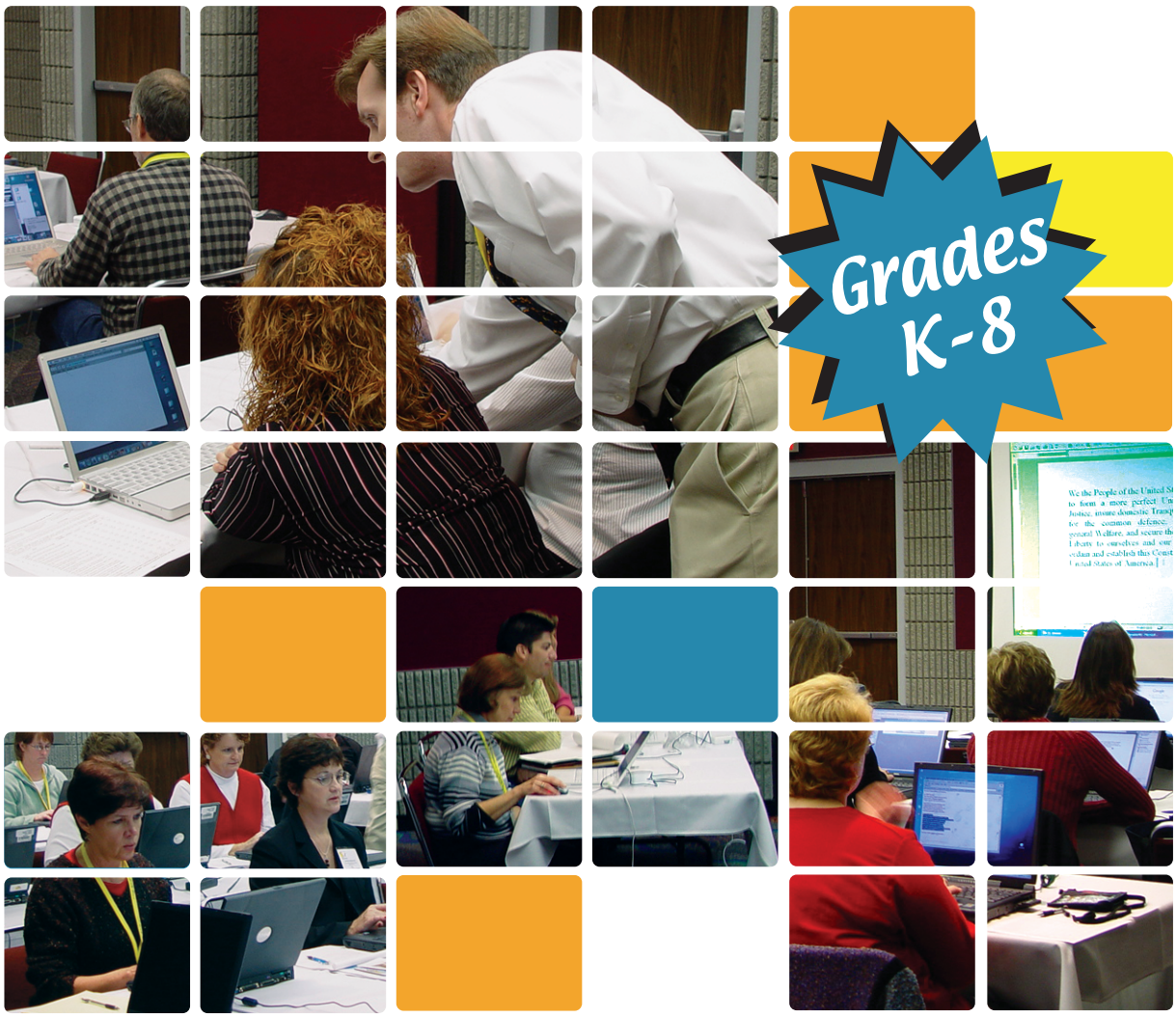
TEACHER'S TECHNOLOGY HANDBOOK



A Resource to Support Effective Technology Integration

Deborah L. Lowther • Michael M. Grant
Eric D. Marvin • Fethi A. Inan • Jong-pil Cheon • Fran Clark

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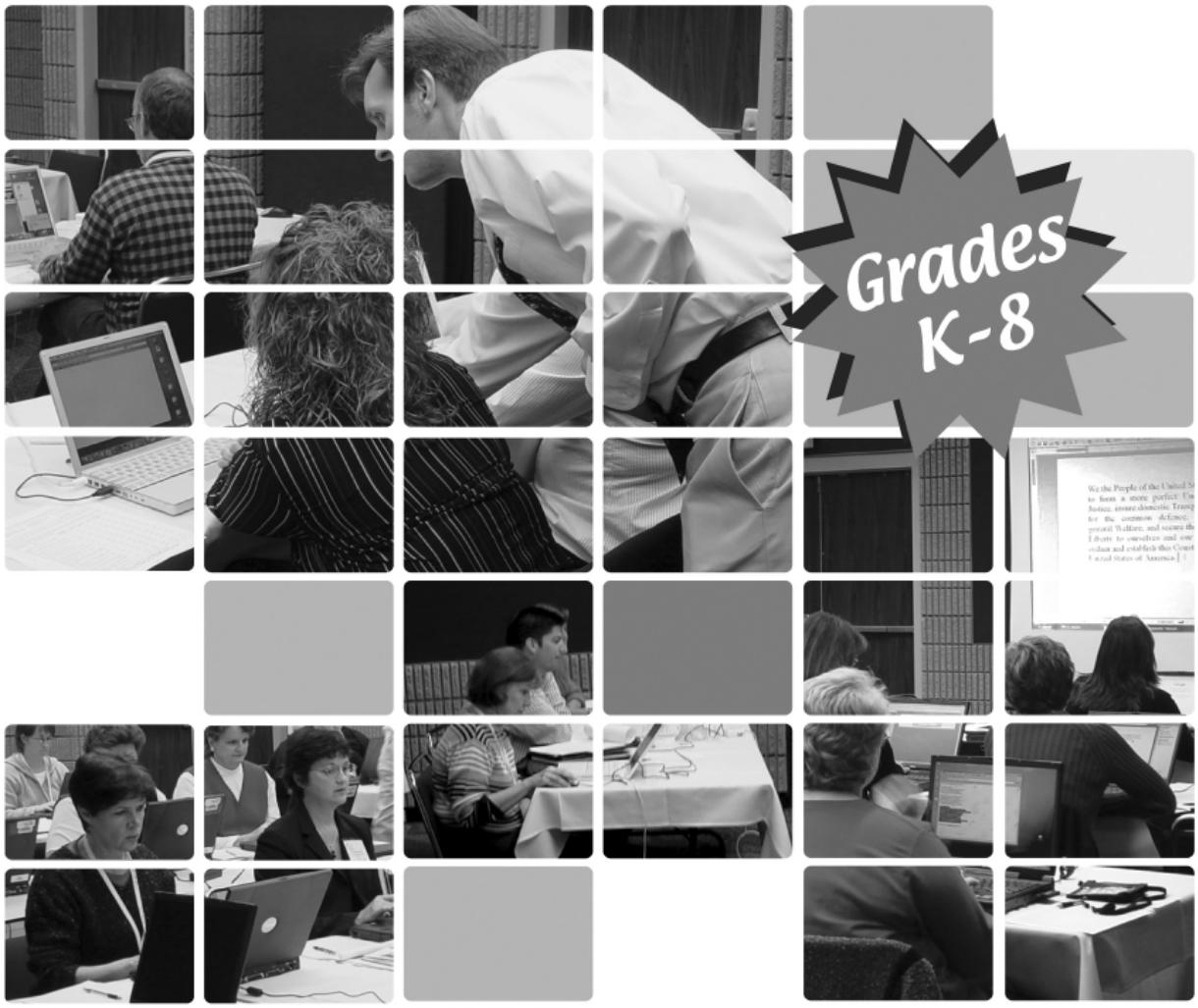
TEACHER'S



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CONTENTS

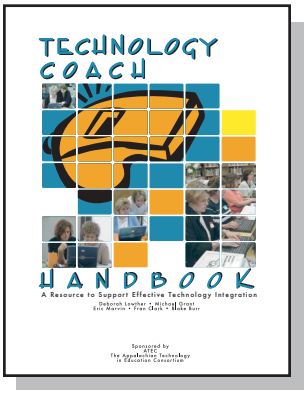
Section 5 : Technology Tools for Learning

Section 6 : Implementing Integration Lessons

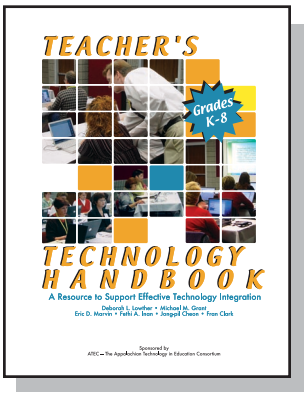
PREFACE

Welcome to the Teacher's Technology Handbook!

This resource was borne out of the success of the *Technology Coach Handbook* (http://techcoach.memphis.edu). The *Technology Coach Handbook* was originally created and began distribution in 2003, primarily in Tennessee, Kentucky, Virginia and West Virginia through the sponsorship of the Appalachian Technology in Education Consortium (ATEC; http://www.the-atec.org). However, we have received requests from many other states in the United States, supplying over well over 5,000 print and digital copies of handbooks as far as California and South Dakota — even outside the U.S. and into Mexico and Puerto Rico.



While the *Technology Coach Handbook* was designed to help the on-site technology coordinators and technology facilitators at a school or district, teachers often asked us what we had available to them to use in their classrooms. In particular during our workshops and discussions with teachers, we would be asked for our lesson plans, lesson ideas and technology tips that we modeled and mentioned. From these requests, we have compiled our best resources for teachers into one place: the *Teacher's Technology Handbook.*



We hope the information and ideas shared in this handbook will enhance and better enable you to foster meaningful use of technology in your schools Intended Users.

Intended Users

Classroom Teachers

This handbook was developed to specifically provide the types of resources that teachers want. Upfront you'll find technology integration ideas and complete lesson plans for each of the four primary content areas: Language Arts, Math, Social Studies and Science. Within the lesson plans are the assessment rubrics and student examples of the finished products. You'll also find sections on developing lesson plans that integrate technology meaningfully. Another section highlights each of the technology tools used in classrooms today, examining their critical features for learning. Finally, sections are focused on managing and implementing technology integrated lessons within the "real world" of your classrooms.

All of the lesson plans, handouts/blackline masters and job aids are yours to freely copy. In fact, we ***want you to copy them*** and use them! Please just leave the footer information at the bottom.

Technology Facilitators

Technology facilitators, technology coordinators, technology resource teachers and technology coaches will also find this handbook useful. The *Teacher's Technology Handbook* was designed to dovetail as a companion to the *Technology Coach Handbook* (http://techcoach.memphis.edu). Many of the handouts and templates available to copy for teachers inside the coach's handbook have been incorporated into the teacher's handbook. This way you would be able to use the teacher's handbook as a participant manual within professional development sessions and workshops you may be conducting with teachers.

There are also exciting new additions to the *Teacher's Technology Handbook*. Complete lessons plans have been developed for Language Arts, Math, Social Studies and Science. These lessons reflect the "real world" and integrate technologies meaningfully. The lessons have been designed to span across the common technology tools available in classrooms today, including word processing, spreadsheets, digital video clips, concept maps, the Internet and web browsers, and digital cameras. Within the lessons, you'll find assessments and handouts to accompany the lesson.

In addition to the lesson plans, classroom ideas for developing others lesson have been included. Each classroom idea is aligned to the appropriate national content standard. Sections following common technology tools through its purposes, classroom ideas and lesson starters, how to develop lessons, how to convert existing lessons, and how to implement technology integrated lessons have been included as well.

Administrators

School leaders and district administrators may also find the contents of this handbook valuable. Schools and districts considering a significant focus on using technology as a tool for learning or wanting to enhance their current initiatives may use this resource as a way to introduce reluctant faculty to technology integration, to give early adopters of technology integration a way to ground their previous work and expand future efforts, as well as to provide the technology integration resources to grade level teams or school work teams to plan curricular scope and sequencing. Administrators may also find it worthwhile to investigate the companion publication, the *Technology Coach Handbook* (http://techcoach.memphis.edu), as another avenue for achieving successful technology integration.

Content Overview

The *Teacher's Technology Handbook* is divided into the following sections:

Section 1: Technology Integration Lessons

The four primary content areas organize this section. For each content area, there are classroom ideas as lesson starters with the national content area standard. In addition to the technology integration ideas, two sample lesson plans have been provided. One lesson plan is targeted to primary grades, and one lesson is intended for higher elementary and middle grades.

Section 2: Why Integrate technology

This section presents why we are integrating technology into our curricula. It provides a rationale for technology integration and makes connections with the national content area standards and state curricular standards.

Section 3: Effective Technology Integration

Section 3 offers some background information on a vision for technology integration. Specifically, we take a look at how technology can improve student learning, and how to engender the types of learning environments to make best use of the technology tools.

Section 4: Planning Technology Integration Lessons

Step-by-step guidance to develop technology-integrated lessons is offered inside Section 4. First, it introduces effective technology integration approaches, including the enGuage and NTeQ models. Next, identifying the unique features of technology tools is presented followed by several different approaches to create new lessons and repurpose existing lessons.

Section 5: Technology Tools for Learning

The focus of this section is on how to use the common technology tools available to most classrooms to engage students in higher-level thinking to improve student learning. Multiple examples and lesson starters are provided for each tool.

Section 6: Implementing Integration Lessons

Finally, Section 6 provides the tried-and-true tips and suggestions necessary to implement technology-integrated into different types of classroom settings. We take a look at the one-computer classroom, multi-computer classroom, laptop carts and computer labs.

SECTION 1

Technology Integration Lessons

Overview of Lesson Plans

Language Arts
-Technology Integration Ideas
-Sample Lesson Plans

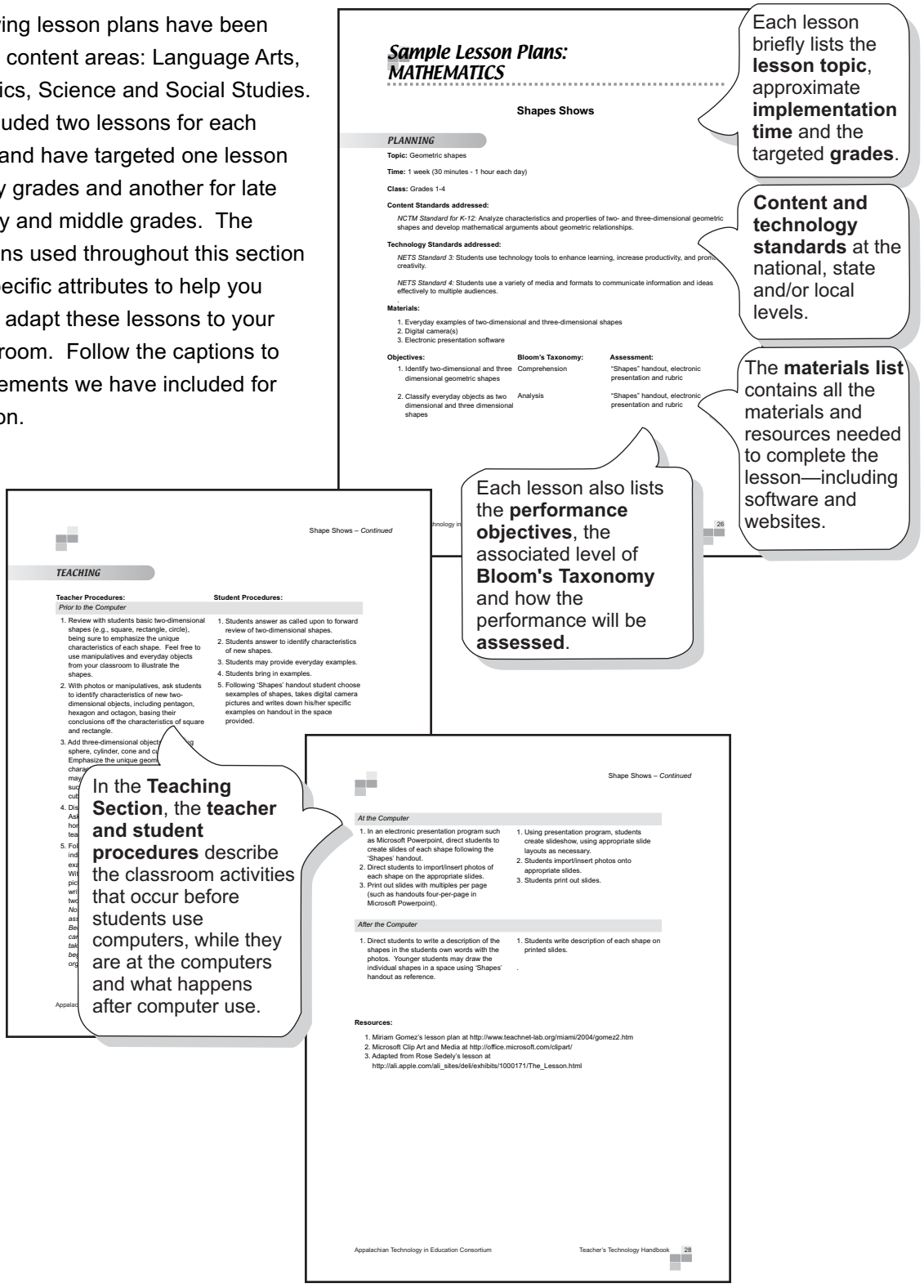
Mathematics
-Technology Integration Ideas
-Sample Lesson Plans

Science
-Technology Integration Ideas
-Sample Lesson Plans

Social Studies
-Technology Integration Ideas
-Sample Lesson Plans

Overview of Lesson Plans

The following lesson plans have been divided by content areas: Language Arts, Mathematics, Science and Social Studies. We've included two lessons for each discipline and have targeted one lesson for primary grades and another for late elementary and middle grades. The lesson plans used throughout this section contain specific attributes to help you adopt and adapt these lessons to your own classroom. Follow the captions to see the elements we have included for each lesson.



Sample Lesson Plans: MATHEMATICS

Shapes Shows

PLANNING

Topic: Geometric shapes

Time: 1 week (30 minutes - 1 hour each day)

Class: Grades 1-4

Content Standards addressed:

NCTM Standard for K-12: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Technology Standards addressed:

NETS Standard 3: Students use technology tools to enhance learning, increase productivity, and promo creativity.

NETS Standard 4: Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

Materials:

1. Everyday examples of two-dimensional and three-dimensional shapes
2. Digital camera(s)
3. Electronic presentation software

Objectives:	Bloom's Taxonomy:	Assessment:
1. Identify two-dimensional and three dimensional geometric shapes	Comprehension	"Shapes" handout, electronic presentation and rubric
2. Classify everyday objects as two dimensional and three dimensional shapes	Analysis	"Shapes" handout, electronic presentation and rubric

Shape Shows – *Continued*

TEACHING

Teacher Procedures:	Student Procedures:
Prior to the Computer	
1. Review with students basic two-dimensional shapes (e.g., square, rectangle, circle), being sure to emphasize the unique characteristics of each shape. Feel free to use manipulatives and everyday objects from your classroom to illustrate the shapes.	1. Students answer as called upon to forward review of two-dimensional shapes.
2. With photos or manipulatives, ask students to identify characteristics of new two-dimensional objects, including pentagon, hexagon and octagon, basing their conclusions off the characteristics of square and rectangle.	2. Students answer to identify characteristics of new shapes.
3. Add three-dimensional objects	3. Students may provide everyday examples.
	4. Students bring in examples.
	5. Following 'Shapes' handout student choose sexamples of shapes, takes digital camera pictures and writes down his/her specific examples on handout in the space provided.

Shape Shows – *Continued*

At the Computer	
1. In an electronic presentation program such as Microsoft Powerpoint, direct students to create slides of each shape following the 'Shapes' handout.	1. Using presentation program, students create slideshow, using appropriate slide layouts as necessary.
2. Direct students to import/insert photos of each shape on the appropriate slides.	2. Students import/insert photos onto appropriate slides.
3. Print out slides with multiples per page (such as handouts four-per-page in Microsoft Powerpoint).	3. Students print out slides.
After the Computer	
1. Direct students to write a description of the shapes in the students own words with the photos. Younger students may draw the individual shapes in a space using 'Shapes' handout as reference.	1. Students write description of each shape on printed slides.

Resources:

1. Miriam Gomez's lesson plan at http://www.teachnet-lab.org/miami/2004/gomez2.htm
2. Microsoft Clip Art and Media at http://office.microsoft.com/clipart/
3. Adapted from Rose Sedely's lesson at http://ali.apple.com/ali_sites/deli/exhibits/1000171/The_Lesson.html

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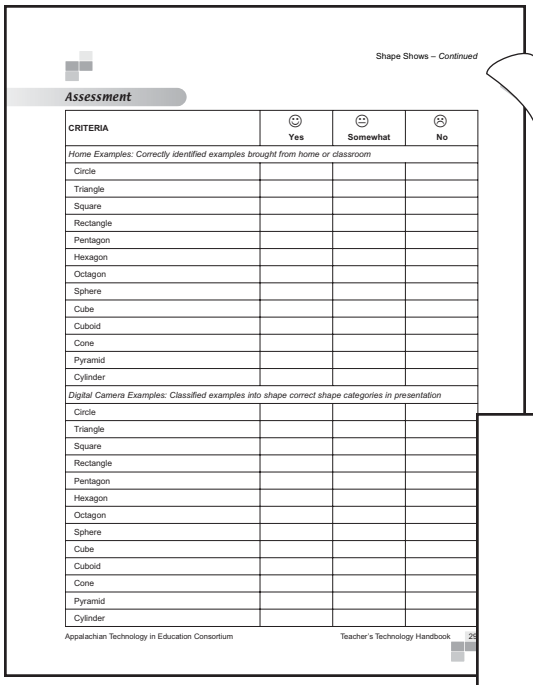
Each lesson briefly lists the **lesson topic**, approximate **implementation time** and the targeted **grades**.

Content and technology standards at the national, state and/or local levels.

The **materials list** contains all the materials and resources needed to complete the lesson—including software and websites.

Each lesson also lists the **performance objectives**, the associated level of **Bloom's Taxonomy** and how the performance will be **assessed**.

In the **Teaching Section**, the **teacher and student procedures** describe the classroom activities that occur before students use computers, while they are at the computers and what happens after computer use.



Shape Shows – *Continued*

Assessment

CRITERIA	☺ Yes	😐 Somewhat	☹ No
Home Examples: Correctly identified examples brought from home or classroom			
Circle			
Triangle			
Square			
Rectangle			
Pentagon			
Hexagon			
Octagon			
Sphere			
Cube			
Cuboid			
Cone			
Pyramid			
Cylinder			
Digital Camera Examples: Classified examples into shape correct shape categories in presentation			
Circle			
Triangle			
Square			
Rectangle			
Pentagon			
Hexagon			
Octagon			
Sphere			
Cube			
Cuboid			
Cone			
Pyramid			
Cylinder			

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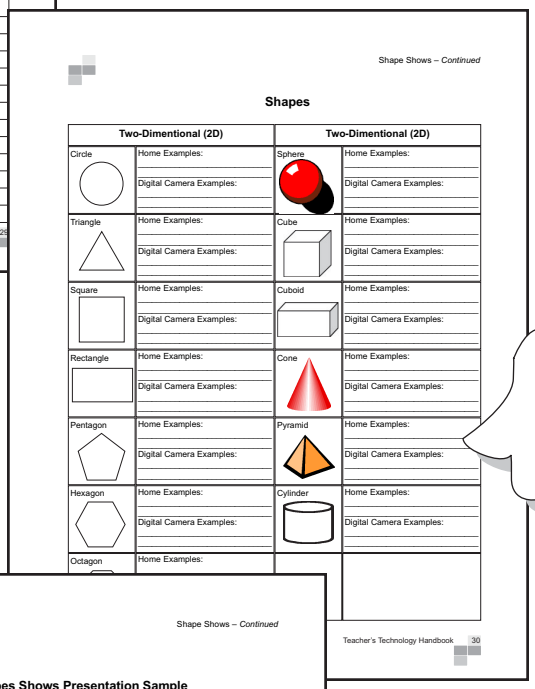
Assessment rubrics are aligned with performance objectives.



Shape Shows – *Continued*

Shapes

Two-Dimentional (2D)		Two-Dimentional (2D)	
Circle	Home Examples: Digital Camera Examples:	Sphere	Home Examples: Digital Camera Examples:
Triangle	Home Examples: Digital Camera Examples:	Cube	Home Examples: Digital Camera Examples:
Square	Home Examples: Digital Camera Examples:	Cuboid	Home Examples: Digital Camera Examples:
Rectangle	Home Examples: Digital Camera Examples:	Cone	Home Examples: Digital Camera Examples:
Pentagon	Home Examples: Digital Camera Examples:	Pyramid	Home Examples: Digital Camera Examples:
Hexagon	Home Examples: Digital Camera Examples:	Cylinder	Home Examples: Digital Camera Examples:
Octagon	Home Examples:		

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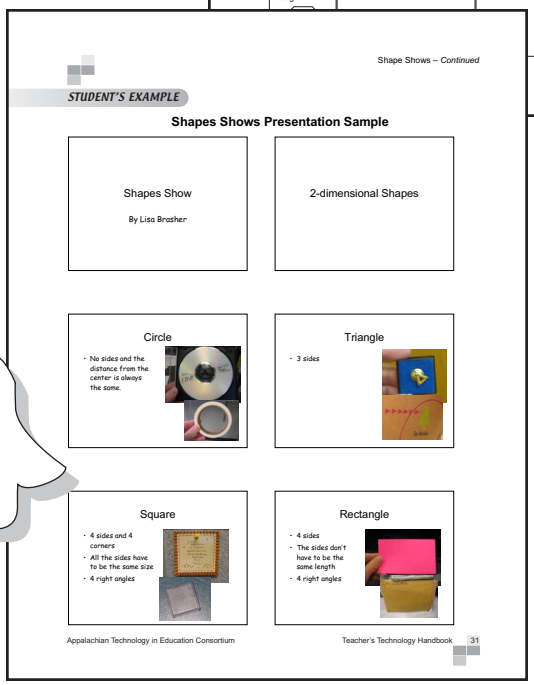
Ready-to-copy **handouts** as blackline masters.



Shape Shows – *Continued*

STUDENT'S EXAMPLE

Shapes Shows Presentation Sample

Shapes Show

By Lisa Brasher

2-dimensional Shapes

Circle

- No sides and the distance from the center is always the same.

Triangle

- 3 sides

Square

- 4 sides and 4 corners
- All the sides have to be the same size
- 4 right angles

Rectangle

- 4 sides
- The sides don't have to be the same length
- 4 right angles

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The final component included in each lesson is examples of **student products.**

Technology Integration Ideas: LANGUAGE ARTS

Below are examples of activities and tools for teachers to integrate technology in the Language Arts area. Also included are the approprate national standards for each activity from Standards for the English Language Arts, p. 24, Copyright 1996 by the International Reading Association and National Council of Teachers of English.

Activities	Tools	Sample National Content Area Standards
Create "vocabulary word" table that included a graphic for each word and a description of why it represents the word.	Word processing	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Download a CNN editorial and replace the adjectives with ones that have a similar meaning.	Word processing	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Rewrite the Bill of Rights to a level that is more easily understood by 2nd grade students	Word processing	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
Download a picture of the State of Liberty and create a list of 50words that describe its features.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
Locate clipart of two birds that are very different, and then write a paragraph that highlights those differences.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
Use weather data from the Internet to create the "Window on Weatherr" section of the school newspaper.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
Compose a letter to the Mayor regarding the poor air quality of your neighborhood. Include digital photos to support your argument.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
Write a one page story that predicts what life in the United States will be like in 75 years.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).

Activities	Tools	Sample National Content Area Standards
Use the "Track Changes" tool to suggest edits on your partner's report.	Word processing	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Use a different color text to add your part of a "chain" story written by students in your group.	Word processing	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Choose three graphics that represents key features of the main character in today's story and describe why you chose each one.	Word processing	Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information).
Use the "Highlight" tool to mark each noun yellow and each verb blue.	Word processing	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Lower the reading level of the 1st paragraph of Abraham Lincoln's presidential acceptance speech by using different adjectives and adverbs.	Word processing	Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes.
Compare the number of adjectives and adverbs used in the first 300 words of a non-fiction book and a fiction book.	Spreadsheets	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Similarities of fairy tales, e.g., setting, theme, characters.	Databases	Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.
Parts of speech examples.	Databases	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.

Activities	Tools	Sample National Content Area Standards
Plot Main Ideas: Punctuation	Concept Maps	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Graphically depict pars of speech	Presentations	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Illustrate prepositions in action	Presentations	Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts.
Books on the Web e.g., Complete Works of Shakespeare	Web Browsers	Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.
Audio - e.g., Robert Frost reading poetry	Web Browsers	Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.
Internet News	Web Browsers	Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.
Human interest stories	Web Browsers	Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.
Online Dictionaries or Thesaurus	Web Browsers	Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, and video) to gather and synthesize information and to create and communicate knowledge.

Activities	Tools	Sample National Content Area Standards
Communicate with other students	Communication Tools	Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, and graphics).
Communicate with writers	Communication Tools	Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, and graphics).

Sample Lesson Plans: LANGUAGE ARTS

Quick as a Cricket

PLANNING

Topic: Figurative Language/Similies

Time: 30 minutes

Class: 2nd Grade Language Arts

Content Standards addressed:

MSC Standard 2—Students should be able to derive literal, implied, and personal meaning from different kinds of texts and presentations (literary, informative, and technical). (2) Demonstrate understanding of oral and printed texts and presentations by interpreting the impact of the author's and speaker's decisions (such as form, content, style, rhetoric, voice, vocabulary, and literary devices).

TN State Standard 3.1.13—Experience various literary and media genres. (i) Explore the ways in which language is used in literary texts (e.g., rhythm, beat, imagery, simile, and metaphor).

Technology Standards addressed:

MCS Technology Standard 3—Students use technology productivity tools to collaboratively construct completed products that represent quality work.

MCS Technology Standard 5—Use a variety of media and technology resources for teacher directed and independent tasks

Materials:

1. *Quick As a Cricket* by A. Woods
2. Storyboard forms
3. Colors, markers

Objectives:	Bloom's Taxonomy:	Assessment:
1. Define similie	Knowledge	Write the definition of a similie
2. Recognize similes in print	Application	Select similes from print
3. Create similes in their personal writings	Application/Synthesis	Create simile story
4. Create a multimedia simile story	Application/Synthesis	Create simile presentation using Powerpoint/Multimedia tools

TEACHING

Introduction:

Turn to your neighbor. Everyone smile at each other. Look carefully. If you compare your neighbor to an animal, what animal does s/he look like?
What makes you say that? (Allow several students to respond) You have just made a comparison of your friend to an animal. In literature, that comparison has a special name and that is what we are going to learn about today.

Teacher Procedures:	**Student Procedures:**
Introduction	
1.Reads the story *Quick as a Cricket*. Asks what do students notice about all of the sentences. Arrive at: They follow the formula …_____ as a _____.	1. Actively listen and interact with teacher.
2.Connects sentence to the word “simile”	
3.Defines simile—making a comparison using like or as	2. Repeat the definition chorally and individually.
Model	
1. Gives several examples of similes using “as” a. As sleepy as a kitten b. As fussy as a baby c. As sleek as a fast car d. As dirty as mud	1. Listen and read along
2. Rereads part or all of story	2. Name recognized similes from story
Guided Practice	
1. Encourages class to come up with other comparisons 2. Writes student similes on board	1. Orally students create other similes
Prior to the Computer	
1. Distribute Planning Sheets and Storyboards. 2. Direct students to complete planning sheets and storyboards to create their own simile story with a slide show. Be sure to include Title slide.	1. At desk, complete Planning Sheet and Storyboards for simile story.

At the Computer	
1. Direct and assist students with creating slide show from storyboards.	1. Use storyboards to create slide show. Type simile sentences as written on storyboards. 2. Use clip art to enhance slide and reflect simile.

