Learning to Research using FCE LTER Data

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1 Unit Plan

State Benchmarks

- SC.H.1.4.1 Investigations are conducted to explore new phenomena, to check on previous results, to test how well a theory predicts, and to compare different theories.
- SC.H.1.4.2 From time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.
- SC.H.1.4.4 Scientists in any one research group tend to see things alike and that therefore scientific teams are expected to seek out the possible sources of bias in the design of their investigations and in their data analysis.
- SC.G.2.4.2 Changes in a component of an ecosystem will have unpredictable effects on the entire system but that the components of the system tend to react in a way that will restore the ecosystem to its original condition. SC.G.2.4.3 Understands how genetic variation of offspring contributes to population control in an environment and that natural selection ensures that those who are best adapted to their surroundings survive to reproduce. SC.G.2.4.4 The world ecosystems are shaped by physical factors that limit their productivity.
- SC.G.1.4.3 The chemical elements that make up the molecules of living things are combined and recombined in different ways.

Objectives

- Select and analyze data to understand the changes in the Everglades ecosystem throughout time.
- Compare and contrast theories that explain natural and man-made long term ecological variations.
- Gather evidence of how the Everglades Restoration Project has impacted the Everglade National Park and surrounding environments.
- Learn how to collect, organize, tabulate and interpret online quantitative data.
- Become proficient in navigating, searching the Internet, exchanging information through the use of Email, summarizing and presenting their findings on a class web site.
- Develop critical thinking and science process skills that are essential for scientific research as evidenced by note taking, proper keeping of a research log and developing of the experimental design.
- Display responsibility, self-management, mutual respect and consensus building in a collaborative group setting.
- Interact and communicate effectively with scientists to discuss their findings from a real world scientific investigation (Ask a Scientist).

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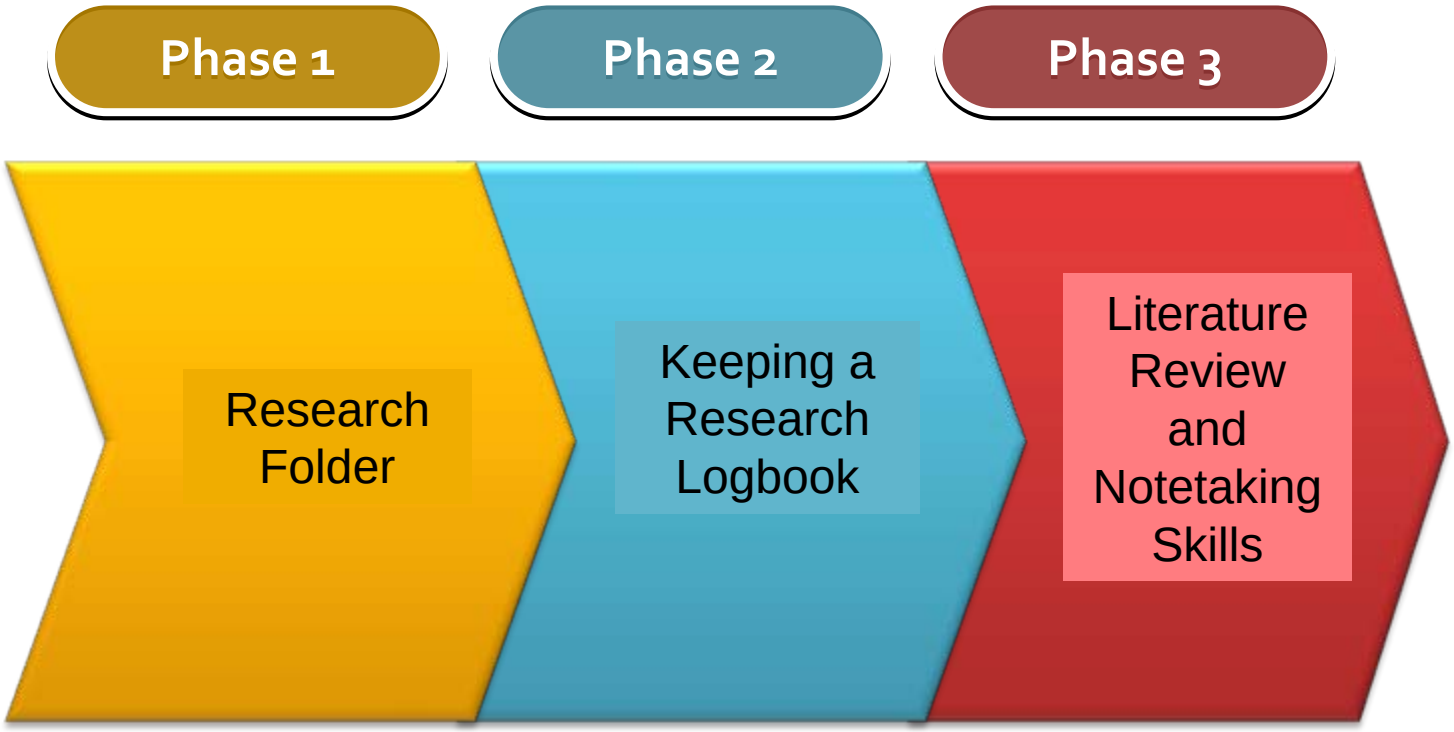
2 Preparing to do Research

