A Thematic Construction:
A Framework For Literacy, Curriculum & Content

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Thematic Title:
Critter Quarters and Ecological Habitats: How Ecologists Utilize Algebra, Business Communications, and Instructional Technology.

Content Areas:
Science – Biology (population ecology, community ecology, ecosystems, conservation)
Math - Algebra (graphing, slope-intercept, plotting points, best fit)
Instructional Technology (IT) – WebQuest (resources and research)
Business and Information Technology (BIT) – Business Communications (oral and written communication)

Grade Level and Population:
Nine and Tenth Grade General Studies, Elective Students

Time Frame and Delivery Plans:
Six weeks, Collaborative Instructional Model

Purpose: A thematic unit allows students to relate topics across content areas and see their relevance to other courses as well as in a real-world context. This provides instruction through which complementary content is explored through context in an authentic, relevant, applicable, and collaborative enterprise by students and teachers alike.

Rationale: This thematic will address the interrelationship of organisms and their environments. The collaboration will include the courses of biology, algebra, business communications, and instructional technology. Biology will serve as the focal point of the collaboration. Algebra will explore graphing concepts which are readily used by scientists. Business and Information Technology will apply written and oral communication skills, which are necessary for a student's professional development. Through this, students will learn how to properly display information to communicate ideas. Instructional Technology will instruct students on how to use valuable web-based resources, which is essential in conducting biological research.

Goals:

Content: In biology, students will study the interrelationship between organisms and their environments.

In algebra, students will understand, interpret, and construct visual graphic organizers to display research data in terms of math expectations.

In BIT, students will understand the importance of oral and written clarity in terms of audience needs and expectations.

In IT, students will use WebQuest as an effective search strategy and problem-solving skill.

Intent: In biology, students will understand that there is a direct human connection to all organisms and environments. As a consequence, we affect our natural world in both positive and negative ways on a daily basis.

In math, students will be given a sense of possible meaningful numerical connections in terms of real life problem solving.

In BIT, students will gain self-confidence as readers, writers, speakers, and listeners.

In IT, students will learn how to make use of web-based information as valuable resources needed for academic and vocational purposes.

Knowledge: In biology, students will become familiar with the language and vocabulary used in the science profession so as to communicate understanding; students will have an enhanced understanding of local flora and fauna; students will have an increased awareness of local and global environmental issues; students will understand that organisms are open systems.

In math, students will become familiar with mathematical terminology and applications.

In BIT, students will develop effective written and oral communication skills.

In IT, students will be able to identify the terms associated with information technology and the Internet, compare and contrast the use of different networks, identify, locate, and evaluate appropriate web-based resources, and understand network etiquette and ethnics.

Skills: In biology, students will be able to engage in environmental discussions founded on a basic level of biological understanding; students will be able to identify biomes and ecosystem classifications; students will be able to plot and interpret graphs; and given an illustration of a food chain and a food web, students will be able to describe each organism as a producer (autotroph), consumer (primary/second order), or decomposer.

In math, students will be able to plot points, draw a best fit line, and interpret data on a graph or chart in terms of mathematical expectations and know how they can be applied to real life situations.

In BIT, students will demonstrate knowledge through the planning and composing of written and oral communication in the forms of written reports and oral presentations.

In IT, students will be able to assess telecommunication tools for information sharing, to apply search engines for seeking information, to use web-based databases for data collection, and to apply multimedia tools to compose a qualified WebQuest report.

Objectives:

Quantitative:

Science

1) Students will recognize the biotic and abiotic factors that affect organisms and their environments (nonliving chemical and physical factors, living factors).
2) Students will understand organism distribution factors (dispersal, behavior and habitat selection, biotic factors including predation, disease, and competition, and abiotic factors including temperature, water, sunlight, wind, rocks, and soil).
3) Students will be familiar with the classification system of biomes (freshwater, wetlands, estuaries, marine communities, intertidal zones, oceanic pelagic, coral reefs, benthos, tropical forest, savanna, desert, chaparral, temperate grassland, temperate deciduous forest, coniferous forest, and tundra).
4) Students will appreciate the basic concepts in population ecology (density and dispersion, demography, life histories, population growth, population limiting factors, and human population growth).
5) Students will appreciate the basic concepts in community ecology (interspecific interactions, trophic structure, keystone/dominant species, community structure, disturbance and ecological succession, and biogeographical factors affecting biodiversity).
6) Students will appreciate the basic concepts of ecosystem ecology (trophic levels, primary production, secondary production, chemical cycling, and human impacts).
7) Students will be aware of human impacts on the environment and current environmental concerns (biodiversity crisis, benefits of diversity and ecosystem services, threats to biodiversity such as bottleneck affect).

Math

1) Students will be able to plot points on the xy-plane.
2) Students will be able to determine the slope of a line.
3) Students will understand how the x- and y- axis can represent different variables.

4) Students will be able to graph an equation in slope intercept form.

BIT

1) Students will be able to explain and understand oral and nonverbal communication.
2) Students will be able to describe anticipating and profiling the audience for a message.
3) Students will be able to describe the basics of a business report including the functions, patterns, formats, and writing style.
4) Students will describe various ways of communicating through technology.
5) Students will be able to plan and organize a written report using the 3 X 3 writing process. The process includes: 1. analyze the problem and purpose, 2. anticipate the audience and issues, and 3. prepare a work plan.
6) Students will be able to use multimedia software to plan, organize, and build a presentation.
7) Students will be able to deliver an effective written and/or oral presentation to an audience.
8) Students will be able to demonstrate the ability to work in groups or teams effectively.

IT

1) Students will be able to use Internet search engines such as Google.
2) Students will be able to use valuable information sources such as community libraries.
3) Students will be able to apply multimedia software tools to design and develop WebQuest projects.

Qualitative*:*

Individual

1) Students will further enhance literacy through oral and written engagements.
2) Students will develop and maintain appropriate communication skills.

Group(s) / Class

1) Students will understand the importance and effectiveness of collaboration.
2) Students will learn to communicate effectively in teams to achieve a common goal.

Standards of Learning and/or Discipline Based Professional Standards:

BIOLOGY:
Obtained from the Virginia Department of Education's Standards of Learning
http://www.pen.k12.va.us/go/Sols/science.html

Standard BIO.8 b, c, d, e

The student will investigate and understand how populations change through time. Key concepts include

b) how genetic variation, reproductive strategies, and environmental pressures impact the survival of populations;
c) how natural selection leads to adaptations;
d) emergence of new species; and
e) scientific explanations for biological evolution.

Essential Understandings:

- Genetic mutations and variety produced by sexual reproduction allow for diversity within a given population.
- Many factors can cause a change in a gene over time.
- Depending on the rate of adaptation, the rate of reproduction, and the environmental factors present, structural adaptations may take millions of years to develop.

Essential Knowledge and Skills:

Knowledge

- Populations are groups of interbreeding individuals that live in the same place at the same time and compete with each other for food, water, shelter, and mates.
- Populations produce more offspring than the environment can support.
- Organisms with certain genetic variations will be favored to survive and pass their variations on to the next generation.
- The unequal ability of individuals to survive and reproduce leads to the gradual change in a population, generation after generation over many generations.
- Through his observations made in the Galapagos Islands, Charles Darwin formulated a theory of how species change over time, called natural selection.
- Natural selection is governed by the principles of genetics. The change frequency of a gene in a given population leads to a change in a population and may result in the emergence of a new species.
- Natural selection operates on populations over many generations.
- Mutations are important in how populations change over time because they result in genetic changes to the gene pool.

- Adaptations sometimes arise in response to environmental pressures, for example, the development of antibiotic resistance in bacterial populations, morphological changes in the peppered moth population, and the development of pesticide resistance in insect populations.
- Stephen Jay Gould's idea of *punctuated equilibrium* proposes that organisms may undergo rapid (in geologic time) bursts of speciation followed by long periods of time unchanged. This view is in contrast to the traditional evolutionary view of gradual and continuous change.

Skills

- Differentiate between relative and absolute dating based on fossils in biological evolution.

Standard BIO.9 a, b, c, d, e
Obtained from the Virginia Department of Education's Standards of Learning

The students will investigate and understand dynamic equilibria within populations, communities, and ecosystems. Key concepts include

a) Interactions within and among populations including carrying capacities, limiting factors, and growth curves.
b) Nutrient cycling and energy flow through ecosystems; and
c) Succession patterns in ecosystems.
d) The effects of natural events and human activities on ecosystems; and
e) Analysis of the flora, fauna, and microorganisms of Virginia ecosystems including the Chesapeake Bay and its tributaries.

