

K-12 Resource Repository

Table of Contents:

1:	Cryptograph: Developed by: Dr. Todd Andel Students learn fundamentals of basic cryptography. They will be able to encrypt & decrypt messages; perform basic cryptanalysis.	Educational Level: 9th – 12th Grade
2:	Blender3D: Developed by: Dr. Todd McDonald & Robert Fornof This encompasses basic 3D coordinates & variables; would be beneficial for math or art classes.	Educational Level: 9th – 12th Grade
3:	Creating a Basic Web Page: Developed by: Dr. Debra Chapman This is elementary web design/HTML coding designed for upper primary students.	Educational Level: 3rd – 5th Grade
4:	Creating a Web Page: Developed by: Dr. Debra Chapman Students will learn how to write the basic structure of an XHTML web page; including embedding images & adding textual content.	Educational Level: 9 th – 12 th Grade
5:	Brain-Computer Interface: Developed by: Dr. Matt Campbell This would be good for middle or high school logic/decision making class or a life science class.	Educational Level: 6th – 12th Grade
6:	Project Management: Critical Path Method Developed by: Dr. Jeff Landry This is a logic/decision making concept for middle school. Note: No use of computers in this field trip.	Educational Level: 6th – 8th Grade
7:	Binary Encoding: Developed by: Dr. David Langan & Dawn McKinney This is appropriate for middle school math (pre-calculus). Note: No use of computers.	Educational Level: 6 th – 8 th Grade
8:	SQL Session: Developed by: Dr. Harold Pardue The SQL sessions would be good for a Logic or Computing/Database course at the high school level.	Educational Level: 9 th – 12 th Grade
9:	Elementary Programming: Using “Scratch the Cat” Developed by: Dr. Debra Chapman Students will use a computer assisted learning tool to write programs to describe simple geometric shapes.	Educational Level: K – 5th Grade
10:	Object Oriented Programming: Using “Scratch the Cat” Developed by: Dr. Debra Chapman Students will use a computer assisted learning tool to write programs to describe simple geometric shapes.	Educational Level: 3rd – 5th Grade
11:	Beginning Object Oriented Programming: with ALICE Developed by: Dr. Debra Chapman Students will learn about introductory Object Oriented programming concepts, including: objects, properties, & methods, all using the ALICE programming software.	Educational Level: 6th – 8th Grade
12:	Advanced Object Oriented Programming: with ALICE Developed by: Dr. Debra Chapman Students will learn about advanced Object Oriented programming concepts, including: method scope & interactivity through events using the ALICE programming software.	Educational level: 6 th – 8 th Grade

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| 13: | Animation Mania:
Developed by: Dr. Debra Chapman
Students will create their own animated movies using Muvizu animation software. Students will learn about objects, animating in passes, & using timelines. | Educational Level: 6th – 12th Grade |
| 14: | Video Podcasting:
Developed by: Dr. Debra Chapman
Create a video podcast, including separate audio & video files, using Audacity & Windows Movie Maker. | Educational Level: 6th – 12th Grade |
| 15: | Beginning Gaming: GameMaker
Developed by: Dr. Debra Chapman
Create basic computer games. An introduction to designing games & the different gaming genres will be discussed. A simple game will be created in GameMaker. | Educational level: 6th – 8th Grade |
| 16: | Intermediate Gaming: GameMaker
Developed by: Dr. Debra Chapman
Ccreate a more advanced maze computer game. An introduction to designing games & interactive gaming features will be discussed. A simple maze game will be created in GameMaker. | Educational Level: 7 th – 12 th Grade |
| 17: | Logic & Procedural Programming: WizBang
Developed by: Dr. Debra Chapman
Students will learn about developing & creating procedural computer programs, which focus on logic & modular programming. Programs will be written in WizBang, debugged & compiled into valid C code. | Educational level: 6 th – 9 th Grade |
| 18: | Android App:
Developed by: Keith Lynn
Students will learn the basics of creating an Android App including creation of views, & handling of events. | Educational Level: 9 th – 12 th Grade |
| 19: | Animations: Java
Developed by: Keith Lynn
The students will learn how to draw shapes using Java & produce a simple animation. | Educational Level: 9 th – 12 th Grade |
| 20: | Creating Simple Music
Developed by: Keith Lynn
The students will learn to create simple midi sounds using the javax.sound.midi package. | Educational Level: 7 th – 12 th Grade |
| 21: | Creating PDFs: Java
Developed by: Keith Lynn
Students will learn to use the third party application itext to create their own PDF files using Java. | Educational Level: 9 th – 12 th Grade |
| 22: | Reading & Writing Excel Documents
Developed by: Keith Lynn
Students will learn to use the 3rd party application POI in order to read & write Microsoft Excel documents. | Educational Level: 9 th – 12 th Grade |
| 23: | Hangman:
Developed by: Keith Lynn
Students will learn how to create a simple hangman game. | Educational Level: 7 th – 12 th Grade |
| 24: | Setting Up a Web Server:
Developed by: Keith Lynn
Students will learn to setup the Apache webserver & Tomcat servlet container locally. | Educational Level: 9 th – 12 th Grade |
| 25: | Creating a Simple Client/Server:
Developed by: Keith Lynn | Educational Level: 9 th – 12 th Grade |

Create a simple client/server application in Java so that requests can be sent from the client to the server & the server can respond.

