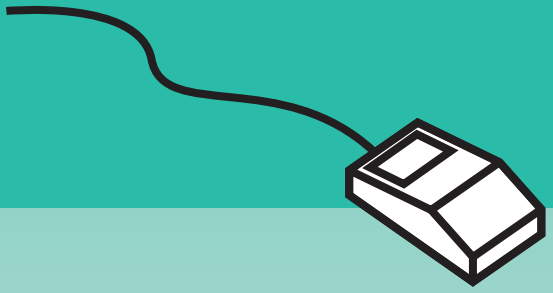




Technology-Based Instructional Guides


Edited by
Linda S. Hodges


tcet
Texas Center for Educational Technology



The Long-Range Plan for Technology, adopted in 1988 by the Texas State Board of Education, called for the creation of a statewide educational technology research and development center. The State Board envisioned that the Center would consist of public school educators, teacher training institutions, and technology vendors all working together, sharing perspectives, and dynamically applying technology to prepare Texas public schools to meet the challenges of the 21st century.

Since its inception in 1990, the Texas Center for Educational Technology (TCET) has made significant contributions toward helping educators throughout Texas apply technology effectively to the teaching and learning process. Its research products and publications are widely recognized as vital ingredients to successful technology planning and implementation ... which directly benefits Texas school children.

All activities undertaken by TCET staff must support its mission and strategic plan:

> to promote research and development collaboration between industry and education in order that technologies and publications can be created and adapted for integration into the public school system.

TCET is uniquely structured to foster collaboration. Board membership brings together public school educators, faculty from colleges of education, and representatives from the business community. Cooperatively, these members create and support a research agenda that reflects the best thinking of all the partners.

Essential to the successful application of technology to education is the timely sharing of what is known, what the research shows, and what works from a practical viewpoint. This means making the information easily available to every educator in Texas. One of TCET's five goals is to serve as a K-12 technology and educational research and development a clearinghouse that disseminates research-based information to the district, school, and classroom levels.

TCET uses multiple approaches to better ensure that needed information is communicated. By hard copy, on-line electronic media, CD-ROM, conference and seminar presentations, and exhibits, the TCET staff focuses on dissemination efforts.

This publication is a partial representation of products that are created by the Super Collider Opportunities for Public Education (SCOPE) Project and the Dallas Independent School District (DISD). The goal of these two projects is to generate classroom-ready materials produced by inservice classroom teachers for classroom teachers. The complete and updated versions of activities and unit plans in this Technology-Based Instructional Guide can be found at the TCET WWW address

http://www.tcet.unt.edu.

Located on the campus of the **University of North Texas** in Denton, Texas, TCET is housed in the College of Education's Academy for Research and Professional Development, Matthews Hall Room 207.

TABLE OF CONTENTS

Topic: Major category, such as optics, will help organize lessons and equipment.	**Title:** Choose one that will capture student and teacher attention.
Grade Level/Course: This can cover a broad range and be adaptable.	**Time Frame:** Instructional time for completing the activity.

Contributors:

Contributor' s name
School and School District
E-mail address

Overview:

A paragraph that will give the reader a summary of the lesson's content and major objective.

TEKS Correlation:

This section will identify the state-mandated essential knowledge and skills for the specific curriculum area being addressed. Since much of what is taught applies to more that one discipline, include each section of the TEKS that is pertinent.

Goals and Objectives:

Broad goals and specific instructional objectives should detail what students are expected to master. It is entirely possible that the section might include several types of objectives.

- *Behavioral objectives* would describe behavior changes that the teacher expects from students upon the completion of the lesson.
- *Performance objectives* would describe what students are expected to do during the lesson. This could include any particular skills that should be mastered.
- *Process objectives* would state activities in which students would be engaged during this lesson.

Prerequisite Skills/Knowledge:

This section should describe what skills and knowledge students should possess before encountering this activity. This should include the topics that the students have studied previously, vocabulary that is relevant to the lesson, a description of the subject matter background that students need, and their level of understanding and experience with the technology to be used in the lesson.

This section might include descriptions such as:

- Students should know a number of strategies used in problem solving, such as breaking problems into small parts and working backwards.
- Students should have mastered addition of fractions with unlike denominators.
- Students should know how to log in to the network and access the school bulletin board.

Materials/Equipment/Resources:

Name all of the materials, in a list format, that are needed to complete this activity. Include textbooks and handouts. If special equipment is required, suggest where it might be obtained.

Instructional Activities/Strategies:

Preparation:
List the various materials that need to be made ready before engaging in the actual activity. This may include instructions such as safety rules.

Classroom management:
Describe the format in which the students will be involved in this activity, including whole class or large group, small groups (number of students per group), or individual.

Questions to investigate:
To promote inquiry and open-ended learning, students should be encouraged to design questions for which they will seek answers. A sample of questions that may be addressed should be included here.

Data Collection:
This section will include the step-by-step procedure of the activity. Be very specific and include things of which to be aware, as well as what should be expected. This segment is for the teacher's understanding of the activity and should be in cookbook form.

Calculations:
Describe how the results are to be organized, analyzed, and made ready for presentation. Include specific equations and formulas.

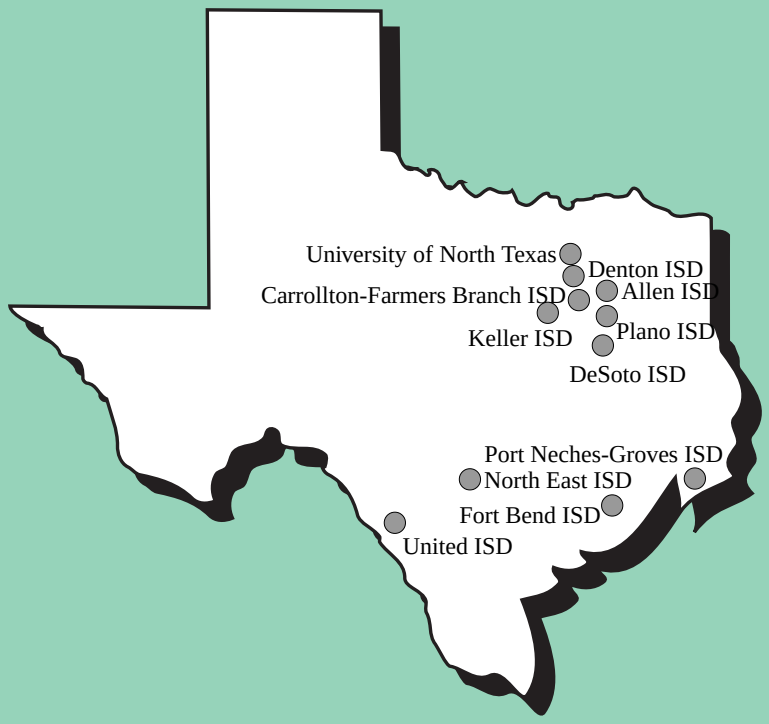
Communicate results:
Students must be able to convey what they have learned. This section includes the general plan for submitting the students' interpretations of the results of the activity. Formats may include such types as formally written papers, poster projects, video tapes, and computer generated presentations.

Assessment:

Evaluation activities should explain how the students demonstrate knowledge of a concept or ability to demonstrate a skill. These activities can include both formative and summative evaluation schemes. It should address ways in which teachers can determine if the objectives of the lesson have been achieved by students' demonstration of mastery. This section should go beyond traditional teaching and should give teachers suggestions about how to determine the extent of student learning when exposed to new technology, etc.

Teaching Suggestions/Extensions:

This section is left open for teachers to explore other ways of teaching the lesson. Ideas may arise during the preparation for the activity, or sparked during the activity. This can include interdisciplinary ideas and alternate equipment.



Texas Map of Stakeholders' Locations

SCOPE Stakeholders

STAKEHOLDER	COUNTY	STUDENT POPULATION
Allen ISD	Collin	6,839
Carrollton/Farmers Branch ISD	Dallas	19,714
Denton ISD	Denton	11,819
DeSoto ISD	Dallas	6,439
Fort Bend ISD	Fort Bend	43,115
Keller ISD	Tarrant	10,971
North East ISD	Bexa	43,834
Plano ISD	Collin	36,426
Port Neches-Groves ISD	Jefferson	6,300
United ISD	Webb	18,528
Total Student Population Influenced by SCOPE Assets		203,985

The Super Collider Opportunities for Public Education (SCOPE) project is operated within the Texas Center for Educational Technology (TCET) at the University of North Texas (UNT). The science initiative is headed by Dr. James L. Poirot, Associate Dean for the College of Education and TCET Project Director.

Planning for SCOPE started in the spring of 1994, soon after the announcement of the federal pullout of support for the Superconducting Super Collider (SSC). UNT serves as the on-site training and operational facility for the collaborative project. With over $2.5 million dollars in assets coming from the Department of Energy and over $1.5 million dollars in support form partner school districts and corporations, SCOPE is the largest single sponsored project in UNT and TCET history.

Central to SCOPE's vision is the linkage of advanced science equipment, computer-based learning tools, and distance learning technologies with science educators and science/technology specialists. The primary goal is to improve science education by allowing teams of Texas science educators to access experts in the field and the needed physical resources as they collaboratively develop science instruction/curriculum, then implement and evaluate this instruction/curriculum in the classroom.

After a period of organization, SCOPE began its professional development workshops for teachers in the summer of 1996. Initially teachers were introduced to the equipment obtained from the SSC Project. This equipment began rotating on a loan-out basis to the SCOPE districts in the fall of 1996. Districts had an opportunity to borrow such equipment as telescopes, spectrum analyzers, and electromagnetic demonstration apparatus for a period of four to six weeks.

Ongoing workshops are built around such sought after topics as lasers, Geiger tubes, grant writing, electronics, and modern physics. As the SCOPE Project evolves, these workshops have been made accessible to all school districts. A central purpose of each workshop is to generate resource activity materials for other teachers. Each activity is correlated with the Texas Essential Knowledge and Skills (TEKS). The goal is to produce classroom-ready materials that can be easily adapted to various grade levels and subject areas. Technology across the curriculum and interdisciplinary activities are included. Activities are designed to be open-ended thus providing teachers with an organized student inquiry design.

A complete collection of these resource activities can be found on the website http://www.tcet.unt.edu. These resource materials are designed using a template plan. Each activity is intended to be dynamic in nature. Each teacher visiting this site is encouraged to update the resource by providing input after exploring the activity with his/her class. Teachers can contribute improved or supplemental methods, materials, etc. by contacting the webmaster found at the TCET/SCOPE site on the web.