Essential Understandings:

- As any population of organisms grows, it is held in check by interactions among a variety of biotic and abiotic factors.
- Ecosystems demonstrate an exchange of energy and nutrients among inhabiting organisms.
- The gradual change in an ecosystem that occurs as communities slowly replace one another is known as ecological succession.
- As the human population increases, so does the human impact on the environment.
- Investigations of local ecosystems provide opportunities for students to enhance their understanding and stimulate their interest in local environmental issues by applying ecological principles in the field.

Essential Knowledge and Skills:

Knowledge

- A community is a collection of interacting populations.
- Population growth curves exhibit many characteristics, such as initial growth stage, exponential growth, steady state, decline, and extinction.

- Limiting factors are the components of the environment that restrict the growth of populations.
- Carrying capacity is the number of organisms that can be supported by the resources in an ecosystem.
- Abiotic factors are the nonliving elements in an ecosystem, such as temperature, moisture, air, salinity, and pH. Biotic factors are all the living organisms that inhabit the environment, including predators, food sources, and competitors.
- *Symbiosis* is a close and permanent relationship between organisms of two different species. Examples include mutualism, commensalism, and parasitism.
- An *ecosystem* consists of all the interacting species and the abiotic environment in a given geographic area.
- Nutrients cycle through an ecosystem. The most common examples of such nutrients include carbon, oxygen, nitrogen, and water.
- Flow of energy occurs between trophic levels in all ecosystems can be depicted as follows: food chain, food web, pyramid of energy, pyramid of biomass, pyramid of numbers.
- *Ecological succession* is a series of changes in a community in which new populations of organisms gradually replace existing ones.
- A climax community occurs when succession slows down and a stable community is established. The climax community is made up of organisms that are successful at competing for resources in a given environment. The climax community in most of Virginia is a deciduous oak-hickory (hardwood) forest.
- Human activities, such as reducing the amount of forest cover, increasing the amount and variety of chemicals released into the atmosphere, and intensive farming, have changed the Earth's land, oceans, and atmosphere.
- Some of these changes have decreased the capacity of the environment to support some life forms.
- Identify and describe an ecosystem in terms of the following: effects of biotic and abiotic components, examples of interdependence, evidence of human influences, energy flow and nutrient cycling, diversity analysis, and ecological succession.

Skills

- Graph and interpret a population growth curve.
- Given an illustration of a food chain and a food web, describe each organism as a producer (autotroph), consumer (primary/second order), or decomposer.
- Observe and identify flora and fauna in a local community, using field guides and dichotomous keys for identifying and describing organisms that characterize the local ecosystem.

MATH:
Obtained from the Virginia Department of Education's Standards of Learning
http://www.pen.k12.va.us/go/Sols/math.html#AlgebraI

A.5 The student will analyze a given set of data for the existence of a pattern, represent the pattern algebraically and graphically, if possible, and determine if the relation

is a function.

A.6 The student will select, justify, and apply an appropriate technique to graph a linear function in two variables. Techniques will include slope-intercept, x- and y-intercepts, graphing by transformation, and the use of the graphing calculator.

A.7 The student will determine the slope of a line when given an equation of the line, the graph of the line, or two points on the line. Slope will be described as rate of change and will be positive, negative, zero, or undefined. The graphing calculator will be used to investigate the effect of changes in the slope on the graph of the line.

A.8 The student will write an equation of a line when given the graph of the line, two points on the line, or the slope and a point on the line.

A.9 The student will solve systems of two linear equations in two variables, both algebraically and graphically, and apply these techniques to solve practical problems. Graphing calculators will be used as both a primary tool of solution and to confirm an algebraic solution.

A.17 The student will, given a set of data points, write an equation for a line of best fit, using the median fit method, and use the equation to make predictions.

Business and Information Technology:
Obtained from the Virginia Department of Education's Standards of Learning
http://www.pen.k12.va.us/VDOE/Instruction/CTE/be/

Business Management Course
Duty Area: Developing Communication Skills for Business (Focus-6 weeks)

Related Math SOL

A.4: The student will use matrices to organize and manipulate data, including matrix addition, subtraction, and scalar multiplication. Data will arise from business, industrial, and consumer situations.

AII.19: The student will collect and analyze data to make predictions and solve practical problems. Graphing calculators will be used to investigate scatterplots and to determine the equation for a curve of best fit. Models will include linear, quadratic, exponential, and logarithmic functions.

Duty Area: Developing Multimedia Presentations
-Task: Plan and build a multimedia presentation.
-Task: Enhance a multimedia presentation with specialized features (color, transitions, backgrounds, graphs, charts)
-Task: Deliver a multimedia presentation according to the principles of effective communication.

Related Math SOL

COM.8: The student will design and implement computer graphics, which will include topics appropriate for the available programming environment as well as student background. Students will use graphics as an end in itself, as an enhancement to other output, and as a vehicle for reinforcing programming techniques.

Related Science SOL

ES.1 The student will plan and conduct investigations in which

a. volume, area, mass, elapsed time, direction, temperature, pressure, distance, density, and changes in elevation/depth are calculated utilizing the most appropriate tools;
b. technologies including computers, probeware, and global positioning systems (GPS), are used to collect, analyze, and report data and to demonstrate concepts and simulate experimental conditions;
c. scales, diagrams, maps, charts, graphs, tables, and profiles are constructed and interpreted;
d. variables are manipulated with repeated trials; and
e. a scientific viewpoint is constructed and defended (the nature of science).

BIO.1 The student will plan and conduct investigations in which

a. observations of living organisms are recorded in the lab and in the field;
b. hypotheses are formulated based on direct observations and information from the scientific literature;
c. variables are defined and investigations are designed to test hypotheses;
d. graphing and arithmetic calculations are used as tools in data analysis;
e. conclusions are formed based on recorded quantitative and qualitative data;
f. sources of error inherent in experimental design are identified and discussed;
g. validity of data is determined;
h. chemicals and equipment are used in a safe manner;
i. appropriate technology, including computers, graphing calculators, and probeware, is used for gathering and analyzing data and communicating results;
j. research utilizes scientific literature;
k. differentiation is made between a scientific hypothesis and theory;
l. alternative scientific explanations and models are recognized and analyzed; and
m. a scientific viewpoint is constructed and defended (the nature of science).

CH.1 The student will investigate and understand that experiments in which variables are measured, analyzed, and evaluated produce observations and verifiable data. Key concepts include

a. designated laboratory techniques;
b. safe use of chemicals and equipment;
c. proper response to emergency situations;
d. manipulation of multiple variables using repeated trials;
e. accurate recording, organization, and analysis of data through repeated trials;
f. mathematical and procedural error analysis;
g. mathematical manipulations (SI units, scientific notation, linear equations, graphing, ratio and proportion, significant digits, dimensional analysis);
h. use of appropriate technology including computers, graphing calculators, and probeware, for gathering data and communicating results; and
i. construction and defense of a scientific viewpoint (the nature of science).

Instructional Technology
Obtained from the Virginia Department of Education's Standards of Learning
http://www.pen.k12.va.us/VDOE/Superintendent/Sols/home.shtml

The Computer/Technology Standards in grades nine through twelve require that technology continues to be integrated across the curriculum. The goal is that students in these grades achieve a higher level of mastery in the application of technology in their learning. The following standards identify essential skills for the student's appropriate use of existing and emerging technology tools for communication, productivity, management, research, problem-solving, and decision making.

C/T12.1 The Student will demonstrate a basic understanding of fundamental computer operations and concepts.

- Successfully operate a multimedia computer system with related peripheral devices.
- Demonstrate touch-typing skills in computer use.
- Use terminology related to computers and technology appropriately in written and oral communications.
- Describe how imaging devices may be used with computer systems.
- Describe how computers may be connected to form a telecommunication network.
- Analyze and solve simple hardware and software problems
- Identify new and emerging technologies.

C/T12.2 The student will use application software to accomplish a variety of learning tasks.

- Use advanced features of word processing, desktop publishing, graphics programs, and utilities in learning activities.
- Use spreadsheets for analyzing, organizing and displaying numeric data graphically.
- Design and manipulate databases and generate customized reports.
- Use features of applications that integrate word processing, database, spreadsheet, telecommunication, and graphics.

- Identify, select, and integrate video and digital images in varying formats for creating multi-media presentations, publications and/or other products.
- Select, evaluate, and use appropriate technology for research and data collection.
- Apply specific-purpose electronic devices (such as, a graphing calculator, scientific probeware, or multi-function keyboards) in appropriate content areas.

C/T12.3 The student will develop skills in the use of telecommunications networks.

Use local, wide area and worldwide network communication systems to access, analyze, interpret, and synthesize information.