Preparing to do Research



Preparing to do Research

Phase 1

Research Folder

Preparing to do Research

Phase 2

Keeping a Research Logbook

How to Keep a Logbook

- Use a hard bound notebook
- Label with your information (phone number of E-mail).
- Organize with table of contents and tabs for sections
- Date every single entry
- Keep entries brief.
- Use during all the phases of your research project.
- Secure all loose items with tape or staples
- Types of Entries
  - Project deadlines and schedules
  - Daily notes, ideas and reflections on project
  - Library and Internet searches
  - Book references
  - Contact information
  - Experimental setup
  - Procedures and proposed changes
  - Sources and prices of supplies
  - Detailed observations
  - Diagrams, maps, sketches
  - Data charts graphs calculations
  - Notes from advisors

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Preparing to do Research

Phase 3

Literature Review and Notetaking Skills

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3 Navigating the FCE LTER Site

An Introduction to Our Research (Phase I, 2000-2006)

In the Everglades, two estuarine ecotones, the Shark River Slough/Gulf of Mexico ecotone and the Taylor Slough/Florida Bay ecotone, are of interest to FCE-LTER researchers. These ecotones are characterized by higher rates of primary productivity – or the amount of living material produced when nutrients and energy from sunlight are used to create plant tissues – than upstream marshes, which are naturally oligotrophic, or nutrient poor.

Scientists once thought that the presence of phosphorus-rich marine water in these ecotones was responsible for the high rates of productivity. They also thought that the Taylor Slough/Florida Bay estuarine ecotone would have reduced rates of productivity compared to the Shark River Slough/Gulf of Mexico ecotone since Florida Bay's low tidal action would inhibit marine phosphorus from entering the ecotone. Phase I of the FCE-LTER project investigated these hypotheses.

FCE-LTER researchers also examined how changes in freshwater quality and quantity – resulting from Everglades restoration projects, sea level rise due to climate change, and disturbances, such as hurricanes and fires – may alter patterns of productivity in these regions. Investigating patterns of primary production was the task of one of seven FCE-LTER working groups.

Working Groups

Phase I of the FCE-LTER project was divided into seven working groups. Each working group focused on a set of key research questions and/or major processes that were being quantified.

- Primary Production
- Soils and Organic Matter Accumulation
- Trophic Dynamics and Community Structure
- Nutrients and Dissolved Organic Matter
- Ecological and Social Modeling
- Abiotic Factors

Current Working Groups

The current phase of the FCE LTER program is organized into 5 working groups and 3 cross-cutting themes. Each working group or cross-cutting theme focuses on a set of key research questions and/or major processes being quantified by the LTER program.