Topic: Astronomy	**Title:** Sunspots Spotted
Grade Level/Course: Grades 11 or 12	**Time Frame:** One month

Contributors:

Linda S. Hodges
University of North Texas
lhodges@coefs.coe.unt.edu

Overview:

In this activity students will study sunspots and their motion. From data gathered, they will determine the significance of the sunspot data. The data will be used to calculate the rotational period of the sun. The students will then draw conclusions as to the sunspot's impact on the world. This activity will also include an historical study of astronomy.

TEKS Correlation:

Astronomy - Grades 11 and 12
§112.48 The student is expected to:
c1A demonstrate safe practices during field and laboratory investigations.
c2A plan and implement investigative procedures.
c2B collect data and make measurements with precision.
c2C organize, analyze, evaluate, make inferences, and predict trends from data.
c2D communicate valid conclusions.
c3E research and describe the history of astronomy and contributions of scientists.
c8A identify the approximate motion of the sun.
c8C describe the sun's effects on the Earth.

Independent Study in Technology Applications - Grades 10-12
§126.29 The student is expected to:
c1A demonstrate knowledge and appropriate use of operating systems and software applications.
c1B make decisions regarding the selection, acquisition and use of software.
c2A demonstrate proficiency in the use of a variety of electronic input devices.
c4A use local area networks (LANs) and wide area networks (WANs) including the Internet.
c4B apply appropriate search strategies in the acquisition of information from the Internet.
c4C pose hypotheses/questions related to a selected problem.
c5A acquire information using appropriate research strategies and a variety of electronic formats.
c7A develop and apply advanced technology application skills.
c7B identify and solve problems utilizing research methods and advanced technology applications.
c7D use foundation and enrichment curricular content in the creation of products.
c7E synthesize and generate new information from data gathered form electronic and telecommunications resources.
c11A determine and implement the best method of presenting or publishing findings
c11B synthesize and publish information in a variety of ways including printed copy, monitor display, and video.

Goals and Objectives:

- Students will carefully collect and keep data over a period of time.
- Students will do a self-directed literature search.
- Students will develop models to analyze their data.
- Students will use mathematics as a tool to solve a practical problem.
- Students will work as a team to accomplish their goals.
- Students will be able to draw conclusions as to cause and effect.
- Students will effectively communicate the results of their research.

Prerequisite Skills/Knowledge:

- Students should have a working knowledge of algebra and geometry.
- Students should have a concept of the motions of the Solar System.
- Students should be able to use a telescope.

Materials/Equipment/Resources:

__Reflector telescope with finder scope removed
__Full aperture solar filter
__Wide angle. low power eyepiece (40mm or greater)
__Clock
__Video camera (Optional)
__Calculator
__Computer

Instructional Activities/Strategies:

Preparation:
1. Assign the students to investigate sunspots using the Internet.
2. Students should demonstrate safe use of the telescope and filter.
3. The computer may be linked to the telescope as a driver with the appropriate software and/or to store video input data.
4. Students should be familiar with various websites which provide daily data on the sun.

Classroom management:
The class should be divided into groups of four or five. Each group should include such jobs as:
   A. Team Leader
   B. Equipment Technologist
   C. Computer Specialist
   D. Data Engineer

Questions to investigate:
1. How long do sunspots last?
2. How are sunspots related to the rotation of the sun?
3. What is the rotational period of the sun?
4. What is the difference between the sidereal period and the synodic period?
5. What patterns of motion do sunspot exhibit?
6. Do sunspots effect the Earth?
7. At what angle does the sun's pole seem to tilt?

Instructional Activities/Strategies (Continued)

Data Collection:

1. Photograph, video tape, or draw the sun's disk and the sunspots at the appropriate position.
2. Record the time that the data is taken.
3. Data should be recorded every day or two for about one month and kept in a journal along with the other research on sunspots.

Calculations:

1. Each group must decide which single sunspot they will plot.
2. Plot the sunspot as it appeared each day onto a disk drawn to represent the sun. There should be as many points on the disk as days the sunspot was spotted.
3. Draw a line through the points. *This line could be straight, or it could be slightly curved, depending upon the month of the year.*
4. These sunspots represent points on the circumference of a rotating circle. Redraw the diagram to demonstrate this. *Refer to Diagrams 1-4.*
5. Measure the angle between the sunspots.
6. Use the time between observations and the angle of rotation for each to determine the rate of rotation.
7. To determine how many days it takes for the sun to rotate once as seen from the Earth, divide 360 degrees by the angle of rotation per day.

Communicate results:

Students can choose one of a variety of formats in which to present their results.

- A mock trial of Galileo as he defends his discovery of the sun's rotation to the Catholic church.
- Write an article in correct form so it could be submitted to a journal.
- A videotaped broadcast of a news program, NOVA, or another science show.
- Use a multimedia computer format.

Assessment:

- Use a rubric or checklist format to determine the degree to which students accomplished the objectives.
- A written quiz may be used to determine the conceptual understanding of each student.

Teaching Suggestions/Extensions:

- Do not put the telescope in the sunlight until the filter has been attached.
- Full-aperture solar filters can be obtained from most telescope suppliers for about $100. An example is ORION Telescope Center (800) 447-1001.

Topic: Electrostatics	**Title:** A Hair Raising Experience
Grade Level/Course: Middle School	**Time Frame:** 90 minutes

Contributors:

Harry Williams
Port Neches-Groves H.S.
(Port Neches-Groves ISD)

Barry Rose
Carrollton-Farmers Branch (CFBISD)
roseb@cfbids.edu

Terrie Hennen
Curtis Middle School
(Allen ISD)

Corlette Anderson
Missouri City Junior High
(Fort Bend ISD)

Anthony McBride
I.H. Kemper H.S.
(Fort Bend ISD)

Alberta Campbell
Missouri City Middle School
(Fort Bend ISD)

Overview:

This activity is designed to help students understand the concept of charged and neutral materials. Students will work with conductors and insulators to produce, detect, and transfer charges.

TEKS Correlation:

Science - Eighth Grade
§112.24 - The student is expected to:
b4A collect, record, and analyze information using tools.
b4B extrapolate from collected information to make predictions.
b8A describe the structure and parts of an atom.
b8B identify the properties of an atom including mass and electrical charge.

Technology Applications (Computer Literacy) - Grades 6-8
§126.12 - The student is expected to:
c4B apply appropriate electronic search strategies in the acquisition of information.
c7A plan, create, and edit documents created with a word processor.
c10D demonstrate appropriate use of fonts, styles, and sizes, as well as effective use of graphics and page design to communicate effectively.

Goals and Objectives:

- Students will discover three basic ways to transfer charge: Conduction, induction, and friction.
- Students will construct devices to demonstrate the transfer of charges.
- Students will use the Internet to do a history search.
- Students will use computer graphic/draw programs to produce a document to explain and illustrate their findings.

Prerequisite Skills/Knowledge:

- Students must have a basic understanding of the atom.
- Students must have familiarity with the Internet.

Materials/Equipment/Resources:

__Van de Graaff Electrostatic Generator
__Aluminum pie pans (the more the better)
__Coffee can
__Plastic bowl/butter tub (large)
__Packing peanuts
__2 cm x 22 cm strips of typing paper
__1 meter insulated wire
__Plastic cups (hard clear plastic is best)
__Aluminum foil
__Transparent tape
__Electroscope
__6 oz. Styrofoam cups
__Styrofoam plate
__Scissors
__Plastic wrap

Instructional Activities/Strategies:

Preparation:
Demonstrate the correct use of the Van de Graaff Electrostatic Generator. Show the students how to discharge it after use.

Classroom management:
Divide the class into groups of four.

Method One -The materials in column two of the materials list is distributed to each group. The activity is done simultaneously by all the groups.
Method Two - Each activity is set up in a station located in the classroom. Groups move from one station to another doing each activity.

Questions to investigate:
1. Through how many pie plates stacked on top of the Van de Graaff Generator will charge flow?
2. Which is safer to be in during a thunderstorm, a plastic shed or a metal shed?
3. How can charges be transferred in metals? In insulators?
4. How long will a metal/insulator stay charged?

Method:
Activity One (Transfer by conduction)
1. Make sure the generator is off and discharged.
2. Stack the aluminum pie pans on top of the generator. The bottom pie pan could be taped on to the generator. Experiment with the number of pie pans to use.
3. Turn on the generator. *The pie pans should begin to fly off one at a time until all are gone.*
4. Turn off the generator and discharge.

Activity Two (Transfer by friction and conduction)
1. Attach the Styrofoam cup to the center inside of the pie pan.
2. Rapidly rub the wadded plastic wrap back and forth across the bottom of a Styrofoam plate.
3. Hold the pie pan by its Styrofoam handle and touch the bottom of the pie pan on to the bottom of the Styrofoam plate to transfer charge. *Be very careful not to touch the metal.*
4. Still holding the pan by its handle, slowly touch a nose to the rim of the pie pan. Just before the touch there should be a small spark. It can be seen in the dark.

Instructional Activities/Stategies: (Continued)

Activity Three (Transfer by conduction and induction)

1. Using 2 aluminum foil circles, about 10 - 15 cm each, cover the bottom inside and outside of the clear plastic cup. *For more information look for Leyden Jar.*
2. Tape one end of the insulated wire to the foil inside the cup. Tape the other end to the electrostatic generator.
3. Turn the generator on to charge the cup. Students can experiment with the time.
4. Disconnect the wire after turning off the generator. Discharge the generator *after* the wire has been removed.
5. Holding the cup by its top edge only, shake off the aluminum foil liner from the outside and the inside of the cup.
6. Test each piece of foil and the cup for charge by holding them, one at a time, to an electroscope. *Note only the cup will be charged.*
7. To discharge the cup, put the liners back on the cup and touch a wire to both the inside and outside of the aluminum foil at the same time. *Like a capacitor.*

Activity Four (Transfer by induction)

1. Fill the plastic bowl with Styrofoam peanuts.
2. Set the bowl of peanuts on top of the electrostatic generator using a small piece of tape to attach the bottom of the bowl to the top of the generator.
3. Turn the generator on for 30 seconds. *The peanuts will fly out of the bowl.*
4. Turn off the generator, discharge, and remove the bowl.
5. Fill the coffee can with the Styrofoam peanuts.
6. Place the can on top of the generator with a piece of tape to secure it.
7. Turn on the generator and run for 30 seconds. *The peanuts will stay in the can . The can is charged on the outside <u>not</u> on the inside. (Gauss's Law)*
8. Turn off the generator, discharge, and remove the can.

<u>Communicate results</u>:
Students will generate a written document that will include graphics demonstrating the results and their understanding of the concepts involved in each activity.

Assessment:

Students are evaluated as to:

- their explanation of charge transfer for each activity.
- their ability to manipulate objects to produce the various types of charge transfer.
- the quality of the Internet research exhibited.
- their ability to illustrate the observed phenomenon.