After the Computer	
1. Direct students to read story to a peer and to the teacher. 2. Have students complete Reflection Sheet about the activity.	1. Read story to peer. 2. Read story to teacher 3. Complete Reflection Sheet.

Resources:

1. *Quick as a Cricket* by A. Wood
2. Dr. Deborah Lowther's planning sheets, storyboards and reflection sheets.
3. Dr. Susan Thompson's course lessons

ASSESSMENT

Similes Presentation			
CRITERIA	☺	😐	☹
Story	Well organized story		Not organized
Similes	Follows similes form.		Does not follow similes
Slide show	There are a title slide and more five slides in the presentation.	There is a title slide and three or four slides in the presentation.	There is no slide in the presentation.
Multimedia	Using clipart in every slide.	Using clipart in several slides.	No clipart.
Spelling	One or fewer errors in spelling.	Two or three errors in spelling.	Four errors in spelling.
Capitals & periods	All sentences start with a capital letter and end with a period.	One or two sentences do not start with a capital letter or end with a period.	Do not use capital letters and periods.

Student Name: _____

Lessons Learned: Reflecting on My Multimedia

Title of Slides/Stack: _____

Please complete the following:

1. What do you like the most about your stack?_____

_____

_____

2. How would you change your stack? _____

_____

_____

3. What did you learn from creating this stack? Please do not list what you learned about HyperStudio or Powerpoint, but what you learned about your school subjects, such as math, reading, wiritng, etc.

_____

_____

_____

_____

_____

4. Was it helpful to create a multimedia presentation for this lesson? Please explain your answer.

_____

_____

_____

_____

Peer Reviewer Name: _____

Multimedia Field Test Report

Title of Slides/Stack: _____

Author: _____

Please √ off each card as you evaluate it and provide comments when appropriate

Card # √	Comments
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
11.	
12.	
13.	
14.	
15.	
16.	
17.	
18.	
19.	
20.	

Best Feature(s) of this multimedia: _____

_____

Things that might improve this multimedia: _____

_____

Date Completed: _____ Comments: _____

_____

Student Name: _____ Grade Level: _____

Multimedia Planning Sheet

Direction:

Complete this information before you develop your multimedia:

Title of Slide/Stack: _____

Purpose of Slides/Stack: _____

_____

Grade Level: _____

Resources needed to make this project:

Information Sources: _____

_____

_____

Graphics: _____ _____

_____

_____

3. What did you learn from creating this stack? Please do not list what you learned about HyperStudio or Powerpoint, but what you learned about your school subjects, such as math, reading, wiritng, etc.

_____

_____

Audio: _____

_____

_____

Notes: _____

_____

_____

_____

_____

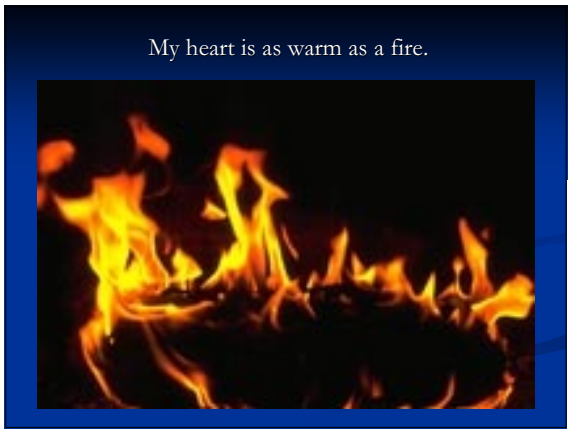
Storyboards

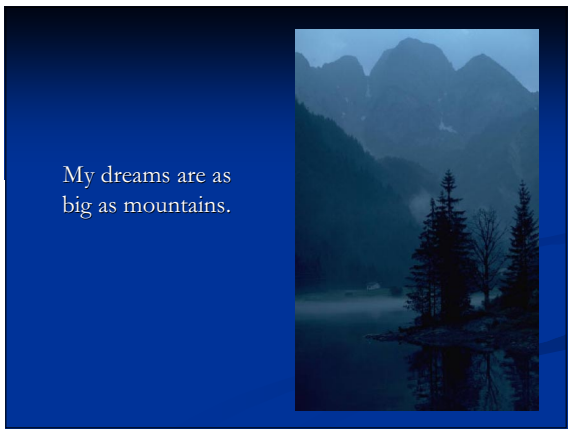
Include in description any clip art ideas, sounds or transitions you want

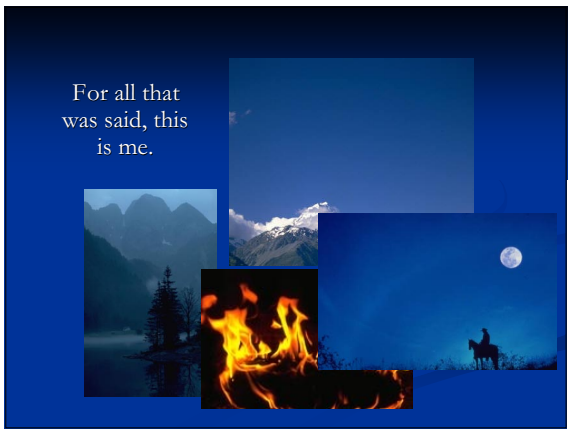
	Description/Script/Music: _____
	Description/Script/Music: _____
	Description/Script/Music: _____
	Description/Script/Music: _____

STUDENT'S EXAMPLE

Simlies Presentation Sample







Sample Lesson Plans: LANGUAGE ARTS

Idea Investigations for Short Stories

PLANNING

Topic: Language Arts

Time: 45 minutes for 2 days

Class: Grade 5-8

Content Standards addressed:

The Standards of Learning for Virginia Public Schools
Writing
6.6 The student will write narratives, descriptions, and explanations.
a) Use a variety of planning strategies to generate and organize ideas.
b) Select vocabulary and information to enhance the central idea, tone, and voice.
Located at: http://www.pen.k12.va.us/VDOE/Superintendent/Sols/home.shtml

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Materials:

1. Idea Investigations for Short Stories Planning Sheet
2. Digital Camera(s)
3. Computer
4. Microsoft Word

Objectives:	Bloom's Taxonomy:	Assessment:
1. TLW use a digital camera to capture images appropriate to be used as the basis for a short fictional story.	Comprehension, application	Idea Investigations for Short Stories Rubric
2. TLW use an outline generate and organize ideas for a short fictional story.	Knowledge, comprehension, analysis	Idea Investigations for Short Stories Rubric
3. TLW select vocabulary and information to enhance the central idea, tone, and voice of a short fictional story.	Synthesis	Idea Investigations for Short Stories Rubric

TEACHING

Introduction:

- Begin the lesson with a brief discussion of fictional stories and generate a list of themes and key ideas in favorite stories.
- Share with students that today they are going to be "Idea Investigators" who are charged with the following task: Capture four unique and interesting objects or scenes that will serve as the key ideas to create short stories. Each photo is to represent a separate idea rather than a series of linked concepts.
- The students will then be given a photo from each group and asked to individually write an outline from which they will create a short fictional story based on the objects in the four photos.

Prior to the Computer

1. After the Introduction, place students into groups of four.
2. Distribute digital cameras to each group, or plan a rotation schedule if only one camera is available (students should be familiar with camera use).
3. Have groups compete the Idea Investigations for Short Stories Planning Sheet and plan where students can go to take photos.

1. Student groups complete their Idea Investigations for Short Stories Planning Sheet by briefly describing possible photos they may take.
2. Groups go on their "Idea Investigation" to take photographs, letting each student focus on one area. Students should take several pictures of the each subject.
3. Students download their four photos onto the Teacher Workstation Computer.

At the Computer

1. Randomly distribute the photos ensuring that each group has one photo from the four groups.
2. Direct the computer monitor from each group to bring a disk to the Teacher Workstation Computer and download his/her group's assigned photos.
3. Direct each student to load the photos in his/her folder.
4. Monitor and assist as needed

1. The Group's computer monitor copies their group's photos onto a disk.
2. The computer monitor then has the four group members copy the photos to his/her personal file.
3. Each student opens MS Word and inserts the four photos into a document.
4. Each student uses the photos as a basis for writing an outline of a short story.
5. Students use outline to write the story.
6. When the story is finished, students correct any errors and print a copy.

After the Computer

1. Place students in their groups and ask them to pass their story to the person on the right and quietly read the story.
2. Continue the process until students have read all the stories in the group.
3. Give students 5 to 10 minutes to select the story they enjoyed the most.
4. Have the students whose stories were selected read them to the class.
5. Discuss how each story was different and how writing is a way for individuals to express their creativity.

1. While in their group, have students exchange papers and read each of the four stories.
2. They collectively select one to share with the class. .
3. Students engage in class discussion about the creative nature of writing.

ASSESSMENT

IDEA INVESTIGATION FOR SHORT STORIES RUBRIC				
CRITERIA	**1**	**2**	**3**	**4**
TLW use a digital camera to capture images appropriate to be used as the basis for a short fictional story.	Very few or none of the digital images represent ideas that could appropriately serve as the basis for a short story..	Only a few of the digital images clearly or somewhat clearly represent ideas that could appropriately serve as the basis for a short story.	Almost all of the digital images clearly represent ideas that could appropriately serve as the basis for a short story.	All of the digital images very clearly represent ideas that could appropriately serve as the basis for a short story.
TLW use an outline to generate and organize ideas for a short fictional story.	The outline provides no or very limited organization to the story ideas. It is not presented in a logical or supported manner.	The outline somewhat organizes the story ideas in a fairly logical manner that provides limited support.	The outline clearly organizes the story ideas in a logical and supported manner.	The outline very clearly organizes the story ideas in a logical and well-supported manner.
TLW select vocabulary and information to enhance the central idea, tone, and voice of a short fictional story.	The story is poorly written and uses vocabulary and information that limits the central idea, tone, and voice of the story.	The story is moderately written and somewhat uses vocabulary and information that enhances the central idea, tone, and voice of the story.	The story is well-written and uses vocabulary and information that enhances the central idea, tone, and voice of the story.	The story is very well-written and expertly uses vocabulary and information that enhances the central idea, tone, and voice of the story.

Idea Investigations for Short Stories Template

Group Members:
1.
2.
3.
4.

Brainstorm topics, subjects, and/or objects for photos that would provide good “Ideas” for writing short stories:

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.
11.
12.

STUDENT'S EXAMPLE

Idea Investigations for Short Stories
Outline

Dan the Fan

a. Dan is a fan of:

i. Baseball

ii. His shiny red monster truck

iii. Maria – a smart girl in his neighborhood

b. Dan wants to impress Maria

i. Asks her to a playoff baseball game

ii. Brings her flowers before they go to the game

iii. Takes her to the game in his truck

c. a surprise ending

i. the homerun baseball

Dan the Fan

By Stephanie Good Performer

Dan Group 2 – Photo 3	**Dan's Shiny Red Monster Truck** Group 1 – Photo 1
	
Flowers For Maria Group 4 – Photo 2	**Homerun Baseball** Group 3 – Photo 4
	

The Story ~

Dan's a friendly kind of guy that always has a smile on his face – especially when he is thinking about baseball or his shiny red monster truck. In fact, he is the biggest fan of baseball in his entire neighborhood. Dan goes to every single game, wears the team jacket, and has baseball posters all over his room – or at least over half of his room. The other half is covered with monster trucks, which are all red. So, I guess you could say that Dan was not only a huge fan of baseball, but also a fan of shiny red monster trucks. That was all he thought about – until he saw Maria.

It happened on a bright sunny day when Maria was walking to the library and Dan was waiting at a stoplight on his way to a baseball game. She turned her head and looked directly at Dan with her big brown eyes. Immediately, his heart jumped inside his chest, as she was the most beautiful girl he had ever seen. Yet, Dan was completely surprised that he had even looked at a girl – he loved baseball and trucks – not females! While at the baseball game, thoughts of Maria kept crossing his mind – even in the last inning. What was he going to do now! How can he really like baseball, trucks, and now a girl?? Especially since he did not know who she was or where she lived.

The next morning, Dan decided to relieve his thoughts of Maria by washing his shiny red monster truck. As he was polishing the chrome rims, he suddenly saw Maria's face in the reflection. She was standing right behind him. Once again, his heart nearly jumped out of his chest. He slowly turned around and she said, "Hi, I'm Maria. We saw each other yesterday when I was going to the library." Dan nervously looked away from her pretty face and started polishing the wheels as he said, "I'm Dan." He was to shy to say anything else. Maria, who had been doing her morning run, continued, "I love your truck! In fact, I recognized you because I remembered your truck. This is my favorite model!" Dan stopped polishing and turned to once again look at the beautiful girl who actually liked monster trucks. Before Dan could say anything, Maria noticed the logo of his baseball team on the back window and asked if he was a fan. By now, Dan is in shock and replied, "Yeah, I am one of their biggest fans. I never miss a game and have all their posters in my room. My greatest dream is catch a homerun ball." Maria quickly replied, "That is amazing, I thought I was their biggest fan! But, I've only seen one game." With a big smile, Dan responded, "Games are for fans – why don't you come with me to the next game. It's a playoff against their biggest contender." So started Dan's switch to being a fan of baseball, trucks, and now Maria.

Dan really wanted to impress Maria, so, he tried to look his best and brought her some bright, fresh flowers. These seemed to do the trick as Maria flashed a big smile and looked happily at Dan with her big brown eyes when she greeted him at the door. They happily climbed into his big red monster truck and headed for the game. Both chattered nonstop about the team and the upcoming playoff game. When there, they ate hot dogs, drank sodas, and yelled a lot. Dan couldn't believe how great the day was going. During the last inning, the bases were loaded, Dan's favorite player was up and hit the ball directly toward Dan. The world was moving in slow motion as the ball drew closer and closer. Dan's heart was once again beating out of his chest. Closer and closer, his arms stretched nearly out of their sockets, striving to get the ball, especially with Maria's big brown eyes watching every move. Unexpectedly, next to his hands, were two petite hands into which the coveted ball slammed. Maria clasped the magnificent catch closely to her face and kissed the ball as she exclaimed, "I got it! I got it! I got it!" Dan's heart sunk. As he looked at Maria dancing happily, her brown eyes no longer looked lovely – he saw her as the one who kept him from his greatest dream. Thus, for now, Dan decided that he was happy just being a true fan of baseball and red, shiny monster trucks.

Technology Integration Ideas: MATHEMATICS

Below are examples of activities and tools for teachers to integrate technology in the Mathematics area. Also included are the approprate national standards for each activity from Principles and Standards for School Mathematics: Discussion Draft, Copyright October 1998, by the National Council of Teachers of Mathematics.

Activities	Tools	Sample National Content Area Standards
Plot average yearly precipitation in your county for the past 50 years.	Spreadsheets	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students interpret data using methods of exploratory data analysis.
Compare miles traveled during migration for 10 different birds.	Spreadsheets	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students interpret data using methods of exploratory data analysis.
Compare the number of U.S. vs. Asian yearly earthquake occurrences for the past 50 years.	Spreadsheets	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students interpret data using methods of exploratory data analysis.
Compare grams of sugar in breakfast cereals.	Spreadsheets	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students interpret data using methods of exploratory data analysis.
Calculate the maximum price per square yard that could be paid, if PTA gave your class $300 to carpet your classroom.	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
Determine the shortest driving route from New York City to San Antonio, Texas.	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems.
Determine the number of trucks needed to transport soil removed for a competition-sized swimming pool.	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
Create a budget that would result in at least $100 profit from selling hot dogs at $1.00 each.	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.

Activities	Tools	Sample National Content Area Standards
Graph the cost differences between using natural gas vs. electricity for heating a home.	Spreadsheets	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students interpret data using methods of exploratory data analysis.
Use data to demonstrate whether or not the environmental protection efforts are working.	Spreadsheets	Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students recognize reasoning and proof as essential and powerful parts of mathematics.
How much time would the hare have to waste for the tortoise to win a 1-mile race?	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students develop a disposition to formulate, represent, abstract, and generalize in situations within and outside mathematics.
Plot the yield per acre for grain crops grown in the Midwest.	Spreadsheets	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems.
Shapes around us.	Databases	Mathematics instructional programs should include attention to geometry and spatial sense so that all students analyze characteristics and properties of two- and three-dimensional geometric objects.
Real world examples of fractions.	Databases	Mathematics instructional programs should foster the development of number and operation sense so that all students understand numbers, ways of representing numbers, relationships among numbers, and number systems.
Use graphics to demonstrate different types of symmetry.	Presentations	Mathematics instructional programs should include attention to geometry and spatial sense so that all students recognize the usefulness of transformations and symmetry in analyzing mathematical situations.
Depict math concepts in motion.	Presentations	Mathematics instructional programs should emphasize connections to foster understanding of mathematics so that all students recognize, use, and learn about mathematics in contexts outside of mathematics.
Online Mathematics dictionaries or Encyclopedias.	Web Browsers	Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems.
Using real statistical data in websites - e.g., census, various report in governments or research centers.	Web Browsers	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students develop and evaluate inferences, predictions, and arguments that are based on data.

Activities	Tools	Sample National Content Area Standards
Using real statistical data in websites - e.g., census, various report in governments or research centers.	Web Browsers	Mathematics instructional programs should include attention to data analysis, statistics, and probability so that all students develop and evaluate inferences, predictions, and arguments that are based on data.
Communicate with other students.	Communication Tools	Mathematics instructional programs should use communication to foster understanding of mathematics so that all students extend their mathematical knowledge by considering the thinking and strategies of others.
Communicate with experts.	Communication Tools	Mathematics instructional programs should use communication to foster understanding of mathematics so that all students express mathematical ideas coherently and clearly to peers, teachers, and others.

Sample Lesson Plans: MATHEMATICS

Shapes Shows

PLANNING

Topic: Geometric shapes

Time: 1 week (30 minutes - 1 hour each day)

Class: Grades 1-4

Content Standards addressed:

NCTM Standard for K-12: Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.

Technology Standards addressed:

NETS Standard 3: Students use technology tools to enhance learning, increase productivity, and promote creativity.

NETS Standard 4: Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

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Materials:

1. Everyday examples of two-dimensional and three-dimensional shapes
2. Digital camera(s)
3. Electronic presentation software

Objectives:	Bloom's Taxonomy:	Assessment:
1. Identify two-dimensional and three dimensional geometric shapes	Comprehension	"Shapes" handout, electronic presentation and rubric
2. Classify everyday objects as two dimensional and three dimensional shapes	Analysis	"Shapes" handout, electronic presentation and rubric

TEACHING

Teacher Procedures:	Student Procedures:
Prior to the Computer	
1. Review with students basic two-dimensional shapes (e.g., square, rectangle, circle), being sure to emphasize the unique characteristics of each shape. Feel free to use manipulatives and everyday objects from your classroom to illustrate the shapes. 2. With photos or manipulatives, ask students to identify characteristics of new two-dimensional objects, including pentagon, hexagon and octagon, basing their conclusions off the characteristics of square and rectangle. 3. Add three-dimensional objects, including sphere, cylinder, cone and cube. Emphasize the unique geometric characteristics of these objects. Teacher may ask students for everyday examples, such basketballs, ice cream cones, ice cubes, etc. 4. Distribute to students the 'Shapes' handout. Ask students to bring in examples from home examples of each of the shapes. The teacher may also provide examples. 5. Following the 'Shapes' handout, direct individual students to choose at least two examples that match each of the shapes. With a digital camera have students take pictures of their examples. Have students write down on their 'Shapes' handout their two examples in the spaces provided. *Note: Teacher/parents/aids may need to assist with digital camera operations. Because of the large memory in digital cameras today, teachers may choose to take a picture of each student before they begin taking their shape pictures in order to organize the photos.*	1. Students answer as called upon to forward review of two-dimensional shapes. 2. Students answer to identify characteristics of new shapes. 3. Students may provide everyday examples. 4. Students bring in examples. 5. Following 'Shapes' handout student choose sexamples of shapes, takes digital camera pictures and writes down his/her specific examples on handout in the space provided.

At the Computer	
1. In an electronic presentation program such as Microsoft Powerpoint, direct students to create slides of each shape following the 'Shapes' handout. 2. Direct students to import/insert photos of each shape on the appropriate slides. 3. Print out slides with multiples per page (such as handouts four-per-page in Microsoft Powerpoint).	1. Using presentation program, students create slideshow, using appropriate slide layouts as necessary. 2. Students import/insert photos onto appropriate slides. 3. Students print out slides.
After the Computer	
1. Direct students to write a description of the shapes in the students own words with the photos. Younger students may draw the individual shapes in a space using 'Shapes' handout as reference.	1. Students write description of each shape on printed slides. .

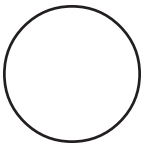
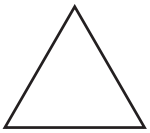
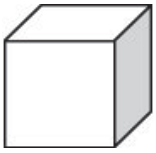
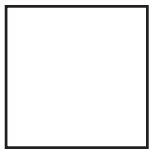
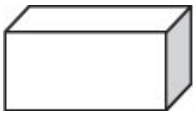
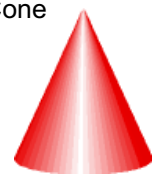
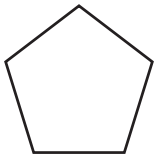
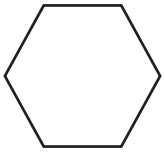
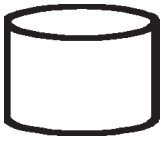
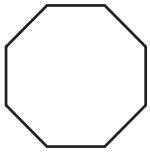
Resources:

1. Miriam Gomez's lesson plan at http://www.teachnet-lab.org/miami/2004/gomez2.htm
2. Microsoft Clip Art and Media at http://office.microsoft.com/clipart/
3. Adapted from Rose Sedely's lesson at http://ali.apple.com/ali_sites/deli/exhibits/1000171/The_Lesson.html

Assessment

CRITERIA	☺ Yes	😐 Somewhat	☹ No
Home Examples: Correctly identified examples brought from home or classroom			
Circle			
Triangle			
Square			
Rectangle			
Pentagon			
Hexagon			
Octagon			
Sphere			
Cube			
Cuboid			
Cone			
Pyramid			
Cylinder			
Digital Camera Examples: Classified examples into correct shape categories in presentation			
Circle			
Triangle			
Square			
Rectangle			
Pentagon			
Hexagon			
Octagon			
Sphere			
Cube			
Cuboid			
Cone			
Pyramid			
Cylinder			

Shapes

Two-Dimentional (2D)		Two-Dimentional (2D)	
Circle 	Home Examples: Digital Camera Examples:	Sphere 	Home Examples: Digital Camera Examples:
Triangle 	Home Examples: Digital Camera Examples:	Cube 	Home Examples: Digital Camera Examples:
Square 	Home Examples: Digital Camera Examples:	Cuboid 	Home Examples: Digital Camera Examples:
Rectangle 	Home Examples: Digital Camera Examples:	Cone 	Home Examples: Digital Camera Examples:
Pentagon 	Home Examples: Digital Camera Examples:	Pyramid 	Home Examples: Digital Camera Examples:
Hexagon 	Home Examples: Digital Camera Examples:	Cylinder 	Home Examples: Digital Camera Examples:
Octagon 	Home Examples: Digital Camera Examples:		

STUDENT'S EXAMPLE

Shapes Shows Presentation Sample

Shapes Show

By Lisa Brasher

2-dimensional Shapes

Circle

- No sides and the distance from the center is always the same.

Triangle

- 3 sides

Square

- 4 sides and 4 corners
- All the sides have to be the same size
- 4 right angles

Rectangle

- 4 sides
- The sides don't have to be the same length
- 4 right angles

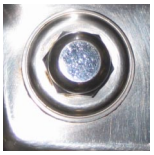
Shapes Shows Presentation Sample

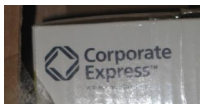
Pentagon

- 5 sides

Hexagon

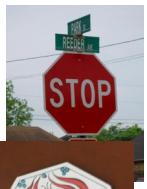
- 6 sides

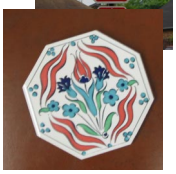




Octagon

- 8 sides





3-Dimensional Shapes

Sphere

- A 3D circle
- The distance from the middle to the outside edge has to be the same.

Cube

- 6 faces
- All the faces are squares with right angles

Shapes Shows Presentation Sample

Rectangular Prism/Cuboid

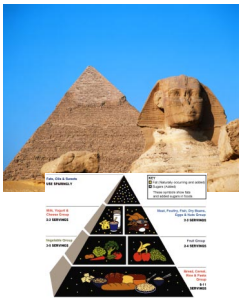
- 6 faces
- Has rectangle faces with right angles
- Can have square faces but not all of them

Cone

- Has a circle on the base and comes up to a point

Pyramid

- Has a square for a base and comes up to a point



Cylinder

- Like a rectangular prism but has 2 circles as bases, can shape

Sample Lesson Plans: MATHEMATICS

Is Each Bag of M&Ms the Same?

PLANNING

Topic: Mathematics

Time: 45 minutes for 2 days

Class: Grades 5-8

Content Standards addressed:

WV Mathematics Standards
MA.6.5.1 - collect, organize, display, and read data using appropriate graphs and tables.
MA.6.1.6 - solve problems in context involving addition, subtraction, multiplication, and division of whole numbers, fractions, mixed numbers and decimals.
MA.6.1.9 - find the percent of a number.

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Standard 5: Technology research tools: Students use technology tools to locate, evaluate, and collect information from a variety of sources, process data, and report materials.

Materials:

1. One package of M&M chocolate candies per group
2. One Problem-Solving Sheet per group
3. One Spreadsheet Planning Sheet per group
4. Computer
5. Microsoft Excel
6. Microsoft Word
7. Pencil

Objectives:	Bloom's Taxonomy:	Assessment:
1. TLW develop spreadsheet formulas that correctly calculate the required data	Comprehension	Spreadsheet Rubric
2. TLW create meaningful spreadsheet graphs	Knowledge, comprehension,	Spreadsheet Rubric
3. TLW interpret data with regard to the given problem	Analysis	Report Rubric
4. TLW summarize conclusions in a data-supported report	Synthesis, evaluation	Report Rubric

TEACHING

Introduction:

Begin the lesson by introducing the following problem to the whole class and briefly discussing the need for quality control teams, how quality control teams collect and use data to make decisions, and how they use software tools like spreadsheets to support their work.

You are a Quality Control Engineer for Mars ® Incorporated, which manufactures m&m candies. Mars has Quality Control Engineers for three areas: taste, packaging, and contents. You are on the team for contents. You and your team must inspect a random sample of m&m packages to determine if the contents are of high quality with regard to matching the published color distribution. These percentages are located at the following site: http://us.mms.com/us/about/products/milkchocolate/

Your team is to summarize the results of your study in a brief report to the Vice President of Quality Control. She expects data to be displayed in the report.

Teacher Procedures:	**Student Procedures:**
Prior to the Computer	
1. Distribute one Problem-Solving Worksheet to each group and ask them to complete each step 2. Provide time for student groups to ask questions 3. Give each group one Spreadsheet Planning Sheet and them to collaboratively plan the spreadsheet layout by adding column and row names for the collected data (e.g., number of candies in each color for the 5 bags of candies) – and – writing the needed formulas (overall percent of red candies in the 5 bags). 4. Use digital projector or a white board to create a consistent spreadsheet layout. Begin by having one group share their design, then modify as needed. 5. Repeat the above procedure to ensure all students use the correct formula. 6. Student groups open their bag of m&m's and record the number of candies by color on their group's modified Spreadsheet Planning Sheets and on the class spreadsheet just created.	Each student group completes the following: 1. Complete the Problem-Solving Worksheet 2. Complete Spreadsheet Planning Sheet 3. Collect data by counting and recording the number of candies by color on your group's planning sheet and on the class spreadsheet. 4. Draft a report that uses a chart and a descriptive summary to present the results.

At the Computer	
1. Model creating setting up a spreadsheet (if needed) 2. Model creating a chart/graph (if needed) 3. Model inserting an Excel chart into a Word document (if needed)	1. Each group sets up spreadsheet according to the layout chosen by the class – including adding formulas 2. Each group enters data from their planning sheets and class data in the appropriate columns 3. Use formulas to calculate results 4. Go to this URL to obtain M&M's data http://us.mms.com/us/about/products/milkchocolate/ 5. Enter the data into the spreadsheet 6. Create a chart/graph showing the class data vs. M&M's data 7. After interpreting the data, create a data-supported report presenting the results
After the Computer	
1. Ask student to interpret the data on the charts and graphs and draft a brief report to the Vice President.	1. Read and interpret graphs 2. Share reports with class.

Resources:

1. Kentucky Curriculum Standards
2. NETS for Students
   Microsoft Excel application
3. Microsoft Word application
4. M&M website
5. Rubistar (http://rubistar.4teachers.org/index.php)

Assessment

SPREADSHEET RUBRIC				
CRITERIA	**1**	**2**	**3**	**4**
TLW develop spreadsheet formulas	Very few or none of the formulas are accurate and produce the results necessary to solve the lesson problem.	Only a few of the formulas are accurate and produce the results necessary to solve the lesson problem.	Almost all of the formulas are accurate and produce the results necessary to solve the lesson problem.	All formulas are accurate and produce the results necessary to solve the lesson problem.
TLW create meaningful graphs	The graph(s) are not included or contains major errors , uses the wrong format, contains irrelevant data, and is mislabeled.	The graph(s) contains a few major errors, uses a somewhat meaningful format, mostly contains irrelevant data, and uses labels that are not easy to understand.	The graph(s) contains a few minor errors, uses a meaningful format, mostly contains relevant data, and uses labels that are somewhat easy to understand.	The graph(s) contains no errors, uses a very meaningful format, contains relevant data, and uses labels that are easy to understand.
TLW interpret data with regard to the given problem	The data interpretation does not reflect the results for the given context.	The data interpretation poorly reflects the results for the given context.	The data interpretation is a somewhat accurate reflection the results within the given context.	The data interpretation accurately reflects the results within the given context.
TLW summarize conclusions in a data-supported report	Information in the report has little or no organization and the table(s) and graph(s) are missing or provide little to no support for the conclusions.	Information in the report is loosely organized with and table(s) and graph(s) provide moderate support for the conclusions.	Information in the report is organized with and supports the conclusions with table(s) and graph(s).	Information in the report is very organized with and fully supports the conclusions with meaningful table(s) and graph(s).