- Compare and contrast the use of local area networks, wide area networks and worldwide networks.
- Access and use telecommunications tools and resources for information sharing, remote information access and retrieval, and multi-media/hypermedia publishing.
- Demonstrate an understanding of the concepts of broadcast instruction, audio/video conferencing, and other distance learning applications.
- Explain legal, personal safety, network etiquette, and ethical behaviors regarding the use of technology and information.

C/T12.4 The student will demonstrate skill in the selection and use of appropriate technologies to gather, process and analyze data and to report information related to an investigation.

- Design and use a wide range of effective search strategies to acquire information.
- Use a wide variety of electronic media and databases to search for and retrieve information.
- Evaluate the usefulness, appropriateness, currency, and reliability of acquired information.
- Select appropriate technology for communicating information for an intended purpose and audience.
- Utilize a variety of media and resources in collaboration with peers, experts, and other to design a learning activity and/or presentation.
- Appropriately cite electronic resources in gathering information.
- Apply Copyright and Fair Use Guidelines in reporting information.

Assessments:
Traditional evaluation expectations will include tests, quizzes, reports, narratives, and exams. Alternative/additional assessments for this thematic include:

1. Nature, Numeracy, and Technology Portfolio

- The purpose of the combined content area portfolio is to help students make the connections between and among science, math, and instructional technology. Through this portfolio, students will keep a log of their activities and reflections throughout the "Critter Quarters and Ecological Habitats" thematic unit. Teachers will be able to continuously evaluate student participation by assessing individual portfolios. Students will be able to refer to their individual portfolios to conveniently review learned concepts and connections.

Student expectations include:

Science

- Students will keep a detailed log of all in-class observations and connections, including that learned in lab and during videos.
- Students will append all lecture and lab hand-outs, with reflections.
- Students will attach chosen weekly journal/newspaper clippings that pertain to current environmental issues and/or conducted ecological research, with reflections.
- Students will reflect on questions prompted by the teacher and/or students.
    - Questions include: How can concepts be applied to real-world biological research? What skills from the other content courses are needed to explore a certain biological question?

Math

- Students will keep a log of and key formulas and concepts.
- Students will write any connections from prior knowledge to the formulas and concepts.
- Students will include one example problem from each formula or concept.
- Students will find an example of how this formula or concept can be used in other areas.

IT

- The portfolio will record the results of the instructional sets and engagements in class.
- The portfolio will include students' reflection on their newly gained skills in class.
- The portfolio will include students' rough and detailed WebQuest project plans.
- The portfolio will include parts of students' final WebQuest projects.

2. PowerPoint Presentation

- The PowerPoint presentation affords students the opportunity to effectively apply their written and oral communication skills to express gained knowledge throughout their thematic unit. Collaboratively using their Project Journals and Nature, Numeracy, and Technology Portfolios, students will create and complete a PowerPoint Presentation. The presentation will enhance students speaking, writing, and listening skills. Teachers will evaluate student's (team) performance based on the effective delivery of the presentation to the class. After the presentations are complete, students will complete a self-assessment to be included in the overall evaluation and will be recorded in the Project Journal.

Student expectations include:

- Working collectively to create and deliver the presentation.
- Using written and oral communication skills gained to effectively deliver their presentation.
- Presenting their PowerPoint presentation in their business class and on community/parent day at the conclusion of the thematic unit.

3. BIT Project Journal

- The purpose of the Project Journal is to allow students to record class notes, use in class activities and assignments, and serve as a guide when creating and developing their shared PowerPoint presentation. It will also be used for students to reflect on class discussions and assignments, and raise any questions students may have. Students will be evaluated based on their completeness of the Project Journal and, the teacher will have a better understanding of what the students are learning based on the reflections.

Student expectations include:
- Using the project journal to record all group activities and assignments.
- Keeping the project journal in an organized order.
- Using journal to complete an outline for their presentation.
- Recording weekly reflections and any questions students have, based on what they learned from class discussions, class activities, and group work, etc.

4. Reflection Brochette

A brochette is a mini pamphlet. It will capture and instill the major objectives-features of the primary enterprises prompted by the course objectives. It will authentically and creatively express in summative fashion the fundamental principles applicable to more successfully addressing the study of content matters as an issue of literacy. It will successfully demonstrate an authentic technology medium applicable to a number of 'concerned' audiences. It will provide a model of an assessment measure applicable to student learning enterprises.

The brochette will be an 8.5 x 11 tri-folded 6-sided document addressing the following:

Page 1: Student's name, photo, and summary of what the brochette is all about.

Page 2: Ecological Principles

-A creative review of the major concepts learned throughout biology class as chosen by the student based on particular interest or relevance.

Page 3: Mathematical Principles

- A creative review of the major concepts learned throughout math class as chosen by the student based on particular interest or relevance.

Page 4: Communication and Technology Principles

-A creative review of the major concepts learned throughout business class as chosen by the student based on particular interest or relevance.

Page 5: Instructional Technology Principles

- A creative review of the major concepts learned throughout instructional technology class as chosen by the student based on particular interest or relevance.

Page 6: Reflections

-A statement regarding the thoughts on the experience and how students will use gained knowledge in the future. Students will also need to discuss how the courses were integrated and connected to emphasize shared concepts.

Instructional Resources:

Textbooks
Use: Textbooks will be used as a resource only

1) Campbell, Neil A. and J. B. Reece. Biology, 6th Ed., Benjamin Cummings Publishing Company: San Francisco, CA. 2002.

2) Guffey, M. E. (2003). Business Communication: Process and Product (4th ed.). Mason, OH: South-Western.

3) Rutkosky, Nita. (2002). *The Benchmark Series Microsoft Office XP*. St. Paul, MN: Paradigm Publishing Inc.

4) ProjectWILD K-12 Curriculum & Activity Guide. 2004. Published by the Council for Environmental Education.

5) *Algebra 1*. Glencoe/McGraw Hill

Professional Consultants
Use: Consultants will be used to allow students to experience how classroom knowledge is applicable in the community around them. Consultants will present content-related material and will answer student questions.

1) Wildlife biologist, VA Department of Game and Inland Fisheries
2) Wildlife/Fisheries Professor, Virginia Tech
3) Business Communication Professor, Radford University

Games
Use: Games will be used to reinforce what is being taught in the classroom.

1) Battleship Game Boards by Milton Bradley

DVD
Use: DVDs will be used as a visual supplement to presented course material, and directly address the ecological habitats of the world and species interactions.

1) The Living Planet – A Portrait of the Earth. 2004 Narrated by Sir David Attenborough. Time Warner Productions.

2) The Life of Birds. 2002. Narrated by Sir David Attenborough. BBC Video.

3) The Life of Mammals. 2002. Narrated by Sir David Attenborough. BBC Video.

Magazines/Journals
Use: Magazines and journals will be used to relate course content material with actual scientific research.

1) Ecology: Published by the Ecological Society of America.
2) Conservation Biology**:** Published by Blackwell Publishing.
3) Journal of Vocational and Technical Education

Technology
Use: Websites will be used as research resources while technology will provide the medium for which students explore communication concepts.

1) Microsoft Office XP Software

2) Virginia Department of Education Website – CTE
http://www.pen.k12.va.us/VDOE/Instruction/CTE/be/

3) Campbell, Neil A. and J. B. Reece. Biology, 6th Ed., Benjamin Cummings Publishing Company: San Francisco, CA. 2002. (CD)

4) The WebQuest Page
By the Educational Technology Department at San Diego State University
http://webquest.sdsu.edu/
It will be used for WebQuest introduction purpose.

5) Everything WebQuest
By ozline & Tom March
http://www.ozline.com/learning/index.htm
It will be used for teaching reference purpose.

Instructional Sets and Instructional Engagements:
Unless otherwise noted, all instructional sets and engagement activities are taken from:

Stephens, E. C. and Brown, J. E. A Handbook of Content Literacy Strategies: 125 Practical Reading and Writing Ideas. 2nd Edition. Christopher-Gordon Publishers, Inc., Norwood, Massachusetts, 2005.

IS #1: An Assessment on Biological Diversity and Bottleneck Genes

The purpose of this instructional set is to initiate a class discussion on biological diversity and bottleneck genes. To support this discussion, information will be recorded and displayed for the whole class to access. This instructional set lays the foundation for the instructional engagement to follow the next day. This instructional set is based upon ProjectWILD's "Bottleneck Genes" activity (p. 172).