Teaching Suggestions/Extensions:

Topic: Lasers	**Title:** Discount Lenses (Gelatin Wave Guides)
Grade Level/Course: Grades 9 -12	**Time Frame:** One class period

Contributors:

Stan Hutto
Theo. Roosevelt H.S. (NEISD)
slhutto@tenet.edu

Rachel Lawson
Theo. Roosevelt H.S. (NEISD)

Jan Mayberry
R.L. Turner H.S. (CFBISD)
mayberryf@cfbisd.edu

Overview:

A study of the attributes associated with the concept of fiber optics is done using a labmade fiber optic from clear molded gelatin. A variety of shapes can be cut and pieced together to form a conduit to transmit the laser beam by internal reflection.

TEKS Correlation:

Integrated Physics & Chemistry - Grade 9 or 10
§112.42 The student is expected to:
c1A demonstrate safe practices during field and laboratory investigations.
c2A plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
c2B collect data and make measurements with precision.
c2C organize, analyze, evaluate, make inferences, and predict trends from data.
c2D communicate valid conclusions.
c3A analyze, review, and critique scientific explanations, including hypotheses and theories.
c5B demonstrate wave interactions including reflection within various materials.
c5C identify uses of electromagnetic waves in various technological applications such as fiber optics.

Physics - Grades 10-12
§112.47 The student is expected to:
c1A demonstrate safe practices during field and laboratory investigations.
c2A plan and implement experimental procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
c2B make quantitative observations and measurements with precision.
c2C organize, analyze, evaluate, make inferences, and predict trends from data.
c2D communicate valid conclusions.
c2E graph data to observe and identify relationships between variables.
c2F read the scale on scientific instruments with precision.
c3A analyze, review, and critique scientific explanations.
c3B express laws symbolically and employ mathematical procedures including vector addition and right-triangle geometry to solve physical problems.
c8A examine and describe a variety of waves propagated in various types of media.
c8B identify the characteristics and behaviors of electromagnetic waves.
c8C interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.

TEKS Correlation: (Continued)

Technology Applications (Computer Literacy) - Middle School
§126.12 The student is expected to:
c2A demonstrate proficiency in the use of a variety of input devices.
c4B apply appropriate electronic search strategies in the acquisition of information.
c7B create and edit spreadsheet documents using all data types, formulas and functions, and chart information.
c7G integrate two or more productivity tools into a document including tables, charts and graphs.

Goals and Objectives:

- Observe refraction and internal reflection and the role they play in wave guides/fiber optics.
- Collect data and organize it into a useful format.
- Manipulate variables to determine correlations.
- Study the uses of fiber optics in industry.

Prerequisite Skills/Knowlege:

- The student should be familiar with spreadsheet and graphing software.
- The student should be able to use a protractor.
- The student should be familiar with the terms used in geometric optics.

Materials/Equipment/Resources:

__Laser
__Knox™ gelatin
__Flat bottom pan (like a cake pan)
__Bowl, spoon, heat resistant container and hotplate
__Knife for slicing the gelatin
__Light probe and associated software and hardware (MBL/CBL)

Instructional Activities/Strategies:

Preparation:
1. Prepare the gelatin at least one day before the lab. Use 4 packages of the gelatin in one cup of cold water to soften. Add 2 to 3 cups of boiling water and stir until dissolved. Put into a flat pan so that the result is about 1 inch thick. Refrigerate until use. Will keep several days.
2. Assign the students to do Internet research on fiber optics.
3. Review laser safety with the class.

Classroom management:
Divide the class into groups so that each group will have a laser, computer light probe with software, and a computer. If only one setup is available, this can be done as a whole-class project.

Questions to investigate:
1. How much light is lost in each centimeter of straight segments?
2. How much light is lost if the strip is bent 10 degrees? 20 degrees? 30 degrees?
3. How much can the strip be bent and still transmit light?
4. Does the width of the strip matter?
5. What is the index of refraction of the gelatin?
6. What is the cost per meter of the gelatin fiber optic?

Instructional Activities/Stategies: (Continued)

Data Collection:

1. Slice the stiff gelatin into narrow strips and place on the lab table. Shine the laser through the narrow end of the strip.
2. Use a light probe to measure the amount of light emitted from the end of the gelatin strip.
3. Lengthen the gelatin fiber optic by adding another strip. Fit the ends together tightly.
4. Measure the amount of light emitted by the longer strip.
5. Keep a chart as more strips are added.
6. Bend the strip(s) through various angles and measure the light emitted.
7. Cut various shapes from the gelatin such as prisms, squares, and lenses to measure other properties such as index of refraction. Do this by placing the shape on paper and outlining the shape with a pencil. Students then direct the laser beam through the shape having the beam strike the incident surface at tan angle. They then determine the point of entry and the point of exit from the form. Marking these points on the paper, the gelatin shape can then be removed. Connect the entry point with the exit point and measure the angle of incidence and the angle of refraction. From this the index of refraction can be calculated.

Calculations:

1. Use a spreadsheet for organizing each set of data.
2. Let students choose an appropriate style of graph for illustrating the data.
3. Compare the index of refraction of the gelatin with that of other materials.

Communicate results:

Encourage students to compare the results from their gelatin optics with those they discovered from researching actual fiber optics. Students can present their work in written form or as a poster project.

Assessment:

- Evaluate the data table, graphs and charts to indicate the correlation students found between the various variables.
- Evaluate the quality and depth of research that was done.

Teaching Suggestions/Extensions:

Topic: Lasers	**Title:** Laser Eyes
Grade Level/Course: Grades 9-12	**Time Frame:** Indeterminate

Contributors:

Stan Hutto
Theo. Roosevelt H.S. (NEISD)
slhutto@tenet.edu

Rachel Lawson
Theo. Roosevelt H.S. (NEISD)

Jan Mayberry
R.L. Turner H.S. (CFBISD)
mayberryf@cfbids.edu

Overview:

The students will observe the "speckled" pattern produced by a He-Ne laser projected upon a wall or screen. By moving the head from side-to-side the students will notice that the speckled pattern appears to move either in concert with their motion (in the same direction) or opposite their motion. This apparent movement correlates to the observer's visual acuity (nearsightedness/farsightedness). This phenomenon can be used as a bases to collect data either locally or via the Internet.

TEKS Correlation:

Integrated Physics and Chemistry
§112.42 The student is expected to:
c2A plan and implement investigative procedures including asking questions, and formulating testable hypotheses.
c2B collect data and make measurements with precision.
c2C organize, analyze, evaluate, make inferences, and predict trends from data.
c2D communicate valid conclusions.
c5B demonstrate wave interactions including interference.
c5C identify uses of electromagnetic waves in various technological applications.

Physics - Grades 10-12
§112.47 The student is expected to:
c1A demonstrate safe practices during field and laboratory investigations.
c2A plan and implement experimental procedures including asking questions and formulating testable hypotheses.
c2C organize, analyze, evaluate, make inferences, and predict trends from data.
c2D communicate valid conclusions.
c8B identify the characteristics and behaviors of electromagnetic waves.
c8C interpret the role of wave characteristics and behaviors found in medicinal and industrial applications.

Web Mastering - Grades 9-12
§126.28 The student is expected to:
c4A use LANs and WANs including the Internet and intranet in research and resource sharing.
c7A use technology tools to create a knowledge base with a broad perspective.
c7B select and integrate appropriate productivity tools into the creation of WWW documents.
c7C use foundation and enrichment curricular content in the creation of WWW pages.
c7D create WWW pages using specific authoring tools.
c8C synthesize and generate new information from data gathered form electronic and telecommunications resources.
c8G participate in relevant, meaningful activities in the larger community.
c11A synthesize and publish information in a variety of ways.

Goals and Objectives:

- Observe the speckled interference phenomenon produced by a divergent laser beam.
- Develop questions which will provide a foundation for a wide spread data base.
- Collect data and make determinations about trends.

Prerequisite Skills/Knowledge:

- The students must understand laser safety.
- Students should understand the concept of 3-dimensional optical wave interference.
- Students should be able to organize large quantities of data.

Materials/Equipment/Resources:

__Laser
__Diverging lens
__Computer with Internet access (If a wide area search is to be done.)

Instructional Activities/Strategies:

Preparation:
1. Science classes should discuss what produces the speckled interference patterns and how the eye focuses the pattern. Nearsightedness and farsightedness should be illustrated so the students will comprehend why the patterns appear to move as they do.
2. The class/group/student should develop a questionnaire which includes such data as result nearsighted or farsighted, gender, race, eyecolor, age, etc.
3. Arrange with other schools, locally or via the Internet, to take and share data.
4. A webpage explaining the project and asking for participation could be produced.

Classroom management:
Can be done as a class project, or in smaller groups.

Questions to investigate:
1. Is there a particular characteristic, such as gender, race, or age, that has a higher occurrence rate of nearsightedness/farsightedness?
2. Is the trend found in Question 1 local or widespread?

Data Collection:
1. Produce a laser beam that is at least 5 cm in diameter by inserting a diverging lens and reflecting the beam from a wall or screen..
2. Each student should look at the reflected beam while moving his/her head from side to side. If the person is farsighted, the pattern will appear to move in the same direction as the head. If the person is nearsighted, the pattern will appear to move in the opposite direction as the head.
3. If the student wears glasses, have them try this both with and without their glasses.
4. Ask each student to fill out the questionnaire that was produced for this activity.
5. Collect this same data from other classes locally or via the Internet. Or the students could take this out into the community to test people at various locations.

Calculations:
1. Keep the data in a spreadsheet on the computer.
2. Analyze the data by comparing the information in the various columns.
3. Produce a graph or other type of visual that will show the results of the research.

Instructional Activities/Strategies: (Continued)

Communicate results:

1. Publish the results of the activity in a document format.
2. This document can also be published on the website, if one was produced for this project.
3. Each school or class which participated in collecting data for this project should be sent a copy of the documented results.

Assessment:

- Students should be evaluated on their participation and the thoroughness with which the project was carried out.
- If a webpage was created, it should be evaluated by a rubric or a checklist format.

Teaching Suggestions/Extensions:

Topic: Lasers	**Title:** Straining for Sound
Grade Level/Course: Sixth Grade	**Time Frame:** One hour

Contributors:

Sandra Garuba-Moreno
Christa McAuliffe Middle School
(Fort Bend ISD)

Matt Johnson
Christa McAuliffe Middle School
(Fort Bend ISD)

Barry Rose
Blalack Middle School (CFBISD)
roseb@cfbisd.edu

Overview:

Using a laser along with computer microphone probeware and the appropriate software, students determine the speed of rotating objects. An audio amplifier is connected to a solar cell to change the laser light signal into a sound signal. A simple calculation is required to find the rate of rotation.