Probelm-Solving Worksheet Template

Group Members: _____ Date: _____

_____

_____

_____

_____

Directions: Use the following chart to plan how your group will approach this probelm-solving task

Component	*Student Action*
Define the problem	Write a statement that clearly defines the problem. _____ _____
What do we know about the problem?	List ideas stated as facts _____ _____
What do we need to know to solve the problem?	List as questions. _____ _____
What data do we need to collect to solve the problem?	Write as action statements and indicate how to collect. _____ _____
How do we manipulate the data?	Describe how the data will be manipulated to develop a solution. _____ _____
What are some possible solutions?	List solutions that are based on results of the data manipulation. _____ _____
How will each solution be evaluated?	List criteria that will be used to select the best solution. _____ _____
How will the best solution be selected?	Consider each solution and identify the implications of each. _____ _____
How will the findings be presented?	Describe how the results will be published. _____ _____

Morrison & Lowther (2002)

Spreadsheet Planning Template

Use this template to design the spreadsheet needed to solve the problem

	A	B	C	D	E	F	G	H
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Formulas needed to solve this problem

Use the space below to plan each formula nedded to solve the problem.

e.g., Name: Total red candies in all bags
Formula= B2+C2+D2+E2+F2

Name: _____

Formula = _____

Name: _____

Formula = _____

Name: _____

Formula = _____

Name: _____

Formula = _____

STUDENT'S EXAMPLE

Class Data Sample

M_M2.XLS

	A	B	C	D	E	F	G	H	I	J
1	COLOR	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5	Total	Team %	M&M® %	Difference
2	Brown	16	17	13	11	12	69	25.2%	13.0%	-12.2%
3	Blue	11	8	12	8	9	48	17.5%	24.0%	6.5%
4	Orange	7	10	8	9	12	46	16.8%	20.0%	3.2%
5	Green	9	7	9	12	8	45	16.4%	16.0%	-0.4%
6	Red	8	11	9	8	5	41	15.0%	13.0%	-2.0%
7	Yellow	4	3	5	6	7	25	9.1%	14.0%	4.9%
8	TOTAL	55	56	56	54	53	274	100.0%	100.0%	0.0%

Class Data with Formulas Sample

COLOR	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5	Total	Team %	M&M®%	Difference
Brown	16	17	13	11	12	=SUM(B2:F2)	=G2/274	0.13	=I2-H2
Blue	11	8	12	8	9	=SUM(B3:F3)	=G3/274	0.24	=I3-H3
Orange	7	10	8	9	12	=SUM(B4:F4)	=G4/274	0.2	=I4-H4
Green	9	7	9	12	8	=SUM(B5:F5)	=G5/274	0.16	=I5-H5
Red	8	11	9	8	5	=SUM(B6:F6)	=G6/274	0.13	=I6-H6
Yellow	4	3	5	6	7	=SUM(B7:F7)	=G7/274	0.14	=I7-H7
TOTAL	=SUM(B2:B7)	=SUM(C2:C7)	=SUM(D2:D7)	=SUM(E2:E7)	=SUM(F2:F7)	=SUM(B8:F8)	=G8/274	=SUM(I2:I7)	=I8-H8

Sample Report

MARS Inc.®
Division of M&M® Candies

Quality Control Report for Milk Chocolate M&M® Candies
Specific Topic: Color Distribution

Purpose of the Study:

The quality control team for contents recently conducted a study to see if random samples of milk chocolate M&M's® contained colors similar to the percentages that MARS Inc.® publishes on their web site.

Procedure:

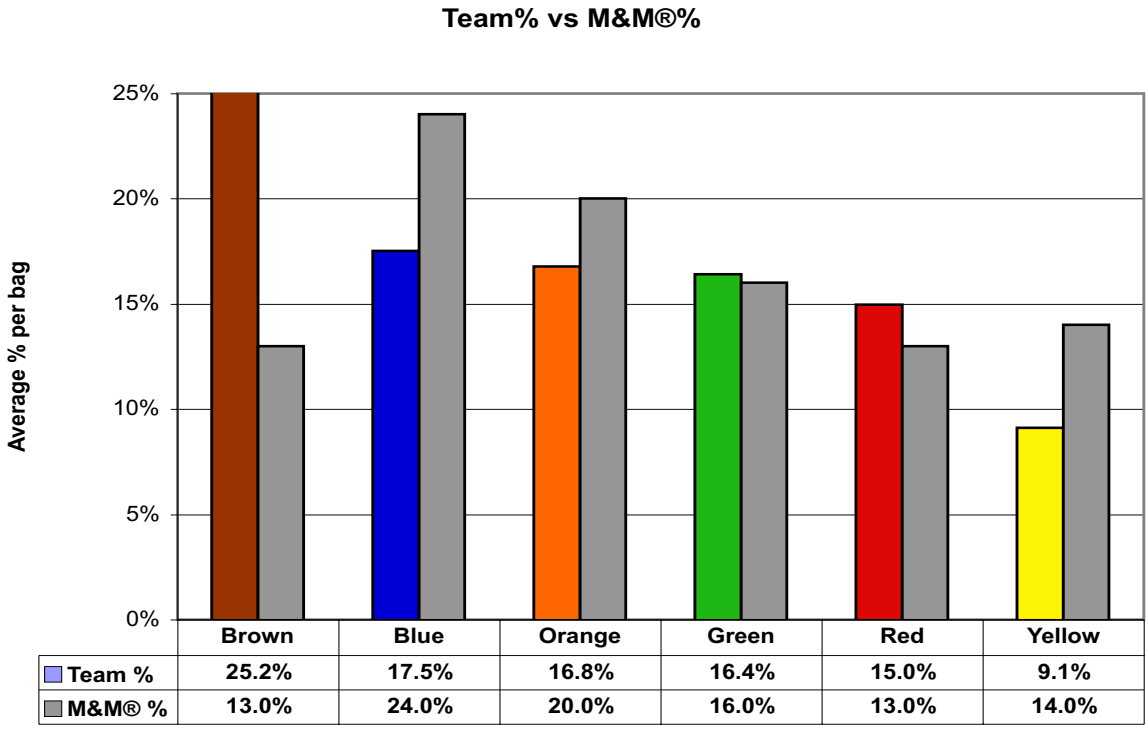
The study involved examining the contents of 5 bags of m ilk chocolate M&M's® candies to determine the number of candies per color found in each bag. From these numbers we then determined an overall percent of candies per color for the five bags. These percentages were then compared with the published color distribution for this candy.

Results

The results of the study are seen in the following Table 1 and Figure 1. As can be seen, the percent of green candies only differed by 0.4% from that published on the web and there was only 2.0% difference for red and 3.2% for orange. The greatest difference was for the brown candies. The bags of candies examined by our Team had 25.2% brown candies as compared to the 13.0% reported by MARS Inc.®

Table 1. Team vs. M&M®: Percent of Colors per Bag

COLOR	Bag 1	Bag 2	Bag 3	Bag 4	Bag 5	Total	Team %	M&M® %	Difference
Brown	16	17	13	11	12	69	25.2%	13.0%	-12.2%
Blue	11	8	12	8	9	48	17.5%	24.0%	6.5%
Orange	7	10	8	9	12	46	16.8%	20.0%	3.2%
Green	9	7	9	12	8	45	16.4%	16.0%	-0.4%
Red	8	11	9	8	5	41	15.0%	13.0%	-2.0%
Yellow	4	3	5	6	7	25	9.1%	14.0%	4.9%
TOTAL	55	56	56	54	53	274	100.0%	100.0%	0.0%



	Brown	Blue	Orange	Green	Red	Yellow
Team %	25.2%	17.5%	16.8%	16.4%	15.0%	9.1%
M&M® %	13.0%	24.0%	20.0%	16.0%	13.0%	14.0%

Figure 1. Overall Percent of Color per bag by Team vs. M&M®

Discussion

The results of this study show that MARS Inc.® is doing a fairly good job of maintaining the percent of green, red, and orange candies per bag. There was less consistency with regard to the yellow (4.9% difference) and blue (6.5% difference), and even greater differences seen for the brown candies (-12.2%).

Recommendations

The Quality Control Team for Contents recommends that MARS Inc.® conduct further research to determine why the color distribution varies from the published numbers by over 10% for the brown candies and almost 10% for the blue. It also recommends conducting a customer survey to find out which colors most people would like to have when they buy M&M® milk chocolate candies. The survey results could be used to set the new percent of colors per bag.

Technology Integration Ideas: SCIENCE

Below are examples of activities and tools for teachers to integrate technology in the Science area. Also included are the approprate national standards for each activity from National Science Education Standards. Copyright 1996 by the National Academy of Sciences, courtesy of the National Academy Press, Washington, D.C.

Activities	Tools	Sample National Content Area Standards
Plot average yearly precipitation in your county for the past 50 years.	Spreadsheets	Science personal and social perspectives - Populations, resources, and environments
Compare miles traveled during migration for 10 different birds.	Spreadsheets	Life Science - Populations and ecosystems
Compare the number of U.S. vs. Asian yearly earthquake occurrences for the past 50 years.	Spreadsheets	Earth and space science - Structure of the earth system
Compare grams of sugar in breakfast cereals.	Spreadsheets	Science in personal and social perspectives - personal health
Use data to demonstrate whether or not the environmental protection efforts are working.	Spreadsheets	Science in personal and social perspectives - Populations, resources, and environments
Digestive systems of organisms - from bacteria to mammals.	Databases	Life Science - Structure and function in living systems
Experimental approaches of famous scientist, e.g., Edison, Watt, Bell.	Databases	Nature of science - Many individuals have contributed to the traditions of science
Dinosaur characteristics.	Databases	Life science - Population and ecosystem Earth and space science - Earth's history
Genetic traits of students.	Databases	Life science - Reproduction and heredity
Nutrients of common food.	Databases	Life science - Matter, energy, and organization in living system
Compare and/or Contrast: Oceans vs. Seas.	Concept Maps	Earth and space science - Structure of the earth system
Compare and/or Contrast: Plant cells vs. Animal cells.	Concept Maps	Life science - the cell
Create a TimeLine: Seed to Plant.	Concept Maps	Life science - Life cycles of organisms

Activities	Tools	Sample National Content Area Standards
Create a TimeLine: Sunlight to Food.	Concept Maps	Life science - Population and ecosystem
Create a TimeLine: Space Program.	Concept Maps	Earth and space science - Earth in the solar system
Create a TimeLine: Rise and Fall of Dinosaurs.	Concept Maps	Earth and space science - Earth's history
Plot Main Ideas: Four Seasons	Concept Maps	Science in personal and social perspectives - Populations, resources, and environments
Demonstrate the before and after of key chemical reactions.	Presentations	Physical science - Chemical reaction
Illustrate the difference between electrical vs. chemical energy.	Presentations	Physical science - Transfer of energy
Create a virtual elevator ride to the Earth's center.	Presentations	Earth and space science - Structure of the earth system
Explain why it rains.	Presentations	Earth and space science - Changes in earth and sky
Compare the role of insects' antennas to humans' five senses.	Presentations	Life Science - Structure and function in living systems
Current Events - Science and Technology	Web Browsers	Science in personal and social perspectives - Science and technology in society
Online Dictionaries or Encyclopedias.	Web Browsers	Science as inquiry - Develop descriptions, explanations, predictions, and models using evidence and explanations.
Online calculators - e.g., graphing, interest calculations.	Web Browsers	Science as inquiry - Use mathematics in all aspects of scientific inquiry.
Explore the Moon with a virtual reality.	Web Browsers	Earth and space science - Objects in the sky
Communicate with other students.	Communication Tools	Science as a human endeavor: - Women and men of various social and ethnic backgrounds engage in the activities of science, engineering, and related fields.
Communicate with researchers, scientists or doctors.	Communication Tools	Understanding about science and technology: - Many different people in different cultures have made and continue to make contributions to science and technology.

Sample Lesson Plans: SCIENCE

Do Birds Eat Three Times a Day?

PLANNING

Topic: Science

Time: 15 minutes for 5 days, 1 hour on the final day

Class: Grades 3-8, Science

Content Standards addressed:

Memphis City Schools Science Standard #1:Students should be able to solve real-world problems through scientific inquiry methods (questioning, predicting, experimenting, collecting and displaying information, and drawing valid conclusions), using appropriate technology to communicate ideas and solutions effectively.

Memphis City Schools Science Standard #3: Students should be able to use knowledge of the similarities, differences and interdependence of living things to analyze and assess events and actions that impact life on Earth.

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Standard 5: Technology research tools: Students use technology tools to locate, evaluate, and collect information from a variety of sources, process data, and report materials.

Materials:

1. ZooCam webpage (http://zoocam.memphis.edu)
2. Data Gathering sheet
3. Computer
4. Microsoft Excel program
5. pencil

Objectives:	Bloom's Taxonomy:	Assessment:
1. TLW develop a hypothesis	Comprehension	Class Hypothesis
2. TLW collect observational data on animals.	Knowledge, comprehension	Data Gathering sheet
3. TLW depict observational data using graphs.	Application	Excel graph
4. TLW interpret observational data with respect to hypothesis.	Analysis	Lab Report

TEACHING

Introduction:
As a whole group, begin by asking the students how many times a day they eat? Ask the students about other animals' (bears, dolphins, lizards, etc.) eating habits.

Teacher Procedures:	Student Procedures:
Prior to the Computer	
1. Based on the initial discussion, help the class develop a hypothesis about birds' eating habits. 2. Distribute and discuss instructions for data gathering chart.	1. Develop and record a hypothesis of birds' eating habits. 2. Review data gathering sheet.
At the Computer	
1. Direct students to the zoocam website at the appropriate times (morning, noon, afternoon) each day for 5 minutes. 2. Model building a chart in Excel. 3. Model creating graphs from charts in Excel.	1. Go to the zoocam website 2. Make observations and record data on Data Gathering Sheet for allotted time 3. Build Excel chart with recorded data 4. Create graphs based on data in Excel chart.
After the Computer	
1. Ask student to interpret the data on the charts and graphs. 2. Ask student to compare finding to the original hypothesis.	1. Read and interpret graphs 2. In a Lab Report, discuss results and compare findings to the hypothesis. Draw conclusions about the data, such as reliability of the data and any limitations of the methods.

Resources:

1. ZooCam website (http://zoocam.memphis.edu)
2. Memphis City Schools TLA website (http://www.memphis-schools.k12.tn.us/admin/tlapages/academyhome.html)
3. Microsoft Excel application
4. Rubistar (http://rubistar.4teachers.org/index.php)

ASSESSMENT

LAB REPORT				
CRITERIA	4	3	2	1
Problem Statement	The purpose of the lab or the question to be answered during the lab is clearly identified and stated.	The purpose of the lab or the question to be answered during the lab is identified, but is stated in a somewhat unclear manner.	The purpose of the lab or the question to be answered during the lab is partially identified, and is stated in a somewhat unclear manner.	The purpose of the lab or the question to be answered during the lab is erroneous or irrelevant.
Hypothesis	Hypothesized relationship between the variables and the predicted results is clear and reasonable based on what has been studied.	Hypothesized relationship between the variables and the predicted results is reasonable based on general knowledge and observations.	Hypothesized relationship between the variables and the predicted results has been stated, but appears to be based on flawed logic.	No hypothesis has been stated.
Experimental Design	Experimental design is a well-constructed test of the stated hypothesis.	Experimental design is adequate to test the hypothesis, but leaves some unanswered questions.	Experimental design is relevant to the hypothesis, but is not a complete test.	Experimental design is not relevant to the hypothesis.
Variables	All variables are clearly described with all relevant details.	All variables are clearly described with most relevant details.	Most variables are clearly described with most relevant details.	Variables are not described OR the majority lack sufficient detail.
Procedures & Materials	Procedures and materials are listed in clear steps. Each step is numbered and is a complete sentence.	Procedures and materials are listed in a logical order, but steps are not numbered and/or are not in complete sentences.	Procedures and materials are listed but are not in a logical order or are difficult to follow.	Procedures do not accurately list the steps and materials of the experiment.
Data	Professional looking and accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in tables and/or graphs. Graphs and tables are labeled and titled.	Accurate representation of the data in written form, but no graphs or tables are presented.	Data are not shown OR are inaccurate.
Analysis	The relationship between the variables is discussed and trends/patterns logically analyzed. Predictions are made about what might happen if part of the lab were changed or how the experimental design could be changed.	The relationship between the variables is discussed and trends/patterns logically analyzed.	The relationship between the variables is discussed but no patterns, trends or predictions are made based on the data.	The relationship between the variables is not discussed.
Conclusion	Conclusion includes whether the findings supported the hypothesis, possible sources of error, and what was learned from the experiment.	Conclusion includes whether the findings supported the hypothesis and what was learned from the experiment.	Conclusion includes what was learned from the experiment.	No conclusion was included in the report OR shows little effort and reflection.
Scientific Concepts	Report illustrates an accurate and thorough understanding of scientific concepts underlying the lab.	Report illustrates an accurate understanding of most scientific concepts underlying the lab.	Report illustrates a limited understanding of scientific concepts underlying the lab.	Report illustrates inaccurate understanding of scientific concepts underlying the lab.
Spelling, Punctuation and Grammar	One or fewer errors in spelling, punctuation and grammar in the report.	Two or three errors in spelling, punctuation and grammar in the report.	Four errors in spelling, punctuation and grammar in the report.	More than 4 errors in spelling, punctuation and grammar in the report. The Lab report should include:

The Lab report should include:

1. Title
2. Statement of Problem
3. Hypothesis
4. Experimental Design
5. Data & Results
6. Analysis & Conclusion

Student Lab Report Template

Title:
Statement of Problem:
Hypothesis:
Experimental Design:
Data & Results:
Analysis & Conclusion:

Student Data Gathering Sheet

Use this table to gather data on birds' eating habits. Mark (with a tally) the number of birds you see feeding at the times below. If one of the "special" birds is feeding, mark a tally under their column as well. Do this for 5 days. Happy bird watching!

	9 AM				12 AM				3 PM			
	All	LK	PW	SF	All	LK	PW	SF	All	LK	PW	SF
Day 1												
Day 2												
Day 3												
Day 4												
Day 5												

Bird Types*:
All- all birds
LK- Lorikeets (green bird with a red head)
PW- Paradise-Whydah (black bird with a long black tail)
SF- Saffron Finch (small yellow bird)

*Find out more information about the types of birds at the zoo on the website- http://zoocam.memphis.edu

Birds Information Sheet

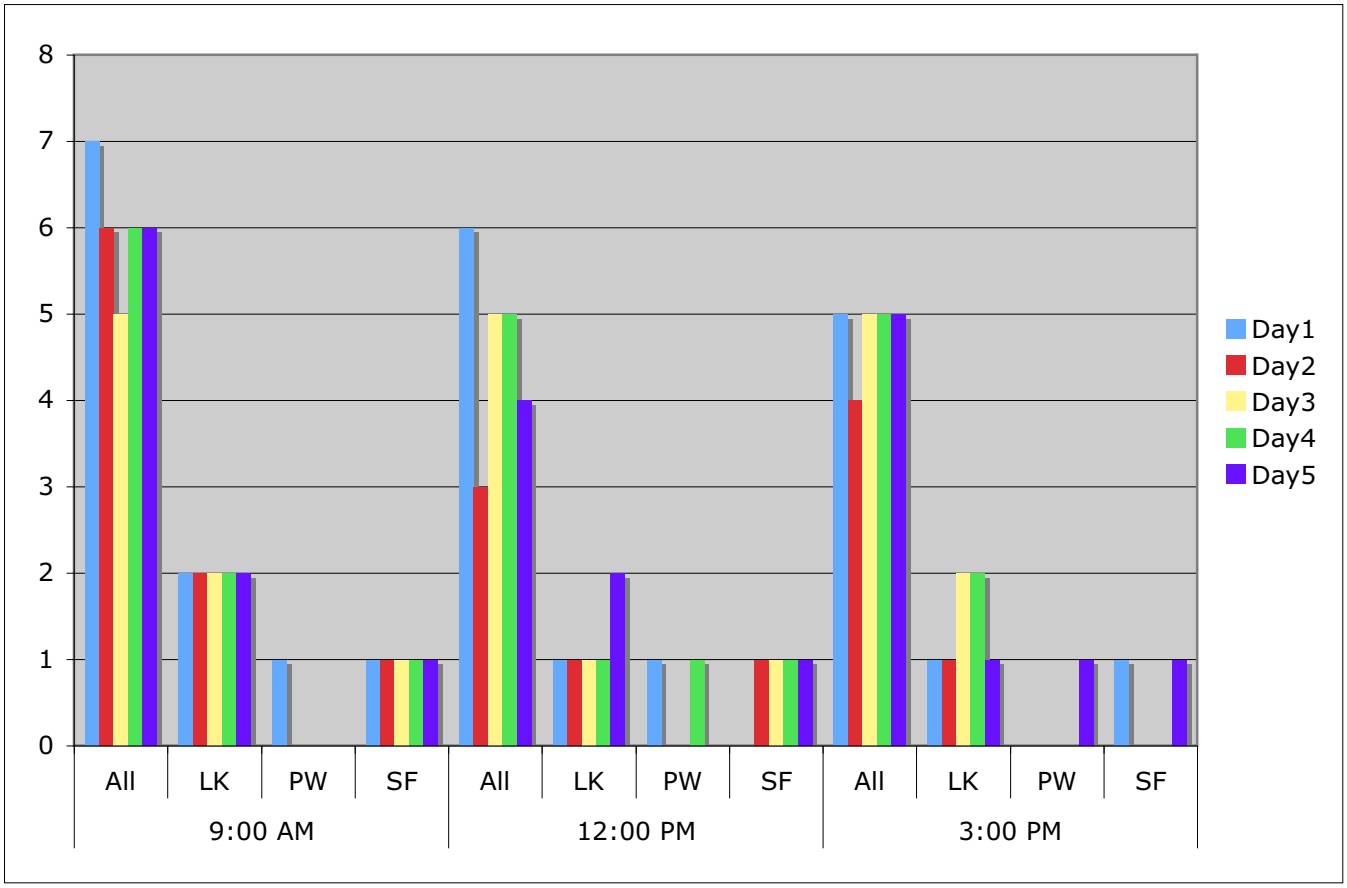
Use the following table as a reference to the birds that you will be observing today.

Type of Birds	Picture of Bird
Lorkeets (LK) is the green bird with a red head	
Paradise Whydah (PW) is the black bird with a long, black tail	
Saffron Finch (SF) is the small yellow bird	

STUDENT'S EXAMPLE

Sample Data Analysis

	9:00 AM				12:00 PM				3:00 PM			
	All	LK	PW	SF	All	LK	PW	SF	All	LK	PW	SF
Day1	7	2	1	1	6	1	1	0	5	1	0	1
Day2	6	2	0	1	3	1	0	1	4	1	0	0
Day3	5	2	0	1	5	1	0	1	5	2	0	0
Day4	6	2	0	1	5	1	1	1	5	2	0	0
Day5	6	2	0	1	4	2	0	1	5	1	1	1
Average	6	2	0.2	1	4.6	1.2	0.4	0.8	4.8	1.4	0.2	0.4



Sample Student Lab Report

Title: Do birds eat three times a day?

Statement of Problem:

The purpose of this experiment is to see if birds in the zoo eat three times a day like human.

Hypothesis:

Birds in the zoo will eat three times a day.

Experimental Design:

Observing object – birds – all birds and specific birds – Lorikeets, Paradise Whydah, Saffron Finch.
What should be observed – the number of times for eating
Observation time – three times a day - 9:00 a.m., 12:00 p.m., 5:00 p.m.
Period of Observation – Five days

Data & Results:

Refer to attached data gathering table and graph.

Analysis & Conclusion:

According to the result, most birds are observed to eat three times a day. However, Paradise Whydah rarely ate at the observing time. The interesting finding is that the average number of eating birds in the morning is 6 which is the highest number. In contrast, the numbers of birds eating in the noon is 4.6 and the one in the evening is 4.8.
In conclusion, this finding supports the hypothesis, but a certain type of bird did not show the pattern. We are not sure if the bird, Paradise Whydah, was sick or the bird has a different eating habit. In addition, we can conclude that birds eat more in the morning than other times.

Sample Lesson Plans: SCIENCE

Our Changing Earth

PLANNING

Topic: Plate Tectonics

Time: 45 minutes

Class: 5-8th grade Science

Science Standards addressed:

Science Standard #4: Students should be able to use knowledge of the Earth and other bodies in the universe to predict and explain natural occurrences, especially those that affect life on Earth.

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Standard 4: Technology communication tools: Students use technology communication tools to communicate information and ideas effectively to multiple audiences.

Standard 5: Technology research tools: Students use technology tools to locate, evaluate, and collect information from a variety of sources, process data and report results.

Materials:

1. Plate Tectonics video clips
2. Inspiration/Kidspiration
3. Textbook & other resources on plate tectonics

Objectives:	Bloom's Taxonomy:	Assessment:
1. Describe plate tectonics	Comprehension	Concept map
2. Describe convergent, divergent and transform shifts occur	Comprehension	Concept map, teacher questioning
3. Hypothesize future plate shifts.	Analysis/Synthesis	Teacher questioning

TEACHING

Introduction:

Use Intro plate tectonic video to stimulate student thinking about natural disasters and what causes these events around them.

Teacher Procedures:	**Student Procedures:**
Prior to the Computer	
1. Show Intro plate tectonic video (See resources below).	1. Watch Intro video
At the Computer	
2. Introduce students to concept mapping using Inspiration/Kidspiration. Have students brainstorm and then link their initial thinking about continental drift and plate tectonics. 3. Distribute plate tectonics reading passage (See resouces below). 4. Show Review video clip on plate tectonics (See resources below). 5. Provide students opportunity to ask questions about video and reading. 6. Have students revise initial concept map based on new information.	2. Use Inspiration/Kidspiration to build and initial concept map representing their current thinking about plate tectonics, natural disasters and continental drift. 3. Read passage. 4. View Review video clip. 5. Ask supplemental questions as necessary. 6. Revise initial concept map to reflect new knowledge.
After the Computer	
7. With whole group, question students about future plate shifts and possible future natural disasters, including where they are most likely to occur (See resources below)	7. Provide answers to teacher as called upon.

Resources:

1.http://www.edHelper.com for plate tectonics information
2.United Streaming video clips from http://www.unitedstreaming.com

ASSESSMENT

Plate Tectonics Concept Map				
CRITERIA	**4**	**3**	**2**	**1**
Conceptual Understanding (x 2)	Map demonstrates strong conceptual understanding of plate tectonic theory because it is comprehensive and accurate.	Map demonstrates solid conceptual understanding of plate tectonic theory because it is mostly comprehensive and accurate.	Map demonstrates adequate conceptual understanding of plate tectonic theory because it is somewhat comprehensive and accurate.	Map fails to demonstrate adequate conceptual understanding of plate tectonic theory.
Relationship (x 2)	All concepts and ideas are arranged in meaningful location and logical links between ideas are defined.	Most of the concepts and ideas are placed in correct location and logical links between ideas are defined.	Some of the ideas placed in correct location and/or are missing logical links between concepts.	Most of the ideas are placed incorrectly. Location and logical links between concepts are not defined.
Organization (x 2)	Concepts, sub-concept and examples are organized into meaningful categories or sections.	Concepts, sub-concept and examples are mostly organized into meaningful categories or sections.	Map is somewhat disorganized making it difficult to understand.	Map has no organization to subdivide categories or section.
Spelling, and Grammar (x 1)	Concept map is free of spelling and grammar errors.	One or two errors in spelling, and grammar on the concept map.		Frequent errors in spelling and grammar on the concept map.
Appearance (x 1)	Overall layout is easy to follow, visually appealing, and information is easy to read.	Overall layout is fairly easy to follow and generally information is easy to read.	Overall layout is crowded. Information and relationships are difficult to follow.	Overall layout appears confused and messy.

Plate Tectonics Handout and Video Clip

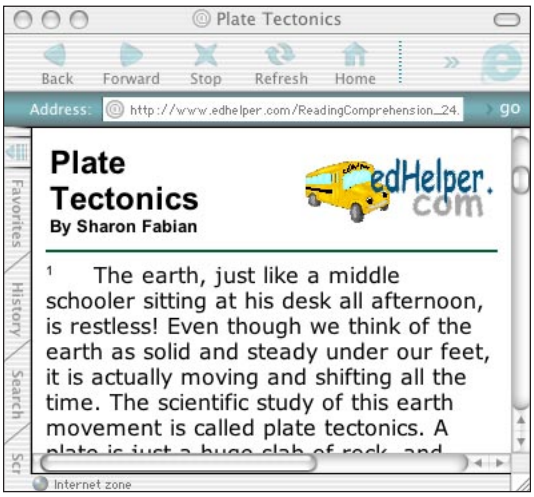


Plate Tectonics Story

from
http://www.edhelper.com/ReadingComprehension_24_81.html

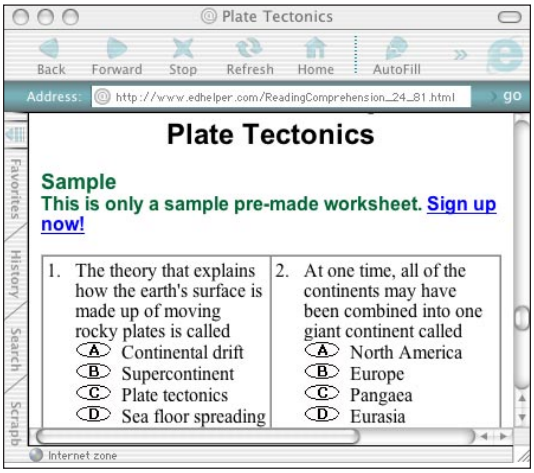


Plate Tectonics Worksheet

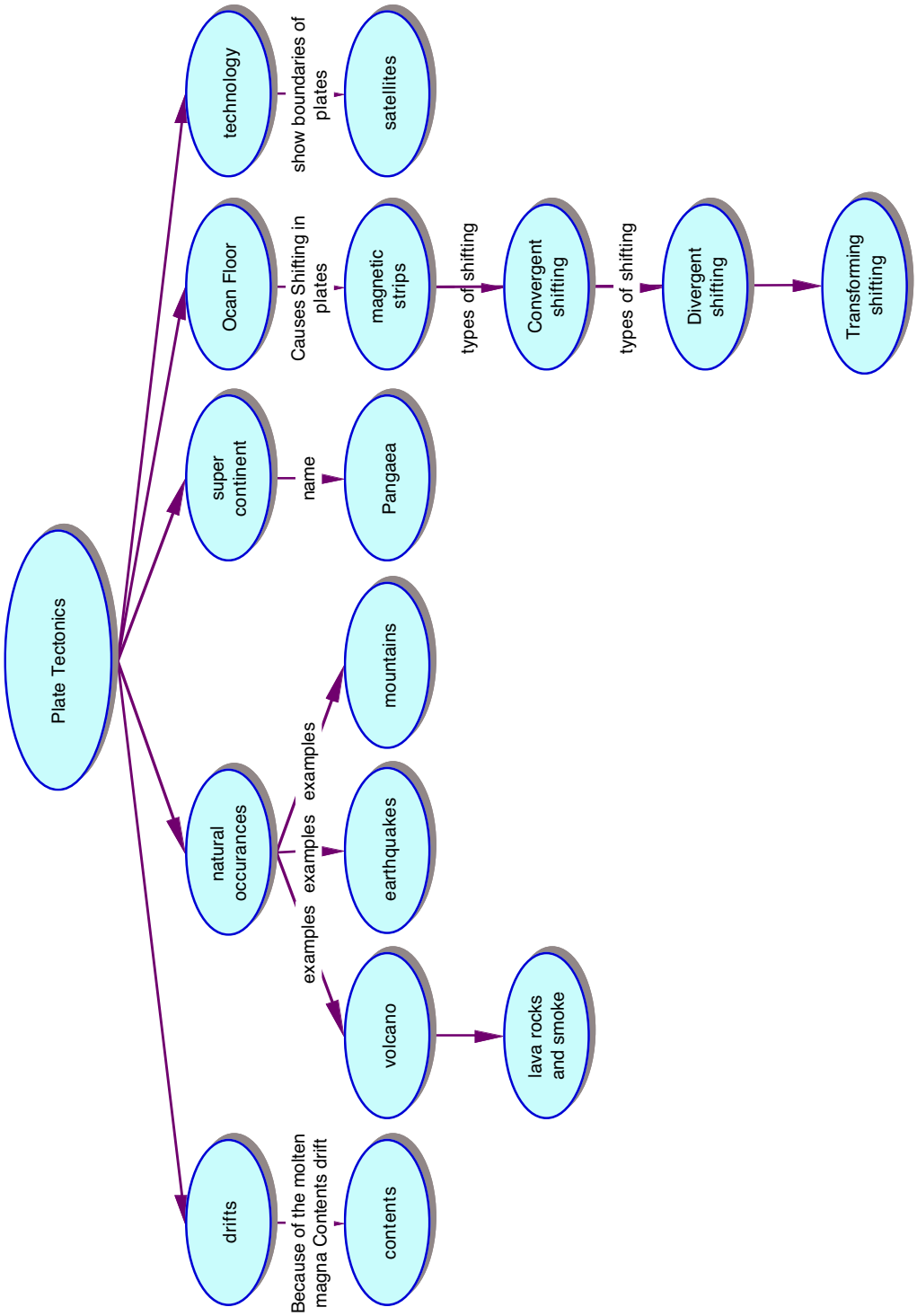
from
http://www.edhelper.com/ReadingComprehension_24_81.html

Video Clip - "Our Changing Earth"