- 26: Creating a Find a Word Puzzle: Java Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will learn to create a simple puzzle in which words are hidden & the user locates them.
- 27: Download Images / Sound: Java Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will learn how to make network connections in Java in order to read images & sounds from web sites.
- 28: Secure a VNC Connection: Java Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will learn how to make a secure connection to a server & tunnel a port through the connection that carries VNC.
- 29: Creating an Event Calendar: Java Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will use the itext libraries to create a PDF document displaying a particular month & listing events that are happening.
- 30: A Memory Game: Educational Level: 7th – 12th Grade
 Developed by: Keith Lynn
 Students will learn how to place buttons or other shapes on the screen in pairs. The user will attempt to choose buttons that contain the same text or image.
- 31: Create a Crossword Puzzle: Java Educational Level: 9th – 12th Grade
 Developed by: Keith
 Students will learn how to create a simple crossword puzzle.
- 32: Create a Digital Alarm Clock: Java Educational Level: 7th – 12th Grade
 Developed by: Keith Lynn
 Students will learn how to access the system time in a thread so they can display the current time & set a timer so that something happens when a time is reached.
- 33: Creating & Saving Fractals: Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will learn how to draw fractal images such as Julia Sets & the Mandelbrot set & use the netpbm package to store the images.
- 34: Creating & Reading .zip files: Java Educational Level: 9th – 12th Grade
 Developed by: Keith Lynn
 Students will learn to use the java.util.zip package to read & create .zip files.
- 35: Building a Media Server: Raspberry Pi Educational Level: 4th – 8th Grade
 Developed by: Dr. Matt Campbell Field trip type: Workshop
 Students will learn how to build their own media server using a Raspberry Pi & open source software. It allows users to play & view most videos, music, podcasts, & other digital media files from local & network storage media & the internet.
- 36: Building a Low Power FM Radio Transmitter: Raspberry Pi Educational Level: 6th – 10th Grade**
 Developed by: Dr. Matt Campbell Field trip type: Workshop
 Students will learn how to build their own low power FM radio transmitter using a Raspberry Pi & open source software.

- 37. Building a Retro Gaming Console Using: Raspberry Pi** **Educational Level: 4th – 10th Grade**
Developed by: Dr. Matt Campbell Field trip type: Workshop
Students will learn how to build their own retro gaming console (e.g. Atari 2600, Nintendo, Sega) using a Raspberry Pi & open source software.
38. Programming a Robotic Arm Using: Raspberry Pi Educational Level: 6th – 8th Grade
Developed by: Dr. Matt Campbell Field trip type: Workshop
Students will learn how to write software to control a robotic arm using a Raspberry Pi & open source software.
- 39. Ethical Hacking** **Educational Level: 11th – 12th Grade**
Ethical Hacking is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming can gain deeper insight into software security.
40. Steganography Educational Level: 11th – 12th Grade
This is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming can gain deeper insight into software security and privacy.
41. Digital Logic with the Program Encryption Toolkit Educational Level: 11th – 12th Grade
This is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming will learn about basic digital logic and circuits and how security impacts their design.

Field Trip #1

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Cryptography

Dr. Todd Anzel, Associate Professor

Cryptography

Students learn fundamentals of basic cryptography. They will be able to encrypt & decrypt messages, as well as perform basic cryptanalysis.

9th – 12th Grade

Lecture with activity

The Student Will Be Able To:

- Explain how a shift cipher works
- Encrypt a message
- Decrypt a message
- Perform cryptanalysis on a secret message

This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for lecture & demonstration. Java runtime environment must be present as well as connection to the Internet to reach the referenced Java applets. It may also be helpful to have pre-encrypted messages with various plaintexts encrypted via different keys so students can use input to cryptanalysis exercises. Lecture slides are also provided.

Field Trip # 2

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Blender3D

Dr. Todd Anzel, Associate Professor & Robert Fornof

Blender3d , Creativity , & Art

Students will learn the basics of 3d coordinates & variables through art. This lesson will use the free, open source Blender3d (<http://www.blender.org>) graphics & animation package to teach students how to create digital pictures & animations. Students will modify pre-made examples to learn about keyframing variables, the x, y, z coordinate system, & digital art.

1st – 6th Grade Math and Art Classes

Lecture

Students will be able to:

- Describe the x, y, z coordinate system using their words.
- Understanding the concept of a variable
- Understanding how animation works through frames & how to animate a variable through keyframing .

Target 50 minutes of material, content, or activity

The projects are designed as starting points for students to explore the Blender3d software & documentation. Blender3d can do just about anything in regards to digital art (video editing, video games, sculpting, 2d drawing, compositing – Photoshop for animation, & many more features) If you have any extra time left, give the students some free time to explore the features of blender3d – perhaps challenge them to make a monkey, or a smiley face from primitive shapes. Or a light saber using a light saber tutorial.

Field Trip # 3

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Creating a Web Page (Elementary School – Writing HTML Code)

Pamela Wisniewski, Dr. Debra Chapman

Creating a Web Page

Students will learn how to write the basic structure of an XHTML web page. Including embedding & images & adding textual content.

3rd – 8th Grade

Applicable Subject Areas: Computers, Internet, English, Newspaper/Journalism
Workshop

The student will be able to:

- Properly structure a basic web page using the <html>, <head>, <title>, & <body>
- Use basic XHTML for Dr. Matting tags to add text
- Embed an image
- Save & view the web page

This activity should be done in a computer lab or classroom with laptop computers. Lesson can be taught using a basic Notepad editor. An Internet connection is necessary to download pictures. I can provide some power point slides as a starting point.

Field Trip # 4

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Creating a Web Page (High School – Writing HTML Code)

Pamela Wisniewski, Dr. Debra Chapman

Creating a Web Page

Students will learn how to write the basic structure of an XHTML web page. Including embedding & images & adding textual content.

