Resource Guide for 8th Grade Comprehensive Science 3

South Cross Bayou Water Reclamation Facility

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Choice! The following resources were designed to allow for teacher choice. Choice for teachers allows for customizing *what* students are expected to learn and differentiating *how* students are expected to demonstrate learning. By choosing the critical learning focus and the methods of demonstrating mastery, teachers design appropriate boundaries for students.

A tour of South Cross Bayou Wastewater Treatment Facility provides opportunities for your students to learn a tremendous amount of relevant information aligned to the Florida Standards for 8th grade Comprehensive Science 3. The Florida Standards have been provided and specific Learning Targets have been written to guide the learning expectations and outcomes. Teachers should review the Florida Standards and Learning Targets provided and choose which Learning Targets will be the critical focus for students.

A wide variety of Activity Options were developed to meet the needs and learning styles of diverse students. Activity Options have been grouped into three different point values based on the amount of student work associated with the activity. Teachers should review the Activity Options for the chosen Learning Targets and select a total of eleven Activity Options that are a good fit for their classroom and learners. *(Note: Students will only be expected to complete two of these eleven Activity Options).* To create a customized 20-50-80 Menu for their class, teachers should copy the eleven chosen Activity Options and paste them into the appropriate boxes of the template for the 20-50-80 Menu. This ensures that students will only see the eleven Activity Options that are predetermined by the teacher.

By establishing these boundaries, teachers can infuse *student* choice as well. Many teachers observe that if students have both choice and voice then there is an increase in motivation and desire to learn.

Students will preview the 20-50-80 Menu before the SCB tour and predetermine *two* learning activities that best fit their interest, comfort and learning style. Students have many combinations to choose from to earn the necessary 100 points. Scaffolded supports for learning, as well as transparency of expectations, are provided through the descriptions on the 20-50-80 Menu, Product Criteria Cards and All-Purpose Product Rubric. The desired effect of students knowing *how* they will use the information from the SCB tour is an increase in motivation and desire to learn.

8TH GRADE COMPREHENSIVE SCIENCE 3 STANDARDS & LEARNING TARGETS

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Pinellas County Schools Mission Statement/ Florida Standards
☐ *Learning Targets*

PCS Mission: Educate and prepare each student for college, career, and life.

- ☐ *Identify and describe various careers available in wastewater treatment.*
- ☐ *Determine required education, training, and skills necessary for a career in wastewater treatment.*

PCS Mission | PCS Mission

SC.8.N.4.1 Explain that science is one of the processes that can be used to inform decision making at the community, state, national and international levels.

- ☐ *Explain how science is used to inform decision making at SCB.*
- ☐ *Explain how science is used at SCB to inform the community.*
- ☐ *Explain how science is used at the state and national level to regulate SCB and other wastewater treatment facilities.*

N.4.1

SC.8.N.4.2 Explain how political, social, and economic concerns can affect science, and vice versa.

- ☐ *Explain how the operations at SCB are affected by governmental agencies.*
- ☐ *Explain how society benefits from SCB's treatment of wastewater, production of reclaimed water, usage of renewable energy and production of pellets.*
- ☐ *Explain how the economy impacts the operations at SCB.*

N.4.2

SC.8.E.5.10 Assess how technology is essential to science for such purposes as access to outer space and other remote locations, sample collection, measurement, data collection and storage, computation, and communication of information.

- ☐ *Explain how technology is essential at SCB for sample collection, measurement, data collection and storage, computation, and communication of information.*

E.5.10

SC.8.P.8.3 Explore and describe the densities of various materials through measurement of their masses and volumes.

- ☐ *Identify the relationship between the density of materials and wastewater treatment.*

P.8.3

SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured; for example, density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points, and know that these properties are independent of the amount of the sample.