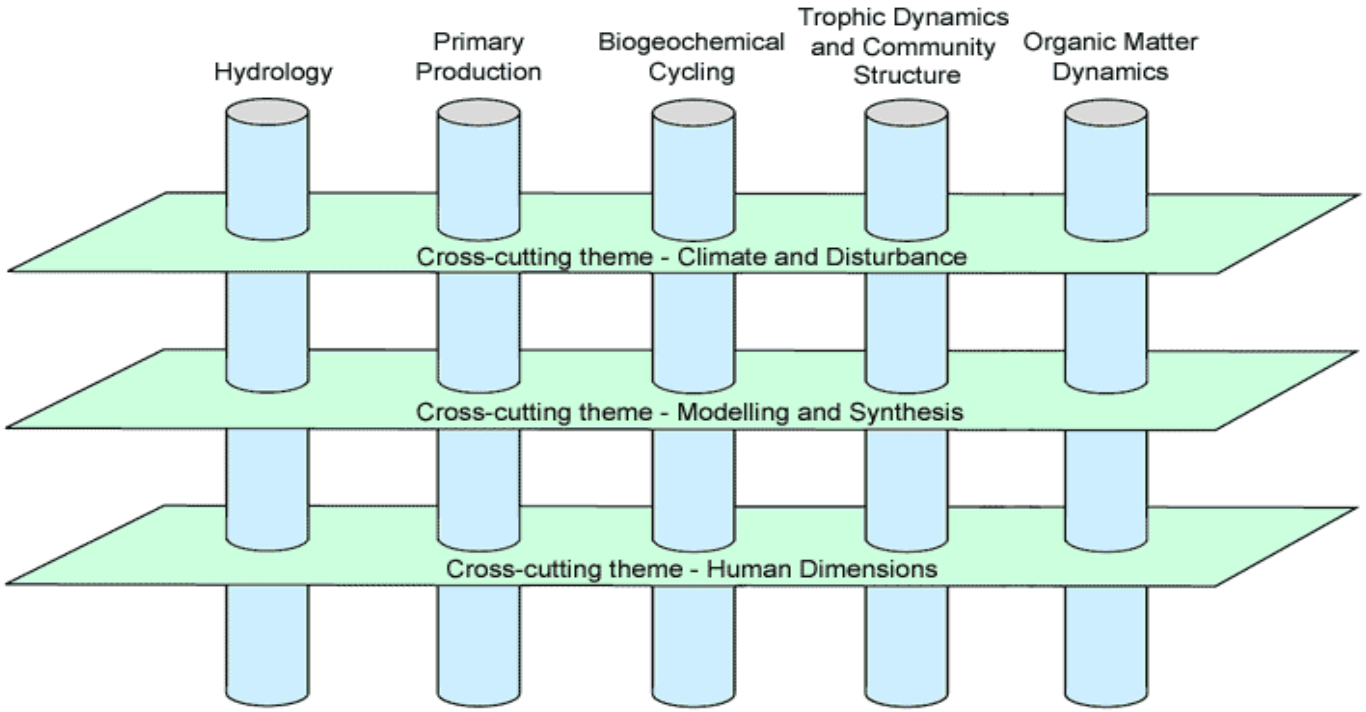
Working Groups

- Primary Production
- Trophic Dynamics and Community Structure
- Biogeochemical Cycling
- Organic Matter Dynamics
- Hydrology

Cross-cutting Themes

- Modeling and Synthesis
- Human Dimensions
- Climate and Disturbance

View Former Working Groups (FCE I, 2000-2006)