Using the KDL strategy (What we already know, Need to know, and Learned), students will first discuss in small groups what they already know regarding the concepts of biological diversity and bottleneck genes. Students will then record group contributions under the (K) column on our class recording sheet. Second, students will discuss what they need to know about these topics in order to simulate a gene-pool analysis of a population of black-footed ferrets. Students will record all class discussions under the (N) column. Lastly, students will read a provided handout that gives general background information about the concepts of biological diversity and bottleneck genes with the purpose of discovering information to answer the questions generated. As a class, students will then record what they have learned about biological diversity and bottleneck genes in their Nature, Numeracy, and Technology Portfolio (Stephens and Brown Ch. 5 P. 84).

Student expectations include being able to do the following at the conclusion of the KDL activity: (1) explain the importance of biological diversity, (2) describe the 3 types of diversity, (3) explain the concept of "survival of the fittest", and (4) describe what a "bottleneck" is.

Rationale: This KDL activity will provide an interactive way to initiate class discussion regarding the concepts of biological diversity and bottleneck genes. During this exercise, students will be laying the foundation for the following day's instructional engagement (ProjectWILD Bottleneck Genes), making sure they have all necessary background information.

IE#1: ProjectWILD Bottleneck Genes

The purpose of this instructional engagement is for students to (1) describe biodiversity as it relates to natural systems, species, or individuals, (2) articulate that genetic diversity is essential to the health of a species because it facilitates adaptation to change and provides sources for new genetic material, (3) explain how natural selection favors individuals with traits adapted to their environments, and (4) explain that for a wildlife population to sustain itself, there must be enough habitat to support a healthy-sized population that will carry a healthy-sized gene diversity.

Using ProjectWILD's "Bottleneck Genes" activity (p. 172), students will simulate the gene-pool analysis of a population of black-footed ferrets using colored beads.

Student expectations include each group being able to successfully (1) fill out the "Black-Footed Ferret Bottleneck Scenario" handout and (2) present their results to the class and answer further complementary questions such as "how does gene diversity help protect a population?" and "why would a smaller population have a higher risk of being eliminated than a large population?".

Rationale: This activity provides a hands-on approach to learning the importance of diversity in animal populations. By using black-footed ferrets, these concepts are applied to the "real world" where wildlife biologists and other researchers must consider these same issues while managing populations.

IS#2: WebQuest Idea Map

The purpose of this instructional set is to prompt student discussion regarding the possible building blocks of a qualified WebQuest according to their prior knowledge. It serves as a start of the WebQuest analysis activity.

Using the *Idea Maps* Strategy students will discuss the components of WebQuest, identify them, draw them in maps and point out the relationship among them. When Idea Maps have been completed, they will be put in the Nature, Numeracy, and Technology Portfolio. (Chapter 6, P. 123&124)

Student expectations include being able to do the following based on the *Idea Maps* activity: 1) name the important components of a WebQuest; 2) describe the relationship among the components; 3) draft a rough structure plan of their own ecology WebQuest projects.

Rationale: An *idea map* presents a graphic representation of a concept. It focuses on a central idea and examines related components. Students can organize their understanding of WebQuest components by using visual images and incorporating it into their knowledge base.

IE#2: WebQuest Data Chart

The purpose of this instructional engagement is to help students organize their WebQuest data so that a basic plan can be prepared in chart form.

Using the *Data Chart* strategy, students will make their own data chart according to the WebQuest components, read data resources of an ecology topic using their data chart for note taking, and reorganize the chart for the preparation of their ecology WebQuest projects.

Student expectations include being able to do the following based on the *Data Chart* activity: 1) create a data chart including WebQuest components and ecology topics; 2) record the related data which they have found in the Internet into the data chart; 3) draft a rough content plan of

their ecology WebQuest projects. (Chapter 6, P. 125-126). The completed data chart will then be included in students' Nature, Numeracy, and Technology Portfolios.

Rationale: A *Data chart* provides students with an effective note-taking device. It also serves as a format for organizing information from several resources. A completed data chart aids students in seeing relationships among major concepts and getting an overall picture of the topic.

IS#3: Ask Your Partner about Ecology

The purpose of this instructional set is to help students form the mode of data content estimating and problem solving. It serves as a preparation of WebQuest information collecting mode.

Using the *Ask Your Partner* strategy, each group of students will review an article regarding ecology that the teacher found online. They will read the title, discuss it and respond to two questions: (1) What do I already know about this topic? and (2) What do I think it will be about? The groups will then read the article with the purpose of collecting information and practicing problem-solving skills. Lastly, they will present their answers to the class, showing proof or evidence from their reading to substantiate their answers. (Chapter 6, P. 141&142)

Students expectations include being able to do the following based on the *Ask Your Partner* activity: 1) estimate data content; 2) analyze and record data content; 3) discuss and provide answers. Completed assignments will be included in students' Nature, Numeracy, and Technology Portfolios.

Ask Your Partner is a strategy that helps students improve comprehension and self-monitoring. It provides a guide for students to estimate data content and conduct data analysis in their ecology WebQuest project.

IE#3: Examine Ecology News: Internet

The purpose of the instructional engagement is to prepare students to make effective use of Internet data resources for their ecology WebQuest project.

Using the *Examining the News: Internet* strategy each group of students will create a viewing log and collect five internet news sources. Each group member is responsible for checking all five sources and completing the viewing log. Group members will then share their findings and prepare a comparative report on their experiences. The reports are presented to the class and used as a springboard for discussion and analysis. (Chapter 7, P. 194&195)

Students expectations include being able to do the following based on the *Examining the News: Internet* activity: 1) create a viewing log; 2) check online information sources; 3) discuss the results; 4) prepare and present a comparative report. Completed reports will be included in students' Nature, Numeracy, and Technology Portfolio.

Examining the News: Internet is a strategy that equips students with a way of utilizing literacy skills in information collection. It prompts students to become critical users of the Internet resources.

IS#4: Pick a Topic

Purpose:
This instructional set is designed to initiate student discussion on learned ecological principles. Using the "Brainstorming" strategy (S&B Ch. 5, P. 60-61), students will team up with their group members and begin brainstorming for ideas on important ecological principles for later consideration for their written and oral presentation. The students will record their ideas in their Project Journal (S & B, ch7, pg 200). Note: the teams will have already been determined. Once the teams have brainstormed for ideas they will then share their ideas with the class. The class will provide input to generate more ideas and class discussion. The teams will need to have their topic approved by the science and business teachers.

Rationale:
This activity allows students to activate their prior knowledge for specific ideas on a topic for their presentation. The teacher will assess student's communication skills during the group activity and help clear up any content misconceptions.

IE#4: Project Communication

Purpose:
This instructional engagement is to prompt the teams to begin their planning, organizing, and generating ideas for their presentation. Using their Project Journal and the "Clustering" strategy (S&B, Ch. 5, P. 82), students will begin arranging and structuring concepts around their topic and expanding on them as much as possible. Once finished, they will start organizing their information as to how they would like it to fit into their presentation. The teams will be encouraged to research and ask questions to fill any gaps in their information. The students will later be expected to give a multimedia presentation (PowerPoint) in business class.

Rationale:
This activity will allow students to collaborate in a hands-on learning approach to plan and organize their presentations. They will use what they have learned in both their science and business classes to successfully complete this project. Students will learn to use their written and oral communication skills effectively and understand the importance and responsibility of working as a team.

IS#5: What is Communication?

Purpose:
This instructional set is designed to initiate class discussion on effective written and oral communication skills while delivering a presentation. Using the "Free Writing" strategy (S& B Ch. 5 P. 99), students will spend five minutes writing about communication skills in their Project Journal (S&B Ch. 7, P. 200). On the board will be a sentence the students will finish and

continue with (i.e. "A good written and oral presentation includes…"). Once students have completed the free write they will be asked to share their entry with the class to generate a class discussion.

Rationale:
This activity allows students to generate their ideas about communication and examine what they already know about it. The activity also allows students to raise questions or concerns regarding communication (written and/or oral). The teacher will be able to view what the students know prior to completing the next activity.

IE#5: Good and Bad Communication

Purpose:
This instructional engagement is to prompt students understanding of effective written and oral communication skills. Given two different types of business reports to read and two video recorded presentations to view, students will work in a partnership to generate a list of pros and cons of each report and presentation. Once finished students will discuss each presentation with their partner and then share their conclusions with the class. Students will take the last five minutes of class to write a reflection in their Project Journal on the activity (i.e. new learning, ideas regarding their upcoming presentation, etc.). The students will be expected to use gained knowledge when delivering their multimedia presentation in business class on important learned ecological concepts.

Rationale:
This activity will permit students to see the difference between a good and effective presentation versus a bad and ineffective presentation. They will understand the importance of communicating to an audience. Students will have an understanding of what a presentation should look and sound like, therefore giving them self-confidence in delivering their presentations.

