

EUROQUEST HANDBOOK

Creating Educational Tabletop Escape Rooms (ETERs) to Enhance Learning About Sustainability and Other Curricular Subjects

* A Practical Guide for Teachers *

The Handbook has been created within the framework of the Erasmus+ project “Enhancing teaching and learning of sustainability with Educational Tabletop Escape Rooms (ETER)” - EUROQUEST - 2024-1-DE03-KA220-SCH-000257334, Activity 2.2b Creating 1 Handbook on teaching sustainability with ETERs

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INTRODUCTION *

Welcome to the comprehensive handbook for creating Educational Tabletop Escape Rooms (ETERs). This practical guide is designed specifically for teachers who want to harness the power of game-based learning to create engaging, immersive educational experiences for their students. This guide has been created within the framework of the EUROQUEST project, Co-funded by the Erasmus+ Programme of the European Union.

WHAT YOU'LL FIND IN THIS HANDBOOK

This handbook serves as both a reference guide and a practical toolkit. Unlike traditional step-by-step courses, this resource is designed for quick lookup, immediate application, and ongoing reference as you develop your ETERs.

HOW TO USE THIS HANDBOOK

- New to ETERs? Start with Chapter 1 (Quick Start Guide)
- Need specific tools? Jump to the relevant chapter
- Looking for templates? Go directly to Chapter 6
- Facing challenges? Check Chapter 7 (Troubleshooting Guide)



TARGET AUDIENCE

This handbook is written for K-12 teachers, regardless of subject area or previous gaming experience. All concepts are explained in accessible language with practical examples from real classroom contexts.

CHAPTER 1: QUICK START GUIDE

What Are Educational Tabletop Escape Rooms (ETERs)?

Educational Tabletop Escape Rooms (ETERs) are compact, puzzle-based learning experiences where students collaborate to solve interconnected challenges within a themed scenario. Unlike physical escape rooms, ETERs are played entirely at tables using cards, worksheets, and printable materials.

Key Characteristics of ETERs:

- Collaborative: Students work in teams of 4-8 players
- Time-limited: Typically 40-60 minutes of gameplay
- Puzzle-based: Learning happens through solving interconnected challenges
- Narrative-driven: Embedded in engaging stories or scenarios
- Portable: All materials fit in a standard folder or box

Why Use ETERs in Your Classroom?

Educational Benefits:

- High engagement: Games naturally motivate students
- Active learning: Students construct knowledge through problem-solving
- Collaborative skills: Teamwork and communication are essential
- Critical thinking: Complex puzzles require analysis and synthesis
- Memorable experiences: Learning through play creates lasting memories

Practical Advantages:

- Flexible group sizes: Adaptable for classes of 15-35 students
- Low cost: Materials are printable and reusable
- Easy setup: No special equipment or room modifications needed
- Curriculum integration: Aligns with existing learning objectives
- Assessment opportunities: Observable learning in action

The ETER Experience: What Students Do

1. Receive the mission: Students are presented with a compelling scenario
2. Form teams: Groups of 4-8 students collaborate
3. Solve puzzles: Teams work through interconnected challenges
4. Make discoveries: Each solved puzzle reveals new information or tools
5. Achieve the goal: Success requires applying learned concepts
6. Debrief: Reflection consolidates learning and identifies key insights

Essential Components of Every ETER

Physical Materials:

- Instruction cards: Clear, engaging scenario setup
- Puzzle cards: Individual challenges and clues
- Resource sheets: Reference materials, maps, or data
- Answer verification: Decoder wheels, answer keys, or apps
- Props (optional): Physical objects that enhance immersion

Structural Elements:

- Clear objective: Students know what they're trying to achieve
- Progressive difficulty: Puzzles build on each other logically
- Multiple solution paths: Accommodates different thinking styles
- Built-in hints: Support struggling teams without breaking immersion
- Satisfying conclusion: Clear success criteria and resolution

5-Minute Setup Checklist

Before Class:

- Print all materials (1 set per team)
- Organize materials in folders or envelopes
- Set up timer or countdown visible to all teams
- Prepare hint system (sealed envelopes or digital)

During Introduction (5 minutes):

- Present the scenario dramatically
- Explain basic rules and time limit
- Demonstrate how to ask for hints
- Start the timer and begin!

Common ETER Formats

Investigation Mystery

Students solve a crime, scientific mystery, or historical puzzle by analyzing evidence and connecting clues. Example: Determine the cause of environmental damage using scientific data.

Rescue Mission

Teams must save someone or something by completing tasks within the time limit.

Example: Prevent an environmental disaster by implementing sustainability solutions

Treasure Hunt

Students follow clues from location to location, learning content at each stop.

Example: Trace the carbon footprint of everyday products through global supply chains

Escape Scenario

Classic format where students must figure out how to escape a situation.

Example: Escape from a future climate-changed world by demonstrating knowledge of current solutions.

Your First ETER: Quick Creation Method

Step 1: Choose Your Learning Goal (5 minutes)

Write one specific thing you want students to be able to do: "Students will be able to identify three renewable energy sources and explain one advantage of each."

Step 2: Create Your Scenario (10 minutes)

Frame your learning goal as a mission: "The town's power plant has failed! Your team must design a new sustainable energy system using the resources available in your emergency kit."

Step 3: Design 3-5 Puzzles (30 minutes)

Create challenges that require students to use your target knowledge:

- Puzzle 1: Match energy sources to their environmental impacts
- Puzzle 2: Calculate energy needs vs. renewable capacity
- Puzzle 3: Design an optimal mix of energy sources
- Final challenge: Present your energy plan

Step 4: Add the Wrapper (15 minutes)

- Create introduction cards explaining the scenario
- Design simple answer verification (answer sheets)
- Add a timer element (45-minute countdown)
- Write success criteria ("Save the town!")

Success Tips for First-Time ETER Creators

Do:

- Start simple with 3-4 straightforward puzzles
- Test with colleagues before using with students
- Include clear instructions and examples
- Plan for different completion times
- Have backup activities for early finishers

Don't:

- Make puzzles too complex for your time limit
- Forget to include learning objectives in puzzles
- Create only one solution path
- Skip the debrief session
- Be afraid to adjust difficulty during gameplay

Measuring Success

Your ETER is successful when:

- Engagement: Students are actively discussing and problem-solving
- Learning: You can see students applying target knowledge/skills
- Collaboration: Teams are working together effectively
- Satisfaction: Students express enjoyment and ask to play again
- Achievement: Most teams complete the experience successfully

* CHAPTER 2: DESIGN FRAMEWORK

The ADDIE Model for ETERs

The ADDIE model provides a systematic approach to creating effective educational experiences. Each phase ensures your ETER achieves its intended learning outcomes.

Phase 1: Analysis

Purpose: Understand your context and constraints before designing

Key Questions:

- Who are your students? (Age, background, gaming experience)
- What are your learning goals? (Knowledge, skills, attitudes)
- What constraints do you face? (Time, space, materials, budget)
- What is your classroom environment like?

Practical Tools:

- Student profile worksheet
- Learning goals clarification checklist
- Constraint analysis template
- Environment assessment guide

Phase 2: Design

Purpose: Plan the learning experience and game structure

Key Activities:

- Define specific, measurable learning objectives
- Choose instructional strategies that support your objectives
- Plan assessment methods
- Ensure alignment between objectives, activities, and assessment

Phase 3: Development

Purpose: Create the actual ETER materials

Deliverables:

- Game materials (cards, worksheets, props)
- Instructions and rules
- Answer keys and verification systems
- Hint systems and support materials

Phase 4: Implementation

Purpose: Execute the ETER in your classroom

Considerations:

- Room setup and logistics
- Team formation strategies
- Facilitation techniques
- Time management approaches

Phase 5: Evaluation

Purpose: Assess effectiveness and identify improvements

Methods:

- Learning outcome assessment
- Student feedback collection
- Observation and reflection
- Iterative improvement planning

Analyzing Your Teaching Context

Understanding Your Learners

Demographics:

- Age range and developmental stage
- Cultural and linguistic diversity
- Special needs and accommodations
- Previous gaming experience

Academic Profile:

- Current knowledge level
- Skill development needs
- Learning preferences and styles
- Motivation and engagement patterns

ASSESSMENT TEMPLATE: STUDENT PROFILE

CLASS: _____ **SUBJECT:** _____
AGE RANGE: _____ **CLASS SIZE:** _____

Prior Knowledge Level:

- Beginner Intermediate Advanced Mixed

Gaming Experience:

- Regular gamers Occasional players New to games

Special Considerations:

- ESL learners Learning disabilities Physical accommodations
 Behavioural challenges Gifted students

Learning Preferences (check all that apply):

- Visual learners Auditory learners Kinaesthetic learners
 Collaborative workers Independent workers

Identifying Learning Purposes

Purpose 1: Information Exchange and Collaboration Use when you want students to:

- Share knowledge and perspectives
- Build understanding through discussion
- Learn from each other's expertise
- Develop collaborative skills

Example: Students share research about different renewable energy sources to solve an energy crisis scenario

Purpose 2: Skills Training and Practice Use when you want students to:

- Practice specific procedures or techniques
- Develop fluency with tools or methods
- Apply skills in varied contexts
- Build confidence through repetition

Example: Students practice calculating carbon footprints using different scenarios and data sets

Purpose 3: Message Broadcasting and Awareness Use when you want students to:

- Understand important concepts or principles
- Change attitudes or perspectives
- Raise awareness about issues
- Internalize key messages

Example: Students experience the impacts of climate change through role-playing different stakeholders

Constraint Analysis

Time Constraints:

- Available class periods
- Duration of each session
- Preparation time available
- Scheduling flexibility

Resource Constraints:

- Printing budget and capabilities
- Available technology
- Physical space limitations
- Material storage options

