

Stevens - Strategy Lesson #1

Introduction:

This lesson plan was developed as an alternative to an observed lesson taught in a 12th grade Environmental Science Class at Bowie High School (PGCPS). The original class period was 90 minutes. The original period included an open-note exam (~35m) and use of an “Exit Slip” (Allen, 2004) during the progression from the exam to the lab portion that I used below. I opted to remove the exam and the “Exit Slip” exercise to 1. Fit within the 50 minute period required, 2. I felt the “Exit Slip” used by the instructor was not very relevant to the actual lesson and served to distract the students from progressing into the lab assignment. I used the content and strategies used in the observed classroom as the base for my lesson plan and then expanded upon them by implementing additional strategies as outlined below. Where possible I attempted to use the actual materials from the class as they are standardized for the Environmental Science curriculum.

The class was composed of 26 students, 11 male and 14 female. According to the teacher there were 6 IEP students though they were not identified to me. The classroom was composed of rows of individual fixed desk-chairs 6-8 deep in the middle of the room. Lab stations were built against the wall encircling the room with each lab station containing a computer. The teacher had available a teacher pc, projector, smart board, clicker devices, and a printer.

The exam held during my observation was open-note allowed. My inclusion of the Academic Notebook (Allen, 2007) strategy was influenced by the observation that numerous students did not bring/have a notebook to use. The use of this strategy will force students to both fill and bring their notebook to class. I expanded upon the use of the inference by the teacher who did use an article involving a baby who died from being trapped in a refrigerator. While the teacher focused more on the back story and briefly used it as a transition into the idea of a vacuum, I have opted to transform it into instruction on Visualization (Brydebell, 2014) that the students can then use when completing their lab sheet.

The differentiation and behavioral modifications that I added to the lesson plan were based on my observations of the classroom and the steps that I feel I could take to control. It must be added that the classroom management techniques and overall teaching methodologies implemented in the observed classroom are not in line with my desired pedagogy or the atmosphere I plan to create. Thusly I created this lesson plan to address the changes that I would make and to implement learning strategies that I feel can best improve the learning process of the class that I observed.

A final note: Actual usage of this and the other developed lesson plans I have made will be taught by me through the use of a Microsoft Surface Pro tablet using One Note. This allows me to organize media, make quick notes, annotate my lesson plans, and draw directly on the screen to display to the class. These “slides” are referenced in the plan, and rough versions are included in the appendix.

Mr. Stevens - Environmental Science (12) – Learning about Fire and Oxygen using Visualization and Lab Techniques

Unit: Introduction to Environmental Science

Lesson Topic: Oxygen and Fire

Type of Lesson: Introductory

Time Allotted: 50m

Relevance: Everyone knows what fire is, how it feels, what it looks like, but what creates fire? How does fire relate to energy?

Standards – Skills and Processes (CCS-MD):

- Expectation 1.2
 - The student will pose scientific questions and suggest investigative approaches to provide answers to questions.
 - Indicator 1.2.1
 - The student will identify meaningful, answerable scientific questions.
 - Indicator 1.2.2
 - The student will pose meaningful, answerable scientific questions.(NTB)
 - Indicator 1.2.3
 - The student will formulate a working hypothesis.
 - Indicator 1.2.7
 - The student will use relationships discovered in the lab to explain phenomena observed outside the laboratory.
- Expectation 1.3
 - The student will carry out scientific investigations effectively and employ the instruments, systems of measurement, and materials of science appropriately.
 - Indicator 1.3.1
 - The student will develop and demonstrate skills in using lab and field equipment to perform investigative techniques.(NTB)
 - Indicator 1.3.2
 - The student will recognize safe laboratory procedures.
 - Indicator 1.3.3
 - The student will demonstrate safe handling of the chemicals and materials of science.(NTB)
 - Indicator 1.3.4
 - The student will learn the use of new instruments and equipment by following instructions in a manual or from oral direction.(NTB)
- Expectation 1.4
 - The student will demonstrate that data analysis is a vital aspect of the process of scientific inquiry and communication.
 - Indicator 1.4.2
 - The student will analyze data to make predictions, decisions, or draw conclusions.
 - Indicator 1.4.9
 - The student will use analyzed data to confirm, modify, or reject a hypothesis.
- Expectation 1.5
 - The student will use appropriate methods for communicating in writing and orally the processes and results of scientific investigation.
 - Indicator 1.5.1
 - The student will demonstrate the ability to summarize data (measurements/observations).