IS#6: Discovering the xy-plane

The purpose of this instructional set is to introduce the topic of plotting points on the xy-plane. Additionally, it will show how this concept can be applied to other areas.

Using the "Ask your Partner" strategy, students will write down what they already know about plotting points and what they expect it will be about. They will then read the section on the xy-plane and find proof of their prior knowledge or questions. They will then ask each other questions regarding concepts they are not familiar with (S&B Ch. 5 P. 141-142).

Student expectations include gaining a background on how the xy-plane is used and understand how other students can help them. They will also be able to understand ways in which they can apply these variables, such as to substitute time and growth for x and y.

Rationale: The "Ask Your Partner" strategy allows students to call on their prior knowledge to begin discussion on a topic. This will give students a connection for later graphing of functions on the plane.

IE#6: Battleship Math

The purpose of this instructional engagement is to familiarize students with coordinates on the xy-plane.

Using the "Battleship and Coordinate System" activity students will play battleship, using a game board designed to look like the xy-plane, against a partner. They will have to use xy-coordinates to try and sink their opponent's ships. (http://www.lessonplanspage.com/MathBattleshipPlotCoordinates79.htm)

Student expectations include each student learning to (1) recognize the x-axis from the y-axis (2) write a point on the plane in (x, y) form (3) plot points given in (x, y) form.

Rationale: The "Battleship and Coordinate System" activity is a fun approach to educate students on how the xy-plane works. The concepts learned in this game will enable students to later use the xy-plane to graph equations. This activity allows students to learn with minimal cognitive effort.

Lesson Plan #1: Algebra (IS#6)
Plotting Points

Purpose: The purpose of this lesson is to introduce students to the concepts of graphing on the xy-plane.

Rationale: Students will gain an understanding of how plotting points can be applied to many content areas. This will serve to give students a connection for later graphing functions on the plane.

Goals:

Content: Understand, interpret, and construct visual graphic organizers to display research data in terms of math expectations.

Intent: Give students a sense of possible meaningful numerical connections in terms of real life problem-solving.

Knowledge: Students should become familiar with mathematical terms and learn how to apply them.

Skills: Students should be able to plot points and interpret data on a graph or chart in terms of mathematical expectations and know how they can be applied to real life situations.

Objectives

- Students will recognize the x-axis from the y-axis.
- Students will be able to choose a point on the xy-plane and write it in (x, y) form.
- Students will be able to plot points given in (x, y) form.

SOLs Adressed:

A.5 The student will analyze a given set of data for the existence of a pattern, represent the pattern algebraically and graphically, if possible, and determine if the relation is a function.

Procedures:

1) "Ask Your Partner" strategy
- First students will be asked to write everything they know about the xy-plane and how it works. They will write what their expectations are for the unit and include any questions they may have.
- Next they will read the section on plotting points and find proof of their prior knowledge and questions.
- Students will then pair up with a partner and share what they have learned

2) Explanation of plotting points on the xy-plane
- Go over specific examples of how to plot points.
- Explain that x and y represent different variables such as time and growth and show how graphs are used in other areas (i.e., plotting an animal's reproductive success and age on an ecological graph).

3) Battleship game
- Students will pair up with a partner and be given a battleship game board with an x and y-axis on them.
- Teacher will explain that the game is just like battleship, only you have to sink your opponent's ships by calling out points on the plane.
- Students will play one full game.

Assessment:

- Assessment will be done by walking around the classroom to see if the students are playing the game using mathematical strategies along with a few homework problems on plotting points.

Resources:

- Battleship game boards
- Text: Algebra 1, Glencoe/McGraw Hill

Lesson Plan #2 – Biology (IS#1)
Project WILD Bottleneck Genes

Purpose: The purpose of this lesson plan is to provide a hands-on activity that explores the concepts of biological diversity and bottleneck genes, based on an actual animal population.

Rationale: This activity will provide students with the opportunity to think critically and it will show students how classroom knowledge is applicable and useful in real-world applications.

Goals:

Content: Students will examine the concepts of biological diversity and bottleneck genes. This will provide students with an example of a current environmental issue. The concepts could be used in the PowerPoint presentation developed in their business course.

Intent: Students will understand that the concepts of biological diversity and bottleneck genes learned in the classroom can be applied to actual animal populations. Thus, students should begin to critically think about how school content can have value and application in their lives outside of the classroom.

Knowledge: Students will better understand how environmental situations affect organism populations, depending upon their existing gene pool and consequent adaptations. Students will better understand why certain populations are more successful than other, depending upon genetic diversity.

Skills: Students will be able to identify successful organism populations. Students will be able to hypothesize if a population will be successful based on its gene pool.

Objectives:

The student will demonstrate the ability to:

- Think critically about concepts explored in class
- Read and comprehend information provided on the handout
- Carry out their own experiments as scientists do

SOLs Addressed:

Standard BIO.8 b, c, e

The student will investigate and understand how populations change through time. Key concepts include:

b) how genetic variation, reproductive strategies, and environmental pressures impact the survival of populations;
c) how natural selection leads to adaptations;
e) scientific explanations for biological evolution.

Essential Understandings:

- Genetic mutations and variety produced by sexual reproduction allow for diversity within a given population.
- Many factors can cause a change in a gene over time.
- Depending on the rate of adaptation, the rate of reproduction, and the environmental factors present, structural adaptations may take millions of years to develop.

Essential Knowledge and Skills:

Knowledge

- Populations produce more offspring than the environment can support.
- Organisms with certain genetic variations will be favored to survive and pass their variations on to the next generation.
- The unequal ability of individuals to survive and reproduce leads to the gradual change in a population, generation after generation over many generations.
- Natural selection is governed by the principles of genetics. The change frequency of a gene in a given population leads to a change in a population and may result in the emergence of a new species.
- Mutations are important in how populations change over time because they result in genetic changes to the gene pool.
- Adaptations sometimes arise in response to environmental pressures, for example, the development of antibiotic resistance in bacterial populations, morphological changes in the peppered moth population, and the development of pesticide resistance in insect populations.

Activity Description:

Students will (1) describe biodiversity as it relates to natural systems, species, or individuals, (2) articulate that genetic diversity is essential to the health of a species because it facilitates adaptation to change and provides sources for new genetic material, (3) explain how natural selection favors individuals with traits adapted to their environments, and (4) explain that for a wildlife population to sustain itself, there must be enough habitat to support a healthy-sized population that will carry a healthy-sized gene diversity. Using ProjectWILD's "Bottleneck Genes" activity (p. 172), students will simulate the gene-pool analysis of a population of black-footed ferrets using colored beads.

Materials:

One large, long-necked glass bottle; eight sets of the Key to Environmental Situations cards (copy and cut) on p. 175 of ProjectWILD book; eight copies of the Key to Genetic

Characteristics on p. 174 of ProjectWILD book; eight copies of the Black-Footed Ferret Bottleneck Scenario worksheet on page 176 of ProjectWILD book; bead of each of the following colors: yellow, black, orange, pink, blue, green, purple, red, and white.

Procedure/Method of Instruction:

1) Divide the class into groups of two to four students. Give each group a copy of the Key to Genetic Characteristics, a Key to Environmental Situations, and a Black-Footed Ferret Bottleneck Scenario.
2) Review the terms "genetic diversity," "biodiversity," and "population bottlenecks" as found in the Background hand-out.
3) Review the gene color key. Discuss the benefits of the different attributes.
4) Place all of the genes (colored beads) into the glass bottle. Shake it gently to mix the colors. Explain to students that the genes will be distributed randomly, as would be found in a real population.
5) Distribute a small handful of beads to each group. These beads represent the genes available in the population of black-footed ferrets for each group. Have the students match their genes to the gene key and circle the colors or genes on the Key to Genetic Characteristics for their ferret population (Please note that all students must be given a small amount of beads to ensure that they do not receive all nine colors).
6) Have the students choose five Environmental Situation Cards randomly from the deck.
7) Students will work with the Black-Footed Ferret Bottleneck Scenario worksheet to complete the following:
    a) Calculate the genetic diversity in their population.
    b) Describe their population according to its current genetic makeup.
    c) Develop and write a prediction for their population in the environmental situation they have chosen for approximately a 1-year period. Then address the following:
        - Is the population genetically equipped to survive in this environment? How well or how poorly?
        - How does a high or low percentage of genetic diversity affect the population's survival?
        - How do random changes in the environment affect the population? (Remind students that for this question they are concerned with how many beads of each they have.)