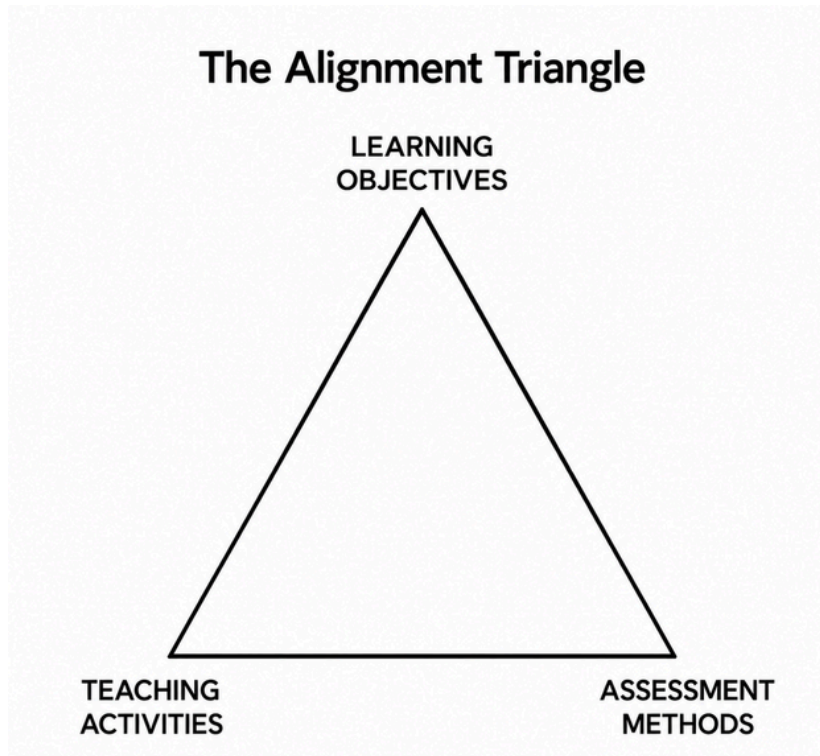
Skill Constraints:

- Your game design experience
- Student readiness for complex games
- Classroom management challenges
- Assessment requirements

Constructive Alignment in ETER Design

Constructive alignment ensures that your learning objectives, learning activities (the ETER), and assessment methods all work together to support student learning.

THE ALIGNMENT TRIANGLE



Achieving Alignment

Step 1: Define Clear Learning Objectives Use action verbs that describe observable behaviors:

- Students will analyze the environmental impact of three transportation choices
- Students will create a plan for reducing classroom waste by 25%
- Students will evaluate the effectiveness of different recycling programs

Step 2: Design ETER Activities That Support Objectives Ensure puzzles and challenges require students to demonstrate the target behaviors:

- Analysis objective → Puzzle requiring comparison and evaluation
- Creation objective → Challenge involving design and construction
- Evaluation objective → Activity requiring judgment and reasoning

Step 3: Plan Assessment Methods That Measure Objectives Choose assessment strategies that can capture evidence of learning:

- Analysis objective → Rubric for evaluating reasoning quality
- Creation objective → Checklist for plan completeness
- Evaluation objective → Discussion reflection or written justification

Alignment Check Template

Learning Objective: _____

ETER Activity Description: _____

Does this activity require students to demonstrate the objective? Yes No

Assessment Method: _____

Does this assessment measure achievement of the objective? Yes No

Alignment Quality:

- Perfect alignment - all components support each other
- Good alignment - minor adjustments needed
- Poor alignment - major redesign required

Design Specifications Framework

Scale and Scope

Individual vs. Team Play:

- Individual: Better for knowledge checking and personal reflection
- Small teams (2-3): Good for skill practice and peer learning
- Large teams (4-8): Best for complex problem-solving and collaboration

Session Length:

- Short (20-30 minutes): Quick review or introduction activities
- Medium (45-60 minutes): Full lesson replacement
- Long (90+ minutes): In-depth exploration or assessment

Complexity Level:

- Simple: 3-4 linear puzzles with clear solutions
- Moderate: 5-7 puzzles with some branching paths
- Complex: 8+ puzzles with multiple solution strategies

Material Requirements

Print-and-Play Design:

- All materials printable on standard paper
- Black and white printing sufficient
- Minimal cutting or folding required
- Reusable components when possible

Cost Considerations:

- Paper and ink usage
- Lamination needs
- Storage solutions
- Replacement frequency

Adaptability Features

Group Size Flexibility:

- Multiple puzzle sets for large classes
- Scalable difficulty for mixed abilities
- Alternative roles for different team sizes

Time Flexibility:

- Core experience with optional extensions
- Natural stopping points for shorter periods
- Fast-track options for advanced students

Design Decision Matrix

Use this matrix to make informed design choices:

Consideration	Option A	Option B	Option C	Best Choice
Group Size	Individual	4-person teams	6-person teams	
Duration	30 Min.	45 Min.	60 Min.	
Complexity	3 puzzles	5 puzzles	7 puzzles	
Materials	Paper only	Props included	Digital hybrid	
Assessment	Observation Product	Creation	Reflection essay	

★ CHAPTER 3: LEARNING OBJECTIVES TOOLKIT

Creating SMART Learning Objectives for ETERs

SMART objectives provide the foundation for effective ETER design by ensuring your goals are clear, measurable, and achievable.

SMART Framework

S - Specific: Clear and detailed description of what students will achieve
M - Measurable: Observable behaviors that can be assessed
A - Attainable: Realistic given your students' current abilities
R - Relevant: Connected to curriculum standards and student needs
T - Time-framed: Achievable within your available time.

The Anatomy of a Learning Objective

Structure: "By [TIME], [LEARNER] will be able to [ACTION VERB] [OBJECT] [CONDITIONS/CRITERIA]"

Examples:

- "By the end of this lesson, students will be able to identify five renewable energy sources with 80% accuracy"
- "During the ETER activity, teams will create a waste reduction plan that addresses at least three different waste streams"
- "After completing the escape room, students will evaluate the effectiveness of different conservation strategies using provided criteria"

SMART Objectives Worksheet

Learning Objective Draft: _____

SMART Check:

- Specific: Does it clearly state what students will do?
- Measurable: Can I observe and assess this behavior?
- Attainable: Is this realistic for my students?
- Relevant: Does this connect to curriculum goals?
- Time-framed: Is the timeframe clear and reasonable?

Revised Objective: _____

Bloom's Taxonomy for ETER Design

Bloom's taxonomy helps you create objectives that target different levels of cognitive complexity, ensuring your ETER challenges students appropriately.

The Six Levels

1. Remember (Recall information)

- Action verbs: define, identify, list, match, recall, recognize
- ETER applications: Memory-based puzzles, fact recognition challenges
- Example: "Students will identify the components of the carbon cycle"



2. Understand (Explain concepts)

- Action verbs: classify, describe, explain, paraphrase, summarize
- ETER applications: Explanation tasks, categorization puzzles
- Example: "Students will explain how deforestation affects climate"

3. Apply (Use knowledge in new situations)

- Action verbs: calculate, demonstrate, solve, use, implement
- ETER applications: Problem-solving scenarios, calculation challenges
- Example: "Students will calculate the carbon footprint of different transportation choices"

4. Analyze (Break down and examine relationships)

- Action verbs: analyze, compare, contrast, examine, investigate
- ETER applications: Comparison tasks, cause-and-effect puzzles
- Example: "Students will analyze the relationship between energy use and environmental impact"

5. Evaluate (Make judgments and decisions)

- Action verbs: assess, critique, evaluate, judge, recommend
- ETER applications: Decision-making scenarios, solution ranking tasks
- Example: "Students will evaluate different renewable energy options for their community"

6. Create (Produce original work)

- Action verbs: create, design, develop, generate, produce
- ETER applications: Design challenges, solution creation tasks
- Example: "Students will design a school recycling program"

Bloom's Taxonomy Planning Template

Subject: _____ Topic: _____

Remember Level Objectives:

- _____
- _____

Understand Level Objectives:

- _____
- _____

Apply Level Objectives:

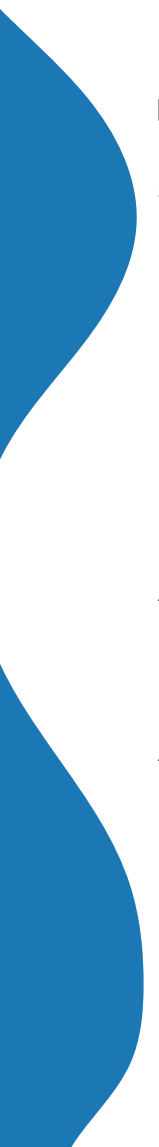
- _____
- _____

Analyze Level Objectives:

- _____
- _____

Evaluate Level Objectives:

- _____
- _____



- Sustainability connections: Personal behavior change, lifelong environmental learning

6. Citizenship Competence

- ETER applications: Democratic decision-making, rights and responsibilities
- Sustainability connections: Environmental justice, community action

7. Entrepreneurship Competence

- ETER applications: Innovation challenges, resource management
- Sustainability connections: Green business models, sustainable solutions

8. Cultural Awareness and Expression Competence

- ETER applications: Creative problem-solving, cultural perspectives
- Sustainability connections: Traditional ecological knowledge, diverse values

GreenComp: The European Sustainability Competence Framework

Embodying Sustainability Values

- Valuing sustainability principles
- Supporting fairness and justice
- Promoting nature conservation

Embracing Complexity in Sustainability

- Systems thinking approach
- Critical thinking about sustainability
- Problem framing skills

Envisioning Sustainable Futures

- Futures literacy development
- Adaptability and resilience
- Exploratory thinking

Acting for Sustainability

- Political agency and collective action
- Individual initiative and responsibility
- Practical implementation skills

Competence Framework Application Worksheet

Selected Framework: _____

Relevant Competences for My ETER:

Competence 1: _____

How my ETER addresses this: _____

Assessment method: _____



Competence 2: _____

How my ETER addresses this: _____

Assessment method: _____

Competence 3: _____

How my ETER addresses this: _____

Assessment method: _____

Learning Gap Analysis

Understanding the gap between your students' current abilities and your target objectives helps you design appropriately challenging ETERs.

Gap Analysis Process

Step 1: Assess Current State

- What do students already know about your topic?
- What skills do they currently possess?
- What are their attitudes toward the subject?

Step 2: Define Future State

- What should they know after the ETER?
- What skills should they demonstrate?
- How should their attitudes change?