TEKS Correlation:

Science - Grade 8
§112.24 The student is expected to:
b1A demonstrate safe practices during laboratory investigations.
b2A plan and implement investigative procedures including asking questions and selecting and using equipment and technology.
b2B collect data by observing and measuring.
b2C organize, analyze, evaluate, make inferences, and predict trends from evidence.
b2D communicate valid conclusions.
b2E construct graphs and tables using tools including computers to organize, examine, and evaluate data.
b3C represent the natural world using models and identify their limitations.
b4A collect, analyze, and record information using computers and computer probes.
b4B extrapolate from collected information to make predictions.
b5A identify a design problem and propose a solution.
b5B design and test a model to solve the problem.
b5C evaluate the model and make recommendations for improving the model.
b7B recognize that waves are generated and can travel through different media.
b13A describe characteristics of the universe such as stars and galaxies.

Technology Applications (Computer Literacy) - Grades 6-8
§126.12 The student is expected to:
c1A demonstrate knowledge and appropriate use of operating systems, software applications ....
c2A demonstrate proficiency in the use of a variety of input devices.

Goals and Objectives:

- The student will set up laboratory equipment to determine the speed of a motor.
- The student will calculate the speed of a motor from collected data.
- The student will evaluate and make recommendations for applying the experimental procedure to measure other rotating objects.
- This concept will be compared to such natural phenomena as quasars.

Prerequisite Skills/Knowledge:

- Students will be familiar with pulsars and quasars.
- Students will have experience with the safe use of lasers.
- Students should understand the term frequency.

Materials/Equipment/Resources:

__1.5 V D.C. motor and battery
__Solar cell with mini-plug attached (Can use a radio earphone and plug with the earphone removed.)
__Radio Shack Audio Amplifier-Speaker (part #277-1008c)
__Laser
__Disk with concentric holes such as a sink strainer
__Microphone computer probeware such as LOGAL, Vernier, or PASCO

Instructional Activities/Strategies:

Preparation:
1. Attach the mini-plug to the solar cell so that it will plug directly into the input jack of the audio amplifier.
2. Attach the disk (sink strainer) to the motor shaft so that it is centered.
3. Familiarize the students with the microphone computer software and hardware.

Classroom management:
The laboratory group size depends upon the number of setups that are available.

Questions to investigate:
1. How can the rotational speed of an object be measured?
2. How can sound frequency be used to measure light modulation?
3. Can this method for measuring speed be used in other “real life” situations?
4. Is the rate of rotation the same for the inside edge and the outside edge of a disk?

Data Collection:
1. Arrange the equipment so that as the disk spins, the laser beam shines through the inner most set of concentric holes. The laser should be intercepted on the other side of the motor by the solar cell attached to the audio amplifier. The audio amplifier should produce a constant tone.
2. Set the microphone so that it will pick up the sound produced by the audio amplifier. The computer program should be set to measure sound frequency.
3. Move the motor-disk combination a little until the laser beam shines through the next set of holes. Measure the frequency with the microphone probe.
4. Continue moving the disk until all of the frequencies have been measured.

Calculations:
1. Count the number of holes in each concentric ring, starting with the set closest to the center.
2. Divide the frequency of the inner most ring (pulses/second) by the number of holes (pulse sources/revolution) in the inner most ring. This will give revolutions/second or speed of rotation.
3. Do this measurement/calculation for each ring of holes.
4. Compare the rotational speed at each position. *The speed of rotation should yield the same result for each calculation.*

Communicate results:
1. Draw a graph of frequency versus number of holes. Explain the meaning of the graph.
2. Draw a graph of speed versus distance from center of the disk. Explain the meaning of the graph.
3. Design a procedure that could be done to measure the speed of another rotating object.
4. Explain how this method could be used to measure quasars.

Assessment:

- Use a checklist to measure laboratory procedure.
- Evaluate each student/group on the explanation of the graphs.
- Give credit for creating an application design using this procedure.

Teaching Suggestions/Extensions:

- This procedure could be done by placing small mirrors at various positions on a fan blade and reflecting the laser light.
- The solar cell/amplifier/microphone setup could be replaced by a light probe which is set to measure pulse frequency.

Topic: Radioactivity	**Title:** Radiation Protection: How much is enough?
Grade Level/Course: Grades 10-12	**Time Frame:** Two class periods

Contributors:

Rosemary Trei
DeSoto High School (DeSoto ISD)
chemistrei@aol.com

Fred Brown
United South High School (United ISD)
redfred@border.net

Overview:

The objective of this laboratory exercise is to study the effects of shielding on the amount of detectable radioactivity from a gamma source. Students will investigate the shielding effect of one type of metal, then design their own experiments to answer questions raised during the investigation. Based on information about various methods currently used for protection and their own investigations, students will be asked to offer their opinions on the best method of protection from nuclear radiation in a practical situation.

TEKS Correlation:

Chemistry - Grades 10-12
§112.45 The student is expected to:
c1A demonstrate safe practices during field and laboratory investigations.
c1B make wise choices in the use and conservation of resources and the disposal of materials.
c2A plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology.
c2B collect data and make measurements with precision.
c2D organize, analyze, evaluate, make inferences, and predict trends from data.
c2E communicate valid conclusions.
c3A analyze, review, and critique scientific explanations as to their strengths and weaknesses.
c3B make responsible choices in selecting everyday products and services using scientific information.
c3C evaluate the impact of research on scientific thought, society, and the environment.
c6A describe the existence and properties of subatomic particles.
c9D evaluate environmental issues associated with the storage, containment, and disposal of nuclear wastes.

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:
c4A use LANs and WANs, including the Internet, in research and resource sharing.
c4B construct appropriate electronic search strategies in the acquisition of information.
c11A publish information in a variety of ways including printed copy and monitor displays.

Goals and Objectives:

- Students will study literature to see what shielding is used in the nuclear industry and why it is necessary.
- Students will learn how a Geiger counter works and how to operate it safely.
- Students will construct charts and graphs using data generated from the investigation.
- Students will form conclusions based on observations and data analysis.
- Students will develop questions related to the initial investigation.
- Students will develop procedures for testing their questions.
- Students will work as a team to accomplish their goals.
- Students will communicate the results of their investigations to the rest of the class.
- Students will correlate their investigations and their knowledge of existing methods to offer an opinion about the best protection against nuclear radiation.

Prerequisite Skills/Knowledge:

- Students will be able to graph and compute data.
- Students should have a basic knowledge of the types of radiation.

Materials/Equipment/Resources:

__Geiger counter or Geiger tube computer probe
__Radioactive source - gamma emitter of about 5000 cpm or greater
__Metal plates about 2” by 2” - several of each type of metal
__Computer Internet and/or reading materials on radioactive shielding

Instructional Activities/Strategies:

Preparation:
1. Discuss radioactive materials and safe handling of them.
2. Demonstrate the use of the Geiger counter/probeware.
3. Allow the students to do research on such topics and nuclear power plants, nuclear accidents such as Chernobyl and 3-Mile Island, transport of radioactive materials, and radioactive waste disposal.

Classroom management:
Groups of four - if only one experimental setup is available, the other groups could be involved in literature search while waiting to use the equipment.

Questions to investigate:
1. Does the type of material effect the amount of gamma ray shielding?
2. What is the relationship between the thickness of the shielding materials and the amount of shielding?
3. How can radioactive materials be handled safely?

Data Collection:
1. Record the background radiation.
2. Place a gamma source at a distance which gives a reading of about 5000 cpm.
3. Take data for a predetermined amount of time.
4. Each group should choose a type of shielding material to test. Place one piece of the material between the source and the Geiger tube and take data for the same amount of time as before. *Do not move either the source or the Geiger tube.*
5. Add an additional piece of the same material and repeat the above procedure.
6. Continue until all of the pieces of the shielding material have been measured.
7. Each group can test a different shielding material.

Instructional Activities/Strategies: (Continued)

Calculations:

1. Organize the data into charts and graphs.
2. Draw a line graph to represent the correlation between thickness and radiation transmitted.
3. Draw a bar graph to represent the comparisons between the various material's shielding effectiveness.
4. Compare each group's results.

Communicate results:

- Each group will decide upon which format they will use to report to the class. Include the question they investigated and the conclusions drawn.
- Each student will write a short paper giving his/her opinion of the best method of shielding against radioactivity using a combination of the results of the literature research and the in-class laboratory findings to support the choice.

Assessment:

Individual student papers will be judged upon:

- the extent of the literature search.
- clarity of expression.
- practicality of choice of materials (expense, availability, etc.).
- supporting evidence for choice of method, citing conclusions from laboratory activity.

The group will be judged upon:

- the proper use of the Geiger tube.
- the thought put into developing questions and procedures for testing the questions.
- the work as a team.
- the quality of the data and graphs produced.
- the effective communication of the results.

Teaching Suggestions/Extensions:

Dallas ISD Unit Plans

During 1996-97, the Instructional Technology Department of DISD began discussions about realigning its high school courses to fit the new Technology Applications TEKS. It was decided to convert Computer Math into Computer Science 1. In order for this to occur, the district sought assistance from partners outside the district. Microsoft donated enough Visual Basic software licenses to upgrade the 27 high school labs.

Next was the implementation of a training program for Computer Math and Computer Science teachers. A collaboration between the University of North Texas and DISD to jointly develop a course for graduate college credit was initiated. Dr. Jim Poirot, Associate Dean of Education, and Dennis Scheer and Marcia Crumby, specialists in the Instructional Technology Department in DISD, developed and delivered the Visual Basic programming curriculum through a 3-week summer Institute taught in the computer lab at Nolan Estes Educational Plaza in Dallas. Participants who completed the coursework received 3 graduate credits. Textbooks and tuition were provided by the Urban Systemic Initiative, a math and science award that the District received through the National Science Foundation.

One of the products developed by the participants was an Instructional Unit Plan. This Plan emphasized the TEKS Correlation as well as Technology Competencies. The template design for these unit plans has been altered slightly from the original designed by the DISD teachers. This was done to conform with the template design used in the SCOPE Project.

TCET is enthusiastic about the collaboration with DISD to produce and publish these new technology-based materials. These products are a valuable contribution to TCET's efforts to provide quality resources for classroom teachers based on the stated adopted TEKS.