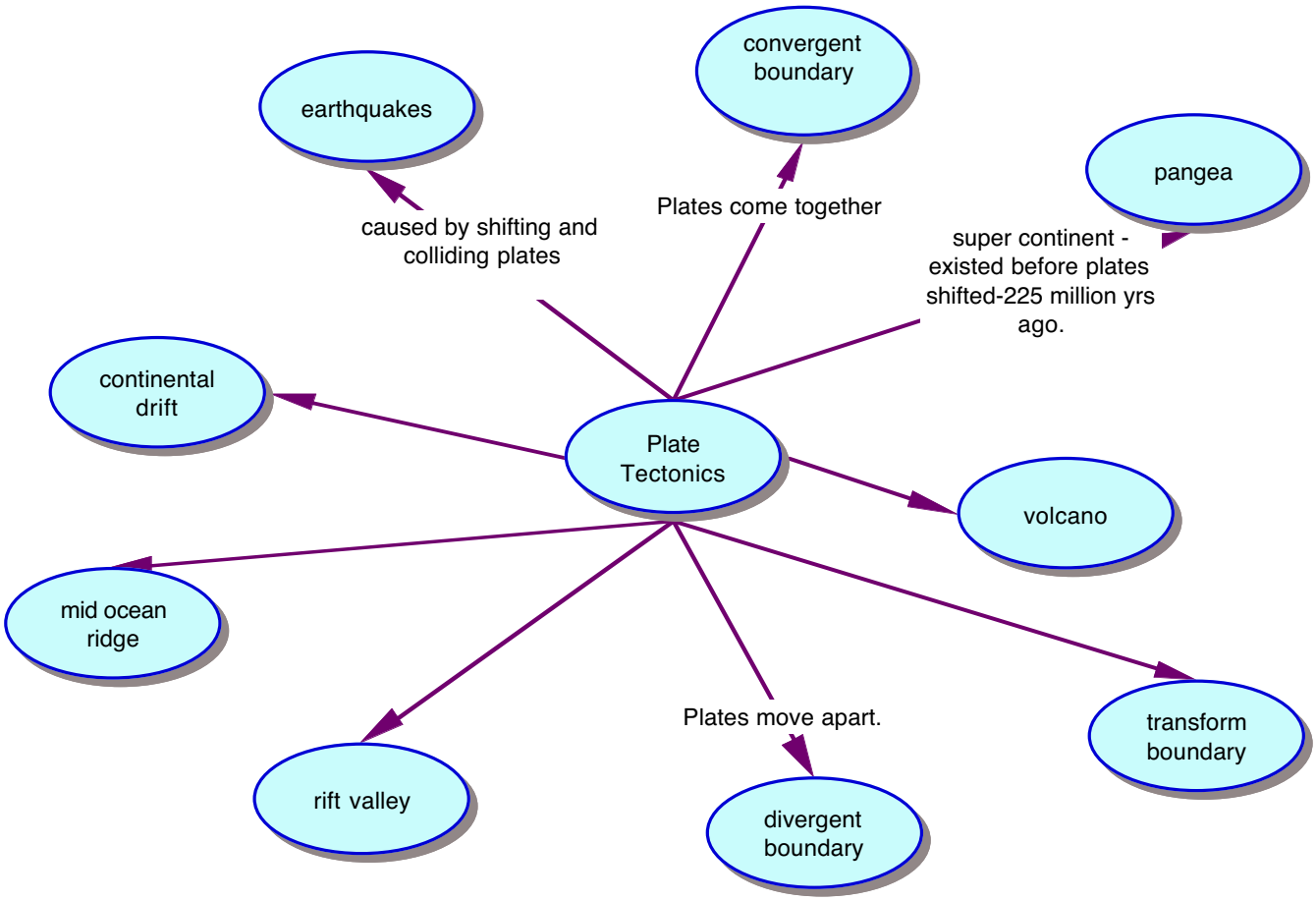
from http://www.unitedstreaming.com

STUDENT'S EXAMPLE

Sample Concept Map



Sample Concept Map



Technology Integration Ideas: SOCIAL STUDIES

Below are examples of activities and tools for teachers to integrate technology in the Social Studies area. Also included are the approprate national standards for each activity from Expectations of Excellence — Curriculum Standards for Social Studies published by National Council for the Social Studies, 1994, pp. 33-45

Activities	Tools	Sample National Content Area Standards
Features of U.S. state flags	Databases	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can give examples of how experiences may be interpreted differently by people from diverse cultural perspectives and frames of reference.
Government structures of different countries	Databases	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can compare similarities and differences in the ways groups, societies, and cultures meet human needs and concerns.
Features of the tallest mountains	Databases	Social studies programs should include experiences that provide for the study of people, places and environments, so that the learner can locate and distinguish among varying landforms and geographic features, such as mountains, plateaus, islands, and oceans.
U.S. Wars	Databases	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can compare and contrast different stories or accounts about past events, people, places, or situations, identifying how they contribute to our understanding of the past.
Female authors of the 1800's	Databases	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can identify and describe selected historical periods and patterns of change within and across cultures, such as the rise of civilizations, the development of transportation systems, the growth and breakdown of colonial systems, and others.
Governors from our state	Databases	Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can identify and describe the basic features of the political system in the United States, and identify representative leaders from various levels and branches of government.

Activities	Tools	Sample National Content Area Standards
Compare and/or Contrast: Pilgrims vs. Native Americans.	Concept Maps	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can compare ways in which people from different cultures think about and deal with their physical environment and social conditions.
Compare and/or Contrast: Matisse vs. Monet.	Concept Maps	socail studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can describe ways in which language, stories, folktales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture.
Compare and/or Contrast: Farm life vs. City life.	Concept Maps	Social studies programs should include experiences that provide for the study of people, places and environments, so that the learner can examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions.
Compare and/or Contrast: City vs. State vs. National Government.	Concept Maps	Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can distinguish among local, state, and national government and identify representative leaders at these levels such as mayor, governor, and president.
Create a TimeLine: Your Life.	Concept Maps	Social studies programs should include experiences that provide for the study of individual development and identity, so that the learner can describe personal changes over time, such as those related to physical development and personal interests.
Create a TimeLine: Civil Rights in the U.S.	Concept Maps	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can demonstrate an ability to use correctly vocabulary associated with time such as past, present, future, and long ago; read and construct simple timelines; identify examples of change; and recognize examples of cause and effect relationships.
Plot Main Ideas: Money.	Concept Maps	Social studies programs should include experiences that provide for the study of how people organize for the production, distribution, and consumption of goods and services, so that the learner can explain and demonstrate the role of money in everyday life.
Showcase items of interest within 100 miles of our school	Presentations	Social studies programs should include experiences that provide for the study of people, places and environments, so that the learner can examine the interaction of human beings and their physical environment, the use of land, building of cities, and ecosystem changes in selected locales and regions.

Activities	Tools	Sample National Content Area Standards
Document the history of money	Presentations	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can identify and describe selected historical periods and patterns of change within and across cultures, such as the rise of civilizations, the development of transportation systems, the growth and breakdown of colonial systems, and others.
Showcase postcard from Asia	Presentations	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can describe ways in which language, stories, folktales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture.
Create a "Countries of Our Heritage" for our class.	Presentations	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can describe ways in which language, stories, folktales, music, and artistic creations serve as expressions of culture and influence behavior of people living in a particular culture.
Show tessellations through time.	Presentations	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can demonstrate an ability to use correctly vocabulary associated with time such as past, present, future, and long ago; read and construct simple timelines; identify examples of change; and recognize examples of cause and effect relationships.
Visualize what happens to a vote.	Presentations	Social studies programs should include experiences that provide for the study of the ideals, principles, and practices of citizenship in a democratic republic, so that the learner can explain actions citizens can take to influence public policy decisions.
Web document - e.g., U.S. Constitution	Web Browsers	Social studies programs should include experiences that provide for the study of the ideals, principles, and practices of citizenship in a democratic republic, so that the learner can identify key ideals of the United States' democratic republican form of government, such as individual human dignity, liberty, justice, equality, and the rule of law, and discuss their application in specific situations.
Video - e.g., Martin Luther King - "I have a Dream"	Web Browsers	Social studies programs should include experiences that provide for the study of the ideals, principles, and practices of citizenship in a democratic republic, so that the learner can recognize that a variety of formal and informal actors influence and shape public policy.

Activities	Tools	Sample National Content Area Standards
Internet News about green house effect.	Web Browsers	Social studies programs should include experiences that provide for the study of global connections and interdependence, so that the learner can explore the causes, consequences, and possible solutions to persistent, contemporary, and emerging global issues, such as health, security, resource allocation, economic development, and environmental quality.
Current Events - Sports or Foreign Relations	Web Browsers	Social studies programs should include experiences that provide for the study of culture and cultural diversity, so that the learner can articulate the implications of cultural diversity, as well as cohesion, within and across groups.
Online Dictionaries or Encyclopedias - searching stock market	Web Browsers	Social studies programs should include experiences that provide for the study of how people organize for the production, distribution, and consumption of goods and services, so that the learner can describe a range of examples of the various institutions that make up economic systems such as households, business firms, banks, government agencies, labor unions, and corporations.
Statistical Data - e.g., census, employment	Web Browsers	Social studies programs should include experiences that provide for the study of interactions among individuals, groups, and institutions, so that the learner can demonstrate an understanding of concepts such as role, status, and social class in describing the interactions of individuals and social groups.
A virtual museum on the Web	Web Browsers	Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time, so that the learner can compare and contrast different stories or accounts about past events, people, places, or situations, identifying how they contribute to our understanding of the past.
Communicate with government officers	Communication Tools	Social studies programs should include experiences that provide for the study of how people create and change structures of power, authority, and governance, so that the learner can recognize how groups and organizations encourage unity and deal with diversity to maintain order and security.

Sample Lesson Plans: SOCIAL STUDIES

Get the Sense of the Census!

PLANNING

Topic: Population

Time: 45 minutes for 2 days

Class: Grades 5-8, Social Studies & Match

Content Standards addressed:

Memphis City School Social Studies Standard #3: Students should be able to analyze the impact of location and the interactions between the environment and people across continents.

Memphis City School Social Studies Standard #4: Students should be able to predict world conditions, based on a knowledge of past and present social, political, and economic conditions.

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Standard 5: Technology research tools: Students use technology tools to locate, evaluate, and collect information from a variety of sources, process data, and report results.

Materials:

1. Census Information
2. Data Collection Chart
3. Computer
4. Microsoft Excel

Objectives:	Bloom's Taxonomy:	Assessment:
1. Collect, interpret, and record Census data	Knowledge, Comprehension	Census Data Worksheet
2. Depict Census data using tables and graphs	Application	Census Data Worksheet, Spreadsheet Chart and Table
3. Compare Census data for the US, Tennessee, and Shelby County.	Analysis	Interpreting Your Graphs and Table Workdsheet, Whole Class Discussion

TEACHING

Introduction:

Ask the students what a census is. Ask the students why a census is conducted. Take a census of the students in the class and record the information.

Teacher Procedures:	Student Procedures:
Prior to the Computer	
1. Distribute & discuss the Data Collection chart 2. Show students how to convert percentages to whole numbers.	1. Review & discuss the Data Collection chart 2. Develop a formula for converting percentages to whole numbers.
At the Computer	
1. Use the calculator to model converting a percentage to a whole number. 2. Display excel worksheet and guide students to create a Data Comparison table. 3. Model turning table information into a graph.	1. Convert percentages to whole numbers. 2. Develop a Data Comparison table. 3. Graph census information for US, Tennessee, and Shelby County.
After the Computer	
1. Ask students to make comparisons using tables and graphs. 2. Discuss results and methods.	1. Compare information on tables and graphs, and complete interpreting your graphs and table worksheet 2. Discuss results and methods.

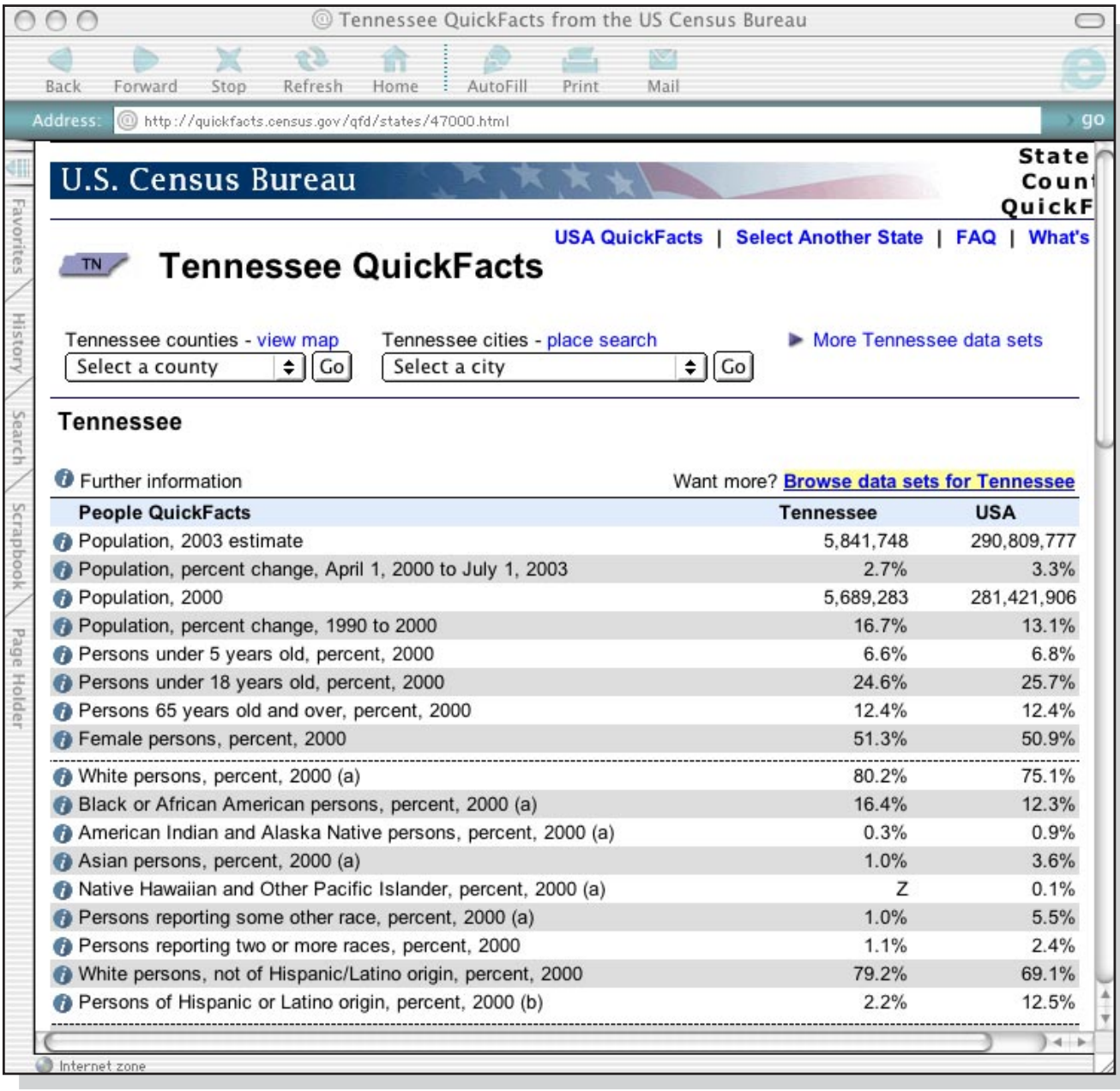
Resources:

1. U.S. Census Bureau Website (http://quickfacts.census.gov)
2. Memphis City Schools TLA website (http://www.memphis-schools.k12.tn.us/admin/tlapages/academyhome.html)

Assessment

CRITERIA	4	3	2	1
Spreadsheet				
Data and Labels (x 1)	All data is included, labeled and displayed in proper form.	Some data entries and/or labels are incorrect or unsupported.	Several data entries and/or labels are incorrect and unsupported.	Most data and/or labels are incorrect and unsupported.
Formulas & Calculations (x 2)	All calculations and formulas are correct.	Just one or two formula errors noted.	Several formula errors noted.	Most formulas are missing or incorrect.
Type of Graph Chosen (x 1)	Graph fits the data well and makes it easy to interpret.	Graph is adequate and does not distort the data, but interpretation of the data is somewhat difficult.	Graph distorts the data somewhat and interpretation of the data is somewhat difficult.	Graph seriously distorts the data making interpretation almost impossible.
Ease of Reading Graphs (x 1)	All titles, labels, and legends are present. Colors, fonts, and sizes are very attractive and easy to read.	Most titles, labels, and legends are present. Colors, fonts, and sizes are ok, easy to read.	Some titles, labels, and legends are present. Hard to read due to color, font, size or missing titles and legend.	No titles, labels, and legends are present.
Questions				
Question 1 (x 2)	Student accurately uses data from table and graphs to explain the difference among populations.	Student uses some data from table and graphs to explain the difference among populations.	Student uses minimal data from table and graphs to explain the difference among populations.	Student fails to uses data from table and graphs to explain the difference among populations.
Question 2 (x 2)	Student offers plausible reasons using social studies concepts for differences in populations.	Student offers some plausible reasons using social studies concepts for differences in populations.	Student offers minimal plausible reasons using social studies concepts for differences in populations.	Student fails to offer any plausible reason for causes in discrepancy using social studies concepts.
Question 3 (x 2)	Student offers two or more plausible reasons for causes in discrepancy with no misconception.	Student offers plausible reasons for causes in discrepancy with minor misconception.	Student offers one plausible reason for causes in discrepancy.	Student fails to offer any plausible reason for causes in discrepancy.

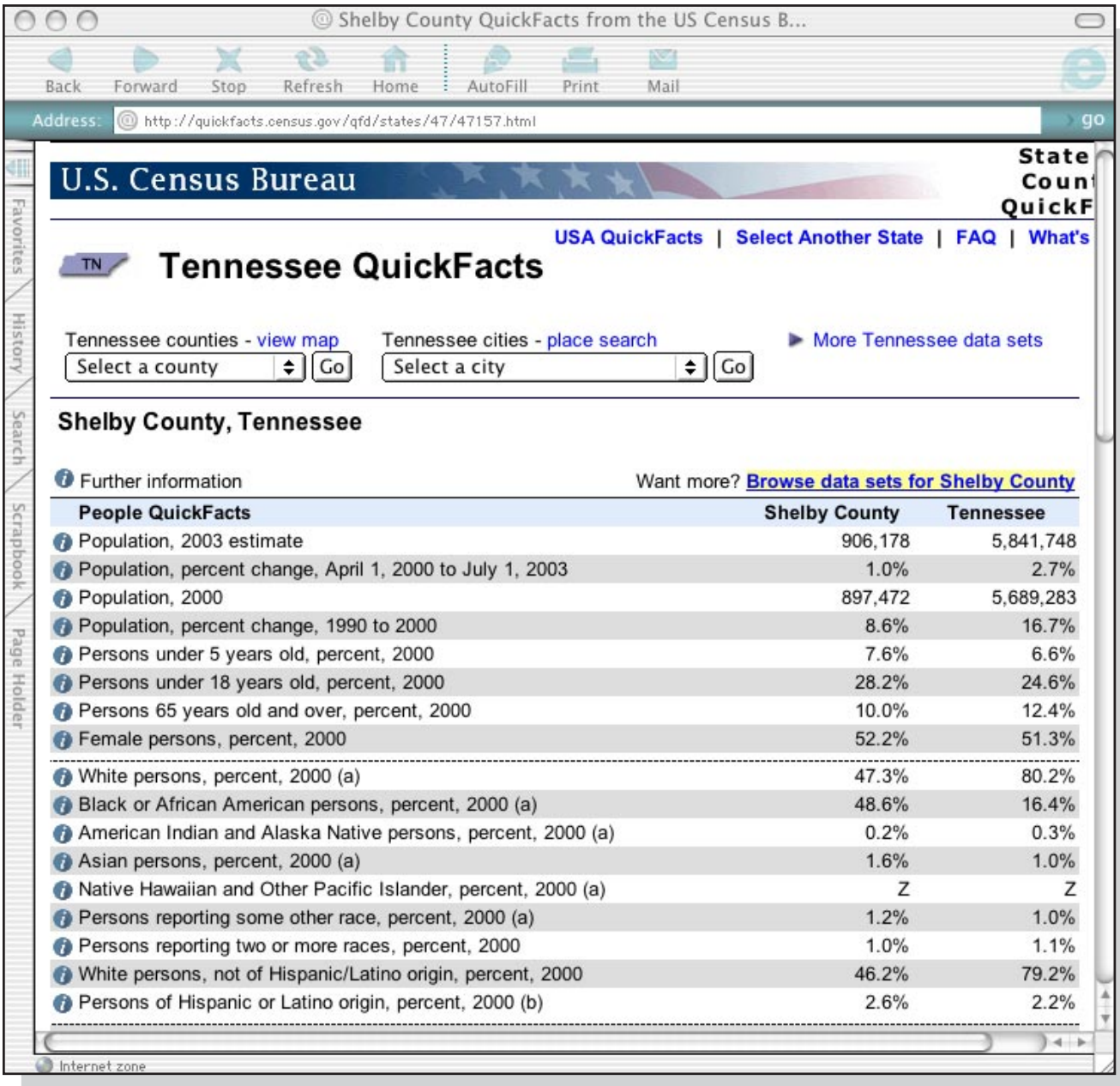
Census Information for U.S.A. and Tennessee



People QuickFacts	Tennessee	USA
Population, 2003 estimate	5,841,748	290,809,777
Population, percent change, April 1, 2000 to July 1, 2003	2.7%	3.3%
Population, 2000	5,689,283	281,421,906
Population, percent change, 1990 to 2000	16.7%	13.1%
Persons under 5 years old, percent, 2000	6.6%	6.8%
Persons under 18 years old, percent, 2000	24.6%	25.7%
Persons 65 years old and over, percent, 2000	12.4%	12.4%
Female persons, percent, 2000	51.3%	50.9%
White persons, percent, 2000 (a)	80.2%	75.1%
Black or African American persons, percent, 2000 (a)	16.4%	12.3%
American Indian and Alaska Native persons, percent, 2000 (a)	0.3%	0.9%
Asian persons, percent, 2000 (a)	1.0%	3.6%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	Z	0.1%
Persons reporting some other race, percent, 2000 (a)	1.0%	5.5%
Persons reporting two or more races, percent, 2000	1.1%	2.4%
White persons, not of Hispanic/Latino origin, percent, 2000	79.2%	69.1%
Persons of Hispanic or Latino origin, percent, 2000 (b)	2.2%	12.5%

from http://quickfacts.census.gov

Census Information for Tennessee and Shelby County



Shelby County QuickFacts from the US Census B...

Back Forward Stop Refresh Home AutoFill Print Mail

Address: http://quickfacts.census.gov/qfd/states/47/47157.html go

U.S. Census Bureau

State Count QuickF

USA QuickFacts | Select Another State | FAQ | What's

TN **Tennessee QuickFacts**

Tennessee counties - view map Select a county Go

Tennessee cities - place search Select a city Go

More Tennessee data sets

Shelby County, Tennessee

Further information Want more? Browse data sets for Shelby County

People QuickFacts	Shelby County	Tennessee
Population, 2003 estimate	906,178	5,841,748
Population, percent change, April 1, 2000 to July 1, 2003	1.0%	2.7%
Population, 2000	897,472	5,689,283
Population, percent change, 1990 to 2000	8.6%	16.7%
Persons under 5 years old, percent, 2000	7.6%	6.6%
Persons under 18 years old, percent, 2000	28.2%	24.6%
Persons 65 years old and over, percent, 2000	10.0%	12.4%
Female persons, percent, 2000	52.2%	51.3%
White persons, percent, 2000 (a)	47.3%	80.2%
Black or African American persons, percent, 2000 (a)	48.6%	16.4%
American Indian and Alaska Native persons, percent, 2000 (a)	0.2%	0.3%
Asian persons, percent, 2000 (a)	1.6%	1.0%
Native Hawaiian and Other Pacific Islander, percent, 2000 (a)	Z	Z
Persons reporting some other race, percent, 2000 (a)	1.2%	1.0%
Persons reporting two or more races, percent, 2000	1.0%	1.1%
White persons, not of Hispanic/Latino origin, percent, 2000	46.2%	79.2%
Persons of Hispanic or Latino origin, percent, 2000 (b)	2.6%	2.2%

Internet zone

from http://quickfacts.census.gov

Data Comparison Table Worksheet Template

	A	B	C	D	E	F	G
1	**Census2000**	**US**		**Tennessee**		**Shelby Co.**	
2	Population	281,421,906		5,689,283		897,472	
3	Ethnicity	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*	*Number*
4	White	75.1%	C-4	80.2%	E-4	47.3%	G-4
5	African-American	12.3%	C-5	16.4%	E-5	48.6%	G-5
6	American Indian	0.9%	C-6	0.3%	E-6	0.2%	G-6
7	Asian-American	3.6%	C-7	1.0%	E-7	1.6%	G-7
8	Hawaiian/Pacific Islander	0.1%	C-8	0.0%	E-8	0.0%	G-8
9	Other race	5.5%	C-9	1.0%	E-9	1.2%	G-9
10	2 races or more	2.4%	C-10	1.1%	E-10	1.0%	G-10
11	Hispanic/Latino	12.5%	C-11	2.2%	E-11	2.6%	G-11
12		TOTAL	C-12	TOTAL	E-12	TOTAL	G-12

Write down the formula to get the answer for each column.

C-4: _____ E-4: _____ G-4: _____

C-5: _____ E-5: _____ G-5: _____

C-6: _____ E-6: _____ G-6: _____

C-7: _____ E-7: _____ G-7: _____

C-8: _____ E-8: _____ G-8: _____

C-9: _____ E-9: _____ G-9: _____

C-10: _____ E-10: _____ G-10: _____

C-11: _____ E-11: _____ G-11: _____

C-12: _____ E-12: _____ G-12: _____

Interpreting Your Graphs and Table Worksheet Template

1. How do the percentage of White, African American and Hispanic differ in the U.S.A., Tennessee, and Shelby Co.?

2. What are the possible reasons for the difference above?

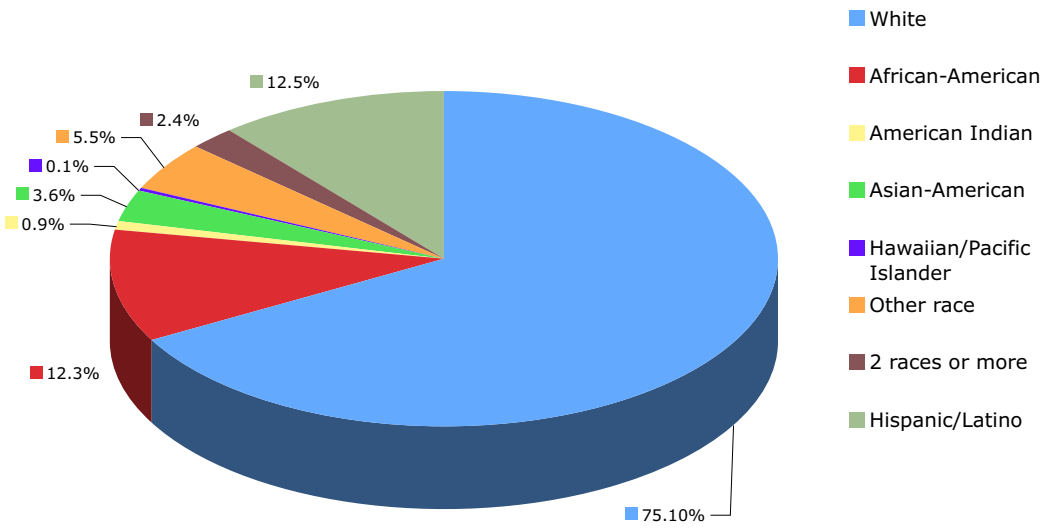
3. When summed up, the percentage column results are higher than 100%. What are the possible causes of this discrepancy?

STUDENT'S EXAMPLE

Data Comparison Table and Chart Sample

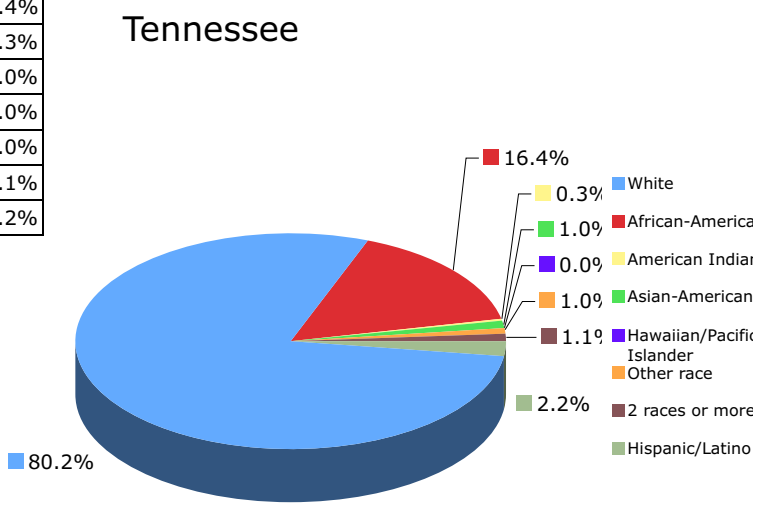
Census2000	US		Tennessee		Shelby Co.	
Population	281,421,906		5,689,283		897,472	
Ethnicity	*Percentage*	*Number*	*Percentage*	*Number*	*Percentage*	*Number*
White	75.10%	211,347,851	80.2%	4,562,805	47.3%	424,504
African-American	12.3%	34,614,894	16.4%	933,042	48.6%	436,171
American Indian	0.9%	2,532,797	0.3%	17,068	0.2%	1,795
Asian-American	3.6%	10,131,189	1.0%	56,893	1.6%	14,360
Hawaiian/Pacific Islander	0.1%	281,422	0.0%	0	0.0%	0
Other race	5.5%	15,478,205	1.0%	56,893	1.2%	10,770
2 races or more	2.4%	6,754,126	1.1%	62,582	1.0%	8,975
Hispanic/Latino	12.5%	35,177,738	2.2%	125,164	2.6%	23,334
	112.40%	316,318,222	102.20%	5,814,447	102.50%	919,909

Census2000	US
White	75.10%
African-American	12.3%
American Indian	0.9%
Asian-American	3.6%
Hawaiian/Pacific Islander	0.1%
Other race	5.5%
2 races or more	2.4%
Hispanic/Latino	12.5%

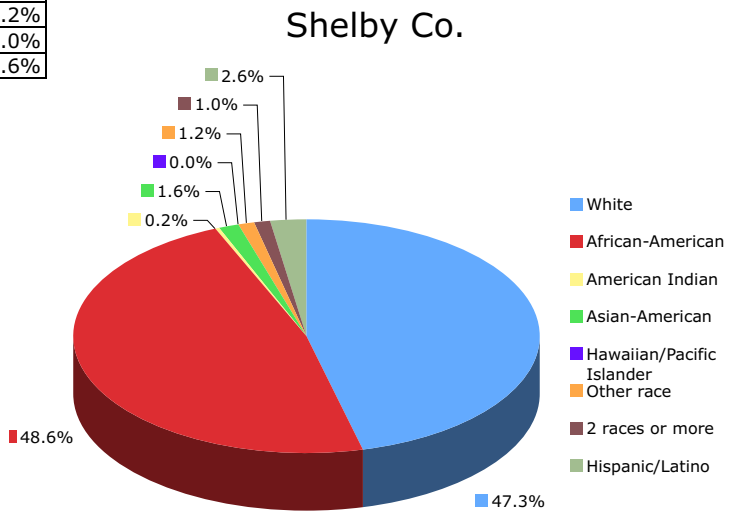


Data Comparison Table and Chart Sample

Census2000	Tennessee
White	80.2%
African-American	16.4%
American Indian	0.3%
Asian-American	1.0%
Hawaiian/Pacific Islander	0.0%
Other race	1.0%
2 races or more	1.1%
Hispanic/Latino	2.2%



Census2000	Shelby Co.
White	47.3%
African-American	48.6%
American Indian	0.2%
Asian-American	1.6%
Hawaiian/Pacific Islander	0.0%
Other race	1.2%
2 races or more	1.0%
Hispanic/Latino	2.6%



Sample Interpreting Your Graphs and Table

1. How do the percentage of White, African American and Hispanic differ in the U.S.A., Tennessee, and Shelby Co.?

   There are more white people in the United States, TN and Shelby County than other races. There are at least five times more White people than African-American or Hispanics in US and TN. However, Whites and African-Americans are at almost the same percentage in Shelby County. There are more African Americans than Hispanics in the U.S., TN and Shelby County. A higher % African Americans and Hispanics live in Shelby County than the state of Tennessee, but there is a lower % of White's in Shelby County compared to the rest of TN.