Step 3: Identify the Gap

- Knowledge gaps: Missing facts, concepts, or understanding
- Skill gaps: Abilities that need development
- Attitude gaps: Values or perspectives to be developed

Step 4: Design Learning Experiences

- Create ETER challenges that address identified gaps
- Sequence activities from simple to complex
- Provide scaffolding and support as needed

Gap Analysis Template

Topic: _____

CURRENT STATE (What students bring):

Knowledge: _____

Skills: _____

Attitudes: _____



DESIRED STATE (Learning objectives):

Knowledge: _____

Skills: _____

Attitudes: _____

LEARNING GAP (What needs to be addressed):

Knowledge gaps: _____

Skill gaps: _____

Attitude gaps: _____

ETER DESIGN IMPLICATIONS:

Priority gaps to address: _____

Appropriate challenge level: _____

Necessary scaffolding: _____





CHAPTER 4: ASSESSMENT STRATEGIES



Assessment Types for ETERs

Effective assessment in game-based learning requires multiple approaches that capture learning without disrupting the gaming experience.

Formative Assessment (Assessment FOR Learning)

Purpose: Support learning in real-time by providing ongoing feedback

ETER Implementation Strategies:

Embedded Feedback Systems

- Puzzle solutions that provide immediate confirmation or correction
- Progressive hint systems that guide students toward correct thinking
- Self-check mechanisms built into game materials

Facilitator Observation Tools

- Structured observation checklists for monitoring team progress
- Quick verbal check-ins during gameplay
- "Temperature checks" to gauge understanding levels

Peer Assessment Activities

- Teams reviewing and commenting on each other's solutions
- Collaborative verification of puzzle answers
- Peer teaching when one team helps another

Example: Embedded Formative Assessment Sustainability ETER - Carbon Footprint Calculation

- Students calculate emissions for different transportation choices
- Answer card provides immediate feedback: "Correct! Bus travel produces 45g CO₂ per km. Notice how this compares to car travel at 120g CO₂ per km."
- If incorrect: "Check your calculation. Remember: bus emissions = base rate × distance × occupancy factor"

Summative Assessment (Assessment OF Learning)

Purpose: Measure final achievement against learning objectives

ETER Implementation Strategies:


Final Challenge Design

- Culminating puzzle that requires synthesis of all learned content
- Complex scenario requiring application of multiple concepts
- Creative solution that demonstrates deep understanding





Post-Game Performance Tasks

- Brief presentation of team solutions
 - Individual reflection essays connecting game experience to learning objectives
 - Quick digital quiz covering key concepts from the ETER
- 

Portfolio Evidence Collection

- Documented problem-solving processes
- Created artifacts (diagrams, plans, calculations)
- Photos or recordings of team discussions and solutions

Example: Summative Assessment Integration Final Challenge: Design a School Sustainability Plan

- Teams use knowledge gained from previous puzzles about energy, waste, and transportation
- Must address budget constraints and stakeholder concerns learned during gameplay
- Assessment rubric evaluates completeness, feasibility, and use of evidence-based reasoning

Metacognitive Assessment (Assessment AS Learning)

Purpose: Develop self-awareness and self-regulation skills

ETER Implementation Strategies:

Reflection Prompts

- Built-in pause points for strategy discussion
- "What are we learning?" checkpoints
- Strategy effectiveness self-evaluation


Think-Aloud Protocols

- Designated team members verbalize thinking processes
- Rotation of "explainer" roles during gameplay
- Recording and review of problem-solving approaches

Goal Setting and Monitoring

- Team goal-setting at game start
- Progress monitoring checkpoints
- Strategy adjustment discussions

Example: Metacognitive Integration Strategy Reflection Cards

- After each major puzzle: "What strategy did your team use? How effective was it? What would you do differently next time?"
 - Teams record responses and compare strategies with other teams during debrief
- 



Diagnostic Assessment (Pre-Assessment)

Purpose: Identify prior knowledge and misconceptions before gameplay

ETER Implementation Strategies:

Entry Tickets

- Quick warm-up puzzles that reveal current understanding
- Concept sorting activities that show knowledge organization
- Pre-game surveys about topic familiarity

Adaptive Difficulty Systems

- Entry assessment determines puzzle difficulty level
- Multiple puzzle versions for different ability levels
- Branching paths based on demonstrated prior knowledge

Knowledge Mapping

- Visual representation of what students already know
- Identification of misconceptions to address during gameplay
- Baseline establishment for measuring growth

Assessment Integration Without Disrupting Flow

Stealth Assessment Principles

Invisible Integration

- Assessment activities feel like natural game elements
- Students focus on puzzle-solving, not being evaluated
- Data collection happens automatically through gameplay

Narrative Integration

- Assessment tasks embedded in story context
- Evaluation criteria presented as mission requirements
- Success measures framed as game achievements

Multiple Evidence Sources

- Combine observations, artifacts, and performance data
- Triangulate evidence from different assessment methods
- Build comprehensive picture of student learning





Assessment Design Templates

Observation Checklist Template



Team: _____ Time: _____ Observer: _____

COLLABORATION SKILLS:

- All members contribute ideas
- Team listens to different perspectives
- Conflicts resolved constructively
- Responsibilities shared effectively

CONTENT UNDERSTANDING:

- Correct use of key vocabulary
- Accurate application of concepts
- Logical reasoning demonstrated
- Connections made between ideas

PROBLEM-SOLVING PROCESS:

- Systematic approach to challenges
- Multiple strategies attempted
- Evidence used to support decisions
- Learning from mistakes

Notes:


Rubric Template for ETER Performance

Criteria | Excellent (4) | Proficient (3) | Developing (2) | Beginning (1)

Content Knowledge:


- Demonstrates comprehensive understanding
- Shows solid grasp of key concepts
- Displays basic knowledge
- Shows limited understanding

Application Skills:

- Applies knowledge creatively and effectively
 - Uses knowledge appropriately
 - Attempts application with support
 - Struggles to apply knowledge
- 



Collaboration:

- Leads and supports team effectively
 - Contributes positively to team
 - Participates with encouragement
 - Minimal participation
- 

Problem-Solving:

- Uses sophisticated strategies
- Employs effective approaches
- Attempts systematic approach
- Random or ineffective attempts

Debrief Strategies for Learning Consolidation

The Three-Phase Debrief Model

Phase 1: What Happened? (Descriptive)

- Recap the gaming experience
- Share highlights and challenges
- Discuss puzzle solutions and strategies

Sample Questions:

- "What was the most challenging puzzle for your team?"
- "Which strategy worked best for solving problems?"
- "What surprised you during the game?"

Phase 2: What Changed? (Analytical)

- Connect gaming experience to learning objectives
- Identify new knowledge and skills gained
- Recognize attitude or perspective shifts


Sample Questions:

- "What did you learn about [topic] that you didn't know before?"
- "How did your thinking about [issue] change during the game?"
- "What skills did your team develop during this activity?"

Phase 3: What Will Last? (Applicational)

- Discuss real-world applications
- Plan future actions or learning
- Set goals for continued growth

Sample Questions:

- "How will you use this knowledge outside of school?"
 - "What questions do you still have about [topic]?"
 - "What actions might you take based on what you learned?"
- 



Debrief Activity Templates

Quick Debrief (10 minutes)

Round Robin Sharing:

- Each team shares one key insight (2 minutes per team)
- Whole class identifies common themes
- Teacher highlights connections to learning objectives

Exit Ticket:

- One thing you learned
- One thing you want to know more about
- One way you'll apply this knowledge

Extended Debrief (20-30 minutes)

Gallery Walk:

- Teams post their solutions and strategies
- Students do a "museum walk" to see different approaches
- Discussion of variety and effectiveness of solutions

Reflection Circles:

- Small groups discuss guided questions
- Groups report key insights to whole class
- Teacher facilitates connections to curriculum

Action Planning:

- Individual reflection on personal learning
- Goal setting for future learning or behaviour
- Sharing of commitments or next steps

Creative Debrief Options

Learning Artifact Creation:

- Teams create posters, diagrams, or models
- Visual representation of learning process
- Display and explanation to other teams

Role-Play Extensions:

- Act out real-world applications
- Simulate related scenarios
- Practice using new knowledge

Digital Reflection:

- Video testimonials about learning
- Blog posts or social media shares
- Online discussion forums



Assessment Data Cycle



Sources of assessment data



Assessment data helps teachers understand learning, support students and improve future ETER activities.



Assessment Data Collection and Analysis

Data Collection Systems

Digital Tools

- Google Forms for quick surveys
- Flipgrid for video reflections
- Padlet for collaborative idea sharing
- Photo documentation of student work

Analog Methods

- Structured observation forms
- Student self-assessment checklists
- Peer evaluation forms
- Portfolio collection systems

Analysis Frameworks

Learning Objective Alignment

- Map assessment data to specific objectives
- Identify areas of strong/weak performance
- Plan targeted follow-up instruction

Individual vs. Group Performance

- Separate individual contributions from team performance
- Identify students needing additional support
- Recognize exceptional individual growth

Process vs. Product Assessment

- Evaluate both problem-solving process and final solutions
- Balance effort recognition with achievement measurement
- Support growth mindset development

Assessment Data Template

ETER Title: _____ **Date:** _____ **Class:** _____

Number of Teams: _____

OBJECTIVE 1: _____ Teams Achieving: ____/____

INDIVIDUAL SUCCESS: ____% NOTES: _____

OBJECTIVE 2: _____ TEAMS ACHIEVING: ____/____

TEAMS INDIVIDUAL SUCCESS: ____% NOTES: _____



OBJECTIVE 3: _____ Teams Achieving: ____/____
Individual Success: ____% Notes _____

OVERALL OBSERVATIONS:

Engagement Level:

- High
- Medium
- Low

Collaboration Quality:

- Excellent
- Good
- Needs Work

Content Understanding:

- Strong
- Adequate
- Weak

FOLLOW-UP NEEDED:

- Re-teach specific concepts
- Provide additional practice
- Extend learning for advanced students
- Address collaboration skills

IMPROVEMENTS FOR NEXT USE:

- Adjust puzzle difficulty
- Modify time allocation
- Enhance materials
- Revise instructions



CHAPTER 5: PUZZLE DESIGN LIBRARY

Understanding Puzzle Categories

Educational puzzles serve as the building blocks of ETERs. Each type engages different cognitive processes and can be tailored to support specific learning objectives.

