Outreach-in-a-Box: Discovering IT

national center for

women&

INFORMATION
TECHNOLOGY

Outreach-in-a-Box: Discovering IT

What is Outreach-in-a-Box?

Outreach-in-a-Box: Discovering IT is a complete set of classroom resources developed for IT professionals to use with middle-school students and educators. Outreach-in-a-Box is an inclusive, activity-based classroom experience that gives male and female students an exciting introduction to information technology (IT): its uses, possibilities, and career opportunities.

Why IT?

The number of students choosing to enter IT fields is diminishing just as the job opportunities are growing! Outreach-in-a-Box seeks to change students' perceptions of IT and encourage them to apply their creativity and skills to this exciting field.

Imagine the Possibilites

Many adults recall an experience in youth that set them on their career path. Outreach-in-a-Box is your chance to engage and inspire young people, at an age where they are excited about scientific and technical fields and respond positively to activity-based learning programs.

Inside the Box

Outreach-in-a-Box provides you all the components you need to deliver a successful classroom presentation at a local middle school. Simply download the "Box" from the NCWIT website at (URL TBD) and follow the Program Guide to "unpack" it, introduce it to your local school, and customize the materials for your own use.

Outreach-in-a-Box Materials List:

Advance Materials
- an introductory letter to school educators
- set-the-stage activity for the hosting educator

Program Guide
- preparation and presentation tips
- ideas for engaging youth
- lesson plan and choice of activities that introduce computing fundamentals (no technology needed)

Presentation Template
- slide presentation template

Extensions and Website Resources
- a menu of activities, from a robotics challenge to programming exercises to deeper careers exploration, for the presenter or the hosting educator to use in extending and reinforcing the lesson

Takeaway Tech
- web index of resources for students and their parents and educators

Resources at the Ready

Visit the NCWIT website (URL TBD) and download the materials you need for an inspired and inspiring program. Here you'll also find extension activities, sample letters and presentations, and ideas for customizing your presentation and activities.

[Please modify or remove any text in brackets.]

[This letter announces the Outreach-in-a-Box opportunity, describes the purpose and contents of the program, and suggests the preferred setting and time-frame. Customize this letter and send it to school personnel (administrators, teachers, or school counselors), or if you prefer, call the school directly to discuss this information]

Dear [PRINCIPAL OR SCHOOL COUNSELOR – INSERT NAMES]:

My name is [NAME] from [INSTITUTION]. I am participating in an outreach effort to encourage youth to consider careers in computer science and information technology (IT). I would like to come to your school and present a 45-minute (or longer) program to one of your classes.

The U.S. Department of Labor predicts that information technology will be one of the fastest-growing occupational fields in the U.S. over the coming decade; yet participation in these fields is dwindling. Young women and minority students are particularly underrepresented in technical fields, and we need the creative input of all students if we are to design technology that benefits all of us. Together we can inspire young people to pursue computer science and information technology fields. Middle school is just the right time to engage kids and show them that they have both the ability and the creativity to design the future.

The presentation and activities I use can typically be completed in one classroom session. The session includes a fun "programming" activity that teaches the fundamentals of computing, and a brief slide presentation that touches on what IT is, what IT people do, and what I do. Time-permitting, I can provide additional activities and web resources kids can use anytime. I am also happy to work with you to tailor the presentation and these activities to meet your students' needs and interests.

Delivery of this presentation and activities requires the following classroom resources: a computer with Microsoft PowerPoint, a digital projector, a screen or wall for the projection, and pens/pencils for the students. I will work with you to provide these resources.

After the classroom session I will share all the program materials and extension activities with the teacher, so he or she may the deliver the lesson again or share it with colleagues. To view or download the program materials, please visit NCWIT at: [URL TBD.]

Please share this opportunity with your fellow educators and give them the NCWIT web address for more information. I welcome any teachers who wish to attend the presentation, as they will benefit from learning about the creativity and opportunities related to IT and may wish to use the materials themselves.

If your teachers are interested, please appoint one teacher or counselor to be my main contact. My personal information follows.

Thank you for your consideration.

Regards,

[NAME]
[ORGANIZATION]
[EMAIL ADDRESS]
[PHONE NUMBER]

Outreach-in-a-Box: Discovering IT
Set-the-Stage Activities for Middle School Educators

Dear Educator:

Set the stage for the upcoming Outreach-in-a-Box presentation by completing this 30-minute activity. It is designed to gauge students' prior knowledge about information technology and computing, and prepare them for the guest presenter's visit. Please be prepared to review the completed activity with the guest presenter prior to his or her visit, and suggest ways to bridge from this activity to the guest's presentation.