2. What are the possible reasons for the difference above?

   More minorities live in or around urban areas. Shelby County has a big city in the middle of it; Memphis. There are more African-Americans in Memphis. That is why there is a higher percentage of minorities in Shelby than TN. There is a smaller percentage of Hispanics in TN because TN is far away from South America where most Hispanics live.

3. When summed up, the percentage column results are higher than 100%. What are the possible causes of this discrepancy?

   Maybe some people are more than one race. So when they are filling out the census survey, they would mark more than one bubble. For example if a person had Hispanic and White heritage they would maybe mark both ethnicities. That makes two ethnicities for one person then making a percentage higher than 100%. Or may be the census people just rounded the numbers up because it's easier to count that way.

Sample Lesson Plans: SOCIAL STUDIES

Picture the Preamble

PLANNING

Topic: Social Studies

Time: 45 minutes for 2 days

Class: Grades 4-6

Content Standards addressed:

National Center for History in the Schools

STANDARD 2.I: The student comprehends a variety of historical sources; therefore the student is able to: **Draw upon the visual, literary, and musical sources** including: (a) photographs, paintings, cartoons, and architectural drawings; (b) novels, poetry, and plays; and, (c) folk, popular and classical music, to clarify, illustrate, or elaborate upon information presented in the historical narrative.

http://nchs.ucla.edu/standards/thinking5-12-2.html

Technology Standards addressed:

Standard 3: Technology productivity tools: Students use technology productivity tools to collaboratively construct completed products that represent quality work.

Standard 5: Technology research tools: Students use technology tools to locate, evaluate, and collect information from a variety of sources, process data, and report materials.
http://cnets.iste.org/students/s_stands.html

Materials:

1. Preamble Planning Sheet
2. Dictionary
3. Computer
4. Microsoft Word
5. Internet Access to:
   a. Online Preamble http://www.law.cornell.edu/constitution/constitution.preamble.html
   b. MS Clipart Gallery http://office.microsoft.com/clipart/default.aspx?lc=en-us
6. Pencil

Objectives:	Bloom's Taxonomy:	Assessment:
1. TLW select graphic images that represent each phrase of the Preamble to the US Constitution.	Comprehension	Preamble Rubric
2. TLW support the decision for selecting each graphic with a written rationale.	Knowledge, comprehension, analysis	Preamble Rubric
3. TLW write one or two paragraphs that demonstrates a clear understanding of the Preamble and what it means to her/him	Synthesis	Preamble Rubric

TEACHING

Introduction:

- Begin by displaying the Preamble to the Constitution of the United States on a large screen display, overhead, or whiteboard.
- Provide some brief background information about its purpose, authors, and when it was written.
- Give students a few minutes to silently read the Preamble; then have the class orally read the Preamble together.
- Follow this with a brief discussion pointing out that the Preamble may be a little difficult to understand because it is a fairly long and complex sentence.
- However, for the next two days, the students will be using pictures and images to make the Preamble easier to understand.

Teacher Procedures:	Student Procedures:
Prior to the Computer	
1. After the Introduction, distribute the Preamble Planning Sheets and dictionaries to students and ask them to briefly describe a possible picture or image that would illustrate each Preamble phrase and list key search words.	1. Students complete their Preamble Planning Sheet by briefly describing a picture or image for each Preamble phrase, using the dictionary when needed. 2. They then list two or three key words they can use to search for the images.

At the Computer

1. Have students open both MS Word and an Internet browser
2. Direct students to the Preamble website.
3. Direct students to the MS Clipart Gallery website
4. Monitor and assist as needed

1. Open MS Word and an Internet browser
2. Go to Preamble website and copy the Preamble
3. Go to MS Word and Paste the Preamble into a new document.
4. Add the following title: Picture the Preamble
5. Below the title, Insert a three-column 9-row table
6. Add the following column names: Preamble Phrase; Picture; Why Picture was Chosen
7. Cut and paste each Preamble phrase into the table.
8. Use key words to locate an image for the first phrase.
9. Use pull-down menu to copy the image
10. Go to Picture cell in the Word document
11. Paste the Picture
12. Write a brief rationale for why the picture represents the phrase
13. Save work
14. Repeat items 7-13 for the remaining phrases.
15. When all phrases are finished, correct any spelling errors
16. Print a copy.

After the Computer

1. Place students in groups of 3 to 4 students
2. Ask students to pass their Picture the Preamble work to the person on the right.
3. Students are to quietly review the work and take notes of the key similarities and differences, then pass the paper to the next person until students have reviewed all the papers in the group.
4. Give students 5 to 10 minutes to discuss the differences.
5. Have students individually write a reflection about what the Preamble means to them.

1. While in a group, students review each other's work and note differences and similarities between final documents.
2. Students discuss the different papers.
3. Students write one or two paragraphs describing what the Preamble means to them.

Assessment

PREAMBLE RUBRIC				
CRITERIA	**1**	**2**	**3**	**4**
Graphic images represent each phrase of the Preamble to the US Constitution.	Very few or none of the chosen graphics represent the concepts of their associated Preamble phrases.	Only a few of the chosen graphics clearly or somewhat clearly represent the concepts of their associated Preamble phrases.	Almost all of the chosen graphics clearly represent the concepts of their associated Preamble phrases.	All of the chosen graphics very clearly represent the concepts of their associated Preamble phrases.
Rationale for using the graphics	The rationale for very few or none of the chosen graphics demonstrates an appropriate representation of the concept.	The rationale for some of the chosen graphics demonstrates a fairly appropriate representation of the concept.	The rationale for almost all of the chosen graphics clearly demonstrates why the image is an appropriate representation of the concept.	The rationale for all of the chosen graphics very clearly demonstrates why the images were an appropriate representation of the concepts.
Reflections	The reflection does not demonstrate an understanding of the Preamble and/or what it means to the student.	The reflection demonstrates a somewhat vague understanding of the Preamble and what it means to the student.	The reflection demonstrates a somewhat clear understanding of the Preamble and what it means to the student.	The reflection demonstrates a clear understanding of the Preamble and what it means to the student.

Preamble Planning Sheet

Preamble Phrase	Describe a Picture that will represent this phrase	Key Search Word to find the picture.
We the People of the United States		
in Order to form a more perfect Union		
establish Justice		
insure domestic Tranquility		
provide for the common defense		
promote the general Welfare		
and secure the Blessings of Liberty to ourselves and our Posterity		
do ordain and establish this Constitution for the United States of America		

STUDENT'S EXAMPLE

Picture the Preamble (Sample)

Preamble Phrase	Preamble Phrase	Why picture was chosen
We the People of the United States		It represents multiple ethnicities with the American flag.
in Order to form a more perfect Union		The flag combined with the US map represent the states as a "Union"
establish Justice		Shows that Justice involves equality (scales), the law (book), and a justice system (the gavel)
insure domestic Tranquility		The dove symbolizes peace and tranquility.

Picture the Preamble (Sample)

Preamble Phrase	Preamble Phrase	Why picture was chosen
provide for the common defense		The pentagon is the defense center of the US and is dedicated to keeping all citizens safe.
promote the general Welfare		The people are happy because they enjoy the benefits of our country.
and secure the Blessings of Liberty to ourselves and our Posterity		The Statue of Liberty represents liberty to all people in the United States.
do ordain and establish this Constitution for the United States of America		Image shows what the Preamble to the constitution may have looked like when it was first written.

What the Preamble Means to Me
By Student Learner

Today, I learned about the Preamble to the United States Constitution. The Preamble showed me how lucky I am to live in the United States because it is truly a country dedicated to the people. The Preamble shows us that all the people in our country are united, including people of all races, all religions, and people from other countries. I also learned that our government protects the rights of all people who live here. We have freedom and the liberty to go to school and to do any type of work we want when we graduate.

Our country is also committed to keeping us safe by providing laws to protect us and also providing military protection.

I feel very proud to be an American.

SECTION 2

Why Integrate Technology

Why Technology Integration?

What Is Expected?

National Benchmarks

State Standards

Why Technology Integration?

In order to be an effective classroom teacher, it is critical to have an understanding of the purpose for technology integration. Later chapters will illustrate how to mentor, support and enable teachers to succeed at technology integration, as well as how to plan and implement a technology integration effort.

This chapter deals with comprehending the responsibilities classroom teachers have for technology integration. This chapter will examine:

- Workforce expectations
- National benchmarks
- Content guidelines

Workforce requirements, national legislation, and educational standards all play a part in what is expected regarding technology integration.

What is expected?

Classroom teachers should be aware of the expectations for their job. Workforce requirements, national legislation, and educational standards all play a part in what is expected regarding technology integration.

Regarding workforce requirements, the Secretary's Commission on Achieving Necessary Skills (SCANS) report from the United States Department of Labor provides some insight. According to this report, five competencies are needed by today's workforce. One of these competencies is the ability to work with a variety of technologies. Specifically, this report identifies three areas in which employees should be competent: selecting technology, applying technology to task, and maintaining and troubleshooting equipment (U.S. Department of Labor, 1991). Further research has identified the most common uses of computers by employees who use computers. They are as follows: bookkeeping/invoicing (66%), word processing (57%), communications (47%), analysis/spreadsheets (41%), and calendar/scheduling (38%) (Snyder and Hoffman, 2002). If today's students are going to be prepared to effectively use these tools, they must begin by gaining hands-on experience with them. Technology coaches must recognize these workforce requirements in order to provide the necessary direction to their schools.

National benchmarks

In addition, government leaders expect to see technology effectively integrated into our nation's schools. In his educational reform plan, *No Child Left Behind*, President George W. Bush is advocating support for technology. According to this plan, his administration has a primary goal to "improve student academic achievement through the use of technology in elementary schools and secondary schools" and to ensure that "every student is technologically literate" (United States Department of Education, 2001). No doubt, the federal government realizes the importance of reform within our educational system and the importance that technology plays in ensuring that the next generation is properly prepared to meet the demands of the information age.

Furthermore, educational standards set expectations for technology to be effectively integrated into our nation's schools. The International Society for Technology in Education (ISTE), one of the leading organizations responsible for creating national educational technology standards, has researched and devised what it believes is the type of learning environment that is needed to prepare students for a knowledge-based society. They rightfully address school reform from a highly regarded perspective that blends traditional and new approaches to learning. They suggest the following characteristics as components of the type of learning environment that is needed to prepare students for the information age:

- Communicate using a variety of media and formats
- Access and exchange information in a variety of ways
- Compile, organize, analyze, and synthesize information
- Draw conclusions and make generalizations based on information gathered
- Use information and select appropriate tools to solve problems
- Know content and be able to locate additional information as needed
- Become self-directed learners
- Collaborate and cooperate in team efforts
- Interact with others in ethical and appropriate ways (International Society for Technology in Education, 1998, pg. 2).

With these guidelines, one can more clearly understand the expectations of a technology coach and the type of environment that is needed to be effective in K-12 technology integration.

Additionally, ISTE's standards include six broad categories as "Technology Foundation Standards" (ISTE, pg. 5). The six standards are as follows:

1. Basic operations and concepts
2. Social, ethical, and human issues
3. Technology productivity tools
4. Technology communications tools
5. Technology research tools
6. Technology problem-solving and decision-making tools

These foundation standards also clearly identify what leaders in the field of educational technology recognize as key components of technology use within all K-12 schools. They therefore, provide technology coaches with a clearer understanding of the expectations for their role within the K-12 environment.

Content specific guidelines

In addition, national discipline-specific organizations have established national curriculum standards in which they recommend the use of technology to support learning. The National Council of Teachers of English includes in its standards that students should "use a variety of technological and information resources to gather and synthesize information and to create and communicate knowledge" (National Council of Teachers of English, 2003). Similarly, the National Council for the Social Studies recommends as a part of its pedagogical standards that teachers should ensure that students are able to use "media communication techniques that foster active inquiry, collaboration, and supportive interaction in the classroom" (National Council for the Social Studies, 2003).

Likewise, according to the National Science Education Standards, K-4 students should be able to develop skills in the use of computers "for conducting investigations" (National Academy of Sciences, 2003), while 5-8 students should be able to use "computers for the collection, summary, and display of evidence" (National Academy of Sciences, 2003). And, finally, the National Council of Teachers of Mathematics recommends that K-2 students "represent data using concrete objects, pictures, and graphs", 3-5 students "represent data using tables and graphs such as line plots, bar graphs, and line graphs", and 6-8 students use bar graphs and histograms to represent data and decide which display is appropriate (National Council of Teachers of Mathematics, 2003).

State standards

State departments of education also provide standards to educators within their state regarding their expectations of technology use in K-12 schools. The Virginia Department of Education, for example, recommends that by the end of grade five students be able to:

- Demonstrate a basic understanding of computer theory, including bits, bytes, and binary logic;
- Develop basic technology skills;
- Process, store, retrieve, and transmit electronic information; and
- Communicate through application software Virginia State Standards of Learning for Computer/Technology Skills (2001).

The West Virginia Department of Education holds similar expectations regarding what they expect regarding technology use within K-12 schools. Their state board of education recommends that students use technology tools for the following purposes:

- To be actively involved in critical thinking and problem solving;
- To collaborate and cooperate;
- To develop as productive citizens; and
- To enhance academic achievement and workplace readiness (West Virginia Department of Education, 2003).

Although these are only two examples of state expectations for technology use within K-12 schools, they exemplify the role states have in encouraging the use of technology in education. Further, they provide direction to the type of leadership that technology coaches should provide when implementing the use of technology in local school environments.

Clearly, the issue of technology integration is addressed by people who hold many expectations. Workforce requirements, national legislation, and educational standards all have expectations regarding what should be occurring within our nation's schools concerning the issue of technology integration. Although these influences may appear too overwhelming to implement, one must remember that such expectations are in place to assist and provide direction to the way in which local goals should be implemented. That is, the variety of expectations are not there as stumbling blocks or purposeful hindrances to technology integration. Rather, they are a road map providing direction to success.

Let's Practice

In my state, when should students use technology?

This chart, along with your state technology standards, can be used to determine when students should be introduced to specific types of computer hardware and/or software. See the example below. Follow the directions below to create a chart that is specific for your state.

Sample: Technology by Grade Level Introduced

Software Used	Grade Levels			
	K-2	3-5	6-8	9-12
Word Processing	X	X	X	X
Spreadsheets	X	X	X	X
Internet Browser	X	X	X	X
HTML			X	X

Directions:

- Determine the grade level divisions of your State Technology Standards and add them as column headers under Grade Level Divisions.
- Begin reviewing the technology standards with the lower grades and each time a specific hardware or software is mentioned, add the name to the chart and place an "X" in the appropriate grade level column.
- Continue the same process with each grade level division, adding software as it is mentioned.

Software Used	Grade Levels			
	K-2	3-5	6-8	9-12

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SECTION 3

Effective Technology Integration

How to Use Technology to Improve Student Learning

How Do Teachers and Students Use Computers?

How to Create New Learning Environments

How to Create Critical Thinking Activities

How to Create Problem-Based Learning Activities

How to go from Objectives to Problem Statements

How to Achieve Successful Problem-Based Learning

How to...

Use Technology to Improve Student Learning

From the previous section, we examined why technology should be integrated into our classroom instruction and what the expectations for technology skills were on a national and state level. This section of the handbook begins to explore how teachers and students are currently using computers in the classroom and suggests ways and methods to rethink how instruction may change when technology is used. When looking at a computer, the primary component is the processor. Learning is enhanced or improved when students engage in activities that require higher-order, critical thinking and ***processing***. Therefore, it is a natural tool to enable students to more easily reach higher-levels of understanding. We examine how restructuring a lesson to introduce problem-based learning focuses on these higher-order and critical thinking skills. Lastly, we begin to move from the district and curriculum standards to problem statements that situate the lesson objectives within "real world" or authentic contexts.

How do...

Teachers and Students Use Computers

The following chart depicts typical differences between how teachers use technology and how students use technology for school-related tasks. You will note that three of the teacher tasks are *supportive* of the instructional process, while one reflects direct use of technology for instructional purposes. The student tasks, on the other hand, are all directly related to classroom activities. The differences in student tasks are in the degree to which students utilize "real-world" software applications (Resource and Learning Tools) vs. pre-programmed educational software (Teaching/Testing Tools).

Teacher Use

Management
- Grades
- Student Information
- Parent Communication
- Student Communication

Production
- Classroom Posters
- Student Handouts
- Tests

Instructional Support
- Display Notes
- Show Internet Sites
- Demonstrate Concepts
- Whole-class Drill & Practice

Student Use

Teaching/Testing Tool
- Drill & Practice
- Tutorial
- Problem-solving
- Individualized Testing

Resource Tool
- Retrieve Information
- Communication with Experts
- Communicate with other Students

Learning Tool
- Calculate
- Organize
- Graph
- Illustrate
- Sequence
- Model
- Narrate
- Animate

How do...

I use Technology in My Classroom?

This chart will help you to plan and keep track of how you use technology as a professional tool.

My Professional Use of Computers Worksheet

Directions: For each Column, record the date then check each computer use.

- Use Column 1 to show current use of technology.
- Use Column 2 to show new uses you would like to try this year.
- Use Column 3 to show your progress at mid-year.
- Use Column 4 to show technology used by the end-of-the-year.

	1 What I use now Date _____	2 What I want to use this year Date _____	3 My Mid-Year Uses Date _____	4 My End-of-Year Uses Date _____
CLASSROOM MANAGEMENT				
Grades				
Student Information				
Parent Communication				
Student Communication				
Other: _____				
PRODUCTION OF CLASSROOM MATERIALS				
Classroom Posters				
Student Handouts				
Tests				
Other: _____				
INSTRUCTIONAL SUPPORT				
Display Notes				
Show Internet Sites				
Demonstrate Concepts				
Whole-class Drill and Practice				
Other: _____				

How do...

My Students Use Technology?

This chart will help you plan and keep track of how your students use technology during the school year.

My Students' Uses of Computers Worksheet

Directions: For each Column, record the date then check each computer use. Use Column 1 to show current student use of technology. Use Column 2 to show new uses students would like to try this year. Use Column 3 to show students' progress at mid-year. Use Column 4 to show technology used by students at the end-of-the-year.

	1 What I use now Date _____	2 What I want to use this year Date _____	3 My Mid-Year Uses Date _____	4 My End-of-Year Uses Date _____
TEACHING/TESTING TOOL				
Drill and Practice				
Tutorials				
Problem-solving				
Individualized Testing				
Other: _____				
RESOURCE TOOL				
Retrieve Information				
Communicate with Experts				
Communicate with other students				
Other: _____				
LEARNING TOOL				
Calculate				
Organize				
Graph				
Illustrate				
Sequence				
Model				
Narrate				
Animate				
Other: _____				

Classroom Ideas

Students Uses of Technology

Below are examples of student uses of computers as teaching/testing, resource, and learning tools. Next to each example is an idea for classroom implementation of the approach.

TEACHING/TESTING TOOL	Examples	Teaching Ideas
Drill and Practice	• Math Blaster®	• Display for whole-class problem solving
Tutorials	• PLATO®	• Students keep journal of challenges
Problem-solving	• Oregon Trail®	• Groups compete to solve the same problems
Individualized Testing	• Accelerated Reader®	• Students choose target book above current reading level as goal
RESOURCE TOOL	**Examples**	**Teaching Ideas**
Retrieve Information	• CD Encyclopedias • National Geographic	• Find state most opposite of the state in which student lives
Communicate with Experts	• Scientists • Government Officials • Writers	• Compare job requirements of experts • Compare opinions of key issues
Communicate with other students	• Same class • Same school • Same city • Same state • National • International	• Homework buddies • Plan recycle plan for school • Debate local issue • Share weather information • Compare fresh water samples • Compare course requirements

LEARNING TOOL	Examples	Teaching Ideas
Calculate	• Spreadsheet	• Cost of pizza per square inch • Gallons of paint for 10 X 12 room • Population density of Mexico vs. U.S.
Organize	• Database	• States by date of entry • Shapes by number of sides • Elements by atomic weight
Graph	• Spreadsheet	• Speed by incline • Number of fall leaves by type • Population growth by decade
Illustrate	• Draw • Kid Pix®	• Cell division • Chemical bonding • Sentence structure
Sequence	• PowerPoint® • Word processing	• Steps for writing a book review • How to divide fractions
Model	• Draw • PowerPoint® • HyperStudio®	• Rotate vs. revolve • Erosion • A tornado
Narrate	• PowerPoint® • HyperStudio	• The birth of a frog • The making of “ The Thinker”
Animate	• HyperStudio® • PowerPoint®	• The water cycle • Even and odd

How to...

Create New Learning Environments

The International Society for Technology in Education (ISTE) suggests that an "essential condition" for successful use of technology is to implement a student-centered approach to learning. The underlying reasoning is that today's workforce requires employees to actively participate in a collaborative environment that utilizes multiple resources and technology tools to solve a variety of problems. To prepare our youth for this world, our classrooms must incorporate new, research-based components into traditional approaches that are proven to be successful. Below is a chart that illustrates these needed changes.

ESTABLISHING NEW LEARNING ENVIRONMENTS

Traditional Learning Environments	New Learning Environments
Teacher-centered instruction	Student-centered learning
Single sense stimulation	Multisensory stimulation
Single path progression	Multipath progression
Single media	Multimedia
Isolated work	Collaborative work
Information delivery	Information exchange
Passive learning	Active/exploratory/inquiry-based learning
Factual, knowledge-based learning	Critical thinking and informed decision-making
Reactive response	Proactive/planned action
Isolated, artificial context	Authentic, real-world context

In order to achieve the new, student-centered environments, ISTE suggests that it is important to engage students in learning experiences that require them to:

- Communicate using a variety of media and formats
- Access and exchange information in a variety of ways
- Compile, organize, analyze, and synthesize information
- Draw conclusions and make generalizations based on information gathered
- Know content and be able to locate additional information as needed
- Become self-directed learners
- Collaborate and cooperate in team efforts
- Interact with others in ethical and appropriate ways

(Source: http://cnets.iste.org/students/s_esscond.html)

As can be seen, many of these activities involve students utilizing technology as a tool needed to achieve the intended outcome. As this is true, attention is turned to the more relevant issue: How can teachers create these new learning environments

How to...

Create Critical Thinking Activities

When students are engaged in critical thinking activities that require them to process and apply new knowledge and skills in a meaningful context, they are better able to generate deeper understanding. This higher level of comprehension helps students to retain and utilize the newly gained knowledge and skills in a variety of ways. These types of activities can be done with or without computers. However, computers enable students to focus on the critical elements of processing information rather than on the tedious, organizational tasks that are not directly related to the overall learning task. Here is an example problem that students from a social studies class might be asked to solve:

> Examine the population growth patterns of the United States, Europe, and Asia, and predict the status of these in 50 years.

If using a calculator, students would have to re-enter information multiple times to examine each trend – thus increasing the possibility of errors and the level of student frustration. If a computer with spreadsheet software were used, the data would only be entered once and students could then concentrate on creating formulas that extract the needed information to examine the differences in population growth and predict future trends – the ultimate goal of the lesson.

Generative Learning Strategies

- Recall
- Integration
- Organization
- Elaboration

An easy way to ensure that your students engage in critical thinking activities is to include one or more of the following **generative learning strategies** in each lesson: recall, integration, organization, and elaboration (Whittrock, 1990). A detailed description of these strategies and some practice items are presented below.

Generative Learning Strategies

Generative learning strategies require students to generate or construct meaningful relationships between their prior knowledge and new information being taught. Each strategy has students interact with the information by processing it in different ways, thus reinforcing deeper understanding and better supporting the transfer of knowledge and skills to new situations.

Level of Thinking	Type of Generative Strategy	Suggested Student Activities
Requires **LOWER-LEVEL** Thinking	**RECALL** Helpful for learning facts and lists for verbatim recall	• Repetition • Rehearsal (e.g. mental practice) • Review • Mnemonics
Requires **HIGHER-LEVEL** Thinking	**INTEGRATION** Useful for transforming information into a more easily remembered form	• Paraphrase • Generate questions • Generate examples
	ORGANIZATION Helps learner identify how new ideas relate to existing ideas	• Analyze & interrelate key ideas • Outline • Categorize
	ELABORATION Requires learner to add his/her ideas to the new information	• Generate mental images • Create physical diagrams • Expand sentences or stories

Adapted from: Morrison, G. R., Ross, S. M. & Kemp, J. E (2004). *Designing effective instruction: Applications of instructional design* (4th. Ed.).

Let's Practice

Identifying Generative Learning Strategies

This activity will help you determine if the listed classroom activities will engage students in higher or lower levels of learning as you identify the type of generative strategy used for each one.

Generative Learning Strategies Handout

Directions: Complete the following table by listing a computer application that could be used with the learning activity. Then, identify the type of Generative Learning Strategy that is being used. Some activities may use more than one strategy.

Ideas for Enhancing Learning	Possible Computer Application	Generative Learning Strategy
Write the " Pledge of Allegiance" .	Word Processor	Recall
Rewrite information from a CD encyclopedia on insects to be used in a report on local pests.	Word Processor	Integration
Write a five-minute play in which the characters reflect life in an Aztec village.	Word Processor	Elaboration
Categorize the food you have eaten in the past week according to calories, fat and protein content.	Database	Organizational
Draw five common objects that contain an isosceles triangle.	Draw	
Make a list of questions and possible answers to be used interviewing an Indian chief from the 1800' s.		
Name the planets that revolve around the sun, beginning with the one closest to the sun.		
Compare and contrast two themes found in Romeo and Juliet.		

Ideas for Enhancing Learning	Possible Computer Application	Generative Learning Strategy
Create a presentation using only graphics to accompany Martin Luther King's "I have a Dream" speech		
Classify items in your refrigerator as liquid, solid, or gas.		
Recite the multiplication tables from 5 to 8.		
Create your version of a Monet painting.		
Create a timeline of the Civil War.		
Group the pictures by time of year: Spring, Summer, Fall, Winter.		
Rewrite the " Preamble" to the Constitution so a 3rd grade student could understand the meaning.		
Compare circulatory systems of three animals.		
Determine if electricity or gas is the most economical fuel in your community.		
Which route is the shortest from your home to Washington, DC?		
Draw and label the main parts of a flower.		
Write a poem.		
Give three examples of an equation using negative expressions.		

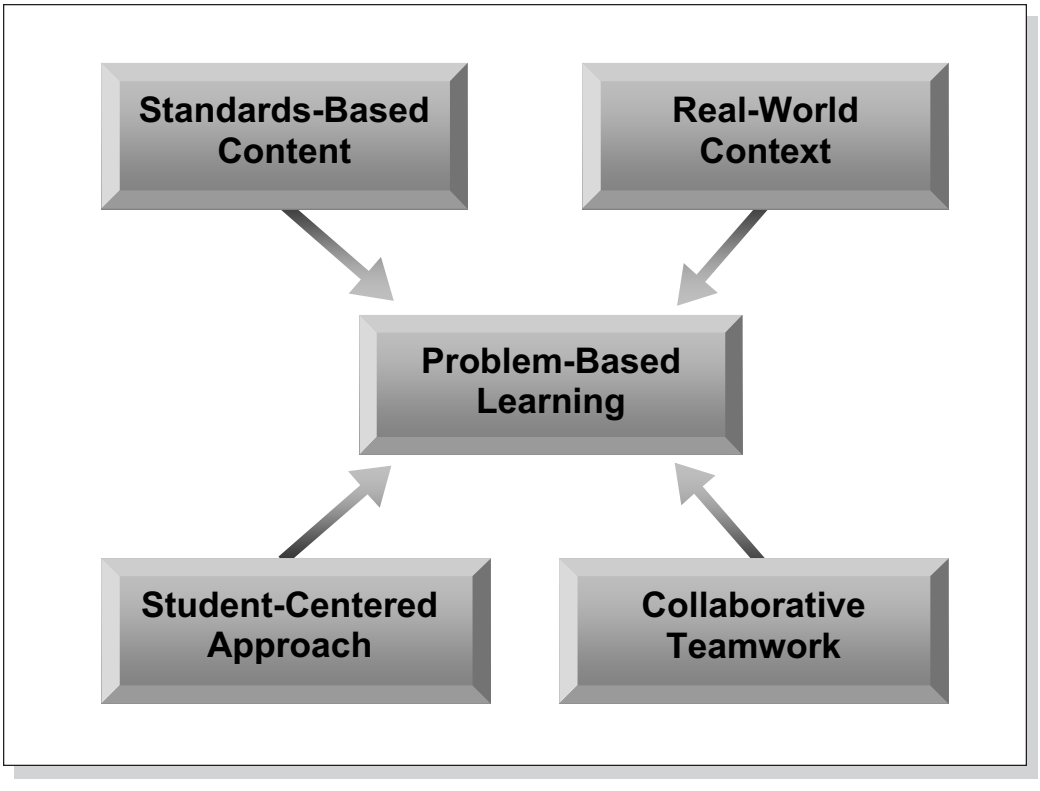
How to...

Create Problem-Based Learning Activities

The renewed emphasis on student performance and accountability, as seen in NCLB, increases the need to ensure that all classroom activities result in improved student achievement. In the past, this meant that students were able to recall memorized facts or solve math problems. As mentioned throughout this handbook, measures of academic achievement for today's students go beyond rote responses by requiring students to apply critical thinking skills to solve complex problems. Therefore, classroom environments can no longer consist of teachers providing factual information through lectures and students "learning" the information through the completion of worksheets and end-of-chapter questions. Instead, students need learning opportunities that equip them with the knowledge and skills to not only perform well on more demanding standardized tests, but also to meet the challenging requirements of today's society. Problem-based learning (PBL), when well structured, is one way to meet these needs.

Components of Problem-Based Lessons

So, how do you create a "well-structured" problem-based learning environment? You begin with four major components: standards-based content, real-world context, student-centered approach, and collaborative teamwork (see diagram below).



Standards-Based Content. When planning problem-based learning, it is critical to ensure that the "problem" which drives the lesson addresses core content from your curriculum standards (Jones, Rasmusen, & Moffit, 1997; Bridges & Hallinger, 1995). This should be fairly easy, as most PBL lessons require the application of knowledge and skills from multiple content areas that are covered in local standards. Noteworthy to avoid, however, is focusing a lesson on a really interesting problem that only results in student achievement of one or two learning objectives covered on the students' standardized test. For example, a 4th grade teacher may want to avoid spending three weeks on a unit about the migration habits of Monarch butterflies, when only one of 48 district science standards for 4th grade requires students to understand the migration habits of animals. However, if the PBL lesson also has students incorporate math skills to examine migration trends over time, map skills aligned to geography objectives, symbolism of butterflies for language arts, and life cycles for science, then a three-week unit may be justified.

When you examine the structure of issues that occur in the "real world," very seldom is there only one solution achieved by using one source of information.

Real-World Context. Next, problem-based learning needs to have a real-world context – or as close to one as possible (Checkley, 1997; Barrows & Myers, 1999). This "reality" can be achieved through the structure of the problem itself, as well as the context. When you examine the structure of issues that occur in the "real world," very seldom is there only one solution achieved by using one source of information. Rather, these problems are ill structured, in that more than one solution is workable and a variety of resources can be used in reaching the different solutions. Therefore, problem-based learning needs to reflect this same structure. With regard to achieving a "real-world" context, you can use information directly related to the students or the community. For example, students can create an "Our Heritage" book that highlights the native countries of the children's ancestors. Community members can work with students to investigate solutions to local problems such as low voter participation, crowded landfills, or graffiti. To expand the focus beyond the community, student groups can assume roles of employees who must solve realistic problems encountered in the workforce. For example, they might be asked to design a smaller cereal container for a food manufacturing company; create an information brochure for a Cherokee Indian museum exhibit; or create a plan to reduce transportation costs of produce.