The Six Categories of Educational Puzzles

Based on De Angeli (2024), puzzles can be categorized into six main types, each serving different educational purposes:

- 1.Observation: Careful examination of visual information
- 2.Exploration: Investigation of environments and information sources
- 3.Creation: Building, assembling, or constructing solutions
- 4.Intellect: Logic, mathematics, and cognitive reasoning
- 5.Narrative: Story-driven interactions and information gathering
- 6.Dexterity: Physical manipulation and coordination

Category 1: Observation Puzzles

Educational Purpose: Develop attention to detail, pattern recognition, and visual analysis skills.

1.1 Hidden Objects and Details

Description: Students search for specific items or information concealed within larger images or text passages.

Learning Applications:

- Scientific observation skills
- Reading comprehension
- Data analysis and interpretation
- Cultural awareness and diversity recognition

DESIGN TEMPLATE:

Hidden Object Puzzle Design

Base Image/Text: _____

Hidden Elements (3-5 items):

1. _____
2. _____
3. _____

Educational Connection:

Each hidden element relates to: _____

Verification Method:

- Answer sheet with locations
- Digital app with click verification
- Team discussion and consensus

Example: Sustainability Focus Hidden Carbon Sources Puzzle

- Large illustration of a typical household
- Students find 8 hidden sources of carbon emissions
- Elements include: old incandescent bulbs, leaky windows, inefficient appliances
- Learning objective: Identify energy waste sources in homes

1.2 Spot-the-Difference Challenges

Description: Compare two similar images or scenarios to identify discrepancies that reveal important information.

Learning Applications:

- Before/after environmental changes
- Historical timeline comparisons
- Scientific process documentation
- Cultural comparison studies

Design Considerations:

- Include 5-8 meaningful differences (not arbitrary changes)
- Ensure differences relate directly to learning content
- Provide context that makes differences educationally significant

Example: Environmental Change Forest Ecosystem Comparison

- "Before" image: Healthy forest ecosystem
- "After" image: Same area showing climate impact
- Differences reveal: species migration, vegetation changes, water level shifts
- Learning objective: Understand visible impacts of climate change

1.3 Visual Ciphers and Codes

Description: Information encoded in visual symbols, colors, or patterns that students must decode.

Visual Code Types:

- Color coding systems (red=high impact, yellow=medium, green=low)
- Symbol substitution (pictograms representing concepts)
- Pattern sequences (mathematical or logical progressions)
- Spatial arrangements (positions conveying meaning)

DESIGN TEMPLATE:

Visual Cipher Design

Encoding System: _____ (Example: Red circles = fossil fuels, Green circles = renewables)

Message to Encode: _____ (Example: "Solar and wind power produce zero emissions")

Verification Method:

- Decoder key provided later in game
- Pattern recognition leads to discovery
- Cross-reference with other materials

1.4 Pattern Detection Challenges

Description: Identify recurring themes, mathematical sequences, or logical patterns within complex visual information.

Educational Applications:

- Mathematical sequence recognition
- Scientific pattern identification (weather, migration, etc.)
- Historical trend analysis
- Economic or social pattern recognition

Complexity Levels:

- Simple: Clear, obvious patterns (ABAB color sequences)
- Moderate: Patterns requiring analysis (Fibonacci sequences, seasonal cycles)
- Complex: Hidden patterns requiring synthesis (correlation between multiple variables)

Category 2: Exploration Puzzles

Educational Purpose: Develop research skills, information literacy, and systematic investigation abilities

2.1 Map and Navigation Challenges

Description: Students use maps, floor plans, or diagrams to navigate spaces or understand spatial relationships.

Educational Applications:

- Geographic literacy development
- Historical event locations
- Scientific process flows
- Urban planning and sustainability

Map Design Elements:

- Legend and symbols: Clear visual vocabulary
- Scale and proportion: Realistic spatial relationships
- Points of interest: Locations relevant to learning objectives
- Navigation challenges: Routes requiring decision-making

DESIGN TEMPLATE:

Map Exploration Design

Map Type: _____ (City plan, building layout, ecosystem diagram, etc.)

Key Locations (4-6 points):

1. _____
2. _____
3. _____
4. _____

Navigation Challenge:

Students must find route from _____ to _____
while considering: _____

Educational Integration:

Each location teaches: _____

Example: Urban Sustainability City Green Infrastructure Map

- Students navigate through city neighborhoods
- Key locations: solar installations, green roofs, bike paths, recycling centers
- Challenge: Plan most sustainable route between locations
- Learning objective: Understand integrated urban sustainability systems

2.2 Information Source Investigation

Description: Students examine multiple information sources (documents, websites, reports) to piece together understanding.

Source Types for ETERs:

- Textual sources: News articles, scientific reports, historical documents
- Visual sources: Photographs, infographics, charts and graphs
- Mathematical sources: Data tables, statistics, calculations
- Digital sources: Website printouts, social media screenshots, app interfaces

Investigation Structure:

1. Initial mystery or question presented to students
2. Multiple information sources provided with partial answers
3. Cross-referencing required to find complete solution
4. Synthesis challenge to combine information meaningfully

Design Considerations:

- Ensure information is age-appropriate and accessible
- Include deliberate information gaps that require combining sources
- Vary source types to engage different learning preferences
- Connect sources to real-world information literacy skills

Category 3: Creation Puzzles

Educational Purpose: Develop constructive thinking, spatial reasoning, and hands-on problem-solving skills.

3.1 Assembly and Construction Challenges

Description: Students physically manipulate, combine, or construct materials to reveal solutions or create functional items.

Assembly Types:

- Paper folding: Origami-style reveals or 3D model creation
- Puzzle pieces: Jigsaw-style combinations with educational content
- Component combination: Mixing different elements to create wholes
- Sequential building: Step-by-step construction following instructions

Educational Integration:

- Science: Build molecular models, ecosystem diagrams, circuit boards
- Mathematics: Construct geometric shapes, measurement tools, graph displays
- Social Studies: Assemble historical timelines, cultural artifacts, maps
- Sustainability: Create energy flow diagrams, recycling process models

Safety and Accessibility Considerations:

- Use only paper, cardboard, and safe materials
- Provide alternatives for students with fine motor challenges
- Ensure culturally sensitive construction activities
- Include clear, step-by-step visual instructions

Example: Renewable Energy System Build a Mini Solar Installation

- Students receive paper components: panels, batteries, inverters, wiring
- Assembly requires understanding energy flow and system components
- Completed model reveals password for next puzzle

3.2 Sliding and Manipulation Puzzles

Description: Students move pieces within constrained spaces to achieve specific configurations.

Manipulation Types:

- Linear sliding: Move pieces along tracks or grooves
- Rotational puzzles: Rotate sections to align information
- Overlay systems: Slide transparent sheets to reveal combinations
- Sequential positioning: Arrange items in correct order through movement

DESIGN TEMPLATE:

Manipulation Puzzle Design

Physical Mechanism: _____ (Sliding cards, rotating wheels, overlay sheets, etc.)

Starting Configuration: _____

Target Configuration: _____

Educational Content Integration:

Movement reveals: _____

Final position shows: _____

Solution Verification:

- Visual confirmation (pattern/image completion)
- Numerical code revealed
- Text message appears
- Physical fit/connection achieved

3.3 Path-Building and Connection Puzzles

Description: Students create routes, networks, or connections between elements to solve problems.

Connection Types:

- Linear paths: Connect point A to point B optimally
- Network creation: Link multiple points efficiently
- Flow systems: Show movement of materials, energy, or information
- Logical connections: Link cause-and-effect relationships

Educational Applications:

- Science: Food webs, nutrient cycles, electrical circuits
- Geography: Trade routes, migration patterns, watershed systems
- Social Studies: Communication networks, cultural exchanges
- Sustainability: Supply chains, waste streams, energy distribution

Example: Carbon Cycle Connections Build the Carbon Flow Network

- Students receive cards representing: atmosphere, oceans, plants, animals, soil, fossil fuels
- Must create arrows showing carbon movement between reservoirs
- Correct connections reveal numerical codes for combination lock
- Learning objective: Understand carbon cycle as interconnected system

Category 4: Intellect Puzzles

Educational Purpose: Develop logical reasoning, mathematical thinking, and analytical problem-solving skills

4.1 Mathematical and Logical Reasoning

Description: Students apply mathematical concepts, logical principles, or analytical thinking to solve problems.

Mathematical Applications:

- Calculation challenges: Apply formulas to real-world problems
- Estimation tasks: Make reasonable approximations
- Data analysis: Interpret graphs, charts, and statistics
- Geometric reasoning: Use spatial and measurement concepts

Logical Reasoning Types:

- Deductive reasoning: Move from general principles to specific conclusions
- Inductive reasoning: Identify patterns and make generalizations
- Conditional logic: Apply if-then reasoning
- Elimination strategies: Systematically rule out incorrect options

Design Considerations:

- Align mathematical complexity with student ability levels
- Provide necessary reference materials (formulas, conversion factors)
- Include multiple pathways to solution when possible
- Connect abstract thinking to concrete, real-world applications

Example: Energy Efficiency Calculations Home Energy Audit Challenge

- Students receive household energy usage data
- Must calculate: monthly costs, annual emissions, potential savings
- Requires: multiplication, percentage calculations, comparative analysis
- Learning objective: Understand relationship between energy use and environmental impact

4.2 Word Puzzles and Language Challenges

Description: Students manipulate language, decode verbal clues, or solve word-based problems.

Word Puzzle Types:

- Crosswords: Vocabulary reinforcement with thematic clues
- Word searches: Find key terms within letter grids
- Anagrams: Unscramble letters to form relevant words
- Acrostics: Use first letters to spell key concepts
- Riddles: Solve descriptive puzzles requiring content knowledge

Language Challenge Types:

- Definition matching: Connect terms with meanings
- Sentence completion: Fill in missing words using context
- Translation tasks: Convert between technical and everyday language
- Synonym/antonym identification: Explore vocabulary relationships

Educational Integration:

- Reinforce key vocabulary and terminology
- Practice reading comprehension skills
- Develop precision in language use
- Connect verbal and conceptual understanding

4.3 Memory and Sequence Challenges

Description: Students recall information, recognize patterns, or organize elements in correct sequences.