8th – 12th Grade

Applicable Subject Areas: Computers, Internet, English, Newspaper/Journalism
Workshop

The student will be able to:

- Properly structure a basic web page using sections
- Identify Doc Types
- Use basic XHTML formatting tags to add & format text
- Embed an image, including alt tags
- Use an image as a hyperlink
- Save & view the web page
- Validate the web page to comply with W3C requirements

This activity should be done in a computer lab or classroom with laptop computers. Lesson can be taught using a basic Notepad editor. An Internet connection is necessary to download pictures & validate the web page. I can provide some power point slides as a starting point.

Field Trip # 5

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Brain-Computer Interface

Dr. Matt Campbell, Assistant Professor & Health Informatics Track Coordinator

Brain-Computer Interface (EEG)

Students will learn how to use brain waves to interact with a computer. Specifically, students will use a single channel, non-invasive electroencephalography (EEG) headset to interact with & manipulate a number of computer games & other activities. Students are encouraged to think creatively about other applications of this technology, especially in relation to helping people with disabilities.

4th – 12th Grade (logic/decision making class or a life science class)Applicable subject areas: computer technology, biology, anatomy & physiology
Workshop

T The student will be able to:

- Explain how brain waves can be used to control a computer or other electrical device
- Propose their own creative uses of EEG technology
- Interact with a computer through the use of brain waves

Students are each assigned an EEG headset to use during the activity. Student will progress through a number of games & tasks that require them to either maintain a high level of concentration or relaxation. Scoring mechanisms within the applications allow the students to compete on each of the activities. It is recommended that the instructor have at least one assistant in the lab to assist learners who need help with the headsets. This learning object can easily be trimmed down to fit into a 50 minute time frame. The instructor can cover as much material as time permits or do fewer activities & games.

Activity should be done in a computer lab or a classroom with laptop computers. The instructor should demonstrate with computer connected to an overhead projector.

Field Trip # 6

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Critical Path Method

Dr. Jeff Landry, Professor

Project Management – Critical Path Method

Students will learn about the critical path method, used by project managers, to plan a project's schedule, identifying areas of risk to focus on & how much "play" there is in a project's schedule. Students will start with a project's activity network diagram, & then learn how to calculate the expected time to complete a project, identify the critical paths for a project, compute slack, or float, for all project activities, & design early & late start schedules.

6th – 12th Grade

Workshop with combination of lecture/lab

By the end of the workshop (Part [n]), the student will be able to:

(Part 1) Given an activity network diagram, find the critical path(s)

(Part 2) Find the float (slack) for any activity in a project

(Part 3) Figure out the earliest (& latest) possible start & finish times for project activities

Follow guidance in the document at:

http://www.headfirstlabs.com/PMP/criticalpath/HeadFirstPMP_CriticalPathDrill.pdf

The workshop is broken down into three parts.

- You need a traditional class with chalk/white board.
- The exercises can be completed with pencil & paper, although the exercises can be adapted to use a software tool such as MS-Project.
- The student would need a handout with the exercises, either directly from the guide, or developed based on the guide.
- Correct answers are provided in the guide.

Field Trip # 7

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Binary Encoding

Dr. David Langan, Professor & Dawn McKinney, Senior Instructor

Binary Encoding Part I – Numbers & Words

This learning module will discuss the concept of items being binary (e.g., heads/tails ; on/off; magnetic charge positive/negative). Given that computers are 100% binary the fundamental question that arises is: “How do we take data as we know it: numbers, words, pictures, etc. & store/encode them into a computer’s (binary) memory?” This learning module is targeted to help address this question & to show how numbers & letters/words can be represented in binary. The module will motivate this skill to count in binary using a card trick.

6th – 8th Grade (Math – pre-calculus)

Lecture with hands on activities (students do not use computers in this module). Presentation of the content can use, if desired, use PowerPoint presentation (available on request).

Students will be able to:

- Describe & define the term “binary” & identify some things in real life that are binary in nature
- Count in binary
- Define the common terms of “bit” & “byte”
- Encode binary using a variety of media (for example using cards or coins).

Materials Used:

- One deck of cards
- Five pennies per team of 2 students
- A set of five pieces of paper per student with those having 1, 2, 4, 8 & 16 dots on each.

Use: http://csunplugged.org/wp-content/uploads/2014/12/unplugged-01-binary_numbers.pdf (page 4 in that PDF) as a printable copy of those numbers.

*Note: portions of this presentation were inspired/ motivated by content from the web site <http://csunplugged.org/> – an excellent source for other computer science learning modules.

Requirements:

- One faculty member can present the content of the learning module, but to properly do the card trick described below requires two people who know how to count in binary.
- This module has been tested/ used in a tag-team style presentation with two faculty members.
- Field trips to South Alabama for this learning module will use two faculty members for this presentation.

Notes to instructors: We start this presentation with the card trick described below to “motivate” the topic of binary (details below). This leads students to wonder how it was done. Answer: we used binary... so let us learn how that works!

Field Trip # 8

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

SQL Session

Dr. Harold Pardue, Professor & IS/IT Program Coordinator

Structured Query Language

Students will use a web-based computer assisted learning tool to write queries against a database of Azalea Trail Race (ATR) race results. Learners will write queries that use statistical & mathematical functions & conditional statements to answer questions related to race results.

6th – 12th Grade

(Logic or Computing/Database course at the high school level.)

Workshop

The Student Will Be Able To:

- Explain the purpose of a database query
- Write a database query to answer data questions: who, what, when, where, how many
- Write a database query that utilizes statistical functions to count the number of occurrences, find a maximum & minimum value, & compute an average (arithmetic mean)
- Write a database query that filters a data result with a conditional statement based on character data & numerical values

The SQL exercises are designed to build incrementally from simple to more complex. It is recommended that the instructor have at least one assistant in the lab to assist learners who fall behind. This learning object can easily be trimmed down to fit into a 50 minute time frame. The instructor can cover as much material as time permits or do fewer queries in each section.