LIST OF TITLES
FOR COMPUTER SCIENCE 1 USING VISUAL BASIC PROGRAMMING

01	Introduction to Computer Science
02	Visual Basic Introduction
03	Visual Basic Objects
04	Programming Fundamentals
05	Built-In Functions
06	Input/Output
07	Debugging
08	Conditional Branching
09	Iteration
10	Arrays and Control Arrays
11	Sorting & Searching
12	Procedures
13	Graphics
14	Structures
15	File Management
16	Database Management

Topic: Visual Basic	**Title:** Introduction to Computers
Grade Level/Course: Computer Science I	**Time Frame:** Two to three weeks

Contributors:

Charmaine Bentley
Roosevelt High School (Dallas ISD)

Overview:

This is an introduction to computers.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1A demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components
c1B compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices
c1C make decisions regarding the selection, acquisition, and use of software taking under consideration its quality, appropriateness, effectiveness, and efficiency
c1D delineate and make necessary adjustments regarding compatibility issues including, but not limited to, digital file formats and cross platform connectivity
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c3A discuss copyright laws/issues and model ethical acquisition and use of digital information, citing sources using established methods
c3B demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet
c3C investigate measures, such as passwords or virus detection/prevention, to protect computer systems and data-bases from unauthorized use and tampering
c4A use local area networks (LANs) and wide area networks (WANs), including the Internet and intranet, in research and resource sharing
c4B construct appropriate electronic search strategies in the acquisition of information including keyword and Boolean search strategies
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c8A participate with electronic communities as a learner, initiator, contributor, and teacher/mentor
c8B demonstrate proficiency in, and appropriate use of, and navigation of LANs and WANs for research and for sharing of resources
c8C extend the learning environment beyond the school walls with digital products created to increase teaching and learning in the foundation and enrichment curricula
c8D participate in relevant, meaningful activities in the larger community and society to create electronic projects
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After completing this unit the student will be able to:
- demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components
- compare, contrast, and appropriately use various input, processing, output, and primary/secondary storage devices
- make decisions regarding selection, acquisition, and use of software
- make decisions regarding selection, acquisition, and use of hardware
- resolve compatibility issues regarding compatibility of hardware and software
- model ethical behavior regarding acquisition and use of digital information
- demonstrate knowledge of proper etiquette and acceptable use policies when using networks (including Internet)
- demonstrate knowledge and use of measures used to protect computer systems (passwords and virus detection/ prevention)
- use networks (LAN, WAN, and Internet)
- construct appropriate electronic search strategies for acquisition of information
- acquire information and knowledge regarding various electronic formats

Process Skills
While working on this unit, students will:
- follow directions to use resources
- use cooperative learning in small and large group settings
- follow directions to produce products representing practical tasks

Technology Competencies
While working on this unit, students will
- demonstrate knowledge and appropriate use of operating systems, software applications, and communication and components
- appropriately use various input, output, and primary/secondary storage devices
- make necessary adjustments regarding compatibility issues including digital file formats
- demonstrate proficiency in the use of a variety of input devices
- use digital keyboarding standards for the input of data
- demonstrate proper etiquette and knowledge of acceptable use policies when using networks
- protect computer systems and databases from unauthorized use and tampering by the appropriate use of such measures as passwords or virus detection/prevention
- use networks (LANs, WANs, and Internet) in research and resource sharing
- construct appropriate electronic search strategies in the acquisition of information
- appropriately apply electronic formats including text, audio, video, and graphics

Prerequisite Skills/Knowledge:

Knowledge of
- Basic keyboarding skills

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1997. P 1-43.
Teacher resource books
Prepared Handouts
Online resources
Catalogues, computer magazines, magazine and newspaper advertisements

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One

1. Introduce students to Software segment of project. Students, independently, and in small groups, using worksheets provided, will identify required software; search resources for information regarding their applications, costs, availability, and requirements. Enter information on a spreadsheet.
2. Introduce vocabulary segment of project. Students, independently and in groups, will research the required vocabulary terms, their use, and their meanings.
3. Introduce students to Poster/Presentation segment of project. Students, in small groups, will produce a poster to represent a storyboard for a presentation to demonstrate understanding of computer system's parts and what they do. Students summarize lesson focus and techniques learned. Upon completion of poster, each small group will use presentation software to produce a demonstration of the computer system's parts and their purpose.

Weeks Two to Three

1. Introduce students to Hardware segment of project.
2. Students, in small groups, using worksheets provided, will select desired hardware / software packages and provide reasons for their selections. Enter information on a spreadsheet. The worksheet will check students' sums, scoring, etc.
3. Students will simulate generating a purchase order using formal request for system selected.
4. Display finished projects.

Assessment:

- 25% Written unit test
- 25% Small group project evaluations
- 25% Intermediate activities
- 25% Completed project (individual)

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Introduction to Programming
Grade Level/Course: Computer Science I	**Time Frame:** One week

Contributors:

Charmaine Bentley
Roosevelt High School (Dallas ISD)

Overview:

In this unit the students will be introduced to Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1A demonstrate knowledge and appropriate use of operating systems, software applications, and communication and networking components
c1B compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices
c1C make decisions regarding the selection, acquisition, and use of software taking under consideration its quality, appropriateness, effectiveness, and efficiency
c1D delineate and make necessary adjustments regarding compatibility issues including, but not limited to, digital file formats and cross platform connectivity
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concepts
c1F differentiate among the levels of programming languages including machine, assembly, high-level compiled and interpreted languages
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c3A discuss copyright laws/issues and model ethical acquisition and use of digital information, citing sources using established methods
c3B demonstrate proper etiquette and knowledge of acceptable use policies when using networks, especially resources on the Internet and intranet
c3C investigate measures, such as passwords or virus detection/prevention, to protect computer systems and databases from unauthorized use and tampering
c3D discuss the impact of computer programming on the World Wide Web (WWW) community
c4A use local area networks (LANs) and wide area networks (WANs), including the Internet and intranet, in research and resource sharing
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c8A participate with electronic communities as a learner, initiator, contributor, and teacher/mentor
c8B demonstrate proficiency in, and appropriate use of, and navigation of LANs and WANs for research and for sharing of resources

TEKS Correlation: (Continued)

c8C extend the learning environment beyond the school walls with digital products created to increase teaching and learning in the foundation and enrichment curricula
c8D participate in relevant, meaningful activities in the larger community and society to create electronic projects
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product

Goals and Objectives:

Content Objectives
After completing this unit the student will be able to
- describe how computer loads, run and save programs
- explain how programming has changed since the 1950's
- use basic Windows 95 commands
- recognize the components of the Visual Basic programming environment

Process Skills
While working on this unit, students will:
- follow directions to use resources
- use cooperative learning in small and large group settings
- follow directions to become acquainted with fundamentals of Visual Basic

Technology Competencies
While working on this unit, students will:
- demonstrate knowledge and appropriate use of operating systems, software applications, and communication and components
- appropriately use various input, output, and primary/secondary storage devices
- make necessary adjustments regarding compatibility issues including digital file formats
- demonstrate proficiency in the use of a variety of input devices
- use digital keyboarding standards for the input of data
- demonstrate proper etiquette and knowledge of acceptable use policies when using networks
- protect computer systems and databases from unauthorized use and tampering by the appropriate use of such measures as passwords or virus detection/prevention
- use networks (LANs, WANs, and Internet) in research and resource sharing
- use basic file commands of Visual Basic

Prerequisite Skills/Knowledge:

Knowledge of:
- basic keyboarding skills.
- Windows 95

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1996. P 226-230, 507-512 .
Teacher resource books
Online resources
Manipulatives (paper, blocks)

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
1. Review components of computer system and relate these to 5 parts of computer system.
2. Students act out to simulate relation and function of 5 parts (input/output, processor, primary/secondary storage).
3. Introduce and discuss the development of computer systems and languages.
4. Review Windows 95 format and basic commands.
5. Demonstrate and introduce Visual Basic.
6. Introduce long term project.
7. Students practice opening, saving and renaming simple program regarding a heading.

Assessment:

- 50% written unit test
- 50% completed project

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Visual Basic Objects
Grade Level/Course: Computer Science I	**Time Frame:** One to two weeks

Contributors:

Don Kreager
Samuell H.S. (Dallas ISD)

Charles Mackin
Pinkston High School (Dallas ISD)

Overview:

Students will create and manipulate objects in Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast, and appropriately use the various input, processing , output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concepts
c1G demonstrate coding proficiency in a contemporary programming language.
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation,
c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working this unit, students will be able to:
- identify the components of the Visual Basic Programming environment.
- design Visual Basic forms.
- create and place Visual Basic objects on a Visual Basic form.
- set property values for Visual Basic objects.
- create, open, save, execute, and rename program files.

Process Skills
While working on this unit, students will:
- follow directions to create objects on a form
- participate in large and small group activities
- apply learned skills to solve programming problems

Technology Competencies
While working on this unit, students will:
- design Visual Basic forms
- develop the skill of placing objects on the Visual Basic forms
- describe the various types of objects and their uses

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- Windows 95
- Visual Basic fundamentals

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1996. P 43-54, 160-165, 182-186, 501-506
Teacher resource books
Prepared handout

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class grouping
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One
1. Review long-range project.
2. Introduce the Toolbox. Include the names and icons of the objects in the Toolbox and what they do.
3. Hands-on practice of placing objects on the form, sizing the objects, dragging the objects about the form, and deleting objects.
4. Changing Caption and name of Commands, Labels, and Text boxes.
5. Have students save, rename, and open program files.
6. Have students use the Toolbar menu to run and stop programs.
7. Discuss ScrollBars, horizontal and vertical, setting properties of ScrollBars.
8. Discuss Timer and setting properties of the Timer.
9. Discuss Common Dialog, Forms, Check boxes, List Boxers, and Combo boxes.
10. Hands-on practice using Common Dialog, Forms, Check boxes, Option boxes, List boxes, and Combo boxes.

Instructional Activities/Strategies: (Continued)

Week Two

1. Discuss Image and Picture boxes.
2. Introduce, make, and create and About Box.
3. Introduce and discuss the menu editor.
4. Have students work in small groups to create a form with at least four different objects and four different menu items that are a practical application to a problem.

Assessment:

- 50% Written unit test
- 10% Rubrics for use of objects
- 10% Participation (teacher observation)
- 30% Small group projects evaluated by peers, as well as the teacher

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Programming Fundamentals
Grade Level/Course: Computer Science I	**Time Frame:** Three weeks

Contributors:

Sally Hunter
Spruce High School (Dallas ISD)

Overview:

The students will write simple programs in Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching , and comparing data
c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After completing this unit the student will be able to:

- identify, compare, contrast, and appropriately use data types, constants and variables.
- identify, compare, contrast, and appropriately use arithmetic and logical operators (including order of operations).
- correctly use steps in problem solving.
- design flowcharts in problem solution and algorithm design.
- design Visual Basic forms.
- write a simple sequence of programming code in Visual Basic.
- correctly use internal and external documentation.

Process Skills
While working on this unit, students will:

- follow directions to create objects on a form
- participate in large and small group activities
- apply learned skills to solve programming problems

Technology Competencies
While working on this unit, students will:

- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- write Visual Basic code

Prerequisite Skills/Knowledge:

- Students will need a knowledge of Visual Basic objects.