Set-the-Stage Activity: IT is Everywhere!

Objective: Prime students about the ubiquity and importance of IT in daily life, and build awareness of technology as something people create to help solve problems, entertain ourselves, or make our lives easier, safer, or more efficient.

Directions:

1) (1 min.) Introduce the presentation to come. You may wish to say something like, "We have a special guest coming from (institution) to teach us about information technology. During the lesson we will learn about the world of information technology and do some fun activities that will get you thinking about how we use and interact with computers. To get started, let's tap into what we already know and like about technology."

2) (5 min.) List a few computing devices on the board or chart pad to get juices flowing (iPod, cell phone, control panel on a microwave oven, TiVo, etc.) and ask students to think of other computing devices. Record their suggestions as they contribute them. If they are not sure an item is a computing device (which is OK!) just put a question mark beside it. As kids run dry suggest other settings, like a car, a hospital, the 911 dispatch office, a grocery store.

3) (5 min.) When you have a big list (20 or 30) ask students to write a reflection about the following: "Choose any one of these devices. Think about who might have been behind its development. Imagine: Why would they have invented this product? What problem were they trying to solve?

4) (3 min.) After five minutes, ask students to stop and look up. Say: Let's see what you picked for your reflection. As I run my finger down the list, raise your hand when I get to the item you wrote about. Look around – which ones seemed to interest people? Why might that be?"

5) (5 min.) Ask several students to their share reflections and discuss. Choose like items that several students chose in order to compare their thinking, and also pick way-out-there items students might have interesting insights about.

6) (1 min.) Bring the point home, saying, "Every computing device we use was built intentionally to solve a problem or improve on an earlier invention. Now imagine YOU get to design the next new device or software. Take a minute and write about your invention and what motivates you to create it."

7) (5 min.) After five minutes, ask students to share their ideas in triads, then have each triad share one idea with the class. Congratulate students on creative thinking.

8) (5 min.) Ask students to prepare for the upcoming visit by listing a set of questions they would like to ask the presenter: "Our upcoming guest makes her [or his] living in IT and will tell us more about the different kinds of work people do in the field. We'll want to ask what motivated her [or him] to be in a technical field." Write this on chart paper or the board: What motivated you to do the work you do? Ask students what other questions they would like the presenter to answer, and add them to the list.

9) In advance of the upcoming program, share the reflections and questions with the presenter. Discuss ways she or he might bridge from this activity to the presentation.

Outreach-in-a-Box: Discovering IT
Program Guide

Dear Presenter:

The Outreach-in-a-Box: Discovering IT Program Guide supplies you with everything you need to prepare and present a 45-minute or extended program about CS and IT for middle school students. Most program elements are completed for you, but you will customize certain features of the program. Please take time to become familiar with the program, discuss it with your host educator, and customize the presentation and brochure insert.

Contents of this Program Guide
1. Using Advance Materials
2. Preparation Steps
3. Tips for Relating to Your Audience
4. Lesson Plan: Activities and Presentation

1. Using advance materials

If you are initiating this event, you will want to use the following advance materials. If you have been invited to the school, review the invitation and Set-the-Stage activity with your host. These advance materials are separate components on the website.

Sample letter This announces the Outreach-In-a-Box opportunity, describes the purpose and contents of the program, and describes logistics such as material needs, preferred setting, and time frame. Customize this letter and send it to school personnel (administrator, teacher, or school counselor) or if you prefer, call the school directly to discuss the opportunity.

Set-the-Stage Activity Your program will have a greater impact if students are prepared. Your host educator has a choice of two *Set-the-Stage* activities to use in advance which will reveal prior understanding and beliefs about IT, and get students thinking about the learning ahead. Share this activity with the hosting educator and learn which activities (one or both) he or she plans to do. Before your presentation review the *Set-the-Stage* experience with the teacher and discuss how the students' experience can serve as the "stepping off" point for your presentation.

2. Preparation Steps

- In advance of your presentation, meet or talk with your hosting educator. Discuss program goals and seek advice about managing activities so they are inclusive (reaching the students who initially may be less interested in technology.)

- If you choose Activity one, ask the teacher about peanut butter allergies in the class. If you choose Activity two, ask the teacher how to best organize the students into pairs.

- Share Set-the-Stage class activity the educator can use to prepare students for the program ahead (see separate document in this bundle.)

- Prepare the slide presentation template. Customize the set by adding your institution's slide background or choose another light background. Insert the information about you and your work into the appropriate slides.

- Read the Lesson Plan and prepare for the presentation and activities as advised.