Student-Centered Approach. For PBL to be successful, the learning environment must center on the students (Bridges, 1992; Delisle, 1997). This means that students need to be actively engaged and responsible for completing the tasks necessary to "solve" the problem. The students also need to be provided opportunities for self-reflection/evaluation to assess personal progress and determine areas of needed improvement (Barrows & Myers, 1999). The teacher "sets the scene" by ensuring student ownership of the problem and access to needed resources, and by providing "just-in-time" guidance and support that meets the individual needs of each student (Hobgood & Walbert, 2001).

Collaborative Teamwork.

The last critical component of PBL is collaborative teamwork (Bridges, 1992; Delisle, 1997). When students are working together to achieve a common goal, many learning opportunities are enhanced. For example, in this type of learning context, students collaboratively define variables of the problem that needs to be investigated, determine what resources are needed and where to get them, decide how to use the collected information, and discuss newly gained knowledge with each other, thus helping to identify misconceptions. Considering that teamwork is a common practice in the workplace, student use of this approach provides better preparation for future employment.

Summary

Learning is enhanced when students are engaged in well-structured PBL that:

- addresses standards-based content,
- is structured on real world content, and
- utilizes a student-centered approach that requires teamwork.

In order to achieve this type of learning environment, however, a key component must be implemented. That is, successful PBL must begin with a good problem, which will serve as the driving force behind the implementation. The next section presents multiple examples of problems and practice exercises.

How to...

Go from Objectives to Problem Statements

As seen in the previous section, for PBL to be successful, it must begin with a well-structured problem that results in student attainment of standards-based knowledge and skills. Likewise, it must reflect a real-world context, be taught in a student-centered environment, and support students working in collaborative teams. The following chart provides examples of problem statements that have been developed to align with state curriculum standards. The examples range from kindergarten to fifth grade and cover language arts and social studies. The chart also points out the type of technology that is used in each problem.

Benchmarks by Grade and Subject Area	Sample Problem and Technology Used
KINDERGARTEN SOCIAL STUDIES	
Benchmark: The student will identify and demonstrate how using civic values will increase their citizenship skills. Indicators - The student: • knows how various symbols are used to depict American' s shared values, principles, and beliefs (eagle, flag, seals, pledge).	**Problem Statement:** We have some new friends who live in Brazil. I would like each group to create a Presentation that tells them about our country. You will need to include our flag, The Pledge of Allegiance, and other symbols that represent our shared beliefs. Please use the computer to locate or draw the symbols and to type a short description of each item that you include. The Brazilian children are doing the same thing for our class. **Technology Used:** • HyperStudio • PowerPoint • KidPix
1ST GRADE LANGUAGE ARTS	
Benchmark: The proficient reader uses literary concepts to interpret literature. Indicators - The student will: • identify and describe the main characters in narrative literature • restate the main idea in narrative literature • describe the setting in narrative literature • identify the problem and solution in narrative literature • identify the concept and supporting details in expository literature.	**Problem Statement:** Our class is going to create a web site just for children. This site will have book reviews that are written by 1st grade students. I would like for you and your partner to use the word processor to create a review of the book you just read. You must include graphics that help to illustrate the story, e.g., find a graphic that makes you think of the main character. **Technology Used:** • Word Processing/Graphics

Adapted from Kansas USD 265 Curriculum Outline

Benchmarks by Grade and Subject Area	Sample Problem and Technology Used
2ND GRADE SOCIAL STUDIES	
Benchmark: The student will understand the rule of law as it applies to family, school, local, state and national governments. Indicators - The student: • describes the need for rules in the family, school, and community.	**Problem Statement:** I would like for you to write a story about a 2nd grade student who decided he/she would move to the 'Land of No Rules' because he/she was tired of following other people's rules. After you write the story, make a list of good and bad reasons for living in the "Land of No Rules". **Technology Used:** • Word Processing/Bullet List
3RD GRADE LANGUAGE ARTS	
Benchmark: The proficient writer uses effective word choice. Indicators - The students: • use a variety of nouns, verbs, and adjectives in writing.	**Problem Statement:** I want our third grade class to be known as the BEST writers in our school. But, to do that, we will have to prepare some special writing tools. We will start with a Writer's Database that will have lots of exciting word choices you can use when writing. You will create this database. Every time you read a story you must choose three nouns, three verbs, and three adjectives to add to the database. Once a week we will print the list of words (and who added them), so you can use the new words in your weekly paper. **Technology Used:** • Database

Adapted from Kansas USD 265 Curriculum Outline

Benchmarks by Grade and Subject Area	Sample Problem and Technology Used
4TH GRADE SOCIAL STUDIES	
Benchmark: The student will identify and demonstrate how using civic values will increase their citizenship skills. Indicators - The student: • recognizes how the Declaration of Independence, the Constitution of the U.S., and the Bill of Rights are the concept which form the basis for democratic values in the U.S.	**Problem Statement:** Some political activists feel we need a new Bill of Rights. Your group is to create a concept map that shows the basic civic values as seen in the Bill of Rights and show how each value impacts your family. Use this map to write an argument discussing whether or not a new Bill of Rights is justified. **Technology Used:** • Concept Mapping • Word Processing
5TH GRADE LANGUAGE ARTS	
Benchmark: The proficient reader comprehends whole pieces of narration, exposition, persuasion, and technical writing. Indicators- The students: • link causes to effects.	Problem Statement: Your group must create a presentation that shows the causes and effects from the story we just read. Each cause/effect must consist of two screens, one for the cause and one for the effect. Your group must choose or create appropriate graphics and use a creative title. **Technology Used:** • PowerPoint

Adapted from Kansas USD 265 Curriculum Outline

Let's Practice

From Problem Statement to Standards

Below are multiple problem statements that could be solved by students in a range of grade levels and content areas. Review each problem and list standards from your local curriculum that students would achieve by reaching a solution.

Problem Statements Handout

Directions: List the local standards that would be addressed by students solving the problem.

Problem Statements		Local Standards Addressed
How would your life be different if you were born in India rather than the US?		
Does the size of a continent impact the population?		
What is the most common shape used in our classroom, in your bedroom, in your car, in your favorite toy? Describe how shape can be related to purpose.		
Your boss has given each of her four work teams $5,000 to invest in mutual funds. She is going to give an extra $1,000 to the team that makes the most profit in three months. Where is your team going to invest?		
We have $50 for our end-of-the-year class pizza party. Where can we buy the most pizza for our money?		

Problem Statements		Local Standards Addressed
How many trees does it take to supply our school with paper for one year, and how can we reduce that amount?		
Draw a 10-step flow chart that shows how milk ends up as cheese in the dairy section of your supermarket.		
Have the efforts for equality had an impact on who has been elected as governors of our nation' s states? Which states have shown the greatest increases in the number of minority governors elected? Which states have never had a female or non-white male as its governor?		
A large city park in Tennessee has a herd of buffalo that live on a restricted tract of land. The herd has outgrown the area of land, so some of them need to be relocated to another state where buffalo can survive on their own. What US locations would be good options?		
It seems that an increased number of animals are becoming endangered. Do these animals have similar characteristics that make them more vulnerable than other species?		
What are the similarities and differences between the works of William Shakespeare and Ernest Hemingway?		

Self-Assessment

How good is your problem statement?

Developing good problem statements can sometimes be challenging, especially if problem-based learning is a new approach. To make the process more fun and rewarding, you may want to create your problem statements with one or more of your fellow teachers. This will help to expand and refine everyone's ideas. The following check sheet can be used to assess whether or not problem statements meet recommended guidelines.

What is the "real-world" context of this problem? _____

_____

_____

What will make this problem interesting to your students? _____

_____

_____

What curriculum standards does this problem address? _____

_____

_____

What makes this problem ill structured? _____

_____

_____

In what activities will students work together? _____

_____

_____

How can you ensure that each student is responsible for his or her own learning? _____

_____

_____

How are you ensuring that students have access to multiple resources? _____

_____

_____

How to...

Achieve Successful Problem-Based Learning

There are several ways to better ensure that your students have successful experiences when engaged in problem-based learning activities. Some key ideas are outlined below:

Prior to the PBL Lesson.
Prepare students for the problem-based lesson by reviewing prior knowledge and skills that will be required during the lesson (Bridges & Hallinger, 1995). For example, before the PBL lesson, make sure that the students:

- practice setting-up and solving similar math problems (e.g., calculating the area, volume, or average, dividing fractions),
- practice data collection techniques (e.g., using a ruler, keeping time, logging Internet searches),
- review content that will be used during the problem-solving process (e.g., parts of a letter, government structure, classes of animals).

During the PBL Lesson. Moursund (2002) recommends four student-centered strategies to better ensure successful implementation of PBL. The four suggestions are that students need to:

- have a clear understanding of the problem,
- know the intended goal – or problem solution,
- know what resources are available and the purpose of each one,
- feel ownership of the problem and responsibility for reaching a solution.

To accomplish these, you may want to provide students with a Problem-Solving Worksheet to help guide the process.

Problem-Solving Worksheet

Date: _____

Group Members: _____

_____

_____

_____

_____

Directions: Use the following chart to plan how your group will approach this problem-solving task.

Component	Student Action
What do we know about the problem?	List ideas stated as facts.
What do we need to know to solve the problem?	List as questions.
What data do we need to collect to solve the problem?	Write as action statements and indicate how to collect the data.
How do we manipulate the data?	Describe how the data will be manipulated to develop a solution.
What are some possible solutions?	List solutions that are based on results of the data manipulation.
How will each solution be evaluated?	List criteria that will be used to select the best solution.
How will the best solution be selected?	Consider each solution and identify the implications of each.
How will the findings be presented?	Describe how the results will be published.

Morrison & Lowther (2005)

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SECTION 4

Planning Technology Integration Lessons

What Is Effective Student Use of Technology?

The enGauge Range of Use Model

The NTeQ Model

How to Plan Integration Lessons

How Are Technology Integration Lessons Different?

How to Know When to Use Computers

How to Integrate Computers into Existing Lessons

How to Create New Computer Lessons

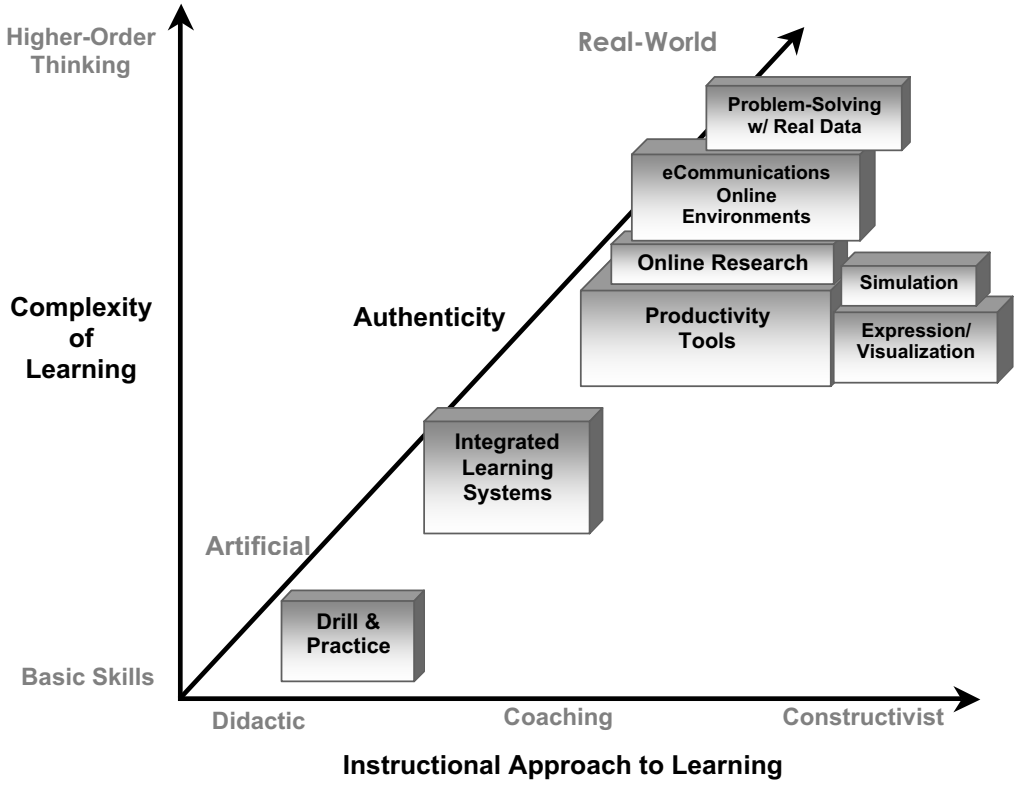
What is...

Effective Student Use of Technology

Effective student use of technology requires both an overall understanding of the environment in which technology is to be integrated and a specific philosophy of action for integrating such technology. The **enGauge** Range of Use model and **NTeQ** model, respectively, provide guidance with both of these concerns.

The enGuage Range of Use Model

The enGuauge Range of Use Model depicts levels of technology use along three continuums: Instructional Approach to Learning (from Didactic to Coaching to Constructivist), Complexity of Learning (from Basic Skills to Higher-Order Thinking), and Authenticity (from Artificial to Real World). As seen, the model shows that drill and practice provides and artificial context in which students learn basic skills in a didactic manner. In contrast, students who engage in the use of production tools for activities such as online research, simulations, problem-solving with real data, are learning in on authentic context in which they are required to use higher-order thinking skills in a constructivitist manner.



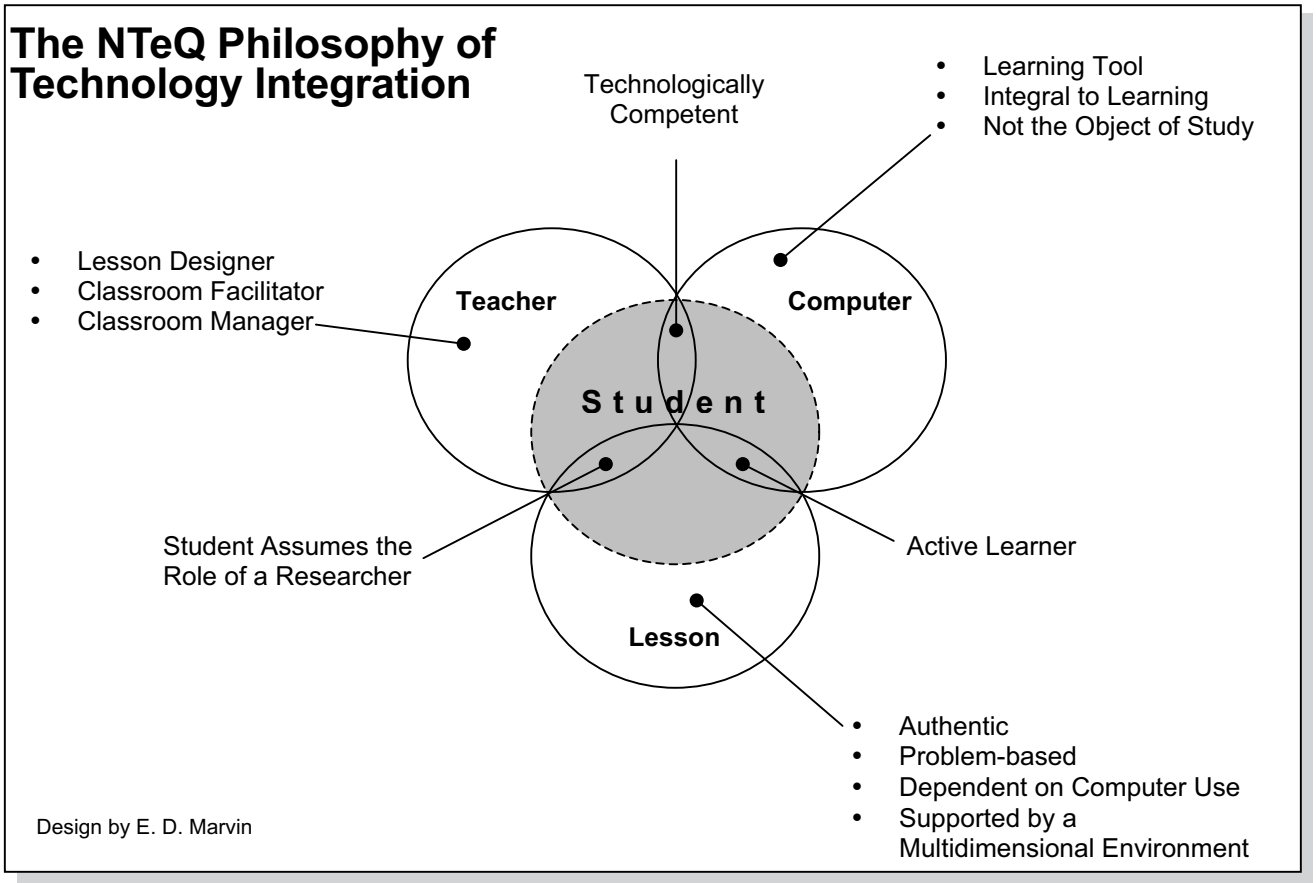
Adapted from NCREL's enGauge Model (NCREL, 2000) – used with permission

The NTeQ Model

Knowing how to use technology for student learning requires an understanding of how to establish an effective learning environment. Traditionally, technology use within schools has emphasized and centered on the use of the computer. At first consideration, this focus appears most appropriate. After all, what could possibly be wrong with emphasizing computers? Aren't they, after all, at the center of the workforce, standards-based, and political expectations for technology use within K-12 schools?

The danger with this traditional, computer-centered view of instruction is that it fails to place students at the center of learning. Technology, given its very nature, will always continue to be at the cutting-edge of society and learning. However, such new developments should not become a distraction to what is important. That is, educators must always continue to focus on students and their learning needs.

The iNtegrating Technology for inQuiry (NTeQ, pronounced "in-tech") approach to technology integration recognizes this underlying philosophy of computer use within K-12 schools (Morrison & Lowther, 2005). As seen in the following diagram, and as will be discussed below,it provides a specific role for the important individuals and components involved in K-12 classroom learning — including students, teachers, computers, and lessons.



NTeQ and Students

With the NTeQ approach, students are placed at the center of learning. This means that instead of sitting at their desks, taking notes, listening to their teacher, students are collaborating in small groups, solving problems with authentic resources. In this way, students are "actively engaged in the learning process".

In addition, with the NTeQ approach, students assume the "role of researcher." That is, they become responsible for investigating solutions to problems. Instead of their teacher telling them what is most important, students are given situations to investigate. Through collaboration with other students and hands-on examination of real-world problems, students are able to investigate solutions to problems.

It is particularly important for a teacher to gain experience using the computer as a learning tool.

And finally, the student role in the NTeQ model allows students to become technologically competent. This means that students who are engaged with an NTeQ lesson become skilled with the tools used in workforce environments. Students learn how to use word processors, databases, spreadsheets, Internet applications, e-mail tools, and presentation software. But even further, students who become technologically competent understand the capabilities of these tools and when and where to use them. These understandings extend beyond their K-12 years. Students can use this knowledge into their college and workforce careers.

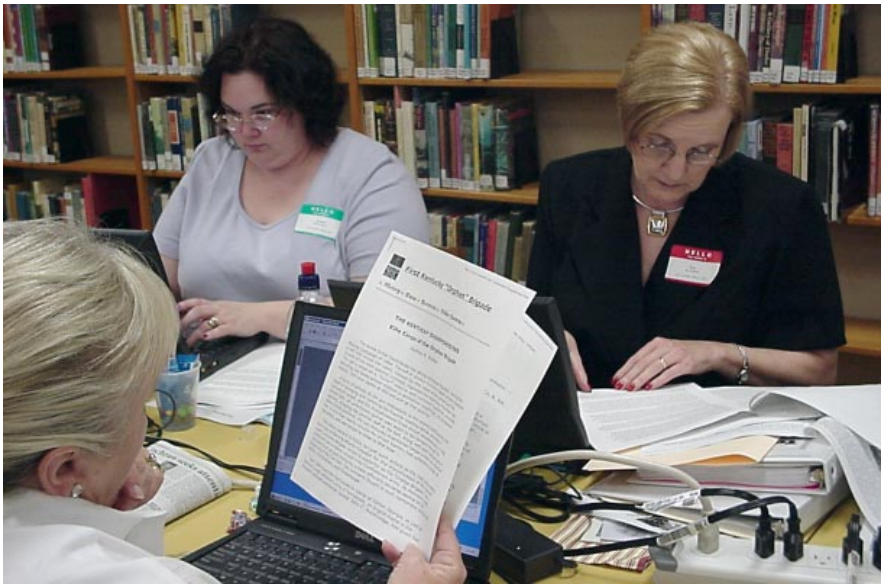
NTeQ and the Teacher

The role of the teacher with the NTeQ approach is also different than what is found in traditional classroom environments. Underlying this perspective is that teachers must become, if they are not already, technologically competent. Technological competence requires teachers to move beyond a basic understanding of computer skills to more insightful, classroom-relevant knowledge. Specifically, this means that teachers need to:

- experience using a computer as a learning tool.
- understand how computer functions can assist student learning.
- apply their knowledge of technology and learning to design, manage, and facilitate a multidimensional classroom learning environment.

Teachers need to understand how computer functions can assist student learning.

In preparing for the teacher's role with the NTeQ approach, it is particularly important for a teacher to gain experience using a computer as a learning tool. Most of us are familiar with traditional learning environments. We know what it is like to sit in a classroom, listen to a teacher, and take notes. Unfortunately, this understanding shapes the way in which we often view classroom learning and instruction. For this reason, it is especially relevant for a teacher to experience what it is like to learn something new with a computer as a learning tool. More specifically, such experience provides teachers with the pleasures and frustrations associated with such learning.



In addition, teachers need to understand how computer functions can assist student learning. By understanding how computers can ease the problem-solving aspect of learning, teachers can begin to integrate the use of technology into their classroom with more relevance. Teachers who have an understanding of how computer functions (and software functions, in particular) can assist student learning will be more prepared to use technology effectively within their classroom. Instead of using a computer merely for the sake of using a computer, such teachers will begin to use technology as a tool to facilitate student-centered learning.

Once teachers begin to understand how computer functions can assist with learning, teachers begin to assume the roles of a designer, facilitator, and manager. As a designer, the teacher can carefully consider and plan a classroom environment that embraces technology-enabled student learning. In such planning, the teacher thinks about what students would be doing as they are actually using the computer during a particular lesson. But even further, the teacher also needs to consider what students will be doing both before and after their use of classroom computers. Along these same lines, teachers must also plan objective-based supporting activities. After all, classroom computer use does not mean that all other resources and research activities are irrelevant. Rather, quite the opposite is true. Such supporting materials and activities can be used to enhance the use of the computer as a tool. But the key

point of understanding on this issue is that other, non-computer related activities are intended to support the objectives of the given lesson. Focusing on lesson objectives will reduce the likelihood that classroom activities are nothing more than busywork.

Teachers need to assume the roles of a designer, facilitator, and manager.

In addition to being a designer, teachers who use the NTeQ model also need to know how to assume the role of a facilitator. Crucial to this role is that teachers view themselves as guides in a resource-rich environment. Instead of being individuals who are telling students the information they need to know, teachers become facilitators who guide students in their own learning process. Another component of this role is the need for teachers to frequently model important processes and demonstrate what it means to be a learner. By showing students how to enter information into a database or outline a plan of action for solving a problem, teachers are able to demonstrate to students some of the excitements and pleasures of learning.

And finally, the NTeQ model asks teachers to become classroom managers. In a management role, teachers oversee student rotation schedules, equity of computer use, and similar supervisory issues. In this role, teachers may also want to practice their own lesson plans to ensure that they are designed in a way that will enhance student learning of the specified objectives.

NTeQ and Computers

Although it has been only implied up to this point, the role of the computer with the NTeQ approach is also different from that of traditional learning environments. The computer from the NTeQ perspective is viewed as a learning tool. Much like a hammer is an extension of one's arm, a computer is used as an extension of one's mind. In this way, students are able to focus on analyzing information, contemplating issues, and solving problems. Instead of organizing data or sorting note cards, students can put their minds to more relevant learning tasks. Once again, according to the NTeQ approach, the student – not the computer – is at the center of learning.

NTeQ and the Lesson

The NTeQ model is intended for lessons that are student-centered, authentic, problem-based, and reliant on the use of technology. Computers, from this perspective, become tools to enhance problem solving and enable deeper levels of learning. Technologically competent teachers are able to analyze the lesson objectives and determine if students use of technology will better enable students to achieve the intended learning outcomes. NTeQ has a ten-step lesson plan to assist

teachers in developing successful lessons. The model and a couple “easier” templates are presented in a later section (Morrison & Lowther, 2005).

The next step

Now that you have a very basic overview of what it takes to effectively integrate technology, it is time to provide you with some specific guidelines for creating a supportive environment for student use of computers. These guidelines will cover creating a new learning environment, how to create critical thinking activities, and how to create problem-based learning activities.

A later section will also provide more specific guidelines on how to plan and implement technology integration lessons as well as how to know when technology use is appropriate.

How to...

Plan Technology Integration Lessons

This section begins by introducing the NTeQ 10-step lesson plan in a model that depicts how technology integration lessons are different from lessons that do not use technology. Following this, is the presentation of three different appoaches for planning technology integration lessons.

- Integrating Computer Use (ICU) Template - Use to integrate computer use into existing lessons - or lessons that teachers already use.
- Three-Step Lesson Plan Template - A quick three-step plan for teachers who have a basic understanding of integration techniques.
- NTeQ Lesson Plan Template - Provides step-by-step guidance for creating a new lesson that integrates student use computers.

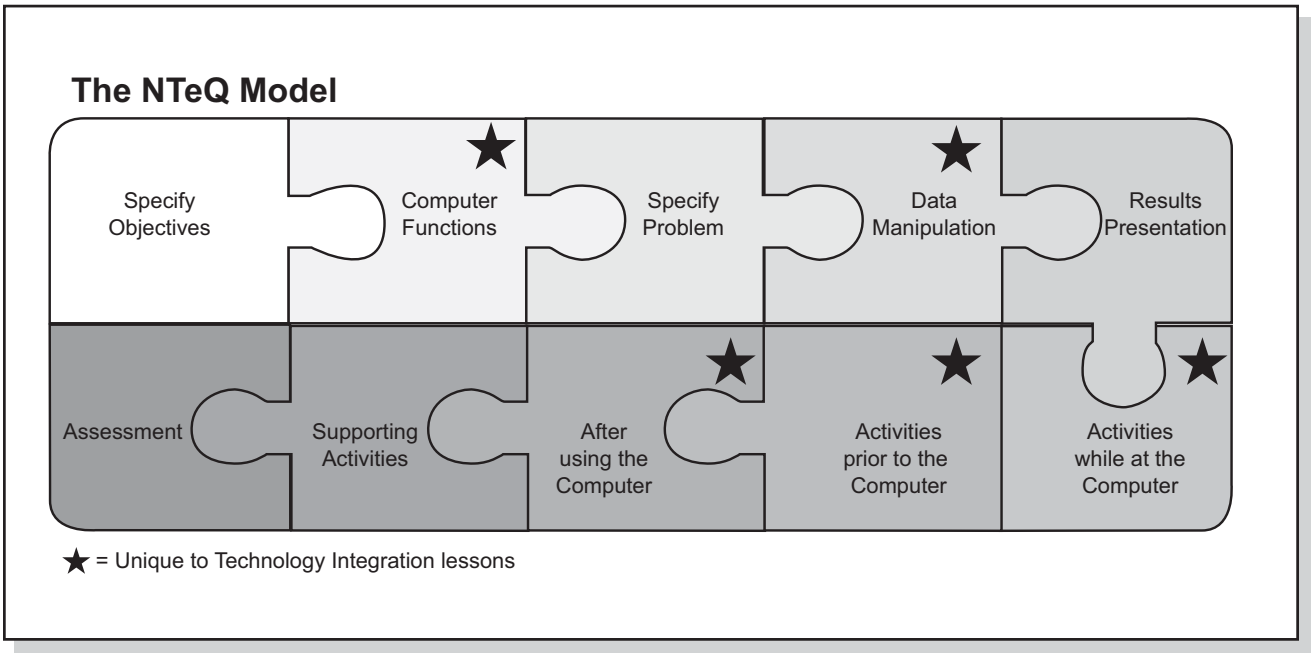
How are...

Technology Integration Lessons Different?

Well-structured lesson plans address what students will be learning (specify objectives), how they will let the teacher know what they have learned (results presentation), how the teacher will evaluate achievement (assessment), and a description of the activities (supporting activities). When the lesson is problem-based, it will also include the problem statement. So, how does a lesson need to be changed to integrate student use of computers?

The NTeQ 10-Step Lesson Plan

As seen in the NTeQ (Morrison & Lowther, 2005) 10-Step Lesson Plan below, there are five components that are unique to technology integration lessons. Descriptions of those five and the other lesson components are included in the model.



STEP 1: Specify Objectives

Based on national, state and/or local standards for curriculum and technology use.

STEP 2 : Match with Computer Functions

Identify verbs from objectives that match with computer functions.

Analyze ▸ Spreadsheet

Identify ▸ Database

Design ▸ Draw

Step2, Step 4, Step 6, Step 7 and Step 8 are unique to technology integration lessons.

STEP 3 : Specify the Problem

Identify the problem (consider using student input) to solve a problem that is relevant to the students and based on real-world data and results in student achievement of objectives.

STEP 4 : Data Manipulation

What is the data source? Will students collect and enter the data? Will you provide them with the data? Will they use data from the Internet or a CD-ROM? How will the students manipulate the data - sort, graph, draw, etc.?

STEP 5 : Results Presentation

How will the students present their findings? Poster, presentation, paper, magazine, web page?

STEP 6 : Activities while At the Computer

What will the students do while at a computer? Enter data, write a report, create a graph, etc.

STEP 7 : Activities Prior to Using the Computer

What tasks must the students complete before they use a computer, e.g., identify search terms, organize data, outline a report, prepare a rough sketch?

STEP 8 : Activities After Using the Computer

What will the students do with the information they generated or obtained while using a computer? Analyze their results, prepare a report, etc.

STEP 9 : Supporting Activities

What other activities will be used to support achievement of all the objectives? Reading, practice, small group discussions, manipulatives, etc.

STEP 10 : Assessment

How will you assess student achievement? Rubrics, portfolios, objective tests, projects, etc.

(Morrison & Lowther, 2005)

How to...

Know When to Use Computers

The NTeQ 10-Step Lesson Plan provides guidance for creating technology integration lessons, but does not really tell you when it is appropriate to have students use computers or which type of computer use would be the most appropriate. The following chart describes the basic functions of each type of software tool and general suggestions for when to use the software (Morrison & Lowther, 2005).

Software	Functions	When to Use
Word Processing	• Edit and Format Text • Create Outlines • Create Columns • Generate Tables • Insert Graphics	Use with information that can be paraphrased and/or organized in meaningful ways.
Spreadsheet	• Perform Calculations • Sort Data • Create Graphs/Charts	Use with sets of numbers that have repetitive patterns that can be described with at least two variables (Row & Column).
Database	• Store Data in Records • Sort Data • Match Data • Merge Data • Create Special Reports	Use with information that has repetitive patterns and can be easily described.
Web Browser	• Searches by Key Words • Bookmarks Web Sites • Hyperlinks to Text, Virtual Tours, etc. • Provides Interactive Feedback	Use to access information or to engage in interactive learning.
Communication	• Allows Synchronous/Asynchronous Communications • Sends/Receives Text • Sends/Receives Video/Audio • Sends/Receives Attachments • Archives Messages	Use when interactivity with others will enhance learning
Concept Mapping	• Connects Ideas • Creates Sequences • Adds Graphics	Use with content that can be categorized, linked, or contrasted.
Presentation	• Displays Text • Supports Navigation • Creates Animation • Inserts and Creates Graphics • Inserts Video • Inserts Sound	Use to display information that can be enhanced by motion and interactivity

How to...