- Indicator 1.5.2
 - The student will explain scientific concepts and processes through drawing, writing, and/or oral communication.
- Indicator 1.5.6
 - The student will read a technical selection and interpret it appropriately.
- Indicator 1.5.8
 - The student will describe similarities and differences when explaining concepts and/or principles.
- Indicator 1.5.9
 - The student will communicate conclusions derived through a synthesis of ideas.

Standards – Environmental Science (CCS-MD):

- Expectation 6.1
 - The student will explain how matter and energy move through the biosphere (lithosphere, hydrosphere, atmosphere and organisms).
 - Indicator 6.1.1
 - The student will demonstrate that matter cycles through and between living systems and the physical environment constantly being recombined in different ways.

Cognitive/Affective Objectives (SWBAT):

- Students will utilize Visualization to infer information on fire through the use of prior knowledge (Brydebell, 2014) .
- Students will practice prediction and hypotheses development.
- Students will gain experience in safe lab practices.
- Students will work effectively to learn and share information with their peers through grouping (Harvey & Goudvis, 2007, p. 54).
- Students will reinforce existing science vocabulary and create connections to new vocabulary through the use of Word Walls (Harvey & Goudvis, 2007, pp. 214-215, 222)
- Students will add new content to the vocabulary, notes, and lab assignment sections of their Academic Notebook (Allen, 2004).

Strategies Implemented

- Direct Instruction (DI)
- Visualization/Inference (VI)
- Assessment of Prior Knowledge (APK)
- Academic Notebooks (AN)
- Word Walls (WW)
- Grouping/Lab Work (LW)

Differentiation/Behavioral Modifications:

- Direct Instruction
 - Provide hard copies of all materials shown on projector
 - Practice proximity monitoring for behavioral students
 - Use repetition of instructions and key vocabulary
- Visualization Strategy
 - Provide aide (if available) copy of lesson plan to work 1:1 with student
 - Provide more relevant analogy or alternate visualization
 - Breathing under-water (drowning) – lack of oxygen
 - Why astronauts have to wear a suit – vacuum
- Lab Work
 - Assign specific lab groups based on skill
 - Advanced – make lab group leader
 - Proficient – split among groups
 - Basic – group with advanced/proficient students
 - Provide visual aids for instruction or use computer based instructions with audible prompts.
- Behavioral
 - Separate known disruptive students across room sections
 - Practice proximity monitoring
 - Remind all students frequently about lab sheet grading requirements
- IEP
 - Email parents assignment and assignment overview
 - Allow extra time to complete assignment during study period or at home.
 - Include vocabulary worksheet for new terms with sentence starters to guide Word Wall homework.
 - Provide pre-written additions for Academic Notebook

Materials:

- Teacher Supplies:
 - Projector
 - PC
 - One-Note Lesson Plan #14
 - Page 1 – SWBAT Objectives / Warmup Exercise (Appendix A, SWBAT & Warmup)
 - Page 2 – Article on baby killed in empty refrigerator (Appendix B, Article)
 - Page 4 – Fire Lab Instructions (Appendix C, Lab Instruction + Rubric)
 - Page 5 – Clicker Response for time hypothesis/actual and homework (Appendix D, Homework)
- Lab Stations (7)
 - Blank Paper for Safety Sign, 4 per station
 - Lab Sheet, 4 per station (Appendix C)

- Candle, in clay, 1 per station
- 200ml Griffin Beaker, 1 per station
- Lighter, 3 – Teacher Controlled.
- Student Supplies:
 - Writing materials
 - Academic Notebook
 - Previous homework
 - Cell phone w/stopwatch application

Warm-Up/Connect and Engage: (15m)

Strategy Used: Academic Notebooks (AN) / Assessment of Prior Knowledge (APK)