- Gather together the required materials for the activity you choose.

- Work with your host to arrange for a computer (or bring your laptop), projector, and screen for the slide presentation.

- Prior to your presentation and following the Set-the-Stage activity in the class, contact the host educator to discuss the results of the Set-the-Stage activity he or she conducted. Discuss ways to respond to these during your presentation.
- Make sure that you have enough business cards to give out to the students, and write the website URL (**URL TBD**) on the back of them.

3. Tips for relating to your audience
The intent of Outreach-in-a-Box is to cast IT in an appealing light and inform young people about the myriad opportunities in IT. Like it or not, as a guest in the school, your very presence puts you in the role of "role model" and as an IT professional you wear the mantle of young people's previous perceptions about people who work in the field. We encourage you -- through your appearance, demeanor, and language -- to put forth the most appealing and professional presence you can. You can do this through your...

Appearance: Unless you are joking and cast them off right away, leave the glasses with black electrical tape and shirt pocket protector at home! Wear "casual Friday" apparel – not so dressy you seem unapproachable, yet not "weekend sloppy" either.

Demeanor: Another stereotype to bust is that of geek or absent-minded professor. Being well prepared will help you appear polished and credible. Strike a professional but friendly demeanor. Students like adults who obviously like them. Chat with students before you begin your presentation and show interest in what is going on in the school. Give students an opportunity to see you as a person first and an IT professional second.

Language: Students know when they are being talked down to, so don't oversimplify the presentation in an effort to make it work. Use the vocabulary of the discipline, but define key terms and write important words on the chalkboard. Avoid acronyms and unnecessary jargon. Check for understanding.

Respect for Individual Differences: The intent of this program is to encourage all students -and especially girls and other underrepresented populations- to get excited about IT. Here are tips for being inclusive of everyone.

- When you ask a question, the more technically inclined students may have their hands raised before your words are out of your mouth. Give the class time to think before you call on anyone. Ask open-ended questions that have many right answers so everyone can participate with confidence.
- If activities involve sharing technology, make sure all kids have turns to use devices. Assertive students may tend to dominate, so ask the hosting teacher for advice on class management and strategic grouping to assure equal access and equal opportunity to learn.

4. Lesson Plan: Activities and Presentation
This lesson plan divides your hour-long classroom experience into four parts: A) Introduction; B) Activity; and C) Presentation. Please note the suggested times for each part, to ensure that you and the students make the most of the presentation and activities over the course of the hour-long experience.

A) Introduction – 3 minutes
Briefly introduce yourself, your work, and your organization (more of this comes in the second part of the slideshow presentation, so be brief.) Ask students if they know others who work where you do, or anyone who works in IT fields.

Briefly review with students what the class did by reviewing pictures on the wall or lists they made, and relate their activity to what you will do during the hour. Tell them by the time the session ends they will have learned more about computing and be inspired to consider computing career opportunities as they move beyond middle school.

B) Activity – 30 minutes (including debrief)
Below are two activities that get students thinking about a foundation of computing: programming. You may wish to discuss which activity to use with the hosting teacher. He or she will also have ideas for grouping students and for overall management of the activity.

CHOOSE ACTIVITY ONE OR ACTIVITY TWO.

Activity One: Tell A "Robot" How to Make a PB&J Sandwich

Description:

The presenter acts as a robot and follows instructions from students in order to build a peanut butter and jelly sandwich. Since the "robot" is a mechanized computing device that only understands finite and sequential instructions and makes assumptions about nothing, it executes the instructions just as they are given, with funny and illuminating results.

Objective:

Students understand that computing devices function by acting on precise and sequenced instructions, and these instructions are delivered through computer program languages that devices "understand" and execute.

Materials needed for this activity: Raised flat surface to work on, loaf of sliced bread, jar of jelly, jar of peanut butter (or other spread if allergies are a concern), plate, knife, spoon.

Directions:

(2 min.) Introduce the activity. You may wish to say, *"We are going to do an activity that helps you understand what is at the heart of all computing – programming. All computing devices function by acting on precise and sequenced instructions. These instructions are delivered through computer program languages that devices 'understand' and execute.*

"In order to think about how robots or any computing devices are programmed to do the things we want them to do, I'm going to pretend to be a robot – a computer with mechanical functions – that needs to make a peanut butter and jelly sandwich. I'll take my instructions from you, ONE STEP AT A TIME. In front of me is a loaf of bread, jar of jelly, jar of peanut butter, plate, knife, and spoon."