- ☐ *Compare two substances found at SCB in terms of density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points.*

P.8.4

SC.8.P.8.9 Distinguish among mixtures (including solutions) and pure substances.	
☐ *Identify the mixtures and pure substances found at SCB.*	**P.8.9**
SC.8.P.9.2 Differentiate between physical changes and chemical changes.	
☐ *Identify the physical changes of matter that occur throughout South Cross Bayou wastewater treatment facility.* ☐ *Identify the chemical changes of matter that occur throughout South Cross Bayou wastewater treatment facility.* ☐ *Describe the physical changes occurring at the following stations: headworks, teacups, grit snails, primary clarifier tanks, dewatering centrifuges, and pelletizer.* ☐ *Describe the chemical changes occurring at the following stations: anoxic tanks, aeration tanks, mixing facility, denitrification, chlorine contact tank, UV system, outflow cascade, and digesters.*	**P.9.2**
SC.8.P.9.3 Investigate and describe how temperature influences chemical changes.	
☐ *Investigate how changes to temperature impact chemical reactions at SCB.*	**P.9.3**
SC.8.L.18.3 Construct a scientific model of the carbon cycle to show how matter and energy are continuously transferred within and between organisms and their physical environment. **SC.8.L.18.2 Describe and investigate how cellular respiration breaks down food to provide energy and releases carbon dioxide.**	
☐ *Describe how the bacteria at SCB undergo cellular respiration in order to break down food for energy and release carbon dioxide.* ☐ *Diagram and explain how the anaerobic bacteria in the Digesters are part of the Carbon Cycle.*	**L.18.3; L.18.2**
SC.8.L.18.4 Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.	
☐ *Cite evidence that the microbial populations at SCB follow the Laws of Conservation of Mass and Energy.*	**L.18.4**

8th Grade Comprehensive Science 3 Teacher Guide for 20-50-80 Menu

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Learning Targets

Relevant 8th grade Comprehensive Science 3 Standards are provided and specific Learning Targets have been developed. Teachers choose the Learning Targets and associated Activity Options that are a desired critical focus for their students.

Student Materials Needed for Activity Options

lined paper	glue/tape	markers	colored pencils	white paper
scissors	coat hanger (for mobile)		smartphone or tablet with video recording	

Special Notes

Since the Activity Options have either a 20, 50 or 80 point value, the All-Purpose Product Rubric must be customized by the students. When using the All-Purpose Product Rubrics have students circle the correct point value for the product (20, 50 or 80) and record the correct partial point values at the top of the full and half credit columns. Use the tables below for partial point values:

Full	Half	No
4	2	0
4	2	0
4	2	0
4	2	0
4	2	0
20 Points Possible		

Full	Half	No
10	5	0
10	5	0
10	5	0
10	5	0
10	5	0
50 Points Possible		

Full	Half	No
16	8	0
16	8	0
16	8	0
16	8	0
16	8	0
80 Points Possible		

Time Frame

Allow one or two 50 minute class periods prior to your SCB visit to have students preview resources and predetermine two activities from the 20-50-80 Menu.
Allow two or three 50 minute class periods after your SCB visit to have students complete their two chosen activities from the Student205080Menu20-50-80 Menu.

Additional Forms

All-Purpose Product Rubrics (two per student)	Product Criteria Cards

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8th Grade Comprehensive Science 3 Teacher Guide for Activity Options

Teachers, below is the master list of suggested in-class activities for students to demonstrate mastery on the Learning Targets. You will narrow down three 20 point options, four 50 point options and three 80 point options and place the eleven options on the 20-50-80 Menu template. Prior to the SCB tour, students will choose two activities (with a sum of 100 points) from the options you provide. Back in the classroom after the SCB tour, students will complete both activities they have selected.

20 Points Options **Teachers, place three options on the 20-50-80 Menu.*	
N.4.2	Create a mobile to display the relationship between SCB and the following influences: government, society, and economy. For government, explain ways that SCB operations are affected by government agencies. For society, explain at least three ways individuals benefit from SCB's operations. For the economy, explain how SCB is dependent on the state of the economy.
P.8.4	Create a poster sized Venn Diagram to compare and contrast two substances found at SCB. The following properties should be researched and used for each substance: density, thermal or electrical conductivity, solubility, magnetic properties, melting and boiling points.
P.9.3	Meteorologists are forecasting a severe El Nino this upcoming winter. Write an internal email to the SCB staff about how an extreme El Nino winter could impact the speed of chemical reactions occurring at SCB. In Florida, El Nino winters are uncharacteristically cold, which impacts the temperature of the water entering the facility. Educate the staff on the implications this may have on day to day operations.
L.18.4	Design and create a poster that demonstrates how populations of bacteria at SCB follow the Laws of Conservation of Mass and Energy. Be sure to use arrows to track inputs and outputs to the system to demonstrate conservation. Color code the arrows to distinguish which law is being represented (Mass or Energy).