Memory Challenge Types:

- Information recall: Remember facts, figures, or details from earlier in game
- Pattern memory: Reproduce visual or auditory sequences
- Spatial memory: Recall locations, arrangements, or relationships
- Procedural memory: Remember steps in processes or methods

Sequence Challenge Types:

- Chronological ordering: Arrange events in time order
- Process sequences: Order steps in procedures
- Causal chains: Arrange cause-and-effect relationships
- Priority ranking: Order items by importance or impact

DESIGN TEMPLATE:

Memory/Sequence Challenge Design

Challenge Type: _____ (Recall, pattern, spatial, procedural, chronological, etc.)

Information to Remember/Sequence:

1. _____
2. _____
3. _____
4. _____

Memory/Sequence Cues Provided:

- Visual aids
- Written reminders
- Audio cues
- Physical objects
- Pattern hints
- Context clues

Verification Method:

- Exact sequence required
- Multiple correct orders acceptable
- Partial credit for close attempts

Educational Connection:

This challenge reinforces: _____

Category 5: Narrative Puzzles

Educational Purpose: Develop reading comprehension, story analysis, and character empathy while learning content through narrative contexts

5.1 Character Interaction and Role-Playing

Description: Students assume roles, interact with characters, or make decisions from specific perspectives.

Role-Playing Elements:

- Character profiles: Detailed backgrounds with motivations and constraints
- Decision points: Choices that affect story outcomes
- Perspective-taking: Understanding different viewpoints
- Conflict resolution: Negotiating between competing interests

Educational Applications:

- Historical empathy: Understanding past perspectives
- Scientific ethics: Considering impacts of research and technology
- Environmental justice: Examining effects on different communities
- Cultural understanding: Exploring diverse worldviews

CHARACTER DEVELOPMENT TEMPLATE:

Character Profile for ETER

Character Name: _____

Role: _____

Background: _____

Motivation: _____

Constraints: _____

Key Knowledge: _____

Perspective on Issue: _____

Decision Points for This Character:

1. _____
2. _____
3. _____

Memory/Sequence Cues Provided:

- Visual aids
- Written reminders
- Audio cues
- Physical objects
- Pattern hints
- Context clues

Verification Method:

- Exact sequence required
- Multiple correct orders acceptable
- Partial credit for close attempts

Educational Connection:

This challenge reinforces: _____

Educational Learning Through This Role: Students will understand:

Example: Climate Action Stakeholders Multi-Perspective Climate Council

- Characters: Mayor (economic concerns), Scientist (data focus), Student (future impact), Business Owner (practical constraints), Indigenous Elder (traditional knowledge)
- Each character has different priorities for climate action plan
- Students must find solutions addressing all perspectives
- Learning objective: Understand complexity of real-world environmental decision-making

5.2 Story Completion and Investigation

Description: Students piece together narratives, solve mysteries, or complete stories using evidence and clues.

Investigation Elements:

- Mystery setup: Compelling question or problem to solve
- Evidence collection: Gathering clues from multiple sources
- Hypothesis formation: Making educated guesses based on evidence
- Solution verification: Testing theories against available information

Story Structure Options:

- Linear investigation: Clues lead step-by-step to solution
- Branching narrative: Multiple paths and possible outcomes
- Parallel storylines: Multiple stories that interconnect
- Time-shifted narrative: Past and present information must be combined

Educational Integration:

- Use narrative context to make abstract concepts concrete
- Develop critical thinking through evidence evaluation
- Practice scientific method through investigation process
- Build empathy through character perspectives

5.3 Information Synthesis from Multiple Sources

Description: Students combine information from different documents, characters, or sources to understand complete picture.

Source Integration Challenges:

- Conflicting accounts: Different sources provide different information
- Incomplete information: Each source provides partial picture
- Bias recognition: Sources have different perspectives or agendas
- Fact vs. opinion: Distinguishing reliable from unreliable information

Synthesis Skills Development:

- Information evaluation: Assessing source credibility and relevance
- Pattern identification: Finding connections across sources
- Gap identification: Recognizing missing information
- Conclusion formation: Drawing reasonable inferences from evidence

Category 6: Dexterity Puzzles

Educational Purpose: Develop fine motor skills, spatial awareness, and hands-on learning experiences.

6.1 Physical Manipulation Tasks

Description: Students use precise movements, coordination, or timing to complete challenges.

Manipulation Types for ETERS:

- Precise folding: Creating specific shapes or revealing hidden information
- Component assembly: Fitting pieces together with accuracy
- Balance challenges: Arranging items in stable configurations
- Coordination tasks: Requiring teamwork and synchronized movements

Accessibility Adaptations:

- Provide alternative methods for students with fine motor difficulties
- Offer larger components for easier manipulation
- Include collaborative options where team members can assist
- Focus on cognitive aspects while accommodating physical limitations

6.2 Timing and Sequence Coordination

Description: Students complete tasks within time constraints or coordinate multiple actions simultaneously.

Timing Applications in Education:

- Process understanding: Learning steps that must occur in specific time sequences
- Coordination skills: Working together to achieve synchronized actions
- Pressure management: Learning to think clearly under time constraints
- Efficiency development: Finding optimal approaches to task completion

Educational Integration Examples:

- Science: Coordinated observations during experiments
- History: Understanding timing in historical events
- Math: Solving problems within time limits
- Environmental science: Understanding time-sensitive ecological processes

PUZZLE DIFFICULTY SCALING

Beginner Level Puzzles

Characteristics:

- Single-step solutions
- Clear, obvious patterns
- Direct cause-and-effect relationships
- Limited information to process
- Strong visual or contextual cues

Example Applications:

- Simple matching tasks
- Basic categorization challenges
- Obvious visual differences
- Straightforward mathematical calculations

Intermediate Level Puzzles

Characteristics:

- Multi-step problem solving
- Pattern recognition required
- Some ambiguity in presentation
- Integration of multiple information sources
- Moderate abstraction level

Example Applications:

- Cross-referencing information from multiple sources
- Identifying less obvious patterns or relationships
- Simple synthesis of ideas
- Basic analytical reasoning

Advanced Level Puzzles

Characteristics:

- Complex, multi-layered challenges
- High level of abstraction
- Multiple possible solution paths
- Significant synthesis required
- Creative or innovative thinking needed

Example Applications:

- System-level thinking and analysis
- Creative solution generation
- Complex data interpretation
- Strategic decision-making with multiple variables

Adaptive Difficulty Strategies

Branching Design:

- Provide multiple puzzle versions at different difficulty levels
- Allow students to choose their challenge level
- Offer "express" and "detailed" solution paths

Scaffolding Systems:

- Built-in hint systems with progressive support
- Collaborative structures where stronger students support others
- Optional extension challenges for early finishers

Assessment-Based Adaptation:

- Pre-assessment determines appropriate starting difficulty
- In-game performance triggers difficulty adjustments
- Post-assessment identifies areas needing reinforcement

CHAPTER 6: READY-TO-USE TEMPLATES

Complete ETER Template: Carbon Footprint Detective

Game Overview

Title: Carbon Footprint Detective - The Case of the Missing Emissions

Subject: Environmental Science/Sustainability

Grade Level: 6-10 (adaptable)

Duration: 45-60 minutes

Team Size: 4-6 students per team

Learning Objectives:

- Calculate carbon footprints for different lifestyle choices
- Identify major sources of greenhouse gas emissions
- Evaluate strategies for reducing personal environmental impact

Materials List

Printable Components (1 set per team):

- Introduction cards (3 cards)
- Evidence folder with household data (8 documents)
- Calculation worksheet and reference tables
- Solution verification wheel
- Final challenge card

Additional Supplies (per team):

- Calculators or smartphones
- Pencils and erasers
- Timer (shared across class)

Game Setup Instructions

Teacher Preparation (10 minutes before class):

1. Print one complete set of materials per team (5-6 teams recommended)
2. Place each team's materials in a folder or envelope
3. Set up timer visible to all teams
4. Prepare hint envelopes (optional support system)

Student Setup (5 minutes):

1. Form teams of 4-6 students
2. Distribute one materials folder per team
3. Designate roles: Calculator, Reader, Recorder, Time Keeper
4. Read introduction cards together

GAME COMPONENTS

Introduction Card 1:

URGENT: Environmental Detective Needed! The mayor has received anonymous reports that someone in Greenville is producing massive carbon emissions - far above the community average of 8 tons per year per person. Your detective team must investigate three suspect households and determine:

1. Which household has the highest carbon footprint?
2. What specific activities are causing excessive emissions?
3. What recommendations would reduce their impact?

Time limit: 45 minutes

Evidence folder contains all necessary data.

Evidence Document Example - Household A Transportation:

EVIDENCE FILE: HOUSEHOLD A - TRANSPORTATION DATA

Family Members: 2 adults, 2 teenagers

Vehicles:

- 2018 SUV (primary vehicle) - 25 mpg
- 2015 compact car (secondary) - 35 mpg

Monthly Transportation:

- Commuting: 800 miles (SUV)
- School transport: 400 miles (compact car)
- Weekend activities: 300 miles (SUV)
- Vacation travel: 200 miles average per month (SUV)

Public Transportation Use: None

Alternative Transportation: Bikes used occasionally for recreation

DETECTIVE NOTES SECTION:

Total monthly miles: _____

Annual miles: _____

Estimated annual CO₂ emissions: _____ tons

Calculation Reference Sheet:

CARBON FOOTPRINT CALCULATION REFERENCE TRANSPORTATION EMISSIONS:

Gasoline vehicles: 19.6 lbs CO₂ per gallon

Convert mpg to emissions: (Annual miles ÷ mpg) × 19.6 lbs

Convert pounds to tons: Divide by 2,000

ENERGY EMISSIONS (per month):

Electricity: kWh × 0.92 lbs CO₂

Natural gas: therms × 11.7 lbs CO₂

Heating oil: gallons × 22.4 lbs CO₂

WASTE EMISSIONS (annual):

Average recycling: Saves 1.2 tons CO₂ per year

No recycling: Adds 0.8 tons CO₂ per year

Composting: Saves 0.3 tons CO₂ per year

FOOD EMISSIONS (rough estimates per person per year):

High meat diet: 3.3 tons CO₂

Moderate meat diet: 2.5 tons CO₂

Low meat diet: 1.9 tons CO₂

Vegetarian diet: 1.7 tons CO₂

SOLUTION GUIDE FOR TEACHERS

Household Carbon Footprints (approximate):