- Warm-up
 - Pre-Bell
 - Address student questions, identify students whom missed previous lesson(s), collect money for upcoming field trip.
 - Prepare Lab Stations as listed above.
 - Load SWBAT and Warm-Up Slide on Projector (Appendix A)
 - Post-Bell (5m)
 - Read through SWBAT with students using call/response (1-2m) (Appendix A)
 - Teacher Says: Students Will....
 - Students Say: Be able to.... (based on objectives)
 - Instruct students to be working on warm-up activity (Appendix A)
 - Identify and redirect students who are not settled.
 - Take attendance
- Connect and Engage (10m)
 - (APK) Ask students about risk (past lesson) -
 - (APK) Call on students to list one of the three requirements for fire -
 - (DI) Write each of the requirements on the board (LARGE)
 - Fuel/Ignition/Oxygen
 - (DI) Instruct students to add these three words to the vocabulary section of their Notebook. (AN)
 - (APK) Have students suggest types of fuel
 - (AN) Add to Notes
 - (DI) Explain Ignition – ENERGY(HEAT)
 - (AN) Add to Vocab/Notes
 - (DI) Bridge into how Oxygen is important
 - (AN) Add to Notes

Motivator/Bridge Pre-Lab: (10m)

Strategy Used: Engagement of Prior Knowledge through Visualization (10m)

- (VI) Display news report of dead children found in refrigerator (Appendix B)
- (DI/Visualization) Engage class in discussion of how and why a baby might die in a refrigerator.
 - (VI) Identify Strategy: Visualization. Direct students to imagine their refrigerators at home, think about what happens when they open the door, the suction they encounter.
 - (VI) Have them imagine what would happen if they were stuck inside with that seal intact.
 - (DI) if no mention of vacuum/oxygen in first 3-4 minutes, direct towards what we need to breathe.
 - (DI) Add “vacuum” to word list on board, discuss definition.
 - (AN) Add to vocab section
- (DI) Briefly inform students of Refrigerator Safety Act of 1956
- Play “Classic Refrigerator Safety PSA” IF TIME AVAILABLE
 - <https://www.youtube.com/watch?v=E2-p6fLgaBw>
- Segway into instructions for Lab

Independent Practice/Lab Work: (20m)

Strategy Used: Grouping and Academic Notebooks

- (DI) Introduce lab before having students break into groups. (8m)
 - Display Lab Instructions slide (Appendix C)
 - Read through lab requirements with students (2m)
 - Make note of Lab Rubric (Appendix C)
 - Remind students that everyone must complete their own copy of the Fire Lab Data Sheet to turn in for credit and to include in Academic Notebook.
 - Remind about important requirements (2m)
 - Ask how students can get accurate time (1m)
 - Ask what “tenths place” means (1m)
 - Ask questions based on instruction: (1m)
 - “When will you start the timer?”
 - “When will you stop the timer?”
 - Instruct students to use “Visualization” strategy when developing hypothesis and reasoning.
 - Inform students that they should send one person to you to get a lighter and to return it when finished. (1m)
 - No students will leave the room before all 3 lights are accounted for!
 - (DI, LW) Instruct students to break into lab groups of no more than 4 individuals and begin the lab. (2m)
 - Extension Activity
 - For students that complete early provide additional observational questions to answer.
 - Why does the candle extinguish?
 - Is it the beaker creating the vacuum? Remember a beaker does not create an air-tight seal. Oxygen can still get in, why does the candle still go out?

- Allow students to begin working on their Word Walls.
- While students are completing lab walk around and observe group work (10m)
- Display Homework and Assessment Slide (Appendix D)
 - Remind students to write down homework assignment.
- (DI) Instruct student to gather assigned clicker on way back to seat

Assessment/Closure: (5m)

Strategy Used: Formative Assessment with Clickers, Word Walls

- Clicker based Formative Assessment (3m)
 - Have each student enter hypothesized time
 - Quick analysis of class data
 - Have each student enter actual time
 - Should only be 7 data points
 - Can use to see which students didn't complete lab
- (WW) Introduce Homework Assignment
 - Students will create Word Walls with the new vocabulary learned today
 - Prior instruction on Word Walls given at beginning of the year
 - New words to use:
 - Ignition
 - Vacuum
 - Fuel
 - Will pick one of each word to add to the classroom Word Wall Display.
- Have students turn in lab sheets as they exit.

Reflection:

Appendix A – SWBAT & Warmup Slide

SWBAT – Students Will Be Able To...

