence progresses?
2. **Extending the Sequence and Analyzing Patterns**
   - **Activity**: Pattern Prediction and Extension
   - **Task**: Students use the rule to predict future numbers in the sequence, discussing how the pattern can help determine the next few values without recalculating the entire sequence.
   - **Reflection Question**: "How can recognizing the formula for triangular numbers help in extending the sequence or calculating large terms?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on calculating values in triangular patterns, interpreting sequence rules, and applying formulas.
- **Reflection Activity**: One-minute paper – "Summarize what you learned about triangular number sequences, and mention where you might encounter similar patterns outside of math."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each position in the triangular sequence with its corresponding triangular number, explaining how the formula predicts each value.

B. Short Answer

1. Explain why the formula Tn=n(n+1)2T_n = \frac{n(n+1)}{2}Tn=2n(n+1) generates triangular numbers.
2. Describe a situation in which understanding a sequence rule helps solve a practical problem.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities help students understand sequence rules and their applications?
- **Student Engagement**: Were students able to calculate and extend triangular numbers effectively using the pattern rule?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in identifying and applying patterns?

LESSON EXEMPLAR: Mathematics Literacy – Smartphone Use

This exemplar provides a structured approach to teaching mathematics literacy through the analysis of smartphone usage data. Students will interpret spreadsheet data, calculate percentages, and analyze trends to understand the proportion of smartphone users across different populations.

I. Curriculum Content, Standards, and Lesson Competencies

1. Content Standards

- Understanding data interpretation, percentage calculation, and trend analysis.
- Recognizing how to analyze and interpret data using a spreadsheet to evaluate proportions.

2. Performance Standards

- By the end of the lesson, learners will be able to calculate the proportion of smartphone users, analyze sorted data, and interpret graphical trends to draw conclusions on smartphone use across countries.

3. Learning Competencies and Objectives

- **Identify** relevant data columns and perform percentage calculations.
    - *Lesson Objective 1*: Recognize the role of each data column (population, smartphone users) and understand how to calculate the proportion.
    - *Lesson Objective 2*: Sort data in the spreadsheet to facilitate analysis.
- **Evaluate** trends and interpret data from a spreadsheet and graphs.
    - *Lesson Objective 1*: Calculate the percentage of smartphone users per country and compare data points.
    - *Lesson Objective 2*: Analyze how variables such as population and minimum hourly wage relate to smartphone usage.
- **Develop Critical Thinking** in identifying factors affecting smartphone usage.
    - *Lesson Objective 1*: Discuss the relationship between smartphone use and socioeconomic factors such as population and income.

II. Learning Resources

- **Source Material**
    - *Frontlearners, Inc. Adapted Released Items: Mathematics Literacy – Smartphone Use* (Adapted from OECD PISA 2025 Mathematics Literacy Framework)
- **Multimedia Resources**
    - Video: "Analyzing Data Trends with Spreadsheets" (YouTube)

III. Teaching and Learning Procedure

A. Activating Prior Knowledge

- **Activity**: Group Discussion – Students discuss factors they believe affect smartphone usage, such as population size or income level.

- **Process Questions**:
    - How might a country's population size influence the number of smartphone users?
    - What role do you think income plays in determining smartphone access?
- **Instructional Note**: This activity introduces students to analyzing data based on socioeconomic factors, preparing them to interpret smartphone usage data.

B. Establishing Lesson Purpose

- **Purpose Statement**: "In this lesson, we will calculate the proportion of smartphone users in different countries, analyze data in a spreadsheet, and interpret graphs to explore trends in smartphone usage."
- **Reading Activity**: Students review the smartphone usage spreadsheet, noting columns for population and smartphone users, and analyze how to calculate the proportion of users.
- **Discussion Prompt**: "What might be the significance of a high or low proportion of smartphone users in a country, and how could this data be useful?"

C. Developing and Deepening Understanding

1. **Calculating the Proportion of Smartphone Users**
    - **Activity**: Proportion Calculation Practice
    - **Task**: Students calculate the percentage of smartphone users for each country using the formula \text{Proportion (%) = }\frac{\text{Smartphone Users}}{\text{Population}} \times 100\%.
    - **Guiding Questions**:
        - How does calculating the proportion help us compare smartphone usage between countries?
        - Why might certain countries have higher or lower percentages?
2. **Analyzing Data Patterns in Graphs**
    - **Activity**: Trend Analysis Using Graphs
    - **Task**: Students use the graph to analyze how smartphone usage proportions change with population and minimum hourly wage, interpreting how socioeconomic variables may correlate with smartphone access.
    - **Reflection Question**: "What patterns do you observe between smartphone usage and variables like population size or income?"

D. Making Generalizations

- **KWL Chart Update**: Students revisit their initial KWL chart to add insights on calculating proportions, using spreadsheets for data analysis, and identifying trends.

- **Reflection Activity**: One-minute paper – "Summarize what you learned about analyzing smartphone usage data, and discuss one insight you gained about the relationship between population and smartphone use."

IV. Evaluating Learning: Formative Assessment

A. Matching Exercise

- Match each country with its proportion of smartphone users and discuss what factors might contribute to differences in smartphone access.

B. Short Answer

1. Explain why calculating the proportion of smartphone users is more insightful than only looking at total numbers.
2. Describe one way the data could be useful for governments or companies interested in technology adoption.

V. Teacher's Reflection

Reflection Guide:

- **Teaching Principles**: How did the lesson activities support students in understanding data analysis and trend identification?
- **Student Engagement**: Were students able to calculate proportions and interpret data trends effectively across different countries?
- **Next Steps**: What additional resources or modifications could enhance students' skills in mathematics literacy, particularly in data interpretation and analysis?