Rationale:

This activity provides a hands-on approach to learning the importance of diversity in animal populations. By using black-footed ferrets, these concepts are applied to the "real world" where wildlife biologists and other researchers must consider these same issues when managing populations.

Assessment:

Students will need to write a reflection on this activity in their Nature, Numeracy, and Technology Portfolio which shows that they grasp the major purposes and concepts of the

instructional set. They will also need to append the "bottleneck genes" handout.

Each of the groups should present their results to the class. The class will then further discuss the following questions:

a. Why does gene diversity help protect a population?
b. Why would a smaller population have a higher risk of being eliminated than a large population?
c. Why do you think smaller populations have a harder time surviving disease? (Inbreeding depletes the gene pool that provides a variety of traits. If there are fewer genes that help an animal fight off disease, the population becomes more susceptible to pathogens).

Resources:

ProjectWILD K-12 Curriculum & Activity Guide. 2004. Published by the Council for Environmental Education.

A Game Frame: "Jeopardy"
Students will engage in a game of "Jeopardy" throughout the six weeks as an integral part of reviewing thematic concepts. Teachers will provide questions for the first game but students will then be responsible for submitting questions and answers on a weekly basis (one student group assigned the task each week). This will allow students to contribute to their own learning. One final game will be played at the conclusion of their thematic unit at the final celebration. This game serves as an entertaining way to review concepts learned in each of the content areas. This game is based on the popular television game show, with two teams playing each other instead of two individuals.

Equipment:
Stopwatch, question board, 2 dry erase boards w/ markers and erasers, 2 response cards

Objective:
Each team answers as many questions correctly as possible, with 1 classmate or teacher's aid being delegated the task of keeping score.

Preparation:
The class is randomly divided into two teams and each team decides on a respective group name. The teacher (moderator) flips a coin to decide who goes first. The first team to go chooses a category and a question (based on number of points given if answered correctly). If answered correctly within the 10-second time limit, the team wins the point(s). If not, the second team gets a chance to answer the question. Teams do lose points for incorrect answers. For the rest of the game, the team who answered a previous question correctly chooses the question to follow. There are two rounds before Final Jeopardy. Final Jeopardy provides the same question to both teams, who write down answers and points wagered.

To Win:
The team who accumulates the most points following Final Jeopardy wins the game.

Questions and Answers:

Biology

Questions	Answers
A group of individuals of a single species that simultaneously occupy the same general area.	Population
The maximum population size that can be supported by the available resources.	Carrying Capacity
The model of population growth that describes an idealized population in an unlimited environment.	Exponential
Age-specific summary of the survival pattern of a population.	Life Table
The study of factors that affect the growth	Demography

and decline of populations.	
Organisms in trophic levels above primary producers, which directly or indirectly depend on photosynthetic output of primary producers.	Heterotrophs
Toxins become more concentrated in successive trophic levels of a food web.	Biological magnification
Percentage of production transferred from one trophic level to the next.	Trophic efficiency
Nutrient that must be added for production to increase.	Limiting nutrient
Largely affects the rates of nutrient cycling	Decomposition
Organisms in trophic levels above primary producers, which directly or indirectly depend on photosynthetic output of primary producers.	Heterotrophs

Math

Category: Reading and plotting points

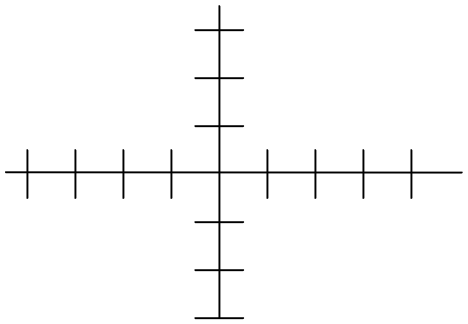
1) Organize the table into ordered pairs.

Time (years)	Growth (thousands)
1	7
2	8
3	10

2) Plot the point (-2, 4) on a graph.

3) Locate the x and y-axis

4) Plot the point (4, -3)



5) construct a table for (3,4), (5,1), (7, 12) with X = time and Y = growth

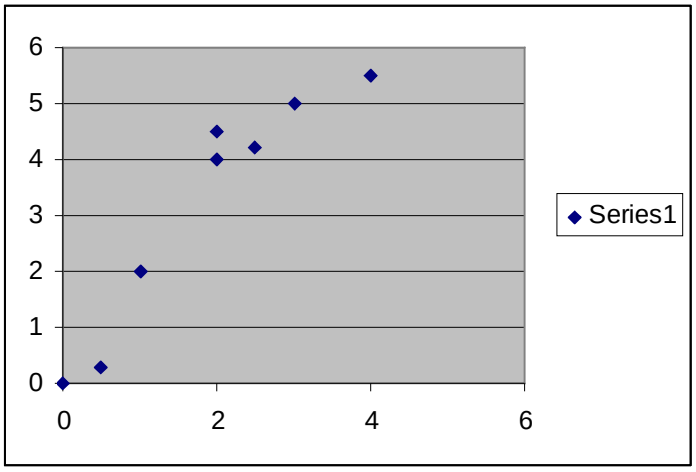
Category: Graphs with lines and slopes

1) find the slope of y = 3x – 14

2) construct a line with the slope of -2

3) what is the slope of a line that goes from point (0, 0) to (6, 3)

4) Draw a best fit line



5) Put 2x + 4y = 6 into slope-intercept form.

BIT

Questions	Answers
The transmission of meaning so that a receiver understands a message as intended by the sender.	Communication
_____ means that team members agree without examining alternative or considering contingency plans.	Groupthink
Prewriting, writing, and revising are parts of what writing process	3 X 3 writing process
The most effective way to communication is.	Face-to-face communication
All unwritten and unspoken messages, both intentional and unintentional.	Non-verbal communication
Spelling, grammar, punctuation, and formats are done when _____ a document	Proof-reading
When preparing an effective oral presentation you must know two things.	Purpose and audience
The best oral presentations focus on a few ___	Key ideas

Multimedia elements include video features, animation, and _____.	Sound
Are most useful to solve problems that require people with different skills to work together.	Self-directed teams

IT

Questions	**Answers**
What are the 3 types of websites?	Commercial, noncommercial, and individual websites
What are the 3 types of WebQuests?	Those incorporating non-computer activities, those beginning by describing real-world problems, and those dealing with sensitive topics
What are 2 levels of WebQuests?	Short-term and long-term WebQuest
What are some benefits of WebQuest?	Motivation, authenticity, thinking skills, and cooperative learning
What are the elements of composing a good WebQuest?	Introduction, task, process, resources, evaluation and conclusion
What are the basic requirements for WebQuest?	A computer and internet connection
How can you find WebQuest online?	By visiting WebQuest sites or using search engines to find WebQuest
List some specific WebQuest sites.	Bernie Dodge's The WebQuest Page, Tom March's WebQuests for Learning, or Kathy Schrock's WebQuests in Our Future: The Teacher's Role in Cyberspace
What are the thinking skills that a longer term WebQuest activity might require?	Comparing, classifying, inducing, deducing, analyzing errors, constructing support, abstraction, and analyzing perspectives
How can you find resources for a WebQuest?	By using print resources to find relevant sites, search engines and directories, and using websites

Diversity Addressed:

Disposition

We live in an increasingly diverse world and must be committed to fostering an atmosphere that is respectful and welcoming of various dispositions. We can all benefit from having a variety of backgrounds and experiences in the classroom. It is everyone's responsibility to encourage equality and collaboration. This thematic will accommodate lesser disposed learners by providing a variety of learning options, including visual, oral, and hands-on teaching methods. In addition, students will have numerous opportunities to share their strengths and weaknesses with each other as collaboration will be an important component of this unit. Working together, students will create a PowerPoint presentation and brochette that they can all be proud of.

Gender

Male students still largely dominate the fields of science, math, business, and technology. However, gender diversity is extremely important. Thus, we resolve to provide all students with an equal opportunity to become actively engaged in all content material. This will include making sure both males and females have valuable roles within project groups and that a variety of materials will be used to ensure content is relevant to all students. To further address the gender issue, all students will be required to find a professional in the field of math, science, instructional technology, or business communications who is of their respective gender. The students will share with one another what each professional has accomplished and what obstacles they might have faced.

Parent-Community (Gov't./Bus./Indust.) Engagements:

Students learn best when they can both demonstrate learned knowledge and skills outside of the classroom and when they can see how their learning applies to the community they live in. Hence, student-community collaboration is essential to relevant and long-lasting learning.