SWBAT Utilize Visualization to infer information on fire through the use of prior knowledge!

SWBAT Practice prediction and hypotheses development!

SWBAT Gain experience in safe lab practices!

SWBAT Work effectively to learn and share information with their peers through grouping!

SWBAT Reinforce existing science vocabulary and create connections to new vocabulary through the use of Word Walls!

SWBAT Add new content to the vocabulary, notes, and lab assignment sections of their Academic Notebook!

Warm-Up #7 10/10

1. What are the 3 requirements for fire?
2. Copy Homework Assignment from the board!

Appendix B – Article

The New York Times

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November 5, 1987

Two Children, Trapped in a Refrigerator, Die

By JOHN T. McQUISTON

A 3-year-old girl and her 4-year-old brother died yesterday evening shortly after their grandfather, who had been searching for them for nearly three hours, found them trapped unconscious in an old refrigerator in the backyard of their home in Jamaica, Queens, the police said.

The two children, Shawana King, and her brother, Vernon, were last seen playing on the back steps of the house at 144-14 South Road around 2:30 P.M., said a police spokesman, Officer Peter O'Donnell.

The grandfather, who was not immediately identified by the police, found the two children in the refrigerator shortly before 6 P.M., Officer O'Donnell said.

The grandfather, Robert Moore, 54, who was watching the children, called the 911 police emergency number for help. Three patrol cars arrived at the scene shortly afterward and took the two children to nearby hospitals.

Vernon, who was taken to Queens General Hospital, was declared dead at 6:36 P.M. Shawana was pronounced dead at Mary Immaculate Hospital at 6:55 P.M.

Officer O'Donnell said the police did not know how long the old, upright refrigerator had been in the backyard. They said the grandfather told them that he had moved it there from the house sometime earlier. The children's mother, Sandonia King, 20, was at home at the time and had helped in the search for the children. The father, Vernon Hill, was not present.

The police said it is illegal to discard or abandon a refrigerator without removing its door. They said an investigation was continuing into whether the old refrigerator had been abandoned. Officer O'Donnell said no one had been charged in the incident.

He said the exact cause of death would be determined by the Medical Examiner's Office.

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Taken from: <http://www.nytimes.com/1987/11/05/nyregion/two-children-trapped-in-a-refrigerator-die.html?pagewanted=print>

Appendix C – Lab Instruction + Rubric

Student Name: _____ Date: _____ Period: _____

Fire Lab

Purpose: To illustrate the three requirements for fire

Hypothesis: When a lit candle is covered with a beaker, then the candle flame will be extinguished in _____ seconds.

Materials: Candles; stop watch; matches; beaker; clay

Procedure:

1. Secure candle to lab table with clay.
2. Light candle with matches.
3. Simultaneously cover the candle with a beaker and start the stop watch.
4. Stop the stop watch at the instant the candle flame has been extinguished.
5. Record the time in the data table to the tenth place.

Data: Seconds till extinguish: _____ sec. (to the tenth place).

REFER TO THE FIRE LAB RUBRIC BEFORE YOU FILL OUT THIS SECTION

Results: _____

Conclusion: Write your concluding statements in full sentences using proper scientific methodology.

Claim: _____

Evidence: _____

Reasoning: _____

Fire Lab Rubric (40 points)

Lab Data	Point Value
1) Name/Date/Period	5
2) Hypothesis in second to the tenths place value	5
3) Data table time to the tenths place value	5
4) Results in sentence form	5
Conclusion	
5) Claim: Restate Hypothesis	5
6) Evidence: Data in sentence form	5
7) Reasoning: Accept or Reject hypothesis in sentence form with data.	10

Appendix D – Homework

Homework Assignment:

**Create Word Walls for the following new words
from today!**

- **Ignition**
- **Fuel**
- **Vacuum**

**Remember I will pick an example for each word to
add to the classroom Word Wall! Be immortalized
for the unit!**

**PUT YOUR LAB SHEETS IN THE
TURN-IN BOX ON YOUR WAY OUT
THE DOOR!**

References:

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- Brydebell, L. (2014). Visualizing in STEM Classes. *UMUC*. from <https://learn.umuc.edu/d2l/le/34114/discussions/threads/1700742/View>
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