(8 min.) As students deliver instructions, avoid taking any assumed steps. If you're told by a student to "put the peanut butter on the bread," pick up the jar of peanut butter and place it on the bread. If a student says, "Spread the peanut butter on the bread," but the cover is still on the jar or you have not been told to pick up the knife, you can say that you are unable to complete that task at this time (or something similar.) Wait for a student to tell you to put the knife into the jar and get some peanut butter on it before executing a spreading "command." When the bread bag is open and you have one slice of bread on the plate, if you are told to do something with the bread, ask which bread. The key is to get students thinking about how to properly sequence the actions needed while providing precise detail for you, the "robot."

Try not to give any analysis of the students' commands during the activity. Let students use the opportunity to figure out on their own how to issue instructions to the "robot." End the activity whenever it seems the point has been made even if you have not constructed a complete sandwich.

(5 min.) Conclude the activity and discuss what happened. Call on a variety of students to answer (even those not raising hands.) Some sample questions:

- *What surprised you about what we just did? What things can you assume when giving instructions to a human that you can't when giving them to a computer or "robot"?*

- *When you told me to pick up the bread, I did. Do you think it would be easy for a robot to find the bread? How could you have told me to find it if I said I didn't know what bread was?*

(5 min.) Now separate the students into small groups of 3 or 4 and ask them to come up with a list of commands that they think would eliminate the problems that arose in the first demonstration.

(5 min.) After five minutes, bring everyone back together to share the commands they think would have made the instructions better. Discuss the fact that humans have ears and eyes, can interpret voice commands and visual cues, and use past experience to influence behavior. Robots need a computer chip that is programmed to "understand" instructions and interpret what a given command means. Humans make assumptions and fill in gaps, while basic computers do not.

(5 min.) Close the discussion by telling students the robot activity was a programming exercise, and remind them programming is at the heart of all computing. For a computing device do anything it needs precise instructions, and these are written in computer languages that any student can learn.

Time-permitting, discuss robotics as an important science. Ask them if they think robots are just for fun, and remind them that most robots in our lives today do real work – especially boring or dangerous work (making the same weld for each car on an assembly line, or detecting and exploding bombs.)

Activity Two: Tell a Computer to Draw a Picture

This is a Kinesthetic Learning Activity (KLA), meant to physically engage students in the learning process. KLAs fill an important niche – energizing students, employing underutilized learning styles, and achieving especially challenging learning goals.

Description:
A student "programmer" thinks about transmitting information so a fellow student "computer" acts on it, moving his or her pencil to draw a line drawing that only the "programmer" sees. Students may describe using some terms that express scale and position, but they will find it takes precise instructions for the drawing to come close to matching the original picture.

Objective: Students understand that computing devices function by acting on precise and sequenced instructions, and these instructions are delivered through computer program languages that devices "understand" and execute.

Materials:
Enough photocopies of several different line drawings so each pair has one sheet (samples included); 8.5" x 11" sheets of blank paper; pencils or pens, space in the room to have students sit back to back on the floor or at tables or desks with a divider between them (could use a propped up 3-ring binder).

Directions:
(8 min.) Introduce the activity. You may wish to say, *"In order to think about how you could program a robot or other computing device to draw a picture, we're going to do a drawing activity in pairs. One of you will be the 'programmer' giving instructions and the other will be the computing device acting on those instructions and drawing. You should sit such that neither of you will be able to see the other's paper. You can do this by sitting back to back or by propping a 3-ring binder or large book on the table between you.* (You may wish to ask the teacher in advance which method is best.)

"I'll start by giving a line drawing to each programmer. (It is important that students sitting near each other have different drawings, otherwise they can listen to descriptions given by describers on other teams.) *If you are the programmer, don't tell the 'device' what the picture is. Instead, try to tell your partner how to draw the object in simpler terms, describing pieces of the drawing one at a time. The 'device' cannot ask any questions, but may ask for a command to be repeated if they can't act on it. After the picture has been described and drawn, wait for my cue and then you can show your pages to one another. This activity should only take five minutes or so."*

(7 min.) After drawing is complete ask pairs to raise their hands if their two pictures (the original and the drawing) ended up different from one another. Call on pairs to describe how the drawings differed (e.g., item placement, shape, scale.) Ask pairs, *"What terms did you use to describe the task?"* Ask if other groups used other terms. Discuss how computers need to have precise language. For example, it would not be enough to say, "Draw a square." The size of the square would need to be specified. Computers (think: "compute") use mathematical terms to express position, shape, size, and relationships.