Activities

1. Story Map of Research Areas
2. Using FCE LTER Maps
3. Writing Scientific Nomenclature

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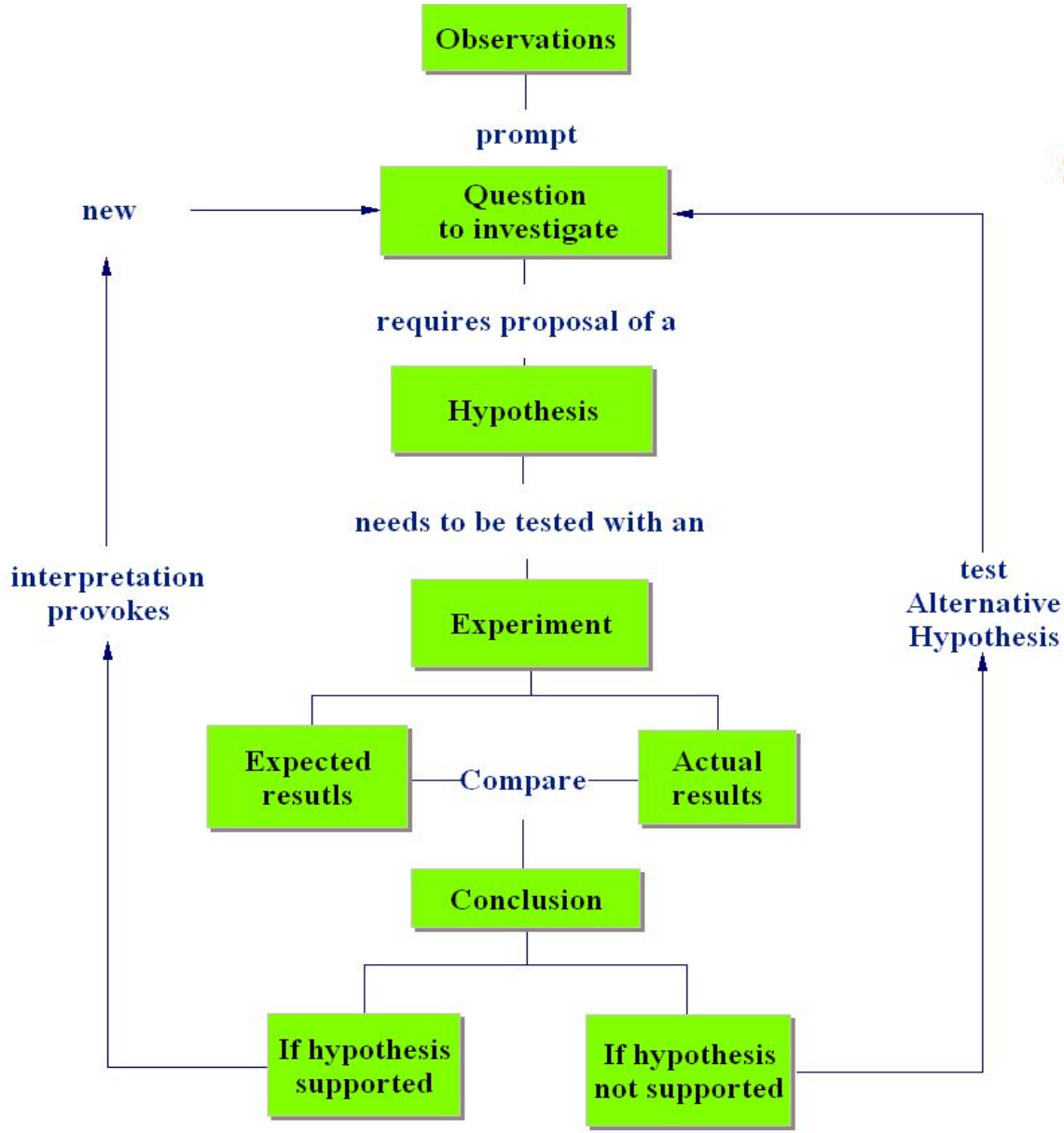
4 Sci. Method and Exp. Design

STEPS TO THE SCIENTIFIC METHOD



Instructions:

Click on each of the steps to propose what you will investigate.

FCE LTER

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Title: The Effect of Various Amounts of Oil on the Number of Popped Corn Kernels

Hypothesis: If the amount of oil placed on the popcorn is increased, then the number of popped kernels will increase.