In order to involve the community, a letter will be sent home to all parents inviting them to come speak to the class about their careers in math, science, instructional technology, or business communications. In addition, science professionals from the community will be invited to class to discuss how they apply the specific knowledge and skills we are learning to their careers. At the conclusion of the thematic, we will celebrate by inviting parents, other students, faculty and administrators, and other community members into our class to look at student Nature, Numeracy, and Technology Portfolios, Project Journals, Brochettes, observe PowerPoint presentations given by students regarding learned concepts. Students will also play a final game of Jeopardy for all to watch. Light refreshments will be provided by the local grocery.

Vocabulary Engagements #1 - Boggle

Students will use the game "Boggle" to create their own vocabulary lists in each content area. This includes taking the randomly selected letters and generating as many words as possible in a given amount of time. This game will be played throughout the thematic unit.

Vocabulary Engagement #2 – Asterisking

The purpose and goal of this vocabulary engagement is see how much students know about a certain topic or subject. By splitting the class into two teams, each team will take turns trying to fill in the six blanks on the board. They may start from the top or bottom. They may only guess one letter at a time. If they guess a correct letter they may continue trying to guess another correct letter and they may also try and guess the word. Each person on the team will take a turn until everyone has gone; this process continues until the game is finished. Once all six blanks are filled in, the teacher may choose to branch off on a word(s) and continue, filling in the entire asterisk. Each student is expected to participate in the Asterisking game.

Rationale: This activity will provide an interactive way to initiate a new topic in class. It will allow the teacher to discover how much the students already know about the topic and allows students to strengthen their vocabulary. This game will be played throughout the thematic unit to introduce a new topic and build on students' vocabulary.
Source: Dr. Graham (2005).

Vocabulary Engagement #3 – Word Chains

The purpose of this vocabulary engagement is to activate students to interact with, make associations, and organize their new vocabulary words in their subject areas.

Using the *Word Chains* strategy, students will be given a group of words. They will explore how the words are related or connected to each other and develop a word chain that demonstrates this relationship. (S&B Chapter 6, P. 133&134)

Student expectations include being able to do the following based on the *Word Chains* activity: 1) explore the relationship between the words; 2) develop a word chain to demonstrate the relationship; 3) share their word chains with the rest of the class; 4) record the result in their Nature, Numeracy, and Technology Portfolios.

Rationale: In most content areas, new vocabulary words are related or connected to other new words or to previously learned words. A word chain provides students with a structure to explore relationship among words, to understand how they can be used, and to remember their meanings.

Vocabulary Engagement #4 – Four square vocabulary approach

The purpose of this vocabulary engagement is to prompt student thinking about an unfamiliar vocabulary word and to brainstorm related words in order to gain an understanding of its meaning. Using the "Four-Square Vocabulary Approach", students will write a vocabulary word

in square one. They will then think of other words which may compose or be derived from the word. Asking students to come up with other words will enable them to make connections with words that they already know and scaffold their learning. Students will write examples and non-examples along with a definition in their own words of the given vocabulary word. This enables students to think of a word in terms of their own experiences. Connection with personal experiences allows for better understanding (S&B Ch. 5, P. 95-96).

Vocabulary & Morphology:

Specialized Vocabulary Words

Biodiversity (bī'ō-dĭ-vûr'sĭ-tē)
The variability among living organisms on the earth, including the variability within and between species and within and between ecosystems.
Bio / divers / it / y
Bio (life) + diverse (different, dissimilar) + it (pronoun) + y (full of, state of being)
Diverse, biodiversification, diversity, diversify

Ecology (ĭ-kŏl'ə-jē)
A branch of science concerned with the interrelationship of organisms and their environments
Eco/ logy
Eco (habitat, environment) + logy (science)
Ecological, gynecology, paleoecology, synecology, radioecology

Biology (bī-ŏl'ə-jē)
The science of life and of living organisms, including their structure, function, growth, origin, evolution, and distribution. It includes botany and zoology and all their subdivisions.
Bio/ logy
Bio (the study of) + logy (science)
Biological, astrobiology, aerobiology, chronobiology

Coefficient (kO-&-'fi-sh&nt)
Any of the factors of a product considered in relation to a specific factor.
Co / efficient
com (with) + efficiens (efficient)
Efficient, cooperation

Monomial (mä-'nO-mE-&l)
A mathematical expression consisting of a single term.
Mono / nomin / al
mono (one) + nomin (name) + al
Polynomial, monorail, monogram

Quadrant ('kwä-dr&nt)
Any of the four parts into which a plane is divided by rectangular coordinate axes lying in that plane.

Quadr / ant
quadri (four) + ant
Quadrilateral, quadriceps

Intranet [intrə′net]
A network based on TCP/IP protocols (an internet) belonging to an organization, usually a corporation, accessible only by the organization's members, employees, or others with authorization.
Intra / net
intra (inside) + net (fabric)
Intragroup, network, netmeeting

Extranet [ekstrə′net]
A buzzword that refers to an intranet that is partially accessible to authorized outsiders.
Extra / net
extra (outside) + net (fabric)
Extracurriculum, extraneous, internet

Kinesic (k&-'nE-siks)
A systematic study of the relationship between nonlinguistic body motions (as blushes, shrugs, or eye movement) and communication.
Kines / ic
Kines (rare) + ic (or, like)
Kinesics

Proxemics (präk-'sE-miks)
The study of the distance individuals maintain between each other in social interaction and its significance. Study of personal space
prox / em / ic / s
prox (in or of) + em (same, as) ic (or, like) +s (verb suffix)
Proximate, Proximal, Proximity

Empathy ('em-p&-thE)
Understanding and feeling from the point of view of the other person, believed in interactionism to lie at the heart of development of self and society.
Em / path / y
Em (same, as) + path (route) + y (state, full of)
Empathic, Sympathy, Empathize

Special Vocabulary Words

Signal (sĭg'nəl)
A behavior that causes a change in behavior in another animal
Sign / al
Sign (motion or bodily action by which a thought is expressed or a command is made known) + al (relating to, suitable to)

Sign, signalize, signally, signalment

Population (pŏp'yə-lā'shən)
A group of individuals of one species that live in a particular geographic area
Populat / ion
Populate (supply with inhabitants) + ion (noun suffix)
Subpopulation, overpopulation, populous, populate,

Endemic (ĕn-dĕm'ĭk)
Native to a particular country or people
En / dem / ic
En (in or on) + dem (population) + ic (or, like)
Demography, demographic

Intercept ("in-t&r-'sept)
The x or y-coordinate of a point where a line, curve, or surface intersects the x or y-axis.
Inter / cept
Inter (among) + capere (to take, seize)
Interception, intercede, reception

Equation (i-'kwA-zh&n)
A usually formal statement of the equality or equivalence of mathematical or logical expressions
Equ / at / ion
aequ (equal) + ate + ion
Equal, equilateral, equilibrium

Independent ("in-d&-'pen-d&nt)
Not subject to control by others
In / de / pend / ent
In (not) + de (opposite) + pend (to be suspended) + ent
Depend, independence, suspenders

Multimedia [mʌltiˈmi:diə]
The combined use of several media, such as movies, slides, music, and lighting, especially for the purpose of education or entertainment.
Multi / media
Multi (many) + media (communication)
Medium, multiply, multitude

Resource [riˈsŏ:s]
Something that can be used for support or help.
Re / source
Re (again) + source (origin)
Source, resourceful, resourceless

Decode (dē kōd)
To convert code into ordinary language.
De / code
De (in or on) + code (system)
Decoded, Decoding, Decipher, Encode

Ethical (‘eth i kəl)
A behavior that means doing the right thing given the circumstances.
Eth / ic / al
Eth (order) + ic (or, like) + al (relating to)
Ethically, Ethicalness, Ethics, Ethicality

Communication (kə myünə-'kāshən)
Something that is exchanged by or to or between people or groups.
Commun / ic / ation
Communa (conversation) + ic (produce) + ation (action)
Communicating, Communicate, Common, Communicative, Telecommunication

Professional Standards Addressed:

While we have addressed and attended to the purpose-intentions of the listed standards associated with the following Professional Organizations throughout this particular course (EDCI 5264, Comprehending Processes and Reading in the Content Areas), we have for purposes of this partnered enterprise, that of designing a ‘Thematic Construction’ focused in particular on the following respective organizational ‘tenets’:

INTASC – Interstate New Teachers Assessment and Support Consortium Standards.
Standard 1. Subject Matter

- 1.13 Relate disciplinary knowledge to their subject areas.
- 1.22 Appreciate multiple perspectives and convey to learners how knowledge is developed from the vantage point of the knower.
- 1.23 Have enthusiasm for the discipline(s) s/he teaches and sees connections to everyday life.
- 1.24 Be committed to continuous learning and engage in professional discourse about subject matter knowledge and children’s learning of the discipline.
- 1.35 Develop and use curricula that encourage students to see, question, and interpret ideas from diverse perspectives.
- 1.36 Create interdisciplinary learning experiences that allow students to integrate knowledge, skills, and methods of inquiry from several subject areas.