(5 min.) Select one original and hold up all its renderings so students can compare. Ask, *"Which picture most closely matches the original?"* Ask that pair of students what kinds of terms they used. Ask the students if they could think of other ways to describe drawings to a computer. If no one has thought about describing line segments in terms of end points, ask if that might be a good way to describe drawings.

Other alternatives to suggest:

- Pen up, pen down, north for ⟨----distance----⟩, south for ⟨----distance----⟩, west for ⟨----distance----⟩, and east for ⟨----distance----⟩. Ask the students if any of them have drawings that could not have been done (easily) with this method (anyone with a circle or diagonal line should show their drawing).

- Drawing a grid, then moving left to right across each row, saying if a grid square should be colored in or not. (This could lead to a discussion of pixels on a computer screen.)

Ask, *"Do you think it would have helped you to know what the object was that you were trying to draw? Do you think it would help a computer?"*

(5 min.) If time allows, switch roles of programmer and computer and repeat the activity with different pictures. At the conclusion, ask students if they did anything differently this second time. Did they change their terms after the discussion about different approaches? How? If so, did they have a better result?

Close the discussion with a suggestion that students try their hand at programming and programmable devices like robots. The links at the NCWIT website offer many opportunities, including activities, camps, devices to buy, competitions, do-it-yourself crafts, and more.

C) Presentation – 15 minutes

Description:
This slide presentation connects students' experiences and interests to the range of uses for information technology, how it is created, and who creates it. It describes career opportunities in IT and allows you to tell your story and that of your institution.

Objective:
Students become familiar with IT and relate their knowledge and interests to possible career opportunities.

Materials needed for the activity: Slide presentation template, a computer, projector, and screen or wall. A remote device for advancing slides is helpful so you can move around the room.
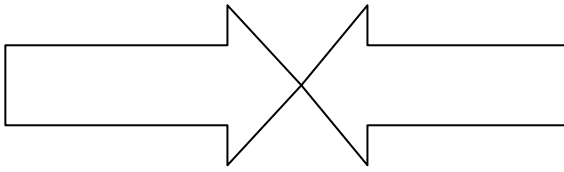
Directions:
Deliver the slide presentation, following the suggestions in the notes associated with each slide. (You may wish to print the presentation with the notes showing to use as a guide when you deliver the presentation.)
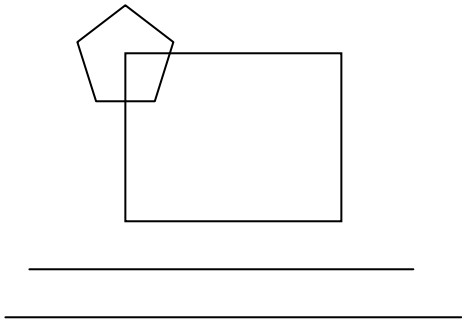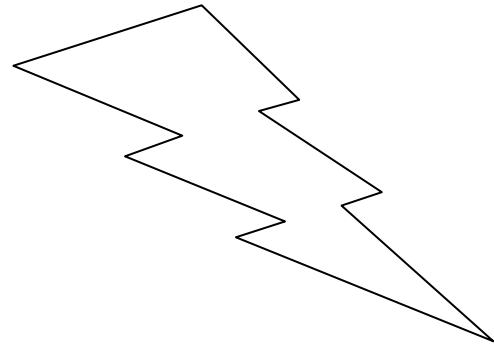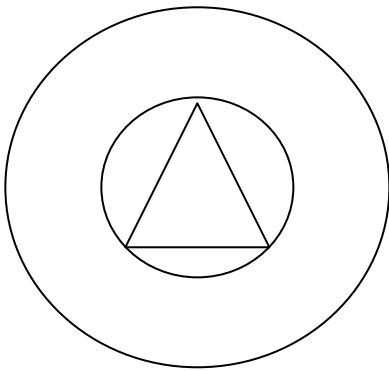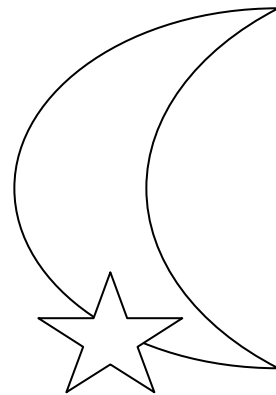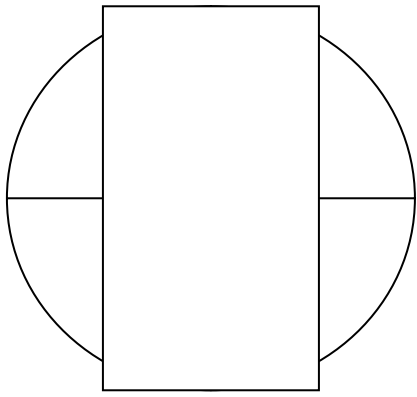
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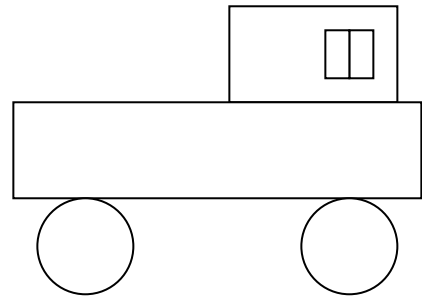
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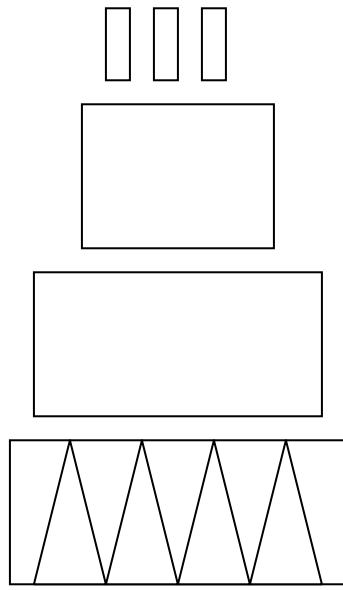
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Outreach-in-a-Box: Discovering IT
Set-the-Stage Activities for Middle School Educators