Integrate Technology into Existing Lessons

One of the easiest ways for teachers to begin integrating technology into their instruction is to begin with lessons that they already teach. Similarly, externally produced lessons that are developed but do not include student use of computers can be a great place to start. Below are a few general guidelines for integrating technology into existing lessons.

1. Choose an existing lesson plan that involves student collection, generation and/or manipulation of data/information. Multiple examples can be found in the Technology Tools for Learning section that follows.
2. Use the ICU Lesson Template to design your lesson. This template is seen on the next page.
3. Prior to lesson implementation, create a sample of the computer product(s) students will generate to make sure everything "works" as planned. The created sample can be shown to students as an example of what they will produce.

Let's Practice

Integrate Computers into Existing Lessons

Lesson plans are readily available to teachers via educational web sites, textbook companies, and fellow teachers. Lesson plans that integrate student use of computers are less common. The following lesson plan template is designed for use with lesson plans that are already developed but lack a technology component.

Integrating Computer Use (ICU) Template

Directions: Use this template when integrating student use of computers into **existing** lesson plans.

Lesson Title: _____

Lesson Plan Source (e.g. curriculum guide, URL): _____

Learning Objectives: _____

Problem students will solve*: _____

_____

_____

* You may need to create the problem if the chosen lesson is not problem-based.

Computer Functions and Data Manipulation

Briefly describe the computer function(s) and list the name of the computer application that will be used (e.g., sort - database, write – word processing, calculate percents - spreadsheet). Next, determine specifically how students will use the identified computer functions to help solve the problem. Think carefully about the problem to be solved and how the data need to be manipulated to find a solution. Briefly describe each manipulation activity. The example below shows the type of wording that can be used to complete the table.

Example

Computer Function	Computer Application	Data Manipulation
Sort information	Database	Students will use a database to sort descriptive information about the leaves they collect (color, type, etc.)
Enter and format text	Word processing	Students will use word processing to write a report describing how they identified the most common leaf type.

Computer Function	Computer Application	Data Manipulation
•	•	•
•	•	•
•	•	•

Planning Computer Activities

The section below contains space for up to four computer activities (e.g. 1. Internet search, 2. create spreadsheet graph, 3. write report). For each activity, briefly describe what students need to do before they go to the computers, while they are at the computers, and what they do after they finish computer work (Morrison & Lowther, 2005).

Computer Activity 1

Activity Title (e.g., Insect Database): _____

Activities ***Prior*** to going to the computer

_____

_____

Activities ***At*** the computer

_____

_____

Activities ***After*** going to the computer

_____

_____

Computer Activity 2

Activity Title: _____

Activities ***Prior*** to going to the computer

_____

_____

Activities ***At*** the computer

_____

_____

Activities ***After*** going to the computer

_____

_____

Computer Activity 3

Activity Title: _____

Activities ***Prior*** to going to the computer

_____

_____

Activities ***At*** the computer

_____

_____

Activities ***After*** going to the computer

_____

_____

Computer Activity 4

Activity Title: _____

Activities ***Prior*** to going to the computer

_____

_____

Activities ***At*** the computer

_____

_____

Activities ***After*** going to the computer

_____

_____

How to...

Integrate Computers in 3 Steps

Use this quick, 3-step plan for integrating technology into your favorite lessons. This plan is best for teachers who are familiar with the basics of using computers to support student learning (Morrison & Lowther, 2005).

3 Step Lesson Plan Template

Lesson Title: _____

Learning Objectives: _____

_____

Problem students will solve: _____

_____

_____

What Do Students Do?

1. Activities ***Prior*** to going to the computer

_____

_____

_____

_____

2. Activities ***At*** the computer

_____

_____

_____

_____

3. Activities ***After*** going to the computer

_____

_____

_____

_____

How to...

Create New Computer Lessons

Use this lesson plan when you want to fully develop a lesson or unit that has students use technology. This lesson plan is based on the NTeQ Model (Morrison & Lowther, 2005) and includes basic guidelines for completing each section.

NTeQ Lesson Plan Template

Lesson Title: _____

Subject Area(s): _____

Grade Level: _____

Learning Objectives

At the end of this lesson, the students will...	District Standard/Benchmark
•	•
•	•
•	•

Materials

It is helpful to include a "**Think Sheet"** of questions that requires students to use critical thinking skills.

•	•
•	•
•	•

Computer Functions and Data Manipulation

List computer function(s) that will be used, the related computer application (e.g., database, spreadsheet), and describe how the data are to be manipulated (e.g., sorted, charted, placed in tables, drawn)

Computer Function	Computer Application	Data Manipulation
•	•	•
•	•	•
•	•	•

Specify Problem

Write in language you will use with students. For example, "Today, we are going to investigate…" "What would you do if…?" _____

_____

_____

Results Presentation

Write a brief description of how the students will demonstrate achievement of the objectives. For example, a written report, presentation, poster, web site.

_____

_____

Computer Activities*

Activity 1	Activity 2	Activity 3
Activities to be completed... 1. ***Prior*** to going to the computer	Activities to be completed... 1. ***Prior*** to going to the computer	Activities to be completed... 1. ***Prior*** to going to the computer
2. ***At*** the computer	2. ***At*** the computer	2. ***At*** the computer
3. ***After*** going to the computer	3. ***After*** going to the computer	3. ***After*** going to the computer

Supporting Activities

Activity 1	Activity 2	Activity 3
Activities to be completed...	Activities to be completed...	Activities to be completed...

* Note: Complete columns as needed for your lesson. A lesson may only require a complete activity and no supporting activities.

Rotation Plan

Briefly describe how students will rotate to and from the computer(s) and supporting activities.

_____

_____

Assessment with Rubrics

Use a template similar to the one below to develop lesson rubric(s). A sample is provided to guide your writing. To develop rubrics, place performance objectives in the first column, and then create descriptions of each level of performance.

Objective or Performance	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
1.	Description of identifiable criteria that reflect a beginning level of performance	Description of identifiable criteria that reflect progress toward mastery of performance	Description of identifiable criteria that reflect mastery of performance	Description of identifiable criteria that reflect exceptional performance.	
2.	Repeat with next item	"	"	"	

Sample Rubric: Newspaper Article on Seatbelt Safety

Objective or Performance	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score
Students will write a persuasive article on why drivers should wear seatbelts.	Persuasive arguments are not clear or concise and had very poor references made to supporting graphics.	Persuasive arguments are fairly clear and concise. References made to graphics provide limited support.	Persuasive arguments are clear, concise, and articulate. References made to supporting graphics are useful.	Persuasive arguments are very clear, concise, and articulate. Excellent references made to supporting graphics.	
Students will create spreadsheet charts that demonstrate a trend.	The charts show very little about seatbelt use. The title, labels, legend are missing or incomplete.	The charts show limited aspects of seatbelt use. The title, labels, legend, and type of chart provide incomplete support.	The charts demonstrate trends in seatbelt use. The title, labels, legend, and type of chart support understanding.	The charts clearly demonstrate trends in seatbelt use. Excellent choice of title, labels, legend, and type of chart.	

Rubric Template

Objective or Performance	Beginning 1	Developing 2	Accomplished 3	Exemplary 4	Score

References

Morrison, G. R. & Lowther, D. L. (2005). *Integrating computer technology into the classroom* (3rd. Ed.). Upper Saddle River, NJ: Merrill Prentice Hall.

North Central Regional Educational Laboratory. (2000). *enGauge: A framework for effective technology use in schools* [Brochure]. Oak Brook, IL: NCREL.

SECTION 5

Technology Tools for Learning

Word Processing

Spreadsheets

Databases

Concept Maps

Presentations

Web Browsers

Communication Tools

Digital Cameras

How to...

Use Word Processing as a Learning Tool:

Word processing software is commonly used in schools because it easily supports traditional types of student activities that require writing. Students normally enjoy using a word processor to "write" their assignments because it automatically checks spelling, makes it easier to fix mistakes, and with a little practice, takes less time than writing a paper by hand. Word processing software also has several functions that make it an excellent critical thinking tool, as seen below.

When to use Word Processing

Use for creative writing or with information that can be paraphrased, illustrated and/or organized in meaningful ways.

Using Word Processing for Higher-Order Thinking

The following chart contains the basic functions of word processing software and example activities for which students could use these functions to engage in higher-order thinking.

Word Processing: Basic Functions	Examples of Higher-Order Thinking Activities
Edit and format text • Track Changes & Comments • Spelling • Grammar • Readability	• Summarize • Paraphrase • Select appropriate font, style, color
Create Outlines	• Determine key ideas • Sequence
Create Columns	• Determine the appropriate flow of text
Insert and Create Graphics	• Match graphics to ideas • Create graphics to demonstrate ideas
Generate Tables	• Determine appropriate column and row names • Create categories • Group into categories

Classroom Ideas : WORD PROCESSING

Below are examples of how students can use word processing as a tool to better learn subject area content. Also included is space for you to add ideas for your students to use word processing.

Student Word Processing Activities	My Ideas for Student Use of Word Processing
Create a '*vocabulary word'* table that includes a graphic for each word and a description of why it represents the word.	•
Download a CNN editorial and replace the adjectives with ones that have a similar meaning.	•
Rewrite the Bill of Rights to a level that is more easily understood by 2nd grade students.	•
Download a picture of the Statue of Liberty and create a list of 50 words that describe its features.	•
Locate clipart of two birds that are very different, and then write a paragraph that highlights those differences.	•
Use weather data from the Internet to create the "Window on Weather" section of the school newspaper.	•
Compose a letter to the Mayor regarding the poor air quality of your neighborhood. Include digital photos to support your argument.	•
Write a one page story that predicts what life in the United States will be like in 75 years.	•
Use the '*Track Changes'* tool to suggest edits on your partner' s report.	•
Use a different color text to add your part of a *chain* story written by students in your group.	•
Choose three graphics that represent key features of the main character in today' s story and describe why you chose each one.	•
Use the *Highlight* tool to mark each noun yellow and each verb blue.	•
Lower the reading level of the 1st paragraph of Abraham Lincoln's presidential acceptance speech by using different adjectives and adverbs.	•

Example Ideas: WORD PROCESSING

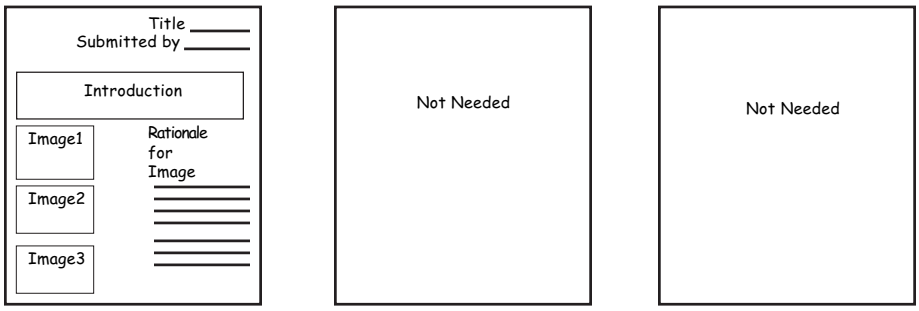
Directions: Use this form to expand and personalize two of the Classroom Ideas for Word Processing (from the previous page). Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Create a sample layout of the final word-processed document that students would produce.

Lesson Idea: Choose three graphics that represent main character in the story and explain.

Learning Objective(s): Identify main character; describe feature of main character you chose; represent ideas with graphics.

Problem(s) that could be solved with this data: The book publisher would like to produce an advertisement for our story and wants to include graphics that illustrate the main character. The advertisement has space for three graphics. Your team is to locate three clipart images and write a one-page proposal for why they should be used in the advertisement.

Briefly sketch the key features of the word-processed document the students will create.

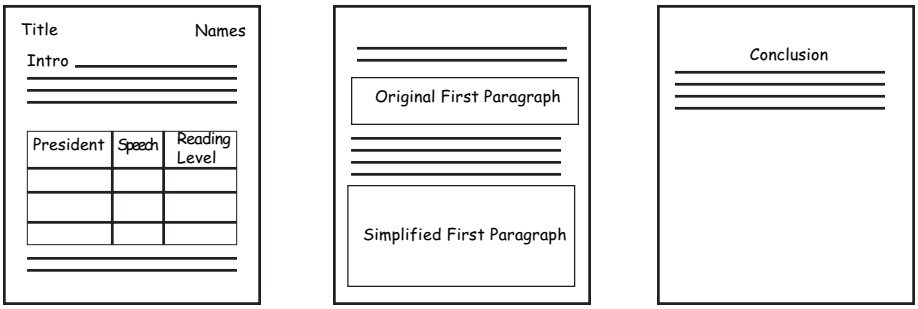


Lesson Idea: Change the reading level of presidential acceptance speeches

Learning Objective: Identify and use grade appropriate vocabulary

Problem(s) that could be solved with this data: There is a concern that most Presidential speeches are not easily understood by the majority of adults in the US. Provide data discussing this issue and an example of how the speech could be more understandable.

Briefly sketch the key features of the word-processed document the students will create.



My Integration Ideas: WORD PROCESSING

Directions: Use this form to expand and personalize two of the Classroom Ideas for Word Processing. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives. Create a sample layout of the final word-processed document that students would produce.

Lesson Idea: _____

Learning Objective(s): _____

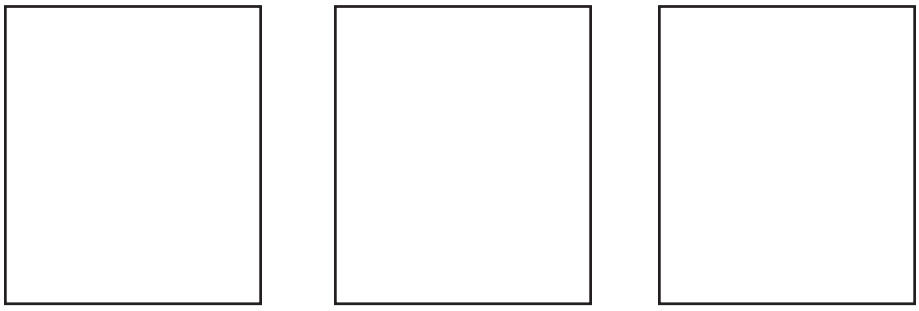
_____

_____

Problem(s) that could be solved with this data: _____

_____

Briefly sketch the key features of the word-processed document the students will create.



Lesson Idea _____

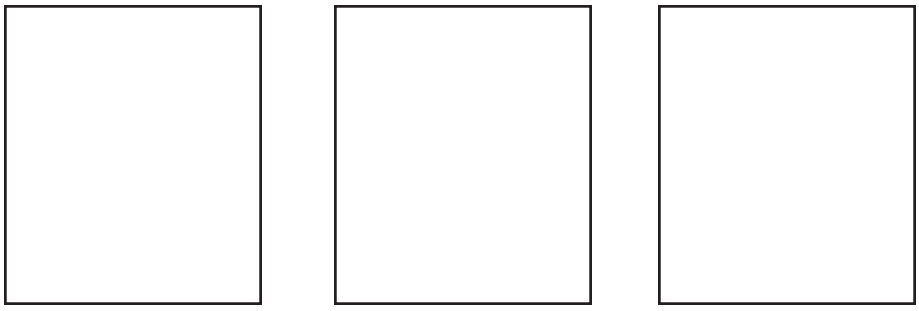
Learning Objective: _____

_____

Problem(s) that could be solved with this data: _____

_____

Briefly sketch the key features of the word-processed document the students will create.



How to...

Use Spreadsheets as a Learning Tool:

Spreadsheet software is commonly used in workplace settings for tasks that involve numbers (e.g., budgets, inventory, population growth, voter returns, and employee turnover). A spreadsheet is a tool that can also enhance classroom learning by allowing students to concentrate on the critical issues of problem-solving, such as creating formulas, examining trends, and making predictions. Spreadsheet software reduces the tediousness of re-entering information into a calculator each time a new question is asked. The following section discusses how to use spreadsheets for higher-order thinking. Additionally, it provides ideas for classroom use.

When to Use Spreadsheets

Use with sets of numbers that have repetitive patterns that can be described with at least two variables (Row & Column).

Using Spreadsheets for Higher-Order Thinking

The following chart contains the basic functions of spreadsheet software and example activities for which students could use these functions to engage in higher-order thinking.

Spreadsheet: Basic Functions	Examples of Higher-Order Thinking Activities
Perform Calculations	• Identify key variables • Determine appropriate formula(s) • Analyze results • Make modifications
Sort Data	• Identify key variables • Determine appropriate sort direction • Determine number of sorts • Analyze results • Make modifications
Create Graphs/Charts	• Select data to be plotted • Arrange data in most meaningful manner • Determine the most appropriate graph or chart to depict data • Label chart to enhance understanding of results

Classroom Ideas: SPREADSHEETS

Below are examples of how students can use spreadsheets as a tool to better learn subject area content. Also included is space for you to add ideas for your students to use spreadsheets.

Student Spreadsheet Activities	My Ideas for Student Use of Spreadsheet
Plot average yearly precipitation in your county for the past 50 years.	•
Compare miles traveled during migration for 10 different birds.	•
Compare the number of adjectives and adverbs used in the first 300 words of a non-fiction book and a fiction book.	•
Compare the number of U.S. vs. Asian yearly earthquake occurrences for the past 50 years.	•
Compare grams of sugar in breakfast cereals.	•
Calculate the maximum price per square yard that could be paid, if the PTA gave your class $300 to carpet your classroom.	•
Determine the shortest driving route from New York City to San Antonio, Texas.	•
Determine the number of dump trucks needed to transport soil removed for a competition-sized swimming pool.	•
Create a budget that would result in at least $100 profit from selling hot dogs at $1.00 each.	•
Graph the cost differences between using natural gas vs. electricity for heating a home.	•
Use data to demonstrate whether or not the environmental protection efforts are working.	•
How much time would the hare have to waste for the tortoise to win a 1-mile race?	•
Plot the yield per acre for grain crops grown in the Midwest.	•

Example Ideas: SPREADSHEETS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Spreadsheets. Select two ideas that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample spreadsheet by filling in column and row names and plausible data entries.

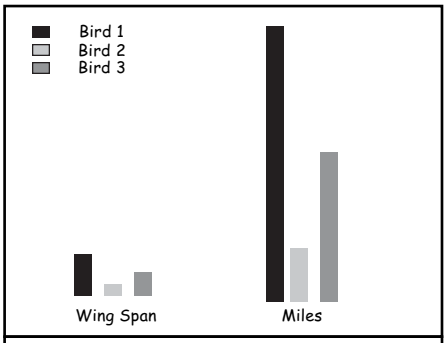
Lesson Idea: Compare miles traveled during migration for 10 different birds

Learning Objectives: Compare relationship between animal structures and purpose; Construct graphs to represent data from real-world problems

Problems that could be solved with this data: Do birds with wider wing spans fly farther during migration?

Fill in the row and column names for a spreadsheet that would be used with this lesson.

	A	B	C	D
1	Bird Name	Wing Span	Miles	
2	Bird 1 (e.g., Hawk)	49 inches	5,600	
3	Bird 2	10 inches	1,000	
4	Bird 3	23 inches	3,000	



Sketch a sample graph for this lesson

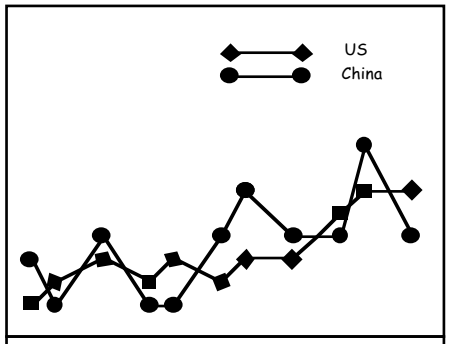
Lesson Idea: Compare number of earthquakes per year in the US vs. China over the past 50 years

Learning Objectives: Construct graphs to represent data from real-world problems; research past geographic conditions (e.g., earthquakes, flooding, volcanoes) and their impact on societies.

Problems that could be solved with this data: Earthquakes…Is one side of the world safer than the other?

Fill in the row and column names for a spreadsheet that would be used with this lesson.

	A	B	C	D	E	F	G	H	I
1	Year	2002	2001	2000	1999	1998	1997	1996	1995
2	US	55	40	70	62	45	65	100	80
3	China	65	53	61	50	48	72	85	68



Sketch a sample graph for this lesson

My Integration Ideas: SPREADSHEETS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Spreadsheets. Select two ideas that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample spreadsheet by filling in column and row names and plausible data entries.

Lesson Idea: _____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Fill in the row and column names for a spreadsheet that would be used with this lesson.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Sketch a sample graph for this lesson

My Integration Ideas: SPREADSHEETS *continued*

Directions: Use this form to expand and personalize two of the Classroom Ideas for Spreadsheets. Select two ideas that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample spreadsheet by filling in column and row names and plausible data entries.

Lesson Idea: _____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Fill in the row and column names for a spreadsheet that would be used with this lesson.

	A	B	C	D
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Sketch a sample graph for this lesson

How to...

Use Databases as a Learning Tool:

A common instructional strategy requires students to create note card sets of important information. These can be called “non-digital” databases. The topics of the cards could be for U.S. Presidents, planets in the Solar System, endangered species, or leading authors. The cards of information are one step better than having the information remain in encyclopedias, but are quite limited when wanting to examine trends and patterns across the records. However, if students use database software to record information, they can easily find answers to multiple questions that would take hours to find using note cards. For example, finding differences between large and small planets; looking for relationships between accomplishments while in office and past positions held by U.S. Presidents; or comparing writing themes by gender of author or year of publication. Further database examples are provided in this section.

When to Use Databases

Use with information that has repetitive patterns and can be easily described.

Using Databases for Higher-Order Thinking

The following chart contains the basic functions of database software and example activities for which students could use these functions to engage in higher-order thinking.

Database: Basic Functions	Examples of Higher-Order Thinking Activities
Store data in records	• Examine variables to identify appropriate fields and record format • Assess data entry process to ensure accuracy
Sort data (alpha or numeric)	• Arrange data to yield needed results
Merge data	• Assemble critical data components
Create specialized reports	• Organize results to demonstrate solution

Classroom Ideas: DATABASES

The following list contains suggestions for databases that can be created by elementary, middle, and/or high school students. Numerous problem statements can be generated from each database.

Student Database Activities	My Ideas for Student Use of Databases
Digestive systems of organisms – from bacteria to mammals	•
Experimental approaches of famous scientists, e.g., Edison, Watt, Bell.	•
Dinosaur characteristics	•
Genetic traits of students	•
Features of U.S. state flags	•
Government structures of different countries	•
Features of the tallest mountains	•
Similarities of fairy tales, e.g., setting, theme, characters	•
U.S. Wars	•
Shapes around us	•
Female authors of the 1800's	•
Parts of speech examples	•
Real world examples of fractions	•
Nutrients of common food	•
Governors from our state	•

Example Ideas: DATABASES

Directions: Use this sheet to create lesson beginnings from the Classroom Ideas for Databases. Select two ideas that would be applicable, or that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample database by filling in the field names and two records to demonstrate how the information would be configured.

Lesson Idea: Shapes Around Us
Learning Objective: Analyze characteristics of geometric shapes.
Problem(s) that could be solved with this data: What is the most common shape in your kitchen?

Create a sample database for this lesson by filling in Field Names and plausible entries for two records.

Field Name	Record 1	Record 2
Shape Name	Sphere	Rectangle
Object Name	Orange	Cereal Box
Number of Sides	1	6

Lesson Idea: Governors From Our State
Learning Objective: Identify political leaders from current nations, including the United States
Problem(s) that could be solved with this data: If our state wanted to elect a governor that best represents the traits of past governors, what type of person would be needed?

Create a sample database for this lesson by filling in Field Names and plausible entries for two records.

Field Name	Record 1	Record 2
Name	Mike Smooth	Sue Serious
Number of Terms	1	1
Party	Democrat	Independent
Home City when First Elected	Metropolis	Country Side
Highest Degree	MBA	Ph.D. Political Science
Previous Job	Corporate CEO	Professor
Age when First Elected	42	38
Key Accomplishment	Tax Reduction	School Reform
Key Accomplishment	Improved Highways	Stronger Drug Penalties

My Integration Ideas: DATABASES

Directions: Use this sheet to create lesson beginnings from the Classroom Ideas for Databases. Select two ideas that would be applicable, or that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample database by filling in the field names and two records to demonstrate how the information would be configured.

Lesson Idea: _____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Create a sample database for this lesson by filling in Field Names and plausible entries for two records.

Field Name	Record 1	Record 2

My Integration Ideas: DATABASES *continued*

Directions: Use this sheet to create lesson beginnings from the Classroom Ideas for Databases. Select two ideas that would be applicable, or that are similar to topics you teach. List learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample database by filling in the field names and two records to demonstrate how the information would be configured.

Lesson Idea: _____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Create a sample database for this lesson by filling in Field Names and plausible entries for two records.

Field Name	Record 1	Record 2

How to...

Use Concept Maps as a Learning Tool:

Concepts maps are useful tools for documenting brainstorming sessions, planning a project, structuring a report, or plotting a timeline. Computer-generated concept maps are advantageous because students can easily change labels, move and/or change component shapes, add graphics, and convert ideas into an outline that can be imported into a different software application, such as a word processor.

When to Use Concept Maps

Use with content that can be categorized, linked, sequenced, or contrasted.

Using Concept Mapping Functions for Higher-Order Thinking

The following chart contains the basic functions of concept mapping software and example activities for which students could use these functions to engage in higher-order thinking.

Concept Maps: Basic Functions	Examples of Higher-Order Thinking Activities
Physically displays information	• Determine most appropriate shape to represent information
Connects ideas	• Integrate information into meaningful connections
Creates sequences	• Assess information to identify and create meaningful sequences
Adds Graphics	• Review available graphics to identify the image best represents the desired concept
Outlines	• Arrange information in meaningful structure

Classroom Ideas: CONCEPT MAPS

Below are examples of how students can use concept maps as a tool to better learn subject area content. We've included three activities for concept maps that incorporate the skills from the list of higher order thinking skills. Also included is space for you to add ideas for your students to use word processing.

Student Concept Map Activities	My Ideas for Student Use of Concept Maps
Compare and/or Contrast	•
• Pilgrims vs. Native Americans	•
• Matisse vs. Monet	•
• Oceans vs. Seas	•
• Farm life vs. City life	•
• Plant cells vs. Animal cells	•
• City vs. State vs. National Government	•
Create a TimeLine	•
• Seed to Plant	•
• Sunlight to Food	•
• Your Life	•
• Civil Rights in the U.S.	•
• Space Program	•
• Rise and Fall of Dinosaurs	•
Plot Main Ideas	•
• Four seasons	•
• Punctuation	•
• Money	•

Example Ideas: CONCEPT MAPS

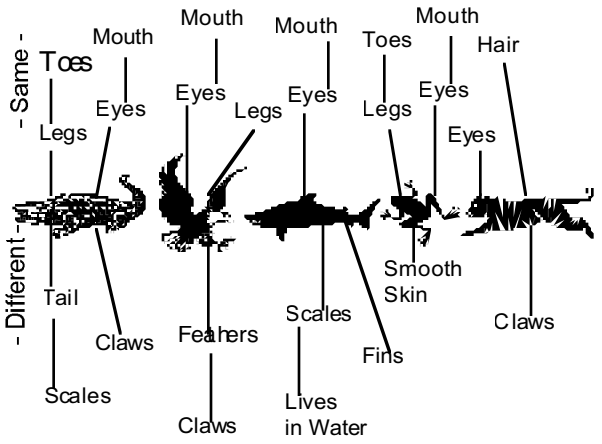
Directions: Use this form to expand and personalize two of the Classroom Ideas for concept maps. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample layout of a concept map that students could produce.

Lesson Idea: Vertebrates

Learning Objective(s): Compare characteristics of amphibians, reptiles, fish, birds, and mammals; Classify objects by observable properties.

Problem(s) that could be solved with this data: How do alligators, eagles, sharks, frogs, and tigers look like you and look different than you?

Briefly sketch the key components of a concept map that students might create for this lesson.

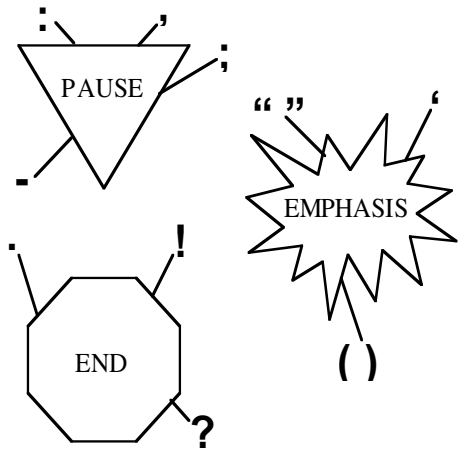


Lesson Idea: Punctuation

Learning Objective(s): Demonstrate correct understanding of punctuation; Use correct punctuation when writing

Problem(s) that could be solved with this data: How can punctuation marks be displayed?

Briefly sketch the key components of a concept map that students might create for this lesson.



My Integration Ideas: CONCEPT MAPS

Directions: Use this form to expand and personalize two of the Classroom Ideas for concept maps. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample layout of a concept map that students could produce.

Lesson Idea: _____

_____

_____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data:

_____

_____

_____

Briefly sketch the key components of a concept map that students might create for this lesson.

Lesson Idea: _____

_____

_____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data:

_____

_____

_____

Briefly sketch the key components of a concept map that students might create for this lesson.

How to...

Use Presentations as a Learning Tool

Presentation software, such as Microsoft PowerPoint®, is commonly used by teachers and students to share information. However, the software has several functions that, when used appropriately, can engage students in higher-order thinking. For example, the animation feature can be used to demonstrate movement during a chemical reaction, change of geographical boundaries over time, or changing a square to a rectangle. The text build tool and slide sorter tools require students to plan the most effective sequence for presenting information. More examples are given below.

When to use Presentations

Use to display information that can be enhanced by motion and interactivity

Using Presentation Functions for Higher-Order Thinking

The following chart contains the basic functions of presentation software and example activities for which students could use these functions to engage in higher-order thinking.

Presentaitons: Basic Functions	Examples of Higher-Order Thinking Activities
Displays Text	Summarize/paraphrase • Titles • Bulleted lists • Labels
Supports Navigation	Determine sequence • From one slide to the next • To designated slides
Creates Animation	Demonstrate concepts • Bring in text or graphics from different locations • Show text or graphics with different effects
Inserts or Creates Graphics or Motion Clips	Match, select, create • Insert clipart and photos from the MS Gallery • Inserts clip art and photos from student-generated files
Inserts Sound	Match, select, create • Insert sound from Microsoft Gallery or music CDs

Classroom Ideas: PRESENTATIONS

The following list contains suggestions for presentations that can be created by elementary, middle, and/or high school students. Space is provided for you to add ideas for how your students can create presentations.

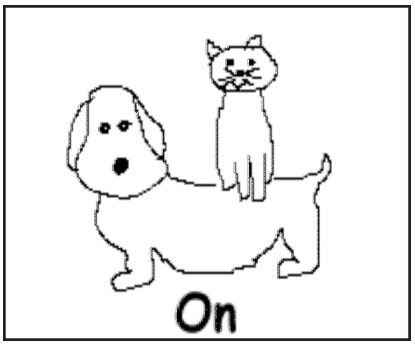
Student Presentation Activities	My Ideas for Student Use of Presentations
Graphically depict parts of speech	•
Showcase items of interest within 100 miles of our school	•
Use graphics to demonstrate different types of symmetry	•
Demonstrate the before and after of key chemical reactions	•
Illustrate the difference between electrical vs. chemical energy	•
Create a virtual elevator ride to the Earth' s center	•
Illustrate prepositions in action	•
Document the history of money	•
Explain why it rains	•
Showcase postcards from Asia	•
Depict math concepts in motion	•
Compare the role of insects' antennas to humans' five senses	•
Create a "Countries of Our Heritage" for our class	•
Show tessellations through time	•
Visualize what happens to a vote	•

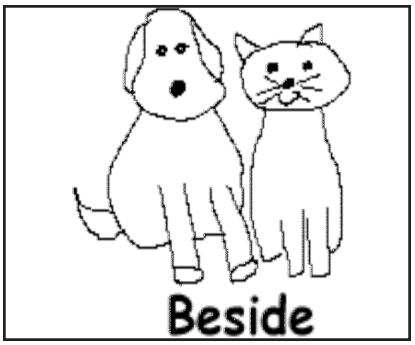
Example Ideas: PRESENTATIONS

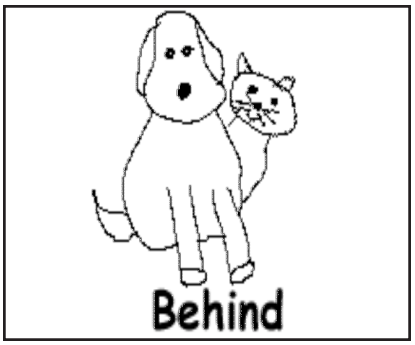
Directions: Use this form to expand and personalize two of the Classroom Ideas for Presentations. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample layout of three main presentation slides that students would produce.