- Household A: 22.4 tons CO₂ per year per person
- Household B: 12.8 tons CO₂ per year per person
- Household C: 6.2 tons CO₂ per year per person

Major Contributing Factors:

- Household A: Large vehicles, long commutes, high energy use, no recycling
- Household B: Moderate transportation, average energy use, some sustainable practices
- Household C: Public transportation, energy-efficient home, vegetarian diet, extensive recycling

Extension Activities (for early finishers):

- Calculate carbon footprint for their own household
- Research carbon offset programs
- Design a "carbon reduction challenge" for the school

Assessment Rubric

CARBON FOOTPRINT DETECTIVE ASSESSMENT RUBRIC

CALCULATION ACCURACY:

- Excellent (4): All calculations correct, work clearly shown
- Proficient (3): Minor errors, mostly accurate calculations
- Developing (2): Some calculation errors, effort evident
- Beginning (1): Many errors, difficult to follow work

PROBLEM-SOLVING PROCESS:

- Excellent (4): Systematic approach, efficient use of time
- Proficient (3): Generally organized, good time management
- Developing (2): Some organization, acceptable pace
- Beginning (1): Disorganized approach, time management issues

RECOMMENDATIONS QUALITY:

- Excellent (4): Specific, realistic, high-impact suggestions
- Proficient (3): Good suggestions with some specificity
- Developing (2): General suggestions, limited detail
- Beginning (1): Vague or unrealistic recommendations

COLLABORATION:

- Excellent (4): All members contribute, excellent teamwork
- Proficient (3): Good participation, effective cooperation
- Developing (2): Adequate teamwork, some participation issues
- Beginning (1): Poor collaboration, unequal participation

ADAPTABLE TEMPLATE STRUCTURE

Universal ETER Template

Use this template to create your own ETERs on any topic:

ETER DESIGN TEMPLATE

BASIC INFORMATION:

Title: _____

Subject Area: _____

Grade Level: _____

Duration: _____

Learning Objectives (3-5):

1. _____

2. _____

3. _____

NARRATIVE SETUP:

Scenario Description: _____

Student Role: _____

Mission/Goal: _____

Time Pressure Explanation: _____

PUZZLE SEQUENCE (4-7 puzzles recommended):

Puzzle 1 Type: _____

Content Focus: _____

Difficulty Level: _____

Puzzle 2 Type: _____

Content Focus: _____

Difficulty Level: _____

Puzzle 3 Type: _____

Content Focus: _____

Difficulty Level: _____

[Continue for all puzzles]

FINAL CHALLENGE:

Synthesis Requirement: _____

Success Criteria: _____

Real-World Connection: _____

ASSESSMENT INTEGRATION:

Formative Assessment: _____

Summative Assessment: _____

Reflection Questions: _____

Subject-Specific Templates

MATHEMATICS ETER TEMPLATE:

MATH ETER COMPONENTS

Problem Context: Real-world situation requiring mathematical analysis

Data Sets: Authentic numbers and measurements for calculations

Tool Integration: Calculators, measuring devices, or online resources

Verification Methods: Self-checking answer keys or logical reasoning

Progressive Complexity: Simple → multi-step → creative application

COMMON MATH ETER PUZZLE TYPES:

- Data analysis and graphing challenges
- Measurement and estimation tasks
- Geometric construction problems
- Pattern recognition and sequence puzzles
- Word problem scenarios with missing information
- Optimization and efficiency challenges

SCIENCE ETER TEMPLATE:

SCIENCE ETER COMPONENTS

Scientific Method Integration: Observation → hypothesis → testing → conclusion

Laboratory Safety: All activities must be safe for classroom environment

Equipment Needs: Simple, readily available materials only

Data Collection: Structured observation and measurement opportunities

Conceptual Understanding: Connect hands-on activities to theoretical knowledge

COMMON SCIENCE ETER PUZZLE TYPES:

- Experimental design challenges
- Classification and identification tasks
- Process sequence and flow diagrams
- Cause-and-effect relationship puzzles
- Model building and testing activities
- Environmental monitoring and analysis

SOCIAL STUDIES ETER TEMPLATE:

SOCIAL STUDIES ETER COMPONENTS

Historical Context: Authentic time periods and events

Cultural Sensitivity: Respectful representation of all groups

Multiple Perspectives: Different viewpoints on events and issues

Primary Sources: Real documents, photos, or artifacts (reproduced)

Geographic Integration: Maps, locations, and spatial relationships

COMMON SOCIAL STUDIES ETER PUZZLE TYPES:

- Timeline construction and sequencing
- Map analysis and navigation challenges
- Document analysis and interpretation
- Role-playing and perspective-taking
- Cause-and-effect historical chains
- Cultural comparison and contrast activities

PRE-MADE PUZZLE COMPONENTS

Observation Puzzle Templates

Hidden Object Puzzle Template:

CREATE YOUR HIDDEN OBJECT PUZZLE

Base Image Description: _____
(classroom, ecosystem, historical scene, etc.)

HIDDEN OBJECTS LIST:

1. _____
(RELATES TO LEARNING OBJECTIVE #___)
2. _____
(RELATES TO LEARNING OBJECTIVE #___)
3. _____
(RELATES TO LEARNING OBJECTIVE #___)
4. _____
(RELATES TO LEARNING OBJECTIVE #___)
5. _____
(RELATES TO LEARNING OBJECTIVE #___)

Discovery Method:

- Students find and list objects
- Objects reveal letters/numbers for code
- Objects must be counted or categorized
- Objects form patterns or sequences

Educational Integration:

Finding these objects teaches: _____

Visual Cipher Template:

DESIGN YOUR VISUAL CIPHER

Message to Encode: _____

Encoding Method:

- Color coding (Red = ____, Blue = ____, Green = ____)
- Symbol substitution (Circle = ____, Square = ____)

- Pattern positioning (Top = ____, Middle = ____, Bottom = ____)
- Size variation (Large = ____, Medium = ____, Small = ____)

Decoding Instructions:

Students will receive: _____

Students must recognize: _____

Verification:

Decoded message reveals: _____

CREATION PUZZLE TEMPLATES

BUILD YOUR ASSEMBLY PUZZLE

Educational Goal: _____

(understanding systems, processes, relationships)

Components to Assemble (6-10 pieces):

1. _____

2. _____

3. _____

[continue as needed]

Assembly Instructions:

- Logical order based on content knowledge
- Physical fit based on shape/size
- Color/symbol matching system
- Sequential numbering system

Completion Evidence:

Assembled item shows/reveals: _____

Extension Activity:

After assembly, students must: _____

INTELLECT PUZZLE TEMPLATES

Mathematical Challenge Template:

DESIGN YOUR MATH CHALLENGE

Math Concepts Targeted: _____

Real-World Context: _____

Data Provided:

Numbers: _____

Formulas: _____

Reference Information: _____

Calculation Required:

Students must: _____

Answer Format:

- Single numerical answer
 - Multiple calculations required
 - Estimation acceptable
 - Exact precision needed
- Verification Method:
- Answer key provided
 - Self-checking through logic
 - Cross-verification with other teams
 - Teacher confirmation required

QUICK SETUP CHECKLISTS

Pre-Game Checklist

ONE WEEK BEFORE:

- All materials designed and tested with colleagues
- Printing completed and organized by team
- Answer keys and hint systems prepared
- Assessment rubrics finalized
- Extension activities planned for early finishers

ONE DAY BEFORE:

- Materials sorted into team folders/envelopes
- Classroom furniture arranged for team work
- Timer and hint system set up
- Assessment materials ready
- Backup plans prepared for potential issues

CLASS PERIOD BEGINNING:

- Teams formed (4-6 students each)
- Materials distributed
- Rules and objectives explained clearly
- Timer started
- Facilitator role assumed (not director!)

During-Game Management Checklist

FIRST 10 MINUTES:

- All teams understand the scenario and objectives
- Materials are complete and accessible
- Students have assumed team roles
- No technical or setup problems exist

MIDDLE PHASE:

- Teams are collaborating effectively
- Progress is being made on puzzles
- Hints provided as needed without giving away answers
- Time management reminders given

FINAL PHASE:

- Teams understand how to verify solutions
- Extension activities available for early finishers
- Debrief questions prepared
- Assessment observations recorded

POST-GAME:

- Materials collected and organized
- Student feedback gathered
- Assessment data recorded
- Improvement notes made for future use

MATERIALS ORGANIZATION SYSTEM

Physical Organization:

TEAM FOLDER CONTENTS (in order of use):

1. Introduction cards (scenario setup)
2. Puzzle materials (in sequence order)
3. Reference sheets and calculation aids
4. Answer verification tools
5. Extension activities (sealed until needed)

TEACHER MATERIALS:

- Answer keys for all puzzles
- Assessment rubrics and observation sheets
- Hint system (graduated support levels)
- Timer and backup timing method
- Emergency troubleshooting guide

STORAGE SYSTEM:

- Labeled containers for each ETER
- Inventory checklist for each game
- Replacement supply tracking
- Student feedback collection system



CHAPTER 7: TROUBLESHOOTING GUIDE



Common Implementation Challenges

Challenge: Students Finish Too Quickly

Symptoms:

- Teams completing the entire ETER in 20-30 minutes
- Students seem bored or disengaged after finishing
- Wide variation in completion times between teams

Diagnosis Questions:

- Are the puzzles too simple for the students' ability level?
- Are students finding shortcuts that bypass learning?
- Is there sufficient content depth in each puzzle?

Solutions:

IMMEDIATE FIXES (for current game):

- Add complexity requirements to existing puzzles
- Require teams to show their work or explain reasoning
- Introduce additional verification steps
- Add extension challenges for early finishers

FUTURE IMPROVEMENTS:

- Increase puzzle difficulty level
- Add more puzzles to the sequence
- Include branching paths with optional challenges
- Design multi-layered puzzles with depth requirements
- Add reflection and explanation requirements to solutions

Extension Activity Bank:

- Research related topics and create mini-presentations
- Design their own puzzle for the same learning objectives
- Peer tutor teams that need assistance
- Complete advanced calculation or analysis tasks
- Create visual summaries of their learning process

Challenge: Students Can't Make Progress

Symptoms:

- Teams stuck on first or second puzzle for extended periods
- High frustration levels and reduced engagement
- Multiple requests for teacher help
- Students giving up rather than persisting

Diagnosis Questions:

- Are prerequisite skills and knowledge adequate?
- Are instructions clear and unambiguous?
- Is the difficulty jump too steep between puzzles?