This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. The query learning tool is web-based so each computer requires internet access.

Field Trip # 9

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Elementary Programming using “Scratch the Cat

Dr. Debra Chapman, Senior Instructor

Programming with Scratch the Cat

Students will use a computer assisted learning tool to write programs to describe simple geometric shapes. Learners will use a graphical user interface, using visual representations to program the actions of Scratch the Cat.

End of year K5 – 1st Grade

Workshop

The Student Will Be Able To:

- Explain the purpose of a program
- Write a program to create several simple shapes, including triangles & squares
- Explain how angles affect shapes

Scratch the Cat is designed to build incrementally from simple to more complex. It is recommended that the instructor have at least one assistant in the lab to assist learners who fall behind. This learning object can easily be trimmed down to fit into a 50 minute time frame. The instructor can cover as much material as time permits. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. Scratch the Cat is free, so the instructors can provide it to the students/parents for home use.

Field Trip # 10

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Object Oriented Programming using “Scratch the Cat”

Dr. Debra Chapman, Senior Instructor

Students will use a computer assisted learning tool to write programs to describe simple geometric shapes. Learners will write algorithms that use a graphical user interface, using visual representations, mathematical functions & conditional statements to program the actions of Scratch the Cat.

3rd – 5th Grade

Workshop

The Student Will Be Able To

- Explain the purpose of an algorithm
- Write an algorithm to create several simple shapes, including triangles & squares.
- Explain how angles affect shapes.
- Explain a conditional statement

Scratch the Cat is designed to build incrementally from simple to more complex. It is recommended that the instructor have at least one assistant in the lab to assist learners who fall behind. This learning object can easily be trimmed down to fit into a 50 minute time frame. The instructor can cover as much material as time permits. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. Scratch the Cat is free, so the instructors can provide it to the students/parents for home use.

Field Trip # 11

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Beginning Object Oriented Programming with ALICE

Dr. Debra Chapman

Object Oriented Programming

Students will learn about introductory Object Oriented programming concepts, including objects, properties, & methods using the ALICE programming software.

6th – 8th Grade

Workshop

The Student will be able to:

- Add objects to the Alice World
- Modify object's properties & methods
- Add new object methods
- Create decisions structures (if statements)
- Create repetition structures (loops)
- Use events to fire methods

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own ALICE projects. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Beginning ALICE
Session

Part 1 (10 minutes: 10)

Introduce ALICE - Discuss OOP & Objects

Create the Alice Background

Part 2 (10 minutes: 20)

Add Objects to Alice environment

Position the Objects

Examine Object Properties

Part 3 (20 minutes: 40)

Methods

- Use object methods
- Create additional object methods
- Decision Structures
 - Create if statements / if then else statements for decisions
- Repetition
 - Create loops to repeat actions

Part 4 (10 minutes: 50)

Discuss object events

Add events to fire methods

Part 5 (5 minutes: 55)

Explore with Alice

Modify their Alice activity on their own

Field Trip # 12

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Advanced Object Oriented Programming with ALICE

Dr. Debra Chapman

Object Oriented Programming

Students will learn about advanced Object Oriented programming concepts, including method scope & interactivity through events using the ALICE programming software. (Students should have completed the Beginning OOP with ALICE learning object)

6th – 8th Grade

Workshop

The Student will be able to:

- Create an interactive object oriented Alice environment using events
- Differentiate between local & global scope (methods & events)
- Use camera cuts
- Add 3-D text for additional effects

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own ALICE projects. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. A started file (similar to what is created in the Beginning OOP with ALICE learning object) containing objects, methods & events is needed to save time.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Advanced ALICE
Session

Part 1 (10 minutes: 10)

Review ALICE environment

Open provided ALICE started file (containing objects, methods & events)

Part 2 (10 minutes: 20)

Discuss Method Scope – Local & Global

Create Local Methods

Create Global (World) Methods

Part 3 (10 minutes: 30)

Add User Events - Create interactivity between user & program

Part 4 (10 minutes: 40)

Discuss use of multiple views / Cameras

Set up camera views – use camera views within storylines

Part 5 (5 minutes: 45)

Discuss 3-D text for additional effects

Modify properties & methods of text

Part 6 (10 minutes: 55)

Explore with Alice

Modify their Alice Activity on their own

Field Trip # 13

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Animation Mania

Dr. Debra Chapman

Animation

Students will create their own animated movies using Muvizu animation software and learn about objects, animating in passes, & using timelines.

6th – 12th Grade

Workshop

The Student will be able to:

- Modify the properties of objects
- Use objects to set up a movie scene
- Prepare object animation
- Direct object movement & animation in passes
- Edit or Delete Timeline components
- Create an .avi file of their movie

It is recommended that the instructor have at least one assistant in the lab to assist learners with the animation. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own movie projects. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Muvizu Session

Part 1 (10 minutes: 10)

Introduce Muvizu – Discuss Animation

Set up Movie Scene

Part 2 (15 minutes: 25)

Add Character Objects to Set up Scene

Modify Object Properties

Part 3 (20 minutes: 45)

Animate the Characters

Prepare the Character Actions

Direction Character Movement & Animation

Add Animation Effects in Passes

Review Animation Timeline

Edit or Delete using Timeline

Part 4 (5 minutes: 50)

Prepare the Movie (.avi) file

Field Trip # 14

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Video Podcasting

Dr. Debra Chapman

Creating a Video Podcast

Students will learn how to create a video podcast, including separate audio & video files, using Audacity & Windows Movie Maker.