50 Points Options **Teachers, place four options on the 20-50-80 Menu.*	
E.5.10	Create an interactive map of SCB wastewater treatment facility. For every location on the map where technology is being used create a flap that when lifted up explains the how the technology assists in sample collection, measurement, data collection and storage, computation, and/or communication of information.
P.8.9	Create an interactive map of SCB wastewater treatment facility. Choose 5 different mixtures and 3 pure substances found at SCB. For every location on the map where your chosen mixtures or pure substances are found, create a flap that when lifted up explains why it was identified as a mixture or pure substance. The top of the flap should contain the name of the mixture or pure substance.
L.18.3 L.18.2	Create a Pinellas County Wastewater Specific Carbon Cycle Diagram poster. View a generic carbon cycle diagram to get a starting point, but then customize the components to include the various specific Pinellas County carbon sources that enter our wastewater. Be sure to track the carbon as it moves through the SCB facility and track the way(s) it leaves the facility and rejoins the local.
PCS Mission	Write and present to the class Three Facts & A Fib for each of three different careers that are present at SCB. You may use resources provided by SCB to help you identify careers and give you general information, but your 9 facts and 3 fibs must be information that was not included in the SCB resources. Conduct independent research on the three careers when writing your facts and fibs.

80 Points Options **Teachers, place three options on the 20-50-80 Menu.*	
N.4.1	You are assistant to the education outreach coordinator at SCB. You have been tasked with recruiting science minded students for an internship at SCB. The regional science fair will be the perfect opportunity to recruit. Research and then design a display board or a brochure that communicates how science is used to inform decision making at the community, state, national and international levels. Include the following: how science is used to inform decision making at SCB, how science is used at SCB to inform the community, how science is used at the state and national level to regulate SCB and other wastewater treatment facilities.
P.8.3	Create a model to demonstrate how density is used to separate mixtures at SCB. Be prepared to demonstrate in front of your class or make a video recording of your model as you demonstrate. Select one location at SCB where density differences are used to separate solids from wastewater. As you use your model you will need to verbally explain what your model is demonstrating. Since your model will use substances of known densities, be sure to state each material's density and explain the mass and volume calculation that gives you density.
P.9.2	Develop a learning game of "Red Rover". Remember that a learning game focuses on concepts, but can still involve score keeping somehow. You must have 13 SCB scenario cards that describe a change (physical or chemical) occurring in specific steps of the wastewater treatment process. When you write the rules, you must incorporate interactions where players read your scenario cards and choose a side (chemical or physical). You must provide either a separate answer key to your scenario cards or write the answer on the back of each scenario card. Your 13 SCB scenario cards should: Identify the physical changes of matter that occur throughout South Cross Bayou wastewater treatment facility; Identify the chemical changes of matter that occur throughout South Cross Bayou wastewater treatment facility; Describe the physical changes occurring at the following stations: headworks, teacups, grit snails, primary clarifier tanks, dewatering centrifuges, and pelletizer; Describe the chemical changes occurring at the following stations: anoxic tanks, aeration tanks, mixing facility, denitrification, chlorine contact tank, UV system, outflow cascade, and digesters.
PCS Mission	You are an employee at SCB and have been asked to speak at a local high school for the Great American Teach-In. Prepare a presentation that describes your role within the treatment facility. Share with class about a situation (power outage to the city due to storms, infiltration/inflow of stormwater due to leaking pipes, sensor failure in the monitoring of water parameters, etc) when you had to problem solve a major crisis.