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**, Cincinnati, Ohio: South-Western Educational Publishing, 1997
pp. 67-106, 148-160, and 230-244.
Teacher resource books
Online Visual Basic Resources

Instructional Activities/Strategies:

Classroom management:
Whole class discussions
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One (Review Visual Basic objects.)
1. Review long-range project and discuss timeline.
2. Review frameworks and designing Visual Basic Forms.
3. Introduce concept of data types.
4. Students identify different data types.

Instructional Activities/Strategies: (Continued)

Week Two
1. Introduce rules for naming variables.
2. Individually students will practice identifying name for variables and constants.
3. Review variable constants and introduce declaration statements.
4. Have students differentiate among local, global, and static variables.
5. Introduce arithmetic and logical operators and practice them.

Week Three
1. Students practice using order of operations with pencil and paper. Check results using a calculator.
2. Introduce steps in problem solving and design tools such as frameworks, flowcharts, pseudocode, etc.
3. Review frameworks and designing Visual Basic forms.
4. Introduce the concept of documentation.
5. Design, write, and test order of operations.
6. Display completed project.

Assessment:

- 50% Written unit test
- 10% Participation
- 10% Small group activities
- 30% Individual coding project

Teaching Suggestions/Extensions:

Given coding segments, students will identify variables, constants, and operators, as well as, determine the scope of the variables.

Topic: Visual Basic	**Title:** Visual Basic's Built-in Functions
Grade Level/Course: Computer Science I	**Time Frame:** One week

Contributors:

Mary Ann Caruth
Adamson High School (Dallas ISD)

Overview:

Students will use Visual Basic's built-in functions appropriately.

TEKS Correlation:

Computer Science 1 - Grades 9-12
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c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation,
c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext

TEKS Correlation: (Continued)

c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, students will be able to:
- identify, create, and use Visual Basic's mathematical functions
- identify, create, and use Visual Basic's financial functions
- identify, create, and use Visual Basic's string functions
- identify, create, and use Visual Basic's time and date functions

Process Skills
While working on this unit, students will:
- follow directions to create projects using functions from each of the four objective areas
- participate in large and small group activities
- apply learned skills to solve programming problems from each of the four objective areas

Technology Competencies
While working on this unit, students will:
- design Visual Basic forms using mathematical functions
- design Visual Basic forms using with financial functions
- design Visual Basic forms using string functions
- design Visual Basic forms using time and date functions

Prerequisite Skills/Knowledge:

Students will need knowledge of
- Visual Basic Objects
- Visual Basic programming fundamentals

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1997.
Prepared Handouts

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class group
Small groups (three to four students)
Teacher/student instruction and demonstration

Instructional Activities/Strategies: (Continued)

Instruction:
Week One

1. Review long range project.
2. Discuss and—with hands-on activities—demonstrate examples of mathematical functions.
3. Students create a form using mathematical functions to solve a programming problem
4. Discuss and—with hands-on activities—demonstrate examples of financial functions.
5. Students create a form using financial functions to solve a programming problem
6. Discuss and—with hands-on activities—demonstrate examples of string functions.
7. Students create a form using string functions to solve a programming problem
8. Discuss and—with hands-on activities—demonstrate examples of time and date functions.
9. Students create a form using time and date functions to solve a programming problem
10. Display completed project.

Assessment:

- 50%—Written unit test
- 40%—Programming problems, individual and group
- 10%—Participation (teacher observation)

Teaching Suggestions/Extensions:

Follow-up Activities

- Create a project solving a real-world problem using as many functions as possible.
- Groups challenge each other to create projects solving student-defined problems using functions.

Topic: Visual Basic	**Title:** Input/Output
Grade Level/Course: Computer Science I	**Time Frame:** One to two weeks

Contributors:

Susan Kile
Sunset High School (Dallas ISD)

Overview:

Students use input and output information in Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types including integer, long integer, real, character, Boolean, string, subrange, user defined, and enumerated data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation,
c9C seek and respond to advice from peers and professionals in delineating technological tasks,

TEKS Correlation: (Continued)

c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

After working on this unit, the student will be able to:
- identify, create, use, contrast and compare Input Boxes, MsgBoxes, TextBoxes, Labels, PictureBoxes.
- use tab( ), Format, and Format$ function to display output.
- manipulate strings using the string comparison operators, the StrComp(str1,str2,n) function, and Ucase, Lcase, and Trim$ functions appropriately.
- use multiline scrollable textboxes.

Process Skills
While working on this unit, the student will:
- participate in large and small groups and individual activities
- use previous learned and new skills to solve programming problems
- apply learned skills to write a program that includes inputting data, sending messages to the user and formatting input

Technology Competencies
While working on this unit, the student:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- apply learned skills to write program to input and output data
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- Visual Basic fundamentals
- Visual Basic objects
- programming fundamentals

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1996. P 210-226
Online Visual Basic Resources
Prepared Handouts (see attached)
Manipulative (blocks)

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/Student Instruction and Demonstration

Instruction:
Week One to Two

1. Review long range project
2. Introduce, review, and discuss the differences of Input Boxes, MsgBoxes, TextBoxes, Labels and PictureBoxes.
3. Class programming activity must use all of the above, acquire data, and inform the user of any irregularities.
4. Introduce format statements, print zones, and tab( )
5. Review string functions.
6. Design, write, test, and debug program to check results of using different functions to process strings. Document results in notebook.
7. Introduce unit project – in small groups, building small text editor using scrollable TextBox and string functions.
8. Groups exchange programs. Try to “bust” and fix the “busts” they find. Improve the other groups’ programs.
9. Display finished project.

Assessment:

- 25% Written unit test.
- 25% Small group program.
- 10% Program documentation.
- 20% Intragroup evaluation
- 10% Class Participation
- 10% Homework

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Debugging
Grade Level/Course: Computer Science I	**Time Frame:** One week

Contributors:

Marcia Crumby
Instructional Technology (Dallas ISD)

Overview:

Students will use Visual Basic debugging tools to correct program errors.

TEKS Correlation:

Computer Science 1 - Grades 9-12
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c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7H identify actual and formal parameters and use value and reference parameters
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive

TEKS Correlation: (Continued)

identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching , and comparing data
c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit the student will be able to:
- use the debugger tools
- set breakpoints
- examine values of variables and expressions in the Immediate window
- use the single-step through process to examine values in a program

Process Skills
While working on this unit, the student:
- will participate in large and small group activities
- will use Visual Basic debugging tools to aid in correcting code in Visual Basic programs
- apply learned skills to solve programming problems (including appropriate documentation)

Technology Competencies
While working on this unit, the student will:
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- use step into, step through, and step out processes for debugging programs
- add and edit variable watches to debug programs
- set breakpoints to aid in debugging programs
- examine values in the Immediate window of Visual Basic

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- Visual Basic fundamentals and objects
- programming fundamentals
- input/output

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**, Cincinnati, Ohio: South-Western Educational Publishing, 1997 pp. 78-82.
Teacher resource books
Online Visual Basic Resources

Instructional Activities/Strategies:

Classroom Management:
Whole class grouping
Small groups (3 to 4 students)
Whole class, discussion

Instruction:
Week One
1. Review long-range project.
2. Introduce and demonstrate how to use the debugging tools of Visual Basic.
3. Using previous program(s), check intermediate results with Visual Basic Debugger.
4. In small groups answer questions from a given handout about debugging.

Assessment:

- 50% Written unit test
- 25% Small group Project Evaluation
- 15% Intermediate programs
- 25% Completed project

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Branching
Grade Level/Course: Computer Science I	**Time Frame:** One to two weeks

Contributors:

Cecelia Mason
Washington Arts Magnet (Dallas ISD)

Overview:

Students will use conditional statements in Visual Basic

TEKS Correlation:

Computer Science 1 - Grades 9-12
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c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
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c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
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c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types including integer, long integer, real, character, Boolean, string, subrange, user defined, and enumerated data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation,

TEKS Correlation: (Continued)

c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
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c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, students will be able to:
- determine the truth value of simple and compound Boolean conditional expressions
- identify, create, and use simple and nested If..Then and If..Then..Else in a program
- identify, create, and use Select Case command along with Case Else and End Select

Process Skills
While working on this unit, students will:
- follow directions to create projects that involve decision making
- participate in large and small group activities
- apply learned skills to solve programming problems

Technology Competencies
While working in this unit, students will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- use simple and nested If Then and If Then Else statements
- use Select Case command along with Case Else and End Select
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Student will need to have a knowledge
- Visual Basic Fundamentals
- Visual Basic Objects
- Input/Output
- Debugging

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1997. P107-148
Teacher resources
Online Visual Basic Resources
Prepared Handouts (see attached)

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One
1. Review requirements for long range project.
2. Introduce and discuss program flow. Include conditional and unconditional branches.
3. Review and discuss relational operators and include comparing string values.
4. Introduce and discuss Boolean conditions and include definitions and truth values of logical connectors And, Or, and Not.
5. Have students determine the truth value of simple and compound conditionals.
6. Introduce and discuss the If command. Include using End If, Else, and nesting Ifs and ElseIfs.
7. Have students find and correct errors in If-Then statements.
8. In small groups, students design, write, test, and debug program to check input for validity and use input to progress to a given form.

Week Two to Three
1. Introduce and discuss Select Case. Include the Case Else option.
2. Have students identify and correct errors in Select Case statements.
3. Students redesign and rewrite earlier program using Select Case to replace IfÖThenÖElse as appropriate.
4. Display completed projects.

Assessment:

- 20% Tests
- 20% Quizzes
- 30% Participation (completed labs and teacher observation)
- 30% Small group project evaluated by peers and teacher

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Iteration
Grade Level/Course: Computer Science 1	**Time Frame:** One week

Contributors:

Charmaine Bentley
Roosevelt H.S. (Dallas ISD)

Overview:

The students will use looping statements in Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
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c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types including integer, long integer, real, character, Boolean, string, subrange, user defined, and enumerated data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation

TEKS Correlation: (Continued)

c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, the student will be able to:
- identify, create, and use iterative control structures (For/Next, Do While/Loop, Do/Loop Until, With/End With)

Process Skills
While working with this unit the student will:
- follow directions to create the several modules (parts) to create a final product
- participate in large and small group activities
- apply learned skills to solve programming problem (including appropriate documentation)

Technology Competencies
While working with this unit the student will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- use control structures (For/Next, Do While/Loop, Do/Loop Until, With/End With)
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Students will need a knowledge of:
- Visual Basic objects
- programming fundamentals
- input/output
- debugging
- control structures (sequential, selection, and iteration), built-in functions

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1997. P 177-182, 244-250, 363
Teacher resource books
Online Visual Basic Resources
Prepared Handouts (see attached)
Manipulative (blocks)

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (3 to 4 students)
Teacher/Student Instruction and Demonstration

Instruction:
Week One

1. Review long range project.
2. As individuals, students will design text pictures, using geometric shapes, and appropriate flowchart(s), test, debug, and program to print picture.
3. Introduce iterative control structures (For/Next, Do While/Loop, Do/Loop Until, With/End With.
4. As a group students will act out what occurs during the execution of each type of control structure.
5. Individually, students will modify earlier program to print text pictures using For.. Next.
6. Students will continue to modify their earlier programs to use each loop introduced (replacing earlier control structure each time). Students record appropriate documentation for each change.
7. Display finished unit project.