6th – 12th Grade

Workshop

The Student will be able to:

- Create an audio file using Audacity
- Import a video file into MovieMaker
- Use the Timeline to adjust podcast elements
- Add effects to the podcast – including video effects, transitions, titles, & credits
- Convert files to MPEG-4 format for posting as a podcast

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own podcasts. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. Headset microphones are recommended – audio files can be distributed if the files cannot be recorded.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Creating an Video
Podcast

Part 1 (5 minutes: 5)

Introduction to Podcasting

Components of a Podcast

Part 2 (10 minutes: 15)

Developing / Planning the Podcast & Script

Part 3 (10 minutes: 25)

Creating Audio File with Audacity

Editing Audio File

Part 4 (10 minutes: 35)

Using Movie Maker

- Import an existing Video File
- Create a Video File using CamStudio or a WebCam

Part 5 (15 minutes: 50)

Adding Effects to the Podcast using the Timeline

- Video Effects
- Transitions
- Titles
- Credits

Part 6 (5 minutes: 55)

Preview & Save the Podcast

Convert to MPEG-4 Format for uploading

Field Trip # 15

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Beginning Gaming with GameMaker

Dr. Debra Chapman

Gaming

Students will learn how to create basic computer games. An introduction to designing games & the different gaming genres will be discussed. A simple game will be created in GameMaker.

6th – 8th Grade

Workshop

The Student will be able to:

- Discuss many of the significant components of a computer game
- Identify different genres of computer games

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own ALICE projects. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration. A started file (similar to what is created in the Beginning OOP with ALICE learning object) containing objects, methods & events is needed to save time.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Advanced ALICE
Session

Part 1 (10 minutes: 10)

Review ALICE environment

Open provided ALICE started file (containing objects, methods & events)

Part 2 (10 minutes: 20)

Discuss Method Scope – Local & Global

Create Local Methods

Create Global (World) Methods

Part 3 (10 minutes: 30)

Add User Events - Create interactivity between user & program

Part 4 (10 minutes: 40)

Discuss use of multiple views / Cameras

Set up camera views – use camera views within storylines

Part 5 (5 minutes: 45)

Discuss 3-D text for additional effects

Modify properties & methods of text

Part 6 (10 minutes: 55)

Explore with Alice

Modify their Alice activity on their own

Field Trip # 16

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

LESSON PLAN for
Advanced Maze
Gaming Session**Intermediate Gaming with GameMaker**

Dr. Debra Chapman

Gaming

Students will learn how to create a more advanced maze computer game. An introduction to designing games & interactive gaming features will be discussed. A simple maze game will be created in GameMaker.

7th – 12th Grade

Workshop

The Student will be able to:

- Discuss many of the components needed in computer games
- Discuss the importance of a design document
- Create a basic maze game with user controllable player, actions, collectable objects, challenges, obstacles, multiple lives, & scorekeeping.

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own games. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

Part 1 (10 minutes: 10)

Review of GameMaker / Introductory Gaming Learning Object

Part 2 (5 minutes: 15)

Game Design Document

Part 3 (10 minutes: 25)

Interactive Gaming – Player Controlled Objects

Part 4 (25 minutes: 50)

Create a basic maze computer game

- Player
- Actions
- Rooms
- Collectable Objects
- Challenges
- Obstacles
- Multiple Lives for Player
- Scorekeeping

Part 5 (5 minutes: 55) – Advanced Features – including bonuses & advanced graphics

Field Trip # 17

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Logic & Procedural Programming with WizBang

Dr. Debra Chapman

Programming Logic & Developing Procedural Computer Programs

Students will learn about developing & creating procedural computer programs, which focus on logic & modular programming. Programs will be written in WizBang, debugged & compiled into valid C code.

6th – 9th Grade

Workshop

The Student will be able to:

- Determine a solution to a simple logical problem
- Create a basic procedural computer program based on logic
- Create a modular program using procedures & functions
- Ask for User Input, Provide Output
- Understand the use of decision & repetition statements
- Compile a Program

It is recommended that the instructor have at least one assistant in the lab to assist learners with the programming. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. The instructor can cover as much material as time permits & allow students to create their own WizBang projects. This activity should be done in a computer lab or a classroom with laptop computers. The instructor should have a computer connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Procedural
Programming with
WizBang Session

Part 1 (10 minutes: 10)

Introduction to Procedural Programming

Discuss Logical Problem Solving – use an example like making a peanut butter sandwich

Part 2 (10 minutes: 20)

Solve a Logical Problem – using PseudoCode or FlowChart

Steps to Solve the Problem

Input – Process - Output

Part 3 (15 minutes: 35)

Create the Program in WizBang

- Input (with input message & variable)
- Mathematical Operations
- Decision Statements
- Repetition Statements
- Output

Part 4 (10 minutes: 45)

Modular Programming using Procedures & Functions (including parameters)

Part 5 (10 minutes: 55)

Debug Programming using Step by Step Debugger

Compile into C Code – examine the code

Field Trip # 18

Developed by:

Android App

Keith Lynn

Subject:	Android Programming
Short description:	Students will learn the basics of creating an Android App including creation of views, & handling of events
Educational Level:	9 th – 12 th Grade
Field trip type:	Lecture with activity
Educational Outcomes:	The student will be able to: <ul style="list-style-type: none"> • Create a basic android app using the Android Virtual Device Manager • Create a simple button & write a handler for the button click • Using images & sounds • Handle touch events
Notes to instructor:	Activity should be done in a laboratory where each machine has the Android Development Environment installed; includes the Android Virtual Device Manager; allows the student to test an Android app without having an Android device. With only 15 students, the School's Androids could be used. Recommended idea; simple game. Some code could be written & the students could complete it.