Standard 2. Student Learning

- 2.21 Appreciate individual variation within each area of development, shows respect for diverse talents of all learners, and is committed to help them develop self-confidence and competence.
- 2.32 Stimulate student reflection on prior knowledge and link new ideas to already familiar ideas, making connections to students’ experiences, providing

opportunities for active engagement, manipulation and testing of ideas and materials, and encouraging students to assume responsibility for shaping their learning skills.

Standard 3. Diverse Learners

3.21 Believe that all children can learn at high levels and persists in helping all children achieve success.

3.22 Appreciate and value human diversity, shows respect for students' varied talents and perspectives, and is committed to the pursuit of "individually configured excellence".

3.24 Be sensitive to community and cultural norms.

3.31 Identify and design instruction appropriate to students' stages of development, learning styles, strengths, and needs.

3.36 Bring multiple perspectives to the discussion of subject matter, including attention to students' personal family and community experiences and cultural norms.

3.37 Create a learning community in which individual differences are respected.

Standard 4. Instructional Strategies

4.12 Understand principles and techniques, along with advantages and limitations associated with various instructional strategies (e. g. cooperative learning, direct instruction, discovery learning, whole group discussion, independent study, interdisciplinary instruction).

4.13 Enhance learning through the use of a wide variety of materials as well as human and technological resources (e.g. computers, audio-visual technologies, videotapes & discs, local experts, primary documents & artifacts, texts, reference books, literature, and other print resources).

4.21 Value the development of student's critical thinking, independent problem solving, and performance capabilities.

4.22 Value the use of educational technology in the teaching and learning process.

4.31 Design teaching strategies and materials to achieve different instructional purposes and to meet student needs (e. g. developmental stages, prior knowledge, learning styles and interests).

4.32 Use multiple teaching and learning strategies to engage students in active learning opportunities that promote the development of critical thinking, problem solving, and performance capabilities and that helps students assume responsibility for identifying and learning resources.

4.36 Use educational technology to broaden student knowledge about technology, to deliver instruction to students at different levels and paces, and stimulate advanced levels of learning.

Standard 5. Learning Environment

5.13 Know how to help people work productively and cooperatively with each other in complex social settings.

5.21 Establish a positive climate in the classroom and participate in maintaining such a climate in the school as a whole.

5.22 Understand how participation supports commitment, and is committed to the expression and use of democratic values in the classroom.
5.23 Value the role of students in prompting each others learning and recognize the importance of peer relationships in establishing a climate of learning.
5.31 Create a smoothly functioning learning community in which students assume responsibility for themselves and one another, participate in decision making, working collaboratively and independently, and engage in purposeful learning activities.
5.32 Engage students in individual and cooperative learning activities that help them develop the motivation to achieve, (e.g.) relating lessons to students' personal interests, allowing students to have choices in their learning, and leading students to ask questions and pursue problems that are meaningful to them.
5.37 Organize, prepare students for, and monitors independent and group work that allows for full and varied participation in all individuals.

Standard 6. Communication

6.22 Value many ways in which people seek to communicate and encourage many modes of communication in the classroom.
6.32 Support and expand learner expression in speaking, writing, and other media.
6.33 Know how to ask questions and stimulate discussion in different ways for particular purposes, for example, probing for learner understanding, helping students articulate their ideas and thinking processes, promoting risk-taking and problem-solving, facilitating factual recall, encouraging convergent and divergent thinking, stimulate curiosity, helping students to question.
6.34 Use a variety of media communication tools, including audio-visual aids and computers, to enrich learning opportunities.

Standard 7. Planning Instruction

7.12 Know how to take contextual considerations (instructional materials, individual student interests, needs, and aptitudes, and community resources) into account in planning instruction that creates an effective bridge between curriculum goals and students' experiences.
7.21 Select and create learning experiences that are appropriate for curriculum goals, relevant to learners, and based upon principles of effective instruction (e.g. that activate students' prior knowledge, anticipate preconceptions, encourage exploration and problem solving, and build new skills on these previously acquired.

Standard 8. Assessment

8.12 Select, construct, and use assessment strategies and instruments appropriate to the learning outcomes being evaluated and to other diagnostic purposes.

8.21 Value ongoing assessment as essential to the instructional process and recognize that many different assessment strategies accurately and systematically used, are necessary for monitoring and promoting student learning.

8.31 use a variety of formal and informal assessment strategies (e.g. observation, portfolios of student work, teacher-made tests, performance tasks, projects, student self-assessments, and standardized tests) to enhance his or her knowledge of learners, evaluate students' progress and performance, and modify teaching and learning strategies.

8.32 Use assessment strategies to involve learners in self-assessment activities, to help them become aware of their strengths and needs, and to encourage them to set personal goals for learning.

Standard 9. Reflection and Professional Development

9.22 Understand the role of reflection, assessment, and learning as an ongoing process.

Standard 10. Collaboration, Ethics, and Relationships

10.33 Identify and use community resources to foster student learning.

IRA – International Reading Association

Standards for Specialized Reading Professionals

Knowledge and Beliefs About

1.5 Perceive reading as the process of constructing meaning through the interaction of the reader's existing knowledge, the information suggested by the written language and the context of the reading situation.

Knowledge Base

2.13 Recognize the importance of giving opportunities in all aspects of literacy (eg., as readers, writer, thinkers, reactors or responders).

Instruction and Assessment

5.1 Create a literate environment that fosters interest and growth in all aspects of literacy

5.2 Use text and trade books to stimulate interest, promote reading growth, foster appreciation for the written word and increase the motivation of learners to read widely and independently for information, pleasure and personal growth.

5.6 Promote the integration of language arts in all content areas.

Word Identification, Vocabulary and Spelling

6.6 Employ effective techniques and strategies for the ongoing development of independent vocabulary acquisition.

Comprehension

7.3 Teach students to connect prior knowledge with new information.

7.4 Teach students strategies for monitoring their own comprehension.

7.5 Ensure that students can use various aspects of text to gain comprehension of written English, text structure and genres, figurative language and intertextual links.

Study Strategies

8.1 Provide opportunities to locate and use a variety of print, non-print and electronic reference sources.

8.2 Teach students to vary reading rate according to the purpose(s) and difficulty of the material.

8.3 Teach students strategies to organize and remember information.

Assessment

10.2 Administer and use information from norm-referenced tests, formal and informal inventories, constructed response measure, portfolio-based assessments. Student self-evaluation, work/performance samples, observations, anecdotal records, journals and other indicators of student progress to inform instruction and learning.

Curriculum Development

12.1 Initiate and participate in ongoing curriculum development and evaluation.

12.4 Select and evaluate instructional materials for literacy, including those that are technology – based.

Virginia Department of Education
Reading Specialist Program Status Matrix

3 - f: Demonstrate expertise in the strategies to increase (oral and written) vocabulary.

3 - g: Demonstrate expertise in the structure of the English language, including an understanding of syntax and vocabulary development.

3 - j: Demonstrates the ability to develop communication skills in all content areas.

5: Research. The candidate must demonstrate the ability to guide students in their use of technology for both process and product as they work with reading, writing and research.

6 - c: Demonstrate an understanding of the needs of high achieving students and of the strategies to challenge them at appropriate levels.

ISTE – International Society For Technology For Education Standards

1.0 Basic Computer/ Technology Operations and Concepts.

1.2 Use terminology related to computers and technology appropriately in written and oral communication. (awareness level)

2.0 Personal and Professional Use of Technology

2.1 Use productivity tools for word processing, database management, and s preadsheet a pplications. (awareness level)

2.1.1 Use features of word processing, desktop publishing, graphics programs, and utilities to develop professional products. (awareness level)

2.2 Apply productivity tools for creating multimedia presentations. (awareness level)
2.2.2 Use computer-based technologies including telecommunications to access information and enhance personal and professional productivity. (application level)
2.4.3 Use automated on-line search tools and intelligent agents to identify and index desired information resources. (application level)
2.7 Identify computer and related technology resources for facilitating lifelong learning and emerging roles of the learner and the educator. (application level)
2.7.4 Identify activities and resources to support regular professional growth related to technology.
3.0 Application of Technology in Instruction.
3.1 Explore, evaluate, and use computer/technology resources including applications, tools, educational software, and associated documentation. (awareness level)
3.3.2 Participate in collaborative projects and team activities. (application level)