Independent Variable: Amount of oil **(unit of measure:** milliliters **)**

Levels of Independent Variable, Including the Control

0 (control)	10 ml	20 ml	30 ml	40 ml

Repeated trials for each of the IV levels

3 times	3 times	3 times	3 times	3 times

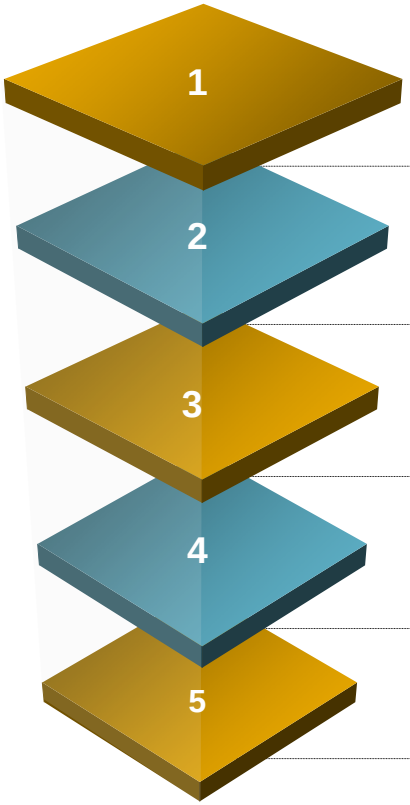
Dependent Variable: number of popped kernels **(unit of measure:** kernels **)**

Potential Variable	*Level held constant*	*Potential Variable*	*Level held constant*
Popcorn brand	**"Pop-Rite"**	**type of oil**	**corn**
# kernels	**100 kernels**	**popper brand**	**"Cor-Pop"**
age of popcorn	**fresh**	**heating time**	**2 minutes**
brand of oil	**"Pazol"**	**cooking time**	**4 minutes**

Safety Considerations:

Popcorn should be poured on a surface and allowed to cool before handling.

Manipulating Datasets



- Select Data set by Theme/Region/Type
- Review Data Set Summary Table
- Fill out Data User Agreement
- Download and save as an ASC II text file.
- Import data as comma delimited

FCE Core Data Table of Contents (DTOC)

The FCE Core Data Table of Contents (DTOC) is a searchable catalog of FCE Core data sets which includes links to metadata and data (if available). The Thematic search lets you search by themes and keywords. The Advanced Search has more options, including searching by originator, working group, keywords, themes, and spatial queries.

Thematic Search

Advanced Search | Display All Current FCE Datasets | FCE Sampling Attributes

Select a Theme:

+ Atmospheric Carbon Flux
+ Climate
+ Consumer Biomass & Composition
+ Consumer Movements
+ Dissolved Organic Carbon
+ Human Dimensions
+ Hydrology
+ Landscape Patterns
+ Microbial Production & Composition
+ Organic Matter Characterization
+ Plant Nutrients & Isotopes
+ Producer Biomass
+ Producer Composition
+ Producer Productivity
+ Sea Level & Encroachment
+ Soil Accretion & Movement
+ Soil Chemistry
+ Storm Disturbance
− Water Physical & Chemical Properties

Select a Region:

- Marsh
- Mangrove/Ecotone
- Marine

Selected theme/region/type:

Keywords (Title, abstract, keywords, and/or dataset originator):

Search | Reset form

Search Results

120 data sets found

FCE Data Set Summary Table

Search FCE Data Sets

FCE Data Set ID Number:	FCE_Everglades_ClimDB_data_v10
FCE Workgroup:	Abiotic Factors
Originator(s):	Linda Powell, National Climatic Data Center NOAA, (powell@fiu.edu, http://ncdc.info@noaa.gov,)
Title:	NOAA Daily Surface Meteorologic Data at NCDC Everglades Station, South Florida from January 1931 to August 31, 2007
Data Set metadata:	View metadata as: HTML (recommended) Text XML
Public file download:	FCE_Everglades_ClimDB_data_v10.txt (Public access, ASCII text) Personalized access to FCE_Everglades_ClimDB_data_v10 .txt (an option for FCE personnel - more information)
Private FCE file download:	None Available
Type of Data Set:	Physical
Time Period of Content:	01-Jan-1931 to 31-Aug-2007
Abstract:	The National Climatic Data Center's (NOAA) daily mean, maximum, and minimum air temperatures and daily precipitation collected at Everglades Station (Coop ID# 082850)
Locations:	Lat/Lon: 25°51'N / 81°23'W