Dear Educator:

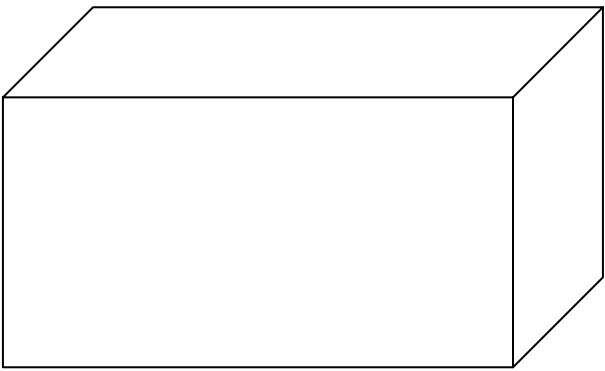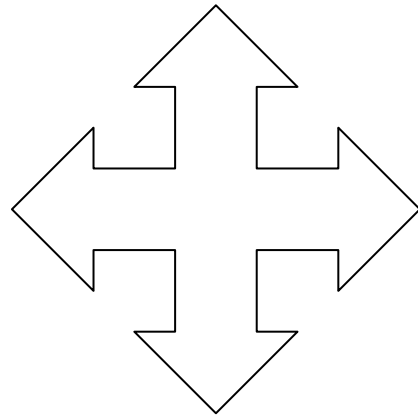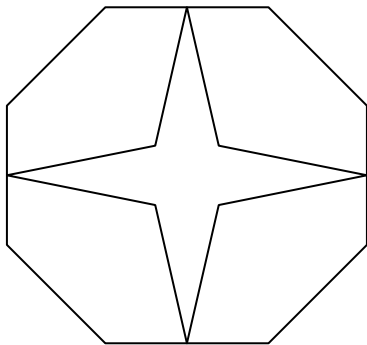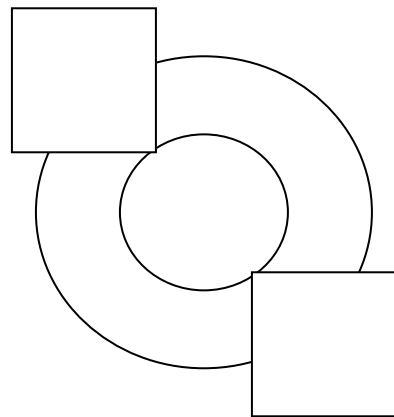Set the stage for the upcoming Outreach-in-a-Box presentation by completing this 30-minute activity. It is designed to gauge students' prior knowledge about information technology and computing, and prepare them for the guest presenter's visit. Please be prepared to review the completed activity with the guest presenter prior to his or her visit, and suggest ways to bridge from this activity to the guest's presentation.

Set-the-Stage Activity: IT is Everywhere!

Objective: Prime students about the ubiquity and importance of IT in daily life, and build awareness of technology as something people create to help solve problems, entertain ourselves, or make our lives easier, safer, or more efficient.

Directions:

1) (1 min.) Introduce the presentation to come. You may wish to say something like, "We have a special guest coming from (institution) to teach us about information technology. During the lesson we will learn about the world of information technology and do some fun activities that will get you thinking about how we use and interact with computers. To get started, let's tap into what we already know and like about technology."