Field Trip # 19

Developed by:	Keith Lynn
Subject:	Animations created with Java
Short description:	The students will learn how to draw shapes using Java & produce a simple animation
Educational Level:	9 th - 12 th Grade (with good mathematics background)
Field trip type:	Lecture with activity
Educational Outcomes:	The student will be able to: <ul style="list-style-type: none"> • Draw triangles, circles, & general polygons • Create a simple thread • Be able to use the thread to animate a figure
Notes to instructor:	Java provides a nice mechanism for drawing shapes likes circles & rectangles. In this activity the student will learn how to draw shapes & figures & then use a simple technique to make it appear the figure is moving.

Field Trip # 20

Developed by:	Keith Lynn
Subject:	Creating MIDI sounds with Java
Short description:	The students will learn to create simple midi sounds using the javax.sound.midi package
Educational Level:	7 th – 12 th Grade
Field trip type:	Lecture with activity
Educational Outcomes:	The student will be able to: <ul style="list-style-type: none"> • Create a Sequencer object to be able to play sounds • Create a Sequence object • Create a Track containing a list of MidiEvents • Create MidiEvents to play a note
Notes to instructor:	Students will use the javax.sound.midi package to create simple midi sounds that can be used to simulate music. It is recommended that Eclipse with Java EE be installed on the machines because it will have the correct package installed. Sample programs can be found in Head First Java.

Field Trip # 21

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Creating PDFs with Java

Keith Lynn

Creating PDF file with Java

In this field trip, the students will learn to use the third party application itext to create their own PDF files using Java

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create a basic PDF document
- Use methods available in the itext package to draw text & graphics on the document
- Learn to create documents using Chunks, Phrases, & Paragraphs

Field Trip # 22

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Reading & Writing Excel

Keith Lynn

Reading & Writing Excel documents

The students will learn to use the 3rd party application POI in order to read & write Microsoft Excel documents.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Open an existing Microsoft Excel document
- Create a new Microsoft Excel document
- Create large amounts of data in Java which can be stored in a Microsoft Excel document

The POI package needs to be installed on the laptops. The documentation for POI can provide some ideas that the instructor can use. It's recommended that the instructor have a particular document in mind they want to create & show the student how to create the document. Also the instructor should create a Microsoft Excel document & have the students read it.

Field Trip # 23

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Hangman

Keith Lynn

Hangman

In this field trip, the students will learn how to create a simple hangman game

7th – 12th Grade

Lecture with Activity

The student will be able to:

- Place buttons on a screen that represent letters to guess
- Learn how to handle the clicking of a button
- Learn how to handle keyboard events
- Draw a simple hangman

This is a simple game that can be writing in basic Java. It is recommended that the instructor write the solution ahead of time & at the beginning of the field trip demonstrate it. Then they should lead the students through development.

Field Trip # 24

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Setting up a web server

Keith Lynn

Setting up a web server

The students will learn to setup the Apache webserver & Tomcat servlet container locally.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Setup the Apache web server to server pages
- Install php & create php pages
- Setup the Tomcat servlet container
- Configure Apache so it forwards requests for servlets to Tomcat

The Apache web server, php, & Tomcat are free downloads. Recommended: install ahead of time or create a virtual machine with the software ready; recommend the instructor have some pages ready that involve html, php, & servlets to demonstrate.

Field Trip # 25

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Creating a simple client/server

Keith Lynn

Creating a simple client/server application

The students will learn how to create a simple client/server application in Java so that requests can be sent from the client to the server & the server can respond.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create a server application
- Create a client application
- Send messages from the client to the server
- Send messages from the server to the client

We can use the Java libraries to create the server & client. It is recommended that some activity like a chat program or tic tac toe game be created to demonstrate a use for the client & server.

Field Trip # 26

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Creating a Find a Word Puzzle in Java

Keith Lynn

Creating a Find a Word Puzzle in Java

The students will learn to create a simple puzzle in which words are hidden & the user locates them.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create an array of words
- Randomly place words in a puzzle
- Using MouseMotionListener events to allow the user to select puzzle words
- Indicate that a word has been found by using a strikethrough

This is an exercise containing several components. The students will be shown how to hide a word in the puzzle. This will involve detecting where to place the word. Recommended: instructor write the code ahead of time & demonstrate it at the beginning of the field trip. Then they should lead the students through development.

Field Trip # 27

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Using Java Classes / Download Images & Sounds

Keith Lynn

Using Java classes to download images & sounds

In this field trip, the students will learn how to make network connections in Java in order to read images & sounds from web sites.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Use a URL object to contact a web site
- Use regular expression to look for links to images & audio
- Use a BufferedInputStream to read the bytes of a file

This can be done using the java.util.regex & java.net packages. It is recommended that beforehand the instructor research website that offers lots of video or audio & then use regular expressions to find the links to audio & video. Then the user can demonstrate how to make the network connection & download the files.

Field Trip # 28

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Secure a VNC Connection - Java

Keith Lynn

Secure a VNC connection with Java

In this field trip, the students will learn how to make a secure connection to a server & tunnel a port through the connection that carries VNC.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create a connection to a remote server running SSH
- Tunnel a VNC connection
- Use the ProcessBuilder class to start the VNC Viewer

This field trip will make use of the Jsch program found in the jcraft package. It is recommended that this & VNC Viewer be installed locally. For demonstration it is recommended that a remote server be setup so that it runs VNC locally.