Solutions:

IMMEDIATE INTERVENTIONS:

- Provide strategic hints without giving away answers
- Facilitate peer collaboration between teams
- Break complex puzzles into smaller steps
- Offer alternative solution pathways
- Adjust time limits to reduce pressure

FUTURE DESIGN IMPROVEMENTS:

- Lower initial difficulty level
- Add more scaffolding and support
- Include worked examples or tutorials
- Design graduated hint systems
- Test with representative students before implementation

Hint System Design:

LEVEL 1 HINTS (encourage, don't guide):

"You're on the right track. Keep working together."

"Look carefully at all the information you have."

"What patterns do you notice?"

LEVEL 2 HINTS (point direction):

"Pay special attention to the numbers in the top section."

"The colors might be more important than you think."

"Try working backwards from what you know."

LEVEL 3 HINTS (specific guidance):

"You need to multiply the usage by the emission factor."

"The red items all share a common characteristic."

"Look for the connection between the map and the data table."

Challenge: Unequal Team Participation

Symptoms:

- One or two students doing all the work
- Some students disengaged or distracted
- Conflicts within teams about task distribution
- Uneven learning outcomes within teams

Diagnosis Questions:

- Are team roles clearly defined and rotated?
- Do all students have necessary background knowledge?
- Are there personality conflicts or social dynamics at play?



Solutions:

TEAM STRUCTURE STRATEGIES:

- Assign specific roles that rotate every 10-15 minutes
- Design puzzles that require multiple people to complete
- Create interdependent tasks where each person has essential information
- Include peer evaluation components in assessment

ROLE DEFINITION EXAMPLES:

- Information Manager: Organizes all written materials
- Calculator: Responsible for all mathematical operations
- Communicator: Presents solutions and asks for help
- Time Keeper: Monitors progress and keeps team on track
- Quality Controller: Checks work and ensures accuracy
- Strategy Coordinator: Helps team decide on approaches

Interdependent Design Techniques:

- Give each team member different pieces of essential information
- Require consensus decisions at key puzzle points
- Design verification systems that need multiple perspectives
- Include tasks that play to different strengths and learning styles

Challenge: Time Management Issues

Symptoms:

- Consistent pattern of teams not finishing within time limit
- Rush to complete final puzzles without learning
- Uneven pacing with slow start and frantic finish
- Time pressure causing anxiety and reducing learning quality

Diagnosis Questions:

- Is the total time allocation realistic for the content amount?
- Are students spending too much time on early puzzles?
- Do teams understand the pacing expectations?

Challenge: Unequal Team Participation

Symptoms:

- One or two students doing all the work
- Some students disengaged or distracted
- Conflicts within teams about task distribution
- Uneven learning outcomes within teams

Diagnosis Questions:

- Are team roles clearly defined and rotated?
- Do all students have necessary background knowledge?
- Are there personality conflicts or social dynamics at play?



Solutions:

TIME MANAGEMENT STRATEGIES:

- Provide time checkpoints ("You should complete puzzle 1 by 15 minutes")
- Design puzzles with recommended time allocations
- Include natural breaks between puzzle sections
- Create "minimum viable completion" options for time pressure

PACING SUPPORT TOOLS:

- Visual timer displayed prominently
- Verbal time updates at regular intervals
- Progress tracking sheets for teams
- Optional puzzle skipping with point deductions
- Time bonus rewards for efficient completion

Flexible Timing Structure:

MODULAR TIME DESIGN:

- Core Experience (30 minutes): Essential learning objectives
- Extension Phase (15 minutes): Deeper exploration and application
- Reflection Time (10 minutes): Debrief and consolidation
- Buffer Time (10 minutes): Flexibility for unexpected needs

CHECKPOINT SYSTEM:

- 15 minutes: Teams should complete introduction and first puzzle
- 30 minutes: Half of all puzzles completed
- 45 minutes: Final puzzle begun, solutions being verified
- 55 minutes: Cleanup and preparation for debrief begins

CONTENT-SPECIFIC ISSUES

Mathematics ETERs

Common Problem: Students make calculation errors that prevent progress

Prevention Strategies:

- Include estimation checks ("Is your answer reasonable?")
- Design self-correcting verification systems
- Provide reference formulas and conversion factors
- Allow calculator use when focus is on problem-solving, not computation

Error Recovery Methods:

- Build in multiple solution pathways
- Include "close enough" acceptance ranges for estimates
- Design puzzles where wrong answers still allow progress with hints
- Create collaborative checking systems between teams



Science ETERs

Common Problem: Students lack prerequisite scientific knowledge

Prevention Strategies:

- Include necessary reference information in game materials
- Design puzzles that teach concepts through discovery
- Provide brief explanatory text with each puzzle
- Connect to students' everyday experiences and observations

Knowledge Building Techniques:

- Progressive revelation of scientific concepts through gameplay
- Peer teaching opportunities built into team structure
- Real-world examples that make abstract concepts concrete
- Hands-on activities that demonstrate scientific principles

Social Studies ETERs

Common Problem: Students struggle with historical context or cultural unfamiliarity

Prevention Strategies:

- Provide adequate background information in accessible formats
- Include multiple perspectives on historical events
- Use primary source materials with modern language explanations
- Connect historical content to current events and student experiences

Cultural Sensitivity Guidelines:

- Avoid stereotypes or oversimplified representations
- Include diverse perspectives and voices
- Acknowledge complexity and multiple interpretations
- Provide context for historical attitudes and behaviors

TECHNICAL AND LOGISTICAL SOLUTIONS

Material Management Issues

Problem: Lost or damaged game components

Prevention:

COMPONENT TRACKING SYSTEM:

- Number each team's materials distinctly
- Include inventory checklists in each game set
- Design games with minimal loose pieces
- Create backup copies of essential components
- Use color coding for different game versions



Recovery Strategies:

- Digital backup copies of all printable materials
- Simple replacement procedures that don't disrupt gameplay
- Alternative puzzle versions for missing components
- Team combination strategies when materials are insufficient

Problem: Printing and setup time constraints

Solutions:

EFFICIENCY STRATEGIES:

- Design for black-and-white printing only
- Minimize cutting and assembly requirements
- Create reusable components when possible
- Develop batch printing schedules
- Recruit student helpers for material preparation
- Partner with other teachers to share preparation workload

CLASSROOM ENVIRONMENT CHALLENGES

Problem: Noise levels too high for concentration

Management Strategies:

- Establish clear volume expectations ("library voices during thinking time")
- Design quiet signal systems for attention
- Create noise-absorbing classroom arrangements
- Schedule ETERs when noise won't disturb other classes
- Include intentional quiet thinking time in puzzle design

Problem: Limited classroom space for team movement

Adaptations:

SPACE-EFFICIENT DESIGN:

- Create tabletop-only games that don't require movement
- Design flexible seating arrangements
- Use hallway or common spaces when available
- Implement staggered timing so teams move at different times
- Create compact material kits that store easily

ASSESSMENT AND LEARNING CONCERNS

Challenge: Difficulty Observing Individual Learning

Symptoms:

- Hard to tell which students understand concepts vs. copying from teammates
- Assessment becomes group-based rather than individual
- Struggling students hide behind more capable teammates



Solutions:

INDIVIDUAL ACCOUNTABILITY STRATEGIES:

- Include individual reflection components
- Require each student to explain specific puzzle solutions
- Design roles that showcase different students' contributions
- Use post-game individual quizzes or exit tickets
- Include peer evaluation of individual contributions

OBSERVATION TECHNIQUES:

- Structured observation forms for each student
- Audio recording of team discussions (with permission)
- Individual interview checkpoints during gameplay
- Portfolio collection of individual work products
- Rotating individual spokesperson responsibilities

Challenge: Learning Objectives Not Being Met

Symptoms:

- Students enjoy the game but don't demonstrate target learning
- Assessment results don't match engagement levels
- Students can't transfer learning to new contexts

Diagnostic Questions:

- Are learning objectives actually embedded in the puzzle solutions?
- Do students understand the connection between gameplay and curriculum?
- Is the debrief session effectively consolidating learning?

Solutions:

LEARNING INTEGRATION IMPROVEMENTS:

- Make learning objectives explicit to students at game start
- Design puzzles that can't be solved without target knowledge/skills
- Include regular reflection checkpoints during gameplay
- Strengthen debrief session with specific learning connections
- Add transfer tasks that apply learning to new situations

ASSESSMENT ALIGNMENT CHECKS:

- Map each puzzle to specific learning objectives
- Verify that successful gameplay requires demonstrated learning
- Include both process and product assessment measures
- Use pre/post assessment to measure learning gains
- Collect multiple forms of evidence for learning achievement

EMERGENCY TROUBLESHOOTING PROTOCOL

When Everything Goes Wrong



Immediate Response Checklist:

CRISIS MANAGEMENT (use within 5 minutes):

- Stop gameplay and gather all teams' attention
- Quickly assess the scope of the problem
- Decide: Fix and continue OR Switch to backup activity
- Communicate plan clearly to students
- Maintain positive, problem-solving attitude

BACKUP ACTIVITY OPTIONS:

- Convert ETER content into traditional worksheet activity
- Use puzzle materials for group discussion and analysis
- Have teams create their own puzzles using provided materials
- Shift to gallery walk and peer presentation format
- Conduct extended debrief of whatever progress was made

Problem Triage Questions:

1. Can this be fixed in under 5 minutes without major disruption?
2. Will students still achieve the learning objectives with a modified activity?
3. Is student engagement salvageable with a quick adjustment?
4. Do I have adequate backup materials and activities prepared?

Communication Scripts:

FOR TECHNICAL PROBLEMS:

"Detectives, we've discovered a problem with our evidence files. Let's adapt our investigation technique and work together to solve this mystery a different way."

FOR TIME PROBLEMS:

"Time update, teams! We're adjusting our mission parameters. Focus on the core evidence and prepare to share your most important discoveries."