2) (5 min.) List a few computing devices on the board or chart pad to get juices flowing (iPod, cell phone, control panel on a microwave oven, TiVo, etc.) and ask students to think of other computing devices. Record their suggestions as they contribute them. If they are not sure an item is a computing device (which is OK!) just put a question mark beside it. As kids run dry suggest other settings, like a car, a hospital, the 911 dispatch office, a grocery store.

3) (5 min.) When you have a big list (20 or 30) ask students to write a reflection about the following: "Choose any one of these devices. Think about who might have been behind its development. Imagine: Why would they have invented this product? What problem were they trying to solve?

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9) In advance of the upcoming program, share the reflections and questions with the presenter. Discuss ways she or he might bridge from this activity to the presentation.

Information Technology: Inventing the Future

Introduce yourself and tell students in the session that today they will learn about computing fields and participate in an activity that helps them understand how computers work. When you leave they will have resources to use to explore their interests.

Have a student read this quote aloud and ask: What did he mean? Discuss the quote. (For reference, Isaac Asimov is a famous science fiction writer and the author of hundreds of works, including I, Robot.)

Information Technology is Everywhere…

Information technology is everywhere! We use computers to help us in so many ways, we often don't think twice about how common they are: bar code scanners, deli weigh scales, climate control, security cameras and alarm systems, inventory control systems, UPC codes on packaging, inventory control methods, cash registers, back-office computers and printers…these are all examples of how information technology is part of our everyday lives.

What is Information Technology?

Information technology (IT) is using computers and computer science to…

- Communicate
- Solve problems
- Design and imagine
- Share, store, retrieve or manipulate information

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Ask the students to cite some examples of information technology that they might see around them every day.

IT is…Computer Science

Do you like to:

Solve problems?

Help people?

Find ways to do things faster, better, more easily?
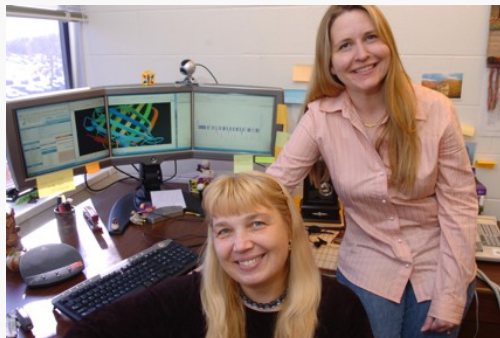
Computer Scientists Natalia Maltsev (left) and Elizabeth Glass using computers to mine genetic information from pathogens, people and plants. This information is essential in understanding disease, developing medicines, and finding cures.

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Discuss what students might be seeing on the triple screen - modeling of DNA, perhaps? Natalia and Elizabeth work with complex ideas at the U.S. Department of Energy's Argonne National Laboratory, outside of Chicago, Ill. Their work with computer science revolves around evolutionary analysis, bioremediation, biodefense and structural biology applications. Tell them that computers are what allow them to make incredible progress with the research and lab experiments used by most biologists.

IT is…Computer Engineering

Do you want to:

Build a better iPod?

Invent new toys?

Create robots that can do the work for you?

Holly Yanco is a Robotics Engineer and an MIT graduate who is on the faculty at the University of Massachusetts at Lowell. She designs robot systems such as robotic wheelchairs and arms to interact with people.

IT is…Computer Graphics and Imaging

Are you:

Very visual?

Someone with a big imagination?

Fascinated by maps, models, or animation?

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You might ask, how many of you use computing devices like cell phones, iPods, etc.? Have you ever thought about how they could be better? How would you change or enhance these technologies? Computer science allows us to create spectacular images for medicine, modeling for car design, simulations for flight training, mapping systems, and animation and special effects in films.

IT is…Software Engineering

Do you…

See the big picture?
Give directions?
Enjoy languages?
Imagine whole new
experiences?

Linus Torvalds (above) designed the world's most
popular "open-source" operating system, called Linux.

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Tell students that software engineers design the programs that run computing devices. Like directors, composers, and architects, software engineers have a clear vision and know how to make it a reality. Remind students that programming is a creative, collaborative process.

Ask students if they know what "open-source" means (that anyone can see and modify the programming code; that the code is "open" to its community of users.) Ask what might be the potential benefits and risks to designing in an open-source environment.

IT is…Information Systems

Are you someone who…

Understands relationships?

Likes to do things efficiently?

Can put yourself in other people's shoes?