Field Trip # 29

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Creating an Event Calendar in Java

Keith Lynn

Creating an event calendar in Java

In this field trip, the students will use the itext libraries to create a PDF document displaying a particular month & listing events that are happening.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create a basic PDF document
- Display a calendar for any month & year
- Draw text on the calendar

This will require itext to be installed on the laptops. It is recommended that this be written ahead of time & demonstrated at the start of the field trip. Then the students can be led through development.

Field Trip # 30

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

A Memory Game

Keith Lynn

A memory game

In this field trip, the students will learn how to place buttons or other shapes on the screen in pairs. The user will attempt to choose buttons that contain the same text or image.

7th – 12th Grade

Lecture with Activity

The student will be able to:

- Create buttons that contain text or images
- Detect two button clicks & display the text or images
- Create a simple thread that will allow a pause

This is a simple game using event handling. It is recommended that this be written ahead of time & demonstrated to the students at the beginning of the field trip. Then the students can be led through development.

Field Trip # 31

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Create a Crossword Puzzle - Java

Keith Lynn

Create a crossword puzzle in Java

In this field trip, students will learn how to create a simple crossword puzzle.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Create buttons & place them on a screen
- Determine where a word can fit on the screen
- Allow the user to use the keyboard or mouse to input letters

This will be a simple game where words are placed onto a puzzle & their corresponding clues are displayed. It is recommended that this be written ahead of time & demonstrated at the beginning of class. Then the students can be led through development.

Field Trip # 32

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Notes to instructor:

Create a Digital Alarm Clock - Java

Keith Lynn

Create a digital alarm clock in Java

In this field trip, the students will learn how to access the system time in a thread so they can display the current time & set a timer so that something happens when a time is reached.

7th – 12th Grade

Lecture with Activity

The student will be able to:

- Create a simple thread
- Get the system time
- Cause something to happen at a time chosen

This is a simple task involving a thread. You can use images of numbers in order to display the clock. It is recommended that this be written ahead of time & demonstrated at the beginning of the field trip. Then the students can be led through development.

Field Trip # 33

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Creating & Saving Fractals

Keith Lynn

Creating & Saving Fractals

In this field trip, the students will learn how to draw fractal images such as Julia Sets & the Mandelbrot set & use the netpbm package to store the images.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Understand what a Julia Set is
- Draw the Julia Set for a quadratic or trigonometric function
- Understand what the Mandelbrot Set is
- Store jpg or gif images of Julia Sets or the Mandelbrot Set

It is recommended that the netpbm packages be installed on the laptops. The instructor can lead the student through the drawing of the Julia Set or Mandelbrot Set so that the students will see how to change the colors associated with a particular orbit of the function.

Field Trip # 34

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Creating & Reading .zip files - Java

Keith Lynn

Creating & Reading .zip files in Java

In this field trip, the students will learn to use the java.util.zip package to read & create .zip files.

9th – 12th Grade

Lecture with Activity

The student will be able to:

- Reading a .zip file
- Create a .zip file
- Create a .zip file of a directory

This is a straightforward exercise using the java.util.zip package. It is recommended that this be written ahead of time & demonstrated at the start of the field trip. Then the students can be led through development.

Field Trip # 35

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Building a Media Server Using Raspberry Pi

Dr. Matt Campbell

Basic scripting & file transfer with Raspberry Pi

Students will learn how to build their own media server using a Raspberry Pi & open source software. It allows users to play & view most videos, music, podcasts, & other digital media files from local & network storage media & the internet.

4th – 8th Grade

Workshop

The Student will be able to:

- Format & install Raspbmc software to a memory card
- Create and/or locate multimedia content & convert it for playback on the Raspberry Pi
- Setup & boot a Raspberry Pi

Source: <http://www.raspbmc.com/> and
<http://www.howtogeek.com/119924/build-a-35-media-center-with-raspbmc-and-raspberry-pi/>

It is recommended that the instructor have at least one assistant in the lab to assist learners with the project. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. This activity should be done in a computer lab or a classroom with **one laptop & one Raspberry Pi**, monitor, mouse, & keyboard for each group of 2-3 students. The instructor should have a Raspberry Pi connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Beginning a Media
Server Using
Raspberry Pi

Part 1 (15 minutes: 15)

Introduce the concept of a media server & what it does

Introduce Raspberry Pi with a brief description of hardware & capabilities

Connect the Raspberry Pi to a monitor, keyboard, & mouse

Part 2 (20 minutes: 35)

Locate multimedia content for playback from sources on the internet

Create new multimedia content for playback using the webcam on the laptop

Convert the multimedia content so that it can be played back on the Raspberry Pi

Part 3 (5 minutes: 40)

Load the multimedia content to the memory card

Boot into the Raspbmc operating system

Part 4 (10 minutes: 50)

Explore using the Raspberry Pi for multimedia playback

Field Trip # 36

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

LESSON PLAN for
Building a Low Power
FM Radio Transmitter
Using Raspberry Pi

Building a Low Power FM Radio Transmitter – Raspberry Pi

Dr. Matt Campbell

Basic scripting & radio wave transmission with Raspberry Pi

Students will learn how to build their own low power FM radio transmitter using a Raspberry Pi & open source software.

6th – 10th Grade

Workshop

The Student will be able to:

- Explain how a radio transmitter works
- Setup & boot a Raspberry Pi
- Modify source code
- Compile the source code
- Modify hardware for FM broadcast
- Evaluate transmission strength

Source:

http://www.icrobotics.co.uk/wiki/index.php/Turning_the_Raspberry_Pi_Into_an_FM_Transmitter

It is recommended that the instructor have at least one assistant in the lab to assist learners with the project. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. This activity should be done in a computer lab or a classroom with one Raspberry Pi, monitor, mouse, & keyboard for each group of 2-3 students. The instructor should have a Raspberry Pi connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

Part 1 (10 minutes: 10)

Explain how radio waves are produced & transmitted

Part 2 (10 minutes: 20)

Introduce Raspberry Pi with a brief description of hardware & capabilities
 Connect the Raspberry Pi to a monitor, keyboard, mouse, & antenna

Part 3 (20 minutes: 40)

Work with source code to make minor modifications
 Compile the software

Part 4 (10 minutes: 50)

Experiment with broadcasting radio signals through the building.