Assessment:

- 25% Written unit test
- 25% Small group Project Evaluations
- 25% Intermediate programs
- 25% Completed project

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Arrays and Control Arrays
Grade Level/Course: Computer Science 1	**Time Frame:** Two to three weeks

Contributors:

Charmaine Bentley
Roosevelt H.S. (Dallas ISD)

Overview:

Students will use a list of values with a single variable in Visual Basic.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types including integer, long integer, real, character, Boolean, string, subrange, user defined, and enumerated data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer
7cF develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria

TEKS Correlation: (Continued)

c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, the student will be able to:
- identify, create, and use Control Arrays
- identify, create and use one and two - dimensional arrays
- identify, create, and use the concept of a dynamic system

Process Skills
While working with this unit the student
- will follow directions to create the several modules (parts) to create the final product (**The Game of Life**),
- will participate in large and small group activities
- apply learned skills to solve programming problem (including appropriate documentation)

Technology Competencies
While working on this unit, the student will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- use control arrays
- manipulate data in one and two-dimensional arrays
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Students will need a knowledge of:
- Visual Basic fundamentals and objects
- programming fundamentals
- input/output
- debugging
- control structures (sequential, selection, and iteration)
- built-in functions
- procedures.

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1996. P 318-353
Teacher resource books
Online Visual Basic Resources
Prepared Handouts
Manipulative (blocks

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One

1. Review long range project.
2. In small groups, design, write, test, and debug program using command buttons as objects (program will place command button on a form, user will click on buttons to display whether they are “on” or “off”).
3. Introduce concept of control array, use and creation during design phase.
4. In small groups, modify, and debug earlier program using control arrays.
5. Discuss use and modification of control arrays during runtime.
6. In small groups, modify, test, and debug earlier program to create and modify control arrays during runtime. Each group will use program and documentation provided by another group.
7. Introduce key terms, vocabulary, and fundamentals related to arrays. Distribute Vocabulary List.

Week Two

1. Review terms and fundamentals of arrays and relate to control arrays used earlier.
2. Introduce methods used to create and access arrays.
3. Review earlier control structures using iteration and relate to use of arrays.
4. As a group, students will act out what occurs to data and how it is manipulated and stored (using array, counter, and simple iterative loop (For..Next)).
5. As individuals, students will redesign and modify earlier text picture and program to print text picture using one-dimensional arrays.
6. Introduce two-dimensional arrays and their relation to tables/spreadsheets.
7. In small groups, students will modify and add to previous program using control array to transfer information regarding buttons are “on” or “off” to two-dimensional array, students will design flowcharts and debug new program.
8. Introduce project (**The Game of Life**). (Students first simulate model by hand.)
9. Have students work in small groups to design, create, and debug program, incorporating previous programs as appropriate, simulating next generation (first generation after initial generation).

Week Three

1. Have students work in small groups to design, create, and finish final required project (**The Game of Life)**.
2. Display completed projects

Assessment:

- 25% Written unit test.
- 25% Small group Project Evaluations.
- 25% Intermediate programs.
- 25% Completed project (**The Game of Life**).

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Sorting and Searching
Grade Level/Course: Computer Science 1	**Time Frame:** Two to three weeks

Contributors:

Kathleen Weaver
Hillcrest (Dallas ISD)

Overview:

The students will use Visual Basic to implement various sorting and search routines.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast, and appropriately use the various input, processing, output, and primary/secondary storage devices
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the final product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c5C design and document sequential search algorithms for digital information storage and retrieval
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics,
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, and algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and code programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types including integer, long integer, real, character, Boolean, string, subrange, user defined, and enumerated data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation,

TEKS Correlation: (Continued)

c9C seek and respond to advice from peers and professionals in delineating technological tasks,
c9D resolve information conflicts and validate information through accessing, researching, and comparing data,
c9E create technology specifications for tasks/ evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria,
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to, printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to, software, Internet documents, and video
c12A write technology specifications for planning and evaluation rubrics documenting variables, prompts, and program internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, the student will be able to:
- identify, create, and use the simple exchange, bubble, and comb sorts
- identify, create, and use the linear search and binary search algorithms

Process Skills
While working on this unit, students will:
- follow directions to create a program that sorts data
- participate in large and small group activities
- apply learned skills to solve programming problems

Technology Competencies
While working on this unit, the student will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- use control arrays
- manipulate data in one and two-dimensional arrays
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- input/output
- debugging
- control structures (sequential, selection, and iteration)
- arrays

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing. 1996. P 383-423
Teacher resource books
Online Visual Basic Resources
Manipulative (several decks of cards)

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One to Two

1. Review long range project and requirements
2. In small groups, students construct a simple program using ListBoxes. One ListBox is used to input data. Initially, the second ListBox will echo the input.
3. Introduce the concept of sorting, and that there are several different sorting algorithms.
4. Introduce the exchange sort. Explain why the exchange sort is not efficient as some others (the list will continue sorting even if the list is sorted).
5. Individually, using one suite of a deck of playing cards, students simulate the actions of an exchange sort.
6. In small groups, students will modify earlier program to sort data using exchange sort
7. Introduce the bubble sort. Explain the limitations and characteristics of the bubble sort.
8. Individually, using one suite of a deck of playing cards, students simulate the actions of a bubble sort.
9. In small groups, students will modify earlier program to sort data using bubble sort
10. Introduce the comb sort.
11. Individually, using one suite of a deck of playing cards, students simulate the actions of an comb sort.
12. In small groups, students will modify earlier program to sort data using comb sort

Week Two to Three

1. Introduce linear and binary searches to students. Use the game “High/Low” to determine the efficiency of a binary search. In group discussion let them discover which is more efficient.
2. In small groups, students will modify earlier program to conduct a linear search of data.
3. In small groups, students will modify earlier program to conduct a binary search of data.
4. Display finished project

Assessment:

- 25% Evaluations from group assignments
- 50% Programming assignments
- 25% Test

Teaching Suggestions/Extensions:

Extensions:
Students compare time for sorts/searches.

Topic: Visual Basic	**Title:** Procedures
Grade Level/Course: Computer Science I	**Time Frame:** One week

Contributors:

Diana Zoth
Skyline High School (Dallas ISD)

Overview:

Students will use Visual Basic tools and code to create and manipulate procedures.

TEKS Correlation:

Computer Science 1 - Grade 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7H identify actual and formal parameters and use value and reference parameters
7cI use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product

TEKS Correlation: (Continued)

c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching, and comparing data
c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, the student will be able to:
- identify, create, and use the concept of reusability
- identify, create, and use the concept of the scope of variables (variable visibility and lifetime)
- identify, create, use, and differentiate between sub and function procedures
- identify, create, use, and differentiate between passing arguments/parameters by value or reference

Process Skills
While working on this unit, the student will:
- follow directions to use and create built-in and user defined functions and procedures
- follow directions to create procedures that pass parameters by reference and value
- participate in large and small group activities
- apply concepts to solve programming problems

Technology Competencies
While working on this unit, the student will:
- design Visual Basic projects with multiple forms
- design flowcharts in problem solution and algorithm design
- use step into, step through, and step out processes for debugging programs
- add and edit variable watches to debug programs
- set breakpoints to aid in debugging programs
- manipulate parameters by reference and by value

Prerequisite Skills/Knowledge:

Students will need a knowledge of:
- Visual Basic fundamentals and objects
- programming fundamentals
- input/output

Materials/Equipment/Resources:

Sprague, Michael. Using Visual Basic, Cincinnati, Ohio: South-Western Educational Publishing, 1997. pp. 459-493, 518-42.
Teacher resource books
Teacher prepared handouts

Instructional Activities/Strategies:

Classroom management:
Whole class grouping
Small groups (three to four students)
Whole class discussions

Instruction:
Week 1
1. Review long-range project
2. Introduce and demonstrate how to use the debugging tools of Visual Basic.
3. Using previous program(s), check intermediate results with Visual Basic Debugger.
4. In small groups answer questions from a given handout about debugging

Assessment:

- 50% Written unit test
- 25% Small group Project Evaluation
- 15% Intermediate programs
- 25% Completed project

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Graphics
Grade Level/Course: Computer Science I	**Time Frame:** Two to three weeks

Contributors:

Don Kreager
Samuell High School (Dallas ISD)

Charles Mackin
Pinkston High School (Dallas ISD)

Overview:

Students will use Visual Basic objects to create graphics.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5A acquire information in and knowledge about electronic formats including text, audio, video, and graphics
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7H identify actual and formal parameters and use value and reference parameters
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files

TEKS Correlation: (Continued)

c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching , and comparing data
c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After completing this unit, students will be able to:
- identify, use, and create computer displays
- describe and use the various built-in coordinate systems provides in the SetMode property of the PictureBox and form object
- initialize and use user-defined coordinate systems appropriate to application programs
- use the Pset method to draw points whose coordinates are stored in an array
- use the line method to draw lines
- use the circle method to draw circles and ellipses of various size at various positions
- use the color function of Visual Basic

Process Skills
While working on this unit, students will:
- participate in large and small group activities
- apply learned skills to solve a graphics related programming problem (including appropriate documentation)

Technology Competencies
While working on this unit, the student will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- create and use functions related to graphics
- manipulate data in one and two-dimensional arrays

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- programming fundamentals
- input/output
- debugging
- control structures (sequential, selection, and iteration)
- procedures
- arrays

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio. South-Western Educational Publishing 1997. P 250-307, 513-531.
Teacher resource books
Online Visual Basic Resources

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (three to four students)
Teacher/student instruction and demonstration

Instruction:
Week One
1. Review requirements for long range project.
2. Introduction to line drawing, circle drawing, line methods and mouse events.
3. Individually, students draw pictures and transfer to coordinate grid. Using picture on grid, students design, write, test, and debug program to draw picture on screen using lines and circles.