Column description:

COLUMN	NAME	UNITS	TYPE
1	LTER Site	None	Text
2	Station	None	Text
3	Date	YYYYMMDD	DateTime
4	Daily_AirTemp_Mean_C	degrees C	Integer
5	Flag_Daily_AirTemp_Mean_C	None	Text

FCE LTER Data User Agreement

FCE LTER Data Set ID Number: FCE_Everglades_ClimDB_data_v10

*Indicates required fields

*Your name: *Your e-mail:

*Your affiliation (name of organization or university):

*Are you affiliated with the FCE LTER? yes no

Your mailing address:

Line 1:

Line 2:

Line 3:

Line 4:

*How do you plan to use the data?
(Please check all that apply. You can add additional information in the box below.)

Education (K-12) University research

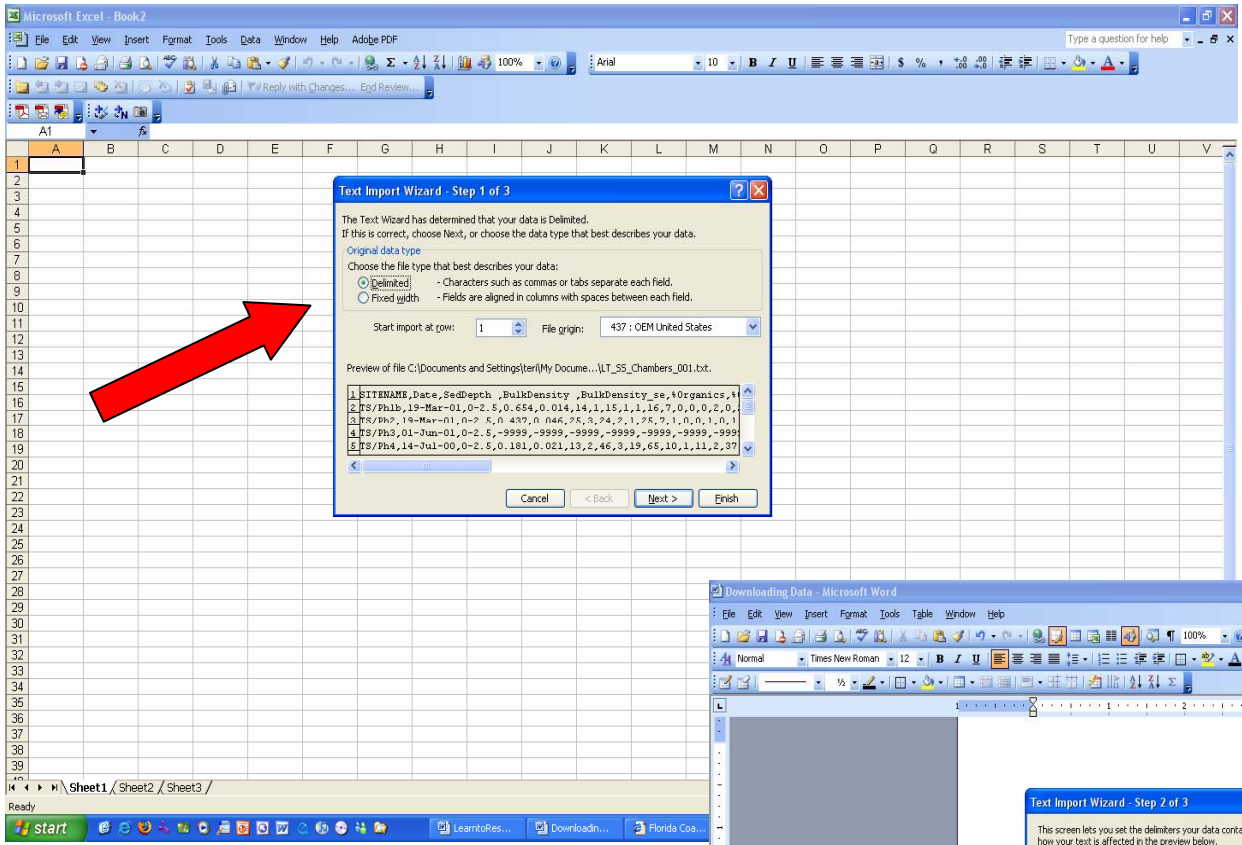
Government research Other research Other (*please describe below)