All-Purpose Product Rubric **Product: _____** **20, 50, or 80 Point Option** **Name: _____**

Aspect	Full Credit Points	Half Credit Points	No Credit 0 Points	Peer Feedback	Self Evaluation
Content: Is the content of the product well chosen?	Content chosen represents the best choice for the product. Graphics are well chosen and related to content.	Information or graphics are related to content, but are not the best choice for the product.	Information or graphics presented do not appear to be related to topic or task.		
Completeness: Is everything included in the product?	All information needed is included. Product meets the product criteria and the criteria of the task as stated.	Some important information is missing. Product meets the product criteria and the criteria of the task as stated.	Most important information is missing. The product does not meet the task or does not meet the product criteria.		
Creativity: Is the product original?	Presentation of information is from a new perspective. Graphics are original. Product has elements of fun and interest.	Presentation of information is from a new perspective. Graphics are not original. Product includes an element of fun and interest.	There is no evidence of new thoughts or perspective in the product.		
Correctness: Is all of the information included correct?	All information presented in the product is correct and accurate.	N/A	Any portion of the information presented in the product is incorrect.		
Communication: Is the information in the product well communicated?	All information is neat and easy to read. Product is in appropriate format and shows significant effort. Oral presentations are easy to understand and presented with fluency.	Most of the product is neat and easy to read. Product is in appropriate format and shows significant effort. Oral presentations are easy to understand, with some fluency.	The product is not neat and easy to read or the product is not in the appropriate format. It does not show significant effort. Oral presentation was not fluent or easy to understand.		
			Total Grade		

Name: _____ Date: _____

8th Grade Comprehensive Science 3 20-50-80 Menu

Student Directions: Choose two activities from the menu below. **<u>The activities must total 100 points</u>**. Place a checkmark next to each box to show which activities you will complete. All activities must be completed by _____.

20 Points	
☐	
☐	
☐	

50 Points	
☐	
☐	
☐	
☐	

80 Points	
☐	
☐	
☐	

Students, attach the Product Criteria Cards for your two activities in the spaces below.	

8th Grade Comprehensive Science 3 Product Criteria Cards

Student Directions: The cards below convey additional criteria for various products. Cut out the two applicable product criteria cards and attach each to your 20-50-80 Menu.

Email	**Presentation: Great American Teach-In**	**Mobile**
• Is typed and printed • Contains appropriate "To" "From" and "Subject" • Contains appropriate greeting and closing • Describes the message in two paragraphs (be sure to cover the who, what, where, when, why & how) • All actionable items are emphasized and include who is responsible and when the action should take place	• Take on the role of the SCB employee • Cover at least 5 important facts about the job of the employee • Should be 3-5 minutes in length • Script must be approved by teacher before information is presented • Must have props or some form of costume Allow for questions at the end of presentation	• At least 10 pieces of related information • Includes color and pictures • 3+ layers of hanging material Is balanced when hanging
Interactive Map	**Poster**	**Learning Game**
• Includes a scale • Has two or more layers that are viewable by lifting paper • Images are in color and are clear • Explanations are thorough and concise • Has a title that explains the location	• Is the **size** of standard poster paper • Includes at least five pieces of important information • Has a clear title • Contains both words and pictures • Name is written on back	• Game will allow all class members to participate • Must provide written rules that are easy to understand • Must provide answer key • Must be preapproved by teacher before being scheduled for play • Must provide all needed materials to play the game

Three Facts & A Fib	Display Board or Brochure	Demonstrate with a Model
• Can be typed, written or on PPT • Contains exactly four statements: three true statements and one false statement • False statement should not be obvious • Paragraph should be included that explains why the fib is false	• Uses either a cardboard trifold board (of any size) or a standard sheet of paper folded to create three columns • Clear and visible overall title and section headings • Uses graphics, charts, images etc (can be hand drawn or printed) • Neat and legible Thoroughly meets the content	• Size is at least 8”x 8”x 12” • Parts of model must be labeled • Should be in scale when appropriate • Must include a title card • Name should be permanently written on model • Manipulate the pieces of the model to demonstrate the concept • Provide verbal explanations of what you are demonstrating • Provide verbal explanations of all required content When demonstrating in front of class-provide time to answer class questions