Field Trip # 37

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Building a Retro Gaming Console Using Raspberry Pi

Dr. Matt Campbell

Basic scripting & file transfer with Raspberry Pi

Students will learn how to build their own retro gaming console (e.g. Atari 2600, Nintendo, Sega) using a Raspberry Pi & open source software.

4th – 10th Grade

Workshop

The Student will be able to:

- Create a bootable RetroPie disk from an image file
- Setup & boot a Raspberry Pi
- Configure EmulationStation for game play

Source: <http://lifehacker.com/how-to-turn-your-raspberry-pi-into-a-retro-game-console-498561192>

It is recommended that the instructor have at least one assistant in the lab to assist learners with the project. This learning object can easily be fit into a 50 minute time frame or expanded as time allows. This activity should be done in a computer lab or a classroom with one Raspberry Pi, monitor, mouse, & keyboard for each group of 2-3 students. The instructor should have a Raspberry Pi connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

LESSON PLAN for
Building a Retro
Gaming Console Using
Raspberry Pi

Part 1 (15 minutes: 15)

Describe what an emulator is & briefly how it works

Introduce Raspberry Pi with a brief description of hardware & capabilities

Connect the Raspberry Pi to a monitor, keyboard, mouse, & antenna

Part 2 (15 minutes: 30)

Create a bootable RetroPie disk from an image file

Load gaming ROM files to the disk

Part 3 (30 minutes: 60)

Experiment with broadcasting radio signals through the building

Field Trip # 38

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Programming a Robotic Arm Using Raspberry Pi

Dr. Matt Campbell

Object Oriented Programming

Students will learn how to write software to control a robotic arm using a Raspberry Pi & open source software.

6th – 8th Grade

Workshop

The Student will be able to:

- Setup & boot a Raspberry Pi
- Write computer code in python to control the robotic arm

Source: [http://www.wikihow.com/Use-a-USB-Robotic-Arm-with-a-Raspberry-Pi-\(Maplin\)](http://www.wikihow.com/Use-a-USB-Robotic-Arm-with-a-Raspberry-Pi-(Maplin))

It is recommended that the instructor have at least one assistant in the lab to assist learners with the project. This learning object can easily be fit into a 60 minute time frame or expanded as time allows. This activity should be done in a computer lab or a classroom with one Raspberry Pi, monitor, mouse, & keyboard for each group of 2-3 students. The instructor should have a Raspberry Pi connected to an overhead projector for demonstration.

A PowerPoint instructional slide show can be provided.

**LESSON PLAN for
Programming a
Robotic Arm Using
Raspberry Pi**

Part 1 (10 minutes: 10)

Introduce Raspberry Pi with a brief description of hardware & capabilities

Connect the Raspberry Pi to a monitor, keyboard, & mouse

Part 2 (20 minutes: 20)

Introduce the python source code

Allow students to write & modify their source code as needed

Part 3 (30 minutes: 60)

Students will compete in a contest to see which group can devise the best program to accomplish a specific task using the robotic arm.

Field Trip # 39

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Ethical Hacking

Todd McDonald

Ethical Hacking

This is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming can gain deeper insight into software security

11th – 12th Grade

Workshop

The Student will be able to:

- Understand the consequences of illegal hacking
- Differentiate between ethical and unethical hacking
- Compute and understand binary and hexadecimal numbers
- Explain the goals of a reverse engineer
- Define a man-at-the-end (MATE) attack
- Use a dynamic analysis tool to understand and reverse engineer a program

The topic focuses on both illegal and ethical uses of hacking and will highlight the negative and illegal consequence of malicious hacking. Students will learn how software can be analyzed to change its intended behavior and learn concepts related to penetration testing and securing software from attack.

Field Trip # 40

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Steganography

Todd McDonald

Ethical Hacking

This is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming can gain deeper insight into software security and privacy

11th – 12th Grade

Workshop

Students will be able to:

- Explain how secret writing came about
- Differentiate between steganography and cryptography
- Understand the advantages and disadvantages of using or detecting stego
- Create or read a text-based stego message
- Understand how information can be embedded in digital media
- Hide a message in an image using a stego tool

The topic focuses on basic types of steganography or secret writing.

Field Trip # 41

Developed by:

Subject:

Short description:

Educational Level:

Field trip type:

Educational

Outcomes:

Content:

Notes to instructor:

Digital Logic with the Program Encryption Toolkit

Todd McDonald

Ethical Hacking

This is an NSF-sponsored hands-on learning activity where students with some knowledge of computers and programming will learn about basic digital logic and circuits and how security impacts their design.

11th – 12th Grade

Workshop

Students will be able to:

- Understand basic types of logic gates like AND, OR, XOR
- Interpret or create a truth table for a logic gate
- Understand the logic equation of a logic gate using canonical sum of products and product of sums
- Create basic components from logic gates
- Create polymorphic variants of a logic circuit
- Understand how to analyze circuits to see if they are equivalent
- Understand the security issues associated with digital logic and circuit designs

The lesson uses a custom research software called the Program Encryption Toolkit (PET) to help students visualize and create digital logic circuits and components. PET is also used to illustrate basic digital logic principles and security techniques such as obfuscation.