Note: A copy of this information will be sent via e-mail to the data set contact(s) and to the FCE Information Manager if you click the 'I agree to abide by the license agreement' button and download a data set. You will receive a copy of the data user agreement via e-mail.

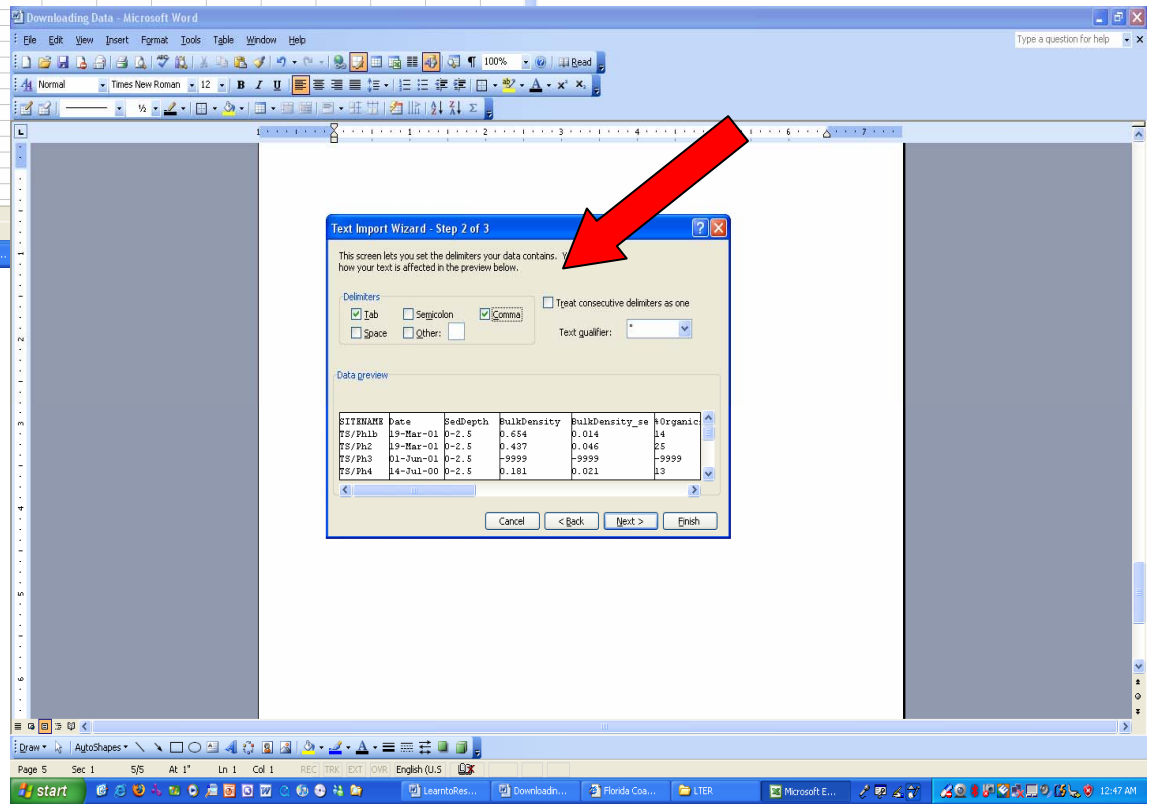
Unlocked data sets available via the FCE LTER Program web site are freely available and can be downloaded for academic, research, or professional purposes subject to the following user terms:

1. User must notify the designated FCE researcher when any future work based on or derived from FCE data is published.

Import Data



Comma Delimited



Manipulating FCE LTER Data Sets

Student Name _____ Period _____ Date _____

1. Practice manipulating data sets with the Excel program. Click on the link to the ASCII text file titled ST_PP_Frankovich_004 which has been downloaded for you from the FCE LTER and complete steps 8-11 (see above) to convert the text file to a spreadsheet file.
2. Now, answer the following questions about your dataset.
   Note: You will need to sort data to complete this activity. Under the **View** menu find **Toolbars**; make sure that the **Basic** toolbar is selected (√). On the Basic toolbar locate the **sort symbols**:

   A↓ Z **to sort in ascending order** A↑ Z **to sort in descending order**

   To sort your data highlight the column that you wish to sort and then select the appropriate symbol to sort (ascending or descending).Since the data in this column sort is associated to other variables, you should select **Expand the selection** when prompted and then click **Sort**. You can now analyze the data across the variables (columns). To unsort the data simply click on **Edit** and **Undo Sort**.

   a. What is the Sitename for this data? _____
   b. What is the range of harvest dates for this data? _____
   c. The range for mean leaf length is _____ and for mean leaf width the range is _____.
   d. The leaf length turnover rate ranges from _____.
   e. The smallest leaf length turnover rates occur during which harvest date? _____
   f. The average of the Areal Growth cm2_m2_d is (round to 1 digit after the decimal point): _____ (Hint: Highlight the numbers in the column then click on the

Contents

5 Preparing for Science Fair

How to do a Science Fair Project

Instructions:
Click on each section below to learn about how to prepare a Science Fair Project

Title

Problem Statement

Hypothesis and Variables

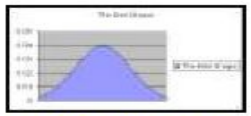
Materials

Abstract

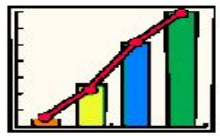
ACTIVITIES AND RESPIRATORY RATES

Activity	Mike and Maria's Average Respiratory Rate
Sitting quietly	17 Breaths/minute
Walking	25 Breaths/minute
Running	32 Breaths/minute

Data Table



Statistics



Graph

Photos

Maps

Diagrams

Procedures

Results and Discussion

Conclusions and Applications

References

Background Information

Log Book

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Data Tables

Data tables are useful for organizing the information collected during the experiment and provide the evidence to draw meaningful conclusions. Although there are no universal rules for constructing data tables, there are some general guidelines that can be followed to help organize data to make it easier to interpret. Supplementary data tables and graphs may be placed in the written report.

Table and Data Organization

1. Organize the **independent variable data** (usually from smallest to largest value).
2. Record the organized **independent variable** in the left column.
3. Document the corresponding data for the **dependent variable** in the next column.
4. List the **repeated trials** in subdivisions under the corresponding dependent variable.
5. Calculate and record the **derived quantities** such as averages in the farthest column to the right.

Titles, Headings and Footnotes

In large part, the clarity of the table depends on the text contained in the titles, headings and notes. These areas should convey the purpose of the table, define the variables or any terms used and explain any special codes or scales. Each table should be numbered and the title should make specific references to the variables of the study.

Table ____ (Table number) The Effect of _____ (Independent Variable) on the ____ (Dependent Variable)

Subtitle of Independent Variable (units)	Subtitle of Dependent Variable (units)				Derived Quantity
	Trials				
	1	2	3	etc.	

Formatting for the Display Board:

When report contains more than one table, the formatting should be consistent across tables: same fonts, heading style, and borders. Use the largest font possible to make the table readable. Use lines or shadowing per section to separate data as necessary.

Thank You !