FOR CONFUSION PROBLEMS:

"Investigation teams, let's pause and make sure everyone understands the next phase of our detective work."

Recovery and Learning from Problems

IMMEDIATE DEBRIEF (with students):

- Acknowledge the challenge and their flexibility
- Identify what learning still occurred
- Celebrate problem-solving and adaptation skills
- Connect experience to real-world problem-solving



TEACHER REFLECTION:

- Document what went wrong and why
- Identify early warning signs for future prevention
- Note what backup strategies worked well
- Plan specific improvements for next implementation
- Consider whether game design needs major revision

Improvement Planning Template:

ETER IMPROVEMENT PLAN

Game Title: _____

Implementation Date: _____

Major Issues Encountered: _____

ROOT CAUSE ANALYSIS:

Design Problems: _____

Preparation Issues: _____

Student Readiness: _____

Environmental Factors: _____

SPECIFIC IMPROVEMENTS NEEDED:

1. _____
2. _____
3. _____

TESTING PLAN:

- Pilot with small group
- Colleague review of revised materials
- Student feedback collection
- Observation protocol development

NEXT IMPLEMENTATION DATE: _____

APPENDICES

Appendix A: Learning Objectives Verbs by Bloom's Level

REMEMBER LEVEL

Definition: Recall previously learned information Verbs: arrange, define, duplicate, label, list, memorize, name, order, recognize, relate, recall, repeat, reproduce, state

ETER Applications:

- Memory-matching games with key terms
- Fact-finding scavenger hunts
- Vocabulary identification challenges
- Timeline sequencing from memory

UNDERSTAND LEVEL

Definition: Demonstrate comprehension of facts and ideas Verbs: classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate

ETER Applications:

- Categorization puzzles
- Cause-and-effect matching
- Concept explanation challenges
- Translation between representations (graphs, words, symbols)

APPLY LEVEL

Definition: Use information in new situations Verbs: apply, choose, demonstrate, dramatize, employ, illustrate, interpret, operate, practice, schedule, sketch, solve, use, write

ETER Applications:

- Problem-solving scenarios
- Calculation challenges
- Procedure implementation tasks
- Tool use demonstrations

ANALYZE LEVEL

Definition: Draw connections among ideas Verbs: analyze, appraise, calculate, categorize, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test

ETER Applications:

- Comparison charts and tables
- Pattern recognition puzzles
- Cause-and-effect chains
- Data analysis challenges

EVALUATE LEVEL

Definition: Justify a stand or decision Verbs: appraise, argue, assess, attach, choose, compare, defend, estimate, judge, predict, rate, core, select, support, value, evaluate

ETER APPLICATIONS:

- Decision-making scenarios
- Solution ranking activities
- Criteria-based evaluation tasks
- Recommendation development challenges

CREATE LEVEL

Definition: Produce new or original work Verbs: assemble, construct, create, design, develop, formulate, author, investigate, compose, generate, modify, organize, plan, produce, write

ETER Applications:

- Design challenges
- Solution creation tasks
- Innovation scenarios
- Original product development

Appendix B: Sustainability-Specific Learning Objectives

ENVIRONMENTAL SCIENCE OBJECTIVES

Knowledge Objectives:

- Students will identify the main greenhouse gases and their sources
- Students will describe the carbon cycle and its components
- Students will explain the difference between renewable and non-renewable energy sources
- Students will list major causes of habitat loss and species extinction
- Students will define key terms: carbon footprint, biodiversity, ecosystem
- services, sustainable development

SKILLS OBJECTIVES:

- Students will calculate personal and household carbon footprints
- Students will analyze energy efficiency data to make recommendations
- Students will interpret climate data graphs and charts
- Students will design waste reduction plans for specific contexts
- Students will evaluate environmental impact assessment reports

ATTITUDE OBJECTIVES:

- Students will demonstrate concern for environmental issues through active participation
- Students will show willingness to modify personal behaviors for environmental benefit
- Students will express appreciation for the complexity of environmental systems
- Students will value diverse perspectives on environmental problems and solutions

ECONOMICS AND SUSTAINABILITY

Knowledge Objectives:

- Students will explain the concept of externalities in environmental economics
- Students will describe how market failures contribute to environmental problems
- Students will identify economic incentives for sustainable practices

- Students will understand the relationship between economic development and environmental impact

Skills Objectives:

- Students will calculate cost-benefit analyses for environmental projects
- Students will analyze the economic impacts of environmental regulations
- Students will compare lifecycle costs of sustainable vs. conventional products
- Students will design economic incentive systems for environmental protection

SOCIAL STUDIES AND ENVIRONMENTAL JUSTICE

Knowledge Objectives:

- Students will identify examples of environmental injustice in their community and globally
- Students will explain how environmental issues affect different populations unequally
- Students will describe the relationship between poverty and environmental degradation
- Students will understand the role of government policy in environmental protection

Skills Objectives:

- Students will analyze demographic data related to environmental hazards
- Students will evaluate different stakeholder perspectives on environmental issues
- Students will research and present case studies of environmental justice issues
- Students will develop action plans for addressing local environmental problems

Appendix C: Assessment Rubric Templates

GENERAL ETER PERFORMANCE RUBRIC

STUDENT NAME: _____

ETER TITLE: _____

TEAM MEMBERS: _____

CONTENT KNOWLEDGE (25 POINTS)

Excellent (23-25 points):

- Demonstrates comprehensive understanding of all key concepts
- Uses vocabulary accurately and appropriately
- Makes sophisticated connections between ideas
- Applies knowledge creatively to solve novel problems

Proficient (18-22 points):

- Shows solid understanding of most key concepts
- Uses most vocabulary correctly
- Makes some connections between ideas
- Applies knowledge appropriately to solve problems

Developing (13-17 points):

- Displays basic understanding of key concepts
- Uses vocabulary with minor errors
- Makes few connections between ideas
- Applies knowledge with guidance

Beginning (0-12 points):

- Shows limited understanding of concepts
- Uses vocabulary incorrectly or not at all
- Does not make connections between ideas
- Cannot apply knowledge even with support

PROBLEM-SOLVING SKILLS (25 points)

Excellent (23-25 points):

- Uses systematic, efficient approach to challenges
- Employs multiple strategies and adapts when needed
- Shows metacognitive awareness of problem-solving process
- Helps others develop problem-solving skills

Proficient (18-22 points):

- Uses generally effective approach to challenges
- Employs appropriate strategies most of the time
- Shows some awareness of problem-solving process
- Contributes to team problem-solving efforts

Developing (13-17 points):

- Uses simple approach to challenges
- Employs limited strategies
- Shows little awareness of problem-solving process
- Participates in team problem-solving with support

Beginning (0-12 points):

- Uses random or ineffective approach
- Does not employ clear strategies
- Shows no awareness of problem-solving process
- Does not contribute to team problem-solving

COLLABORATION SKILLS (25 points)

[Similar 4-level structure for collaboration assessment]

COMMUNICATION SKILLS (25 points)

[Similar 4-level structure for communication assessment]

TOTAL SCORE: ____/100 points

WRITTEN COMMENTS:

Strengths observed: _____

Areas for growth: _____

Specific recommendations: _____

Subject-Specific Rubric: Environmental Science

ENVIRONMENTAL SCIENCE ETER RUBRIC

SCIENTIFIC REASONING (30 points)

- Uses evidence to support conclusions
- Identifies cause-and-effect relationships
- Distinguishes between correlation and causation
- Applies scientific method thinking

QUANTITATIVE ANALYSIS (25 points)

- Performs calculations accurately- Interprets data correctly
- Creates appropriate graphs or charts
- Uses quantitative reasoning to solve problems

SYSTEMS THINKING (25 points)

- Recognizes interconnections in environmental systems
- Understands feedback loops and cycles
- Considers multiple scales (local to global)
- Identifies unintended consequences

ENVIRONMENTAL STEWARDSHIP (20 points)

- Demonstrates personal responsibility for environmental issues
- Proposes realistic solutions to environmental problems
- Shows awareness of individual and collective impact
- Connects learning to potential action

Appendix D: Technology Integration Ideas

Digital Enhancement Options

QR Code Integration:

- Link physical puzzle cards to online videos or simulations
- Provide instant access to reference materials
- Enable self-checking through digital answer verification
- Connect to real-time data sources (weather, pollution levels)

Augmented Reality (AR) Applications:

- Overlay digital information on physical puzzle components
- Visualize invisible concepts (carbon emissions, energy flows)
- Provide 3D models of complex systems
- Enable virtual field trip experiences

Online Collaboration Tools:

- Shared documents for team note-taking and solution recording
- Digital polling for team decision-making
- Video conferencing for expert consultations
- Online mapping tools for geographic challenges

Hybrid ETER Design

Blended Physical-Digital Structure:

HYBRID ETER FRAMEWORKPHYSICAL COMPONENTS:

- Printed puzzle cards and reference materials
- Manipulative objects and props
- Team workspace organization
- Face-to-face collaboration

DIGITAL COMPONENTS:

- Timer and hint systems via app or website
- Data input and calculation tools
- Multimedia content (videos, simulations)
- Real-time feedback and verification

INTEGRATION POINTS:

- QR codes bridge physical to digital
- Digital tools enhance physical puzzles
- Online verification for physical solutions
- Digital portfolio collection of physical work

Implementation Considerations:

- Ensure digital components enhance rather than complicate the experience
- Plan for technology failures with analog backup options
- Consider equity issues around device access
- Maintain focus on learning objectives rather than technology novelty

About EuroQuest

This handbook is a product of the EuroQuest project, a collaboration between educational institutions across Europe focused on developing innovative game-based learning approaches for sustainability education. The project is co-funded by the Erasmus+ Programme of the European Union (2024-2027).

Project Partners:

- EBB Europass Berlin Beratungsbüro GmbH (Germany) - Coordinator
- Scuola IMT Alti Studi di Lucca (Italy)
- INDEPCIE SCA (Spain)
- Ventspils State Gymnasium No. 1 (Latvia)
- SOU Kuzman Josifovski-Pitu Prilep (North Macedonia)

Additional Resources:

- Full MOOC available online at: <https://euroquestproject.eu/>
- Ready-to-print ETER materials available for download

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"The best way to predict the future is to create it through education."