Week Two
1. Students continue to work on earlier program.
2. Students modify program to use color including fill command.
3. Using earlier program, modify program to demonstrate different built-in coordinate systems (twips, points, characters, inches, millimeters, centimeters, pixels).
4. Modify previous program to include a “Quadratic Formula” module. The module should plot and solve a quadratic equation.

Assessment:

- 50% Written tests (short quizzes and two major tests)
- 40% Teacher observation, student participation, and project evaluation
- 10% Student/peer evaluations of their own and their classmates projects.

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** User Defined Types/Structures
Grade Level/Course: Computer Science I	**Time Frame:** One week

Contributors:

Written by Marcia Crumby
Instructional Technology (Dallas ISD)

Overview:

Students will use user–defined data types to allow a variable to hold multiple pieces of data.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7H identify actual and formal parameters and use value and reference parameters
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching , and comparing data

TEKS Correlation: (Continued)

c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, the student will be able to:
- declare user-defined data types
- write programs using user-defined data types

Process Skills
While working on this unit, the student:
- will participate in large and small group activities
- will use Visual Basic debugging tools to aid in correcting code in Visual Basic programs
- apply learned skills to solve programming problems (including appropriate documentation)

Technology Competencies
While working on this unit, the student will
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- write programming code
- declare user-defined data types in Visual Basic modules

Prerequisite Skills/Knowledge:

Students will need a knowledge of:
- Visual Basic objects
- programming
- input, output
- debugging
- branching
- iteration
- procedures

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**. Cincinnati, Ohio: South-Western Educational Publishing, 1997. pp. 459-493, 518-42.
Teacher resource books
Teacher prepared handouts

Instructional Activities/Strategies:

Classroom management:
Whole class participation
Small groups (3 to 4 students)
Varied presentation style

Instruction:
Week One
1. Review long-range project.
2. Introduce code modules and review addition, subtraction, multiplication, inverses, lowest terms and greatest common factor of fractions.
3. Have students create a code module that contains a user-defined data type.
4. Have students add procedures that pass parameters by value and by reference.
5. In small groups have students create subroutines that handle fractions.
6. Have students design a form to label and display the results of the subroutines.
7. Display the completed project.

Assessment:

- 50% Small group projects evaluated by peers as well as the teacher
- 30% Participation
- 20% Development of rubric for the created project

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** File Management
Grade Level/Course: Computer Science I	**Time Frame:** One to two weeks

Contributors:

Marcia Crumby
Instructional Technology (Dallas ISD)

Overview:

Students will use coding statements to read data or to write data from a permanent file.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary storage devices
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c5B use a variety of resources, including foundation and enrichment curricula, together with various productivity tools to gather authentic data as a basis for individual and group programming projects
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
c7F develop coding with correct and efficient use of expressions and assignment statements including the use of standard/user-defined functions, data structures, operators/proper operator precedence, and sequential/conditional/repetitive control structures
c7G create and use libraries of generic modular code to be used for efficient programming
c7H identify actual and formal parameters and use value and reference parameters
c7I use control structures such as conditional statements and iterated, pretest, and posttest loops
c7J use sequential, conditional, selection, and repetition execution control structures such as menu-driven programs that branch and allow user input
c7K identify and use structured data types of one-dimensional arrays, records, and text files
c9A design and implement procedures to track trends, set timelines, and review/evaluate progress for continual improvement in process and product
c9B use correct programming style to enhance the readability and functionality of the code such as spacing, descriptive identifiers, comments, or documentation
c9C seek and respond to advice from peers and professionals in delineating technological tasks
c9D resolve information conflicts and validate information through accessing, researching , and comparing data

TEKS Correlation: (Continued)

c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
c10A annotate coding properly with comments, indentation, and formatting
c10B create interactive documents using modeling, simulation, and hypertext
c11A publish information in a variety of ways including, but not limited to printed copy and monitor displays
c11B publish information in a variety of ways including, but not limited to software, Internet documents, and video
c12A write technology specifications for planning/evaluation rubrics documenting variables, prompts, and programming code internally and externally
c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit, students will be able to:
- identify, create, open, close, and appropriately use sequential files
- identify, create, open, close, and appropriately use random access files
- identify, create, open, close, and appropriately use binary files
- integrate the drive, directory, and file list boxes into programs that use files

Process Skills
While working on this unit, the student:
- will follow directions to create and use different types of files
- will follow directions to create and use different types of files
- will participate in large and small group activities
- apply learned skills to solve programming problems (including appropriate documentation)

Technology Competencies
While working on this unit, the student will:
- use hierarchical tables/charts in project design
- design Visual Basic forms (frameworks)
- design flowcharts in problem solution and algorithm design
- document project (internally and externally)
- use the drive, directory, and list box controls
- create program to satisfy conditions stated in problem definition

Prerequisite Skills/Knowledge:

Students will need a knowledge of
- Visual Basic objects
- Visual Basic programming
- input/output
- debugging
- control structures
- procedures
- arrays
- user defined types

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**, Cincinnati, Ohio: South-Western Educational Publishing, 1997. pp. 355-382, 487-497.
Online Visual Basic Resources
Teacher resource books

Instructional Activities/Strategies:

Classroom management:
Whole class discussion
Large class groups
Small groups (3 to 4 students)
Teacher/student instruction and demonstration

Instruction:
Weeks One to Two

1. Review long-range project.
2. Following teacher directions, individually, students will create a text editor application and enter some text.
3. The teacher will write the code necessary to open a sequential file for output to a disk (save) using the entered text.
4. In small groups students will practice creating code to each other's entered text to save them to sequential files.
5. The teacher will introduce and discuss drive, directory, and file list boxes.
6. The teacher will write the code necessary to open a sequential file for input from a disk (open) using a text file.
7. In small groups students will practice opening each other's sequential files.
8. Following teacher directions, individually, students will create a database application that contains a user defined data type. Students will save the database application as version 1 and version 2.
9. The teacher will write the code necessary to open a random access file for output to a disk (save) using the database application.
10. In small groups students will practice creating code to version 1 of the database application to save to a random access file.
11. The teacher will write the code necessary to open a random access file for input from a disk (open).
12. In small groups students will practice opening each other's random access file.
13. The teacher will write the code necessary to open a binary file for output to a disk (save) using the database application.
14. In small groups students will practice creating code to version 2 of the database application to save to a random access file.
15. The teacher will write the code necessary to open a binary file for input from a disk (open).
16. In small groups students will practice opening each other's binary file.
17. Display finished projects

Assessment:

- 25% Written unit test
- 25% Small group project evaluations
- 25% Intermediate activities
- 25% Completed project (individual)

Teaching Suggestions/Extensions:

Topic: Visual Basic	**Title:** Database Management
Grade Level/Course: Computer Science I	**Time Frame:** Two to three weeks

Contributors:

Marcia Crumby
Instructional Technology (Dallas ISD)

Dennis Scheer
Instructional Technology (Dallas ISD)

Overview:

Students will use Visual Basic tools to create and manipulate data.

TEKS Correlation:

Computer Science 1 - Grades 9-12
§126.22 The student is expected to:

c1B compare, contrast and appropriately use the various input, processing, output, and primary/secondary
c1E differentiate current programming languages, discuss the use of the languages in other fields of study, and demonstrate knowledge of specific programming terminology and concept
c1G demonstrate coding proficiency in a contemporary programming language
c2A demonstrate proficiency in the use of a variety of input devices such as keyboard, scanner, voice/sound recorder, mouse, touch screen, or digital video by appropriately incorporating such components into the product
c2B use digital keyboarding standards for the input of data
c6A determine and employ methods to evaluate the design and functionality of the process using effective coding, design, and test data
c6B implement methods for the evaluation of the information using defined rubrics
c7A apply problem-solving strategies such as design specifications, modular top-down design, step-wise refinement, or algorithm development
c7B use visual organizers to design solutions such as flowcharts or schematic drawings
c7C develop sequential and iterative algorithms and codes programs in prevailing computer languages to solve practical problems modeled from school and community
c7D code using various data types
c7E demonstrate effective use of predefined input and output procedures for lists of computer instructions including procedure to protect from invalid output
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TEKS Correlation: (Continued)

c9D resolve information conflicts and validate information through accessing, researching , and comparing data
c9E create technology specifications for tasks/evaluation rubrics and demonstrate that products/product quality can be evaluated against established criteria
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c12B seek and respond to advice from peers and professionals in evaluating the product
c12C debug and solve problems using reference materials and effective strategies

Goals and Objectives:

Content Objectives
After working on this unit the student will be able to:
- use the Data Manager program to create databases compatible with Microsoft Access
- use Visual Basic applications to display and manipulate database information
- use the Structured Query Language (SQL) to initiate searches in a specified database

Processing Skills
While working on this unit, the student will:
- participate in large and small group activities
- use Visual Basic debugging tools to aid in correcting code in Visual Basic programs
- apply learned skills to solve programming problems (including appropriate documentation)

Technology Competencies
While working on this unit the student will:
- design Visual Basic forms
- create a database
- manipulate a database
- create a report from the database

Prerequisite Skills/Knowledge:

Students will need a knowledge of
Visual Basic fundamentals and objects
programming fundamentals
input/output

Materials/Equipment/Resources:

Sprague, Michael. **Using Visual Basic**,. Cincinnati, Ohio: South- Western Educational Publishing, 1997 pp. 78-82.
Teacher resource books
Samples off a database (i. e. phone book)

Instructional Activities/Strategies:

Classroom management:
Whole class grouping
Small groups (3 to 4 students)
Whole class discussions
Varied presentation styles

Instructional Activities/Strategies: (Continued)

Instruction:
Week 1
1. Introduce the concept of databases. Include the terms of record, field, table, and database.
2. Discuss the difference between relational and flat databases.
3. Discuss database engines.
4. Have the students use the Data Manager to create a database and enter information.
5. Discuss how the data control is used to link Visual Basic to a set of records.
6. Have the students create a form to display information from a database. Add the Data Control to form and set the properties of DataSource and DataField.
7. Review long-range project.

Week 2
1. Discuss how records can be added and deleted from a database.
2. Discuss the uses of Structured Query Language (SQL) for searching the database.
3. Have the students modify the program to create menus that will add and delete records, and search by various fields.

Week 3
1. Have the students work in small groups to create a personal inventory program.
2. Display completed project.

Assessment:

- 50% Written unit test
- 10% Rubric for the created database
- 10% Participation (teacher observation)
- 30% Small group projects evaluated by peers as well as the teacher

Teaching Suggestions/Extensions:

Follow-up Activities
- Create a personal and business phone book.

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For information about ***TCET*** products and services contact:

Texas Center for Educational Technology
University of North Texas
P.O. 311337 Denton, Texas 76203-1337
www.tcet.unt.edu
PHONE: (940) 565-4433 FAX: (940) 565-4425

University of North Texas
Denton, Texas