Lesson Idea: Prepositions in Action
Learning Objective(s): Identify and use prepositions; recognize the function of prepositional phrases
Problem(s) that could be solved with this data: How many different places can Felix the cat sit with Max the dog?

Briefly sketch three main presentation slides that students would produce.

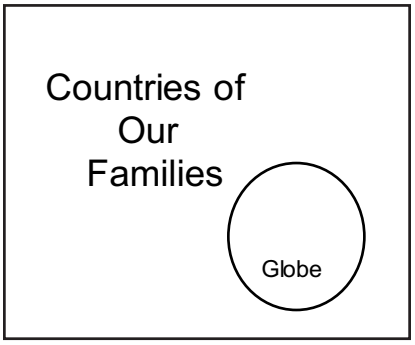


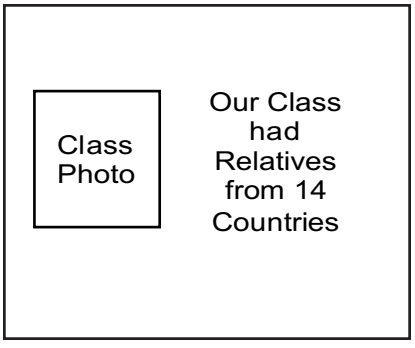


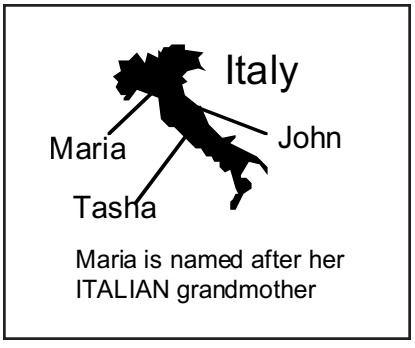


Lesson Idea: Countries of our Heritage
Learning Objective: Recognize how migration influences the culture of world societies
Problem(s) that could be solved with this data: From how many countries did our ancestors come?

Briefly sketch three main presentation slides that students would produce.







My Integration Ideas: PRESENTATIONS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Presentations. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample layout of three main presentation slides that students would produce.

Lesson Idea: _____

_____

Learning Objective(s): _____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Briefly sketch the main presentation slides that students would produce.

My Integration Ideas: PRESENTATIONS *continued*

Directions: Use this form to expand and personalize two of the Classroom Ideas for Presentations. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, create a sample layout of three main presentation slides that students would produce.

Lesson Idea: _____

_____

Learning Objective(s): _____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Briefly sketch three main presentation slides that students would produce.

How to...

Use Web Browsers as a Learning Tool

One of the key changes to today's educational environment is the Internet. Students now have access to almost any type of information – from historical archives to up-to-the-minute news. Since the information is in a digital format, it can often be downloaded to student computers that allow for information to be more closely examined and deeper understanding to be gained. This section provides ideas for using a web browser to not only access information, but also to take advantage of its interactive functionality.

When to use Web Browsers

Use to access information or to engage in interactive learning.

Using Web Browser for Higher-Order Thinking

The following chart contains the basic functions of web browser and communication software. Additionally, it includes example activities for which students could use these functions to engage in higher-order thinking.

Web Browser: Basic Functions	Examples of Higher-Order Thinking Activities
Searches for information	• Clarify intended outcome(s) • Identify related descriptive search terms • Evaluate and modify search based on results
Bookmarks web sites	• Create system for organizing bookmarks
Hyperlinks to related resources	• Examine information prior to and after using hyperlinks
Provides interactive feedback	• Engage in decision-making

Classroom Ideas: WEB BROWSERS

Below are examples of how students can use web browsers as a tool to better learn subject area content. Also included is space for you to add additional ideas for your students to use web browsers.

Student Web Browser Activities	My Ideas for Student Use of Web Browsers
Historical Documents	•
• Books – e.g., Complete Works of Shakespeare	•
• Documents – e.g., U.S. Constitution	•
• Video – e.g., Martin Luther King – "I have a Dream"	•
• Audio - e.g., Robert Frost reading poetry	•
Current Events	•
• News	•
• Human Interest stories	•
• Sports	•
• Science and Technology	•
• Foreign Relations	•
Reference and Resources Tools	•
• Dictionaries	•
• Thesaurus	•
• Encyclopedias	•
• Calculators - e.g., graphing, interest calculations	•
• Statistics - e.g., census, employment	•
Interactive Learning	•
• Basic skills drill and practice	•
• Problem-solving	•
• Virtual reality	•

Example Ideas: WEB BROWSERS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Web Browsers. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then,generate a list of key words that could be used to search for the information or web sites that contain the information, and briefly describe the information that would be collected.

Lesson Idea: Cost of Living
Learning Objective(s): Understand cost of living in different geographic locations
Problem(s) that could be solved with this data: What would it cost to build your dream house in Florida, Connecticut, Texas, Seattle, and California?

Keyword Search Terms	Search Results
building costs	Building costs per square foot
square footage in Texas	Create your own estimate
cost of living	
building estimate	

Lesson Idea: Interactive Learning: Virtual Reality
Learning Objective(s): Science – demonstrate the structure of chemical bonds
Problem(s) that could be solved with this data: We plot chemical bonds with pencil and paper – what do you think they look like in reality or when represented in a 3D format

Keyword Search Terms	Search Results
chemical bonding	Virtual reality environment that allows students to create and examine a variety of chemical bonds.
3-D models	

My Integration Ideas: WEB BROWSERS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Web Browsers. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then,generate a list of key words that could be used to search for the information or web sites that contain the information, and briefly describe the information that would be collected.

Lesson Idea: _____

_____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

Keyword Search Terms	Search Results

My Integration Ideas: WEB BROWSERS *continued*

Directions: Use this form to expand and personalize two of the Classroom Ideas for Web Browsers. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then,generate a list of key words that could be used to search for the information or web sites that contain the information, and briefly describe the information that would be collected.

Lesson Idea: _____

_____

Learning Objective(s): _____

_____

_____

Problem(s) that could be solved with this data: _____

_____

Keyword Search Terms	Search Results

How to...

Use Communication Tools as Learning Tools

With the use of Internet-based communication tools, the educational opportunities for students have become limitless. Under strict security and close supervision, students can now instantaneously exchange ideas, school projects, and photos with other children across the globe. Students can ask a writer why they added particular components to a story, a scientist how to set-up an experiment, an engineer which mathematics skills they use while working, and a grandmother how she created her quilt pattern. These experiences and gained knowledge add a "real-world" component to the classroom environment.

When to use Communication Tools

Use when interactivity with others will enhance learning

Using Communication Tools for Higher-Order Thinking

The following chart contains the basic functions of communication software and example activities for which students could use these functions to engage in higher-order thinking.

Communication Tools: Basic Functions	Examples of Higher-Order Thinking Activities
Allows synchronous/ asynchronous communications	• Select conversation topics and questions.
Sends/Receives Text	• Evaluate received text to establish alignment with purpose.
Sends/Receives Video/Audio	• Determine appropriate content and format to allow easy retrieval.
Sends/Receives Attachments	• Determine content to ensure it supports purpose.
Archives Messages	• Establish meaningful structure to ensure retrieval of information.

Classroom Ideas: COMMUNICATION TOOLS

Below are examples of whom students can contact using communication tools, such as email, listservs, bulletin boards, chats and instant messaging, as a tool to better learn subject area content. Also included is space for you to add additional ideas for your students to use communication tools.

Student Communication Tools Suggested Participants	More Ideas for Student Use of Communication Tools
Other Students	•
Same class	•
Same school	•
Same city	•
Same state	•
Throughout the United States	•
International (e.g., keypals)	•
Experts	•
Researchers (e.g., professors, scientists)	•
Government (e.g., local, state, national, international)	•
Medical (e.g., doctors, nurses, pharmacists, technicians)	•
Writers (e.g., newspaper, books, poets)	•
Artists (e.g., musicians, painters, sculptors)	•

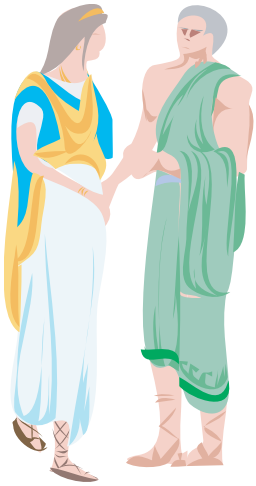
My Integration Ideas: COMMUNICATION TOOLS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Communication Tools. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, list who will participate (specific names may not be needed, e.g., high school students in Alaska) and briefly describe the exchange of information that would occur.

Lesson Idea: Other students - International
Learning Objective(s): Compare cultural characteristics of the world
Problem(s) that could be solved with this data: Do Greeks believe in Greek mythology?

Sample Email:

From: Group A
To: 13 year old in Greece
Subject: Greek mythology
Message: We are studying Greek mythology and wanted to know if students in Greek schools also study Greek mythology. If you do, which of these myths is your favorite and why?



Lesson Idea: Expert - Business
Learning Objective(s): Connect math procedures to real-world situation
Problem(s) that could be solved with this data: Is the math that we have to learn in high school really used in the real world?

Sample Email:

From: Mrs. Smith's class
To: Architects
Subject: Mathematics
Message: I am a high school freshman considering becoming an architect and would like to know what type of mathematics you use while doing your work.

My Integration Ideas: COMMUNICATION TOOLS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Communication Tools. Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then, list who will participate (specific names may not be needed, e.g., high school students in Alaska) and briefly describe the exchange of information that would occur.

Lesson Idea: _____

Learning Objective(s): _____

_____

Problem(s) that could be solved with this data: _____

_____

Sample Email:

From: _____
To: _____
Subject: _____
Message: _____
_____
_____

Lesson Idea: _____

Learning Objective(s): _____

_____

Problem(s) that could be solved with this data: _____

_____

_____

Sample Email:

From: _____
To: _____
Subject: _____
Message: _____
_____
_____

How to...

Use Digital Cameras as a Learning Tool:

In the past, when students needed a graphic image, they typically completed hand drawings, which were time-consuming, lacked detail, and primarily benefited students who could draw well. Today, this situation is changed due to student use of digital cameras, which can be used by all students, regardless of artistic abilities. Now, even low cost cameras let students bring the outside world into the classroom in a quick and very accurate manner. These captured images can then be further investigated through the use of editing software. The combined function of the camera and the software enable students to engage in multiple critical thinking activities.

When to use Digital Cameras

Use to capture or create images representing such things as concepts, change, sequence, and/or artifacts.

Using Digital Cameras for Higher-Order Thinking

The following chart contains the basic functions of a digital camera and editing software and example activities for which students could use these functions to engage in higher-order thinking.

Digital Camera: Basic Functions	Examples of Higher-Order Thinking Activities
Capture digital images	• Analyze surroundings to identify appropriate viewpoint
Modify digital cameras	• Analyze setting to identify appropriate combination to achieve the desired outcome
Review captured images	• Analyze captured images to determine if they achieve the desired outcomes
Graphic Image Editing Sofeware	**Examples of Higher-Order Thinking Activities**
Review captured images	• Analyze captured images to determine which need to be modified
Modify digital images	• Synthesize a new image using the appropriate editing software features
Assemble groupings of images	• Synthesize images into a meaningful grouping to represent the desired outcome

Classroom Ideas: DIGITAL CAMERAS

Below are examples of how students can use digital cameras as a tool to better learn subject area content. Also included is space for you to add ideas for your students to use word processing.

Student Digital Cameras Activities	My Ideas for Student Use of Digital Cameras
Take photo of a tree every two weeks to examine life cycle of trees.	•
Create a "Living History" presentation by taking digital images of family members.	•
Create a narrated photo journal of how to write a research paper.	•
Write a story about "What I see in the clouds" that includes digital photos of clouds.	•
Select 10 things that mean the most to you and create a photo archive that includes a narrative description of each item and why you included it in your archive.	•
Photograph things in your classroom that can be used to describe symmetry.	•
Photograph examples where recycling has not occurred. Use toy figures to create and photograph three key scenes from this week's story.	•
Use photographs you take to explain how form is connected to function.	•
Choose one of the three main characters from the story and take from two to five photographs that you think represent the character's personality.	•
Take two photographs that you think are completely opposite from each other. Place the two photos in a word processing table and write compare/contrast statements supporting your choice.	•

Example Ideas: DIGITAL CAMERAS

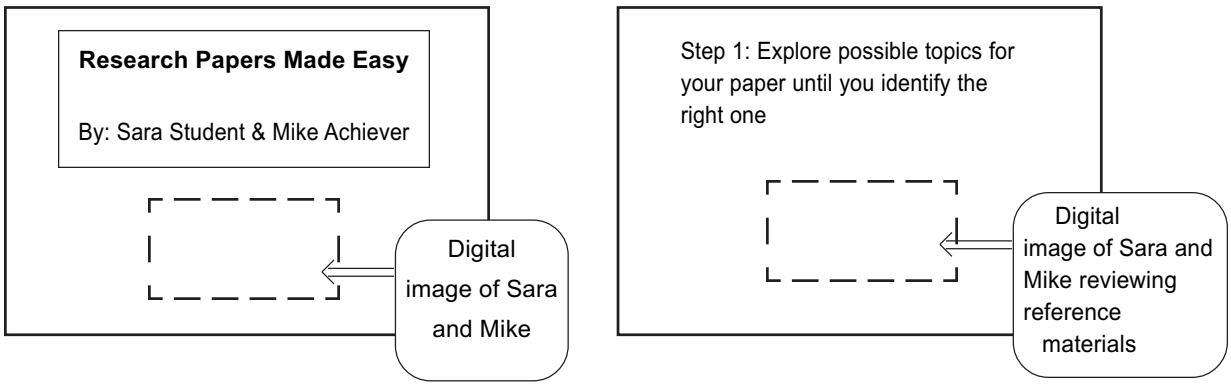
Directions: Use this form to expand and personalize two of the Classroom Ideas for Digital Cameras (from the previous page). 1) Select two ideas that are similar to topics you teach. 2) List the key learning objectives that would be achieved, if students completed these tasks. 3) Create a problem that would result in student attainment of the objectives by reaching a solution. 4) Then create a sample layout of the final word-processed document that students would produce.

Lesson Idea: Create a narrated photo journal of how to write a research paper

Learning Objective(s): Describe the key steps of writing a research paper

Problem(s) that could be solved with this data: Many students struggle with knowing how to write a research paper, so your team is going to create a narrated, step-by-step guide titled "Research Papers Made Easy!" The journal will be completed with a digital camera and PowerPoint.

Briefly sketch the key features of the final digital camera project

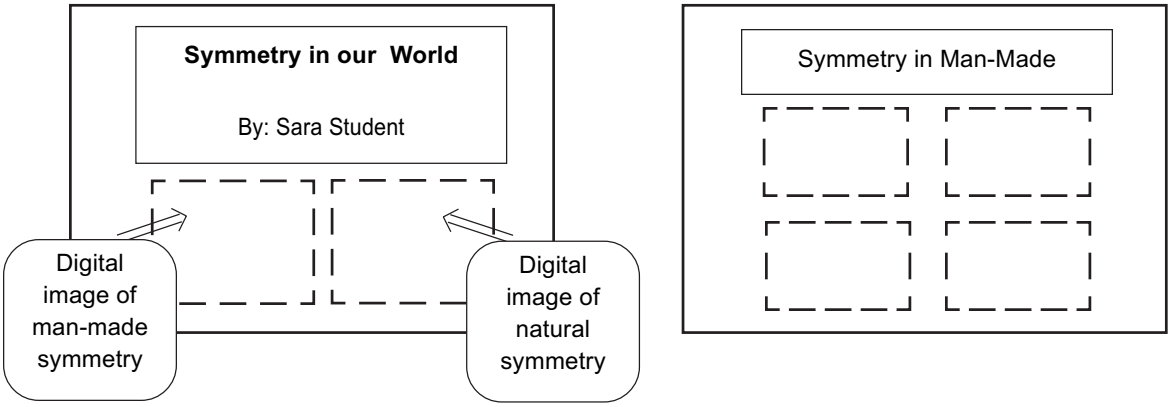


Lesson Idea: Photograph natural and man-made items that represent symmetry

Learning Objective(s): Distinguish symmetrical items from non-symmetrical items

Problem(s) that could be solved with this data: Does symmetry occur naturally or only in man-made objects?

Briefly sketch the key features of the final project students will create with the use of a digital camera



My Integration Ideas: DIGITAL CAMERAS

Directions: Use this form to expand and personalize two of the Classroom Ideas for Digital Cameras (from the previous page). Select two ideas that are similar to topics you teach. List the key learning objectives that would be achieved, if students completed these tasks. Create a problem that would result in student attainment of the objectives by reaching a solution. Then create a sample layout of the final word-processed document that students would produce.

Lesson Idea: _____

Learning Objective(s): _____

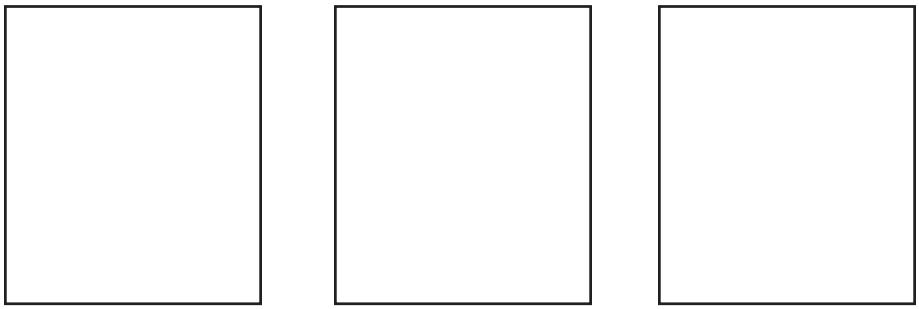
_____

_____

Problem(s) that could be solved with this data: _____

_____

Briefly sketch the key features of the final project students will create with the use of a digital camera.



Lesson Idea _____

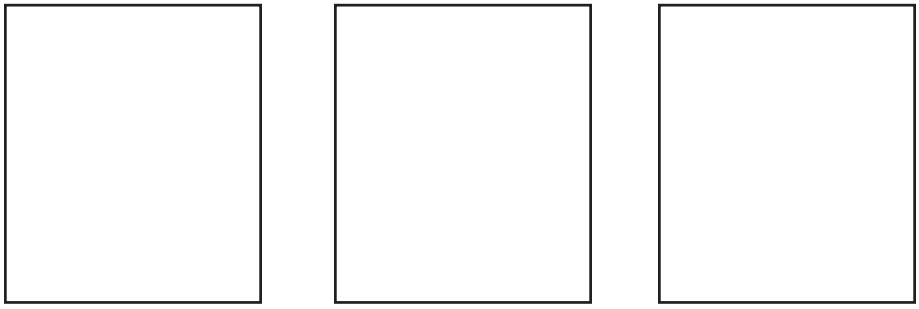
Learning Objective: _____

_____

Problem(s) that could be solved with this data: _____

_____

Briefly sketch the key features of the final project students will create with the use of a digital camera.



SECTION 6

Implementing Integration Lessons

The One Computer Classroom

The Multi-Computer Classroom

Using Laptop carts

Working in a Computer Lab

The One Computer Classroom

In the one computer classroom, the teacher creates a schedule where students take turns or have a special weekly time on the computer. The student on the computer is excused from the work the rest of the class is doing. There are several ways to set up the computer rotation schedule for the one computer classroom. One way is to schedule students based on their academic strengths. For example, if a student was especially strong in math, math time would be a good time to schedule his/her computer time. Another way is to rotate students through the computer as a one student "station." Students rotate according to a posted list.

Whole Class Management Tips

- Group students in front of the computer in the most comfortable arrangement possible.
- Make sure that all students are able to see the monitor.
- Introduce a web site or software program to the whole class with a projection device before having students access the web site or program independently.
- Demonstrate how to use a computer application before the students use it independently. Have students follow along on a prepared job aid they will use when at the computer.
- Demonstrate loading and running a software program.
- Prepare students for what they will be learning and what will be expected of them.
- Give students opportunities to respond to and interact with the computer when appropriate.
- Use a selected web site or software program to serve as a catalyst for a class discussion.

Individual Work Management Tips

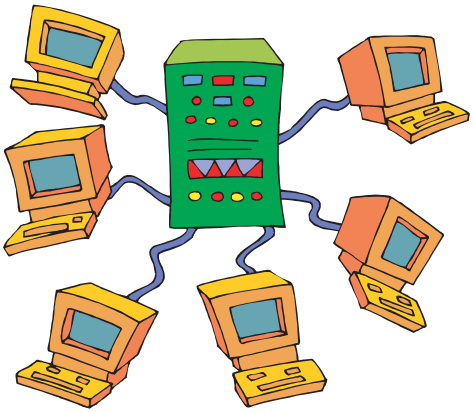
- Present familiar concepts. Choose attitudes/ideas with which the student has experienced prior success.
- Make sure that the student is familiar with the menu, prompts or special commands before she/he begins the assignment. This can be done in a large group, with a peer tutor, or by the teacher.
- Be specific about which program the student is to use. Make sure the student knows where to find directions.

- Establish a non-verbal signal, such as placing a plastic cup upside down, for the student to get the teacher's or peer-tutor's attention without disturbing others.
- Establish clear guidelines regarding how long the student is to stay at the computer and which student is to go next. Teach the student how to use a timer and have a rotation schedule posted near the computer.
- Be clear and consistent in your expectations regarding the student's behavior at the computer.
- Model the computer project for the class. Provide a sample of the completed work for the specified project along with a checklist that students can use to check off tasks as they work. Have students attach the checklist to their completed work.
- Create a template when teaching a new computer skill. The students will be able to rotate through the activity, and the original file will not be lost or altered.

You can use a progress chart to help you and your students monitor their progress as they rotate through the computer.

The Multi-Computer Classroom

A classroom model that uses “learning stations” works well in a multi-computer classroom. Small groups of students rotate from one station to another during a portion of the day or throughout the school day. Another type of rotation that is also effective in the multi-computer classroom is independent rotation. In this rotation approach, small groups of students are assigned to a computer on a scheduled basis. The teacher creates a weekly rotation schedule. This rotation plan allows each student group to have access to a computer several times a week or even daily. One of the advantages of this rotation plan is that student work can be ongoing, and does not necessarily have to be completed by the end of a group’s specified daily time.



Multi-Computer Classroom Management Tips

- Establish student behavior expectations for working in a cooperative group and taking turns.
- Introduce students to basic computer skills before sending them to the computer.
- Assign students specific tasks such as keyboard operator, recorder, and screen reader, and rotate tasks to ensure equitable computer use.
- Use a non-verbal signal, such as a cup turned upside down, to indicate need for teacher assistance.
- Be specific about what students are to do when computer work is finished.
- Have clear and consistent expectations regarding care of hardware and software.
- Have necessary software ready when students go to the computer.
- Create bookmarks for frequently used web sites.
- Assign a “peer expert” to assist students who need help.
- Post step-by step instructions for common computer functions near the computer, e.g., how to save work, how to print.
- Place a timer next to the computer. Have students set the timer for a specified amount of time. When timer goes off, students rotate.
- Post a daily or weekly computer schedule. This schedule should be created so that students move by means of turns rather than an assigned time of day or day. With this type of schedule, a student would not miss his/her turn if there were a school holiday, a class field trip, or a student assembly.

- Plan a related activity that may be done by students who are not at the computer in another area of the classroom. For example, have students use printed resources to research the same questions as students who are using the Internet.
- Have students keep a journal of what they accomplished during their scheduled computer time. Some suggested topics are:
  - New vocabulary words
  - Questions that they may have when working on the computer
  - Web site addresses that were used and what they found at the site
  - Summarization of what they have learned
- Make sure that student assignments are age appropriate and at the appropriate reading level, so the help needs are minimal.
- Use 3 x 5 recipe card file with student names to identify computer users for each day.
- Create two folders, one for completed projects and one for work in progress. Have a checklist available so that, after each session, students can indicate whether the project is complete or additional time is needed.
- Make sure that activity centers have a clearly written description of the student tasks that are to be completed. Use an 8 x 10 plastic sheet protector to hold the directions for the activity, and place it near the computer. This will eliminate the need for verbal directions and will allow the students to begin their tasks as soon as they sit down at the computer.
- Prepare task cards that define the student roles required to complete the assignment. This will help to ensure that all students are actively engaged. Always relate computer assignments to the curriculum that is being covered in the classroom.

Multi-Computer Classroom Rotation Schedules

Scheduling student use of the computer is an effective method for implementing the integration of technology into the curriculum and ensuring that every student has an equal opportunity to benefit from the use of computer technology. The number of students in the class, the number of computer workstations available, and the number of students who will be at each of the computes helps determine the rotation schedule. The length of time necessary for a lesson/activity must be calculated and activities must be created for the students who are not at the computer. Please see the example of a computer rotation schedule created for a multi-computer classroom that has twenty-four students and four computers.

Sample Weekly Rotation Schedule

Day	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Day One	Center 1	Center 2	Center 3	Center 4	Center 5	Center 6
Day Two	Center 2	Center 3	Center 4	Center 5	Center 6	Center 1
Day Three	Center 3	Center 4	Center 5	Center 6	Center 1	Center 2
Day Four	Center 4	Center 5	Center 6	Center 1	Center 2	Center 3
Day Five	Center 5	Center 6	Center 1	Center 2	Center 3	Center 4
Day Six	Center 6	Center 1	Center 2	Center 3	Center 4	Center 5

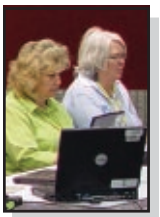
Adapted from Scheduling Activities available at http://www.nycenet.edu/oit/mgmt/scheduling.htm

Check the “Sample Day One Activities” table below to see an example of which activities each group would be participating in on Day One. This table also specifies in which areas of the classroom where each group should be located.

Sample Day One Activities

Group 1	Group 2	Group 3	Group 4	Group5	Group 6
Center 1 Computer 1	Center 2 Computer 2	Center 3 Computer 3	Center 4 Computer 4	Center 5 At the TV	Center 6 At desk
Research on the Internet the effects of pollution on the environment.	Use CD ROM encyclopedias to find information about water and air pollution.	Prepare a PowerPoint presentation about the effects of pollution on the environment.	Use simulation software such as Tom Snyder's "Decisions-The Environment."	Watch a video about the effects of pollution on the environment.	Read chapter in textbook about pollution and answer study guide questions.

Using Laptop Carts



As an alternative to computer labs, some schools have purchased mobile laptop carts, or computers on wheels (COWs). These carts of 5 to 25 mobile computers are typically wireless and can be wheeled from classroom to classroom as needed. Schools have used this model to promote collaboration among students and aid in transitioning among groups of students and in classroom settings (e.g., Gwaltney, 2003). Many of the laptop carts used in classrooms offer each student a computer to work with. This is an excellent opening for each student to demonstrate his or her own computer skills, as well as content knowledge in a unique way. Because the laptop carts are moved from one classroom to another, the time lost organizing students to attend computer labs is reduced.

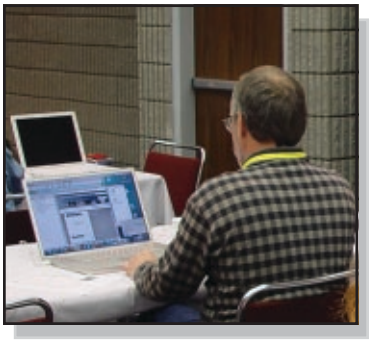
With this one-computer-for-every-student opportunity, teachers must be prepared to manage this environment. For example, new techniques for classroom management must be in place to help facilitate the teaching and learning process. In addition to classroom management, technical and logistical issues also have to be considered, such as battery life and saving work. Some of the same management tips appropriate to multi-computer classrooms and computer labs are appropriate for laptop carts. So, feel free to take a look at those suggestions as well.

Laptop Carts Management Tips

- Use “Lids down” to get students to close the laptops and focus their attention on the teach
- Have web sites bookmarked to the computer instead of inside the web browser.
- Have a plan for recharging batteries in class and between periods during the school day.
- Consider buying a back-up set of batteries to switch out with.
- Devise a plan for saving student work to external devices, such as USB Flash/ key drives, network servers and floppy disks.
- Consider purchasing external mice for the laptops as some young students do not have the manual dexterity needed to manage the trackpads and clicking simultaneously.
- Considering using tables instead of desks to accommodate the laptop computers with textbooks and notebooks.
- Use handouts or project sheets to direct the student’s work

- Use whole-class progress charts to manage where each student is during a computer-supported project. Students can “check off” each phase of the project as it’s completed. The teacher can initial their project sheet, too, in order for the student progress to the next phase.
- Consider using reflection strategies, like “What did I accomplish today? What did I learn today? What do I need to learn/do next?,” in longer computer-supported projects to document the students learning process.
- Use proximity and other traditional classroom management techniques to keep students on task.
- Impress upon students their responsibility for care with using the laptop computers.
- Consider putting the laptops to sleep instead of shutting them down to reduce transition times between class periods.
- Number/identify the laptops and assign students to specific computers, so you can track any problems, including technical problems or student abuse.
- Plan the portions of your unit that will be computer-supported, so you can sign up to use the laptop cart on specific days as opposed to blocking out an entire week.
- Consider using a keyboarding program regularly with students.
- Be clear on student tasks and what activities are off limits, such as email and instant messaging.
- Remind students about safety on the Internet

Working in a Computer Lab



To make best use and access of the computers they have, many schools have created computer labs. Teachers typically register to use the computer lab for specific days. The advantage to computer labs is that they offer a reduced student-to-computer ratio. Like laptop carts in many cases, there is one computer for every student. In contrast to laptop carts, stationary computer labs typically have fixed placements, so the computers cannot be moved. This sometimes inhibits collaborations among students. The physical placement of computers in a lab is often in rows, so all students look forward. This unfortunately sometimes puts the computer monitor between the teacher and the student. Plus, the teacher has difficulty monitoring student progress with this set up. Because many teachers are sharing access to the computer lab, it is sometimes difficult to align the computer-supported activity with the "perfect" unit.

Computer Lap Management Tips

- Consider introducing initial concepts or skills in the classroom before moving to the computer lab.
- Be sure to move about the computer lab as best you can to monitor students.
- Ask parents or older students to help with the computer activities. Consider stationing a guide for each row of students.
- Use planning documents like storyboards and topical outlines before students begin work on computers to maximize the computer use time.
- Use handouts or project sheets to direct the student's work.
- Use "Kill your mice" in order to get students turn their mice upside-down and focus attention on the teacher. This prevents clicking mice.

- Use whole-class progress charts to manage where each student is during a computer-supported project. Students can “check off” each phase of the project as it’s completed. The teacher can initial their project sheet, too, in order for the student progress to the next phase.
- Consider using reflection strategies, like “What did I accomplished today? What did I learn today? What do I need to learn/do next?,” in longer computer-supported projects to document the students learning process.
- Use a non-verbal signal, such as a cup turned upside down, to indicate the need for teacher assitance.
- Use a seating chart for each class period to assign students to specific computers so you can track any problems, including technical problems or student abuse.
- Devise a plan for saving student work to external devices, such as USB Flash/ key drives, network servers and floppy disks.
- Be clear on student tasks and what activities are off limits, such as email and instant messaging.
- Remind students about safety on the Internet.

References

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