Marissa Mayer (above) is Vice President of Search Products & User Experience at Google. Marissa manages Google's search products – web search, images, groups, news, Froogle, the Google Toolbar, and more. She joined Google in 1999 as Google's first female engineer. She has several patents in artificial intelligence and interface design.

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Ask students: Have you ever shopped on the Web? Purchased music? Participated in an online auction? Looked for important information?

Say: Imagine what it takes to organize and present information so it can be put to productive use. Information systems specialists apply computing to the needs of businesses and organizations. Information systems organize and manage huge amounts of information. Imagine what BANKING requires now, or how GOOGLE might work.

Paths to Careers: How Do People Get Started?

Follow the traditional path…

Take math, physics, computer science classes; intern with a company's technology department

Participate in your school's computer club; enter a science fair; attend a technology summer camp

Steve Chen (above) is Chief Technology Officer at YouTube. He attended the Illinois Math and Science Academy and majored in Computer Science at the University of Illinois at Urbana-Champaign.

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Steve Chen is Chief Technology Officer at YouTube. He was an early employee at PayPal, where he met YouTube's other co-founders, Chad Hurley and Jawed Karim.

The three friends started YouTube together by working on it in Chad Hurley's garage. Do you know any other famous companies that were started in people's garages? How about HP (Hewlett-Packard), Apple, and Google, to name a few?

Paths to Careers: How Do People Get Started?

Follow your own path…

Introducing Leah Buechley

Before College: Interested in design and textiles, liked math.

In College: Studied fine arts, then computer science.

Now: Computer scientist at University of Colorado, Boulder. Researches new techniques for integrating computation, electronics and textiles.

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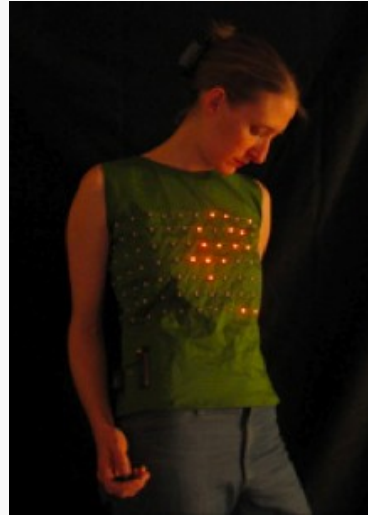
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Leah is an example of someone who didn't start out in information technology. She blended computing with her other interests, including art and design. This is Leah wearing her programmable shirt. It has LEDs (light emitting diodes) sawn into it that run on a watch battery. Conductive thread connects the LEDS to a programmable chip inside the shirt.

Students can make this shirt themselves! Direct them to the NCWIT website [URL TBD] for instructions.

CS undergraduate students, Carnegie Mellon University

Here is a collage of Computer Science undergraduate students at Carnegie Mellon University in Pittsburg PA. Notice they are working in collaboration and using a variety of devices. All types of people study computer science.

Paths to Careers:

What are your interests?
How do they merge with IT and computing?

Architecture + Computing = Amusement Park Designer
Biology + Computing = Genetics Researcher
Business + Computing = Chief Technology Officer
Design + Computing = Website Designer
Engineering + Computing = Rocket Builder
Law + Computing = Digital Rights Attorney
Medicine + Computing =Artificial Heart Designer
Sports + Computing = Running Shoe Designer
Writing + Computing = Technical Writer
Music + Computing = DJ

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Ask a student or two about their interests, then ask the class how each might mix with computing.

How Much Do IT Workers Make?

Mean Annual Wages, 2005 Occupations (U.S. Dept. of Labor)

Physicians and Surgeons	$138,910
Lawyers	*$110,520*
Computer and Information Systems Managers	**$102,360**
Computer Scientists (Research)	**$94,030**
Computer Hardware Engineers	**$87,170**
Computer Software Engineers	**$79,540**
Veterinarians	$77,710
Biomedical Engineers	**$75,380**
Network Systems/Data Communications Analysts	**$64,970**
Middle School Teachers	$47,890
Graphic Designers	$42,530
Firefighters	$40,420
Fast Food Cooks or Servers	$15,500

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Explain that the "mean" gives you average, and doesn't factor in extreme salaries. Generally, careers in computing afford a comfortable lifestyle. Three of the top-ten fastest-growing occupations are computer-related, according to the Department of Labor.

People who invent technologies or computer applications and software can become quite wealthy. Three of the five wealthiest Americans are billionaires from technical fields: Bill Gates, Microsoft; Lawrence Ellison, Oracle; Paul Allen, Microsoft.

Paths to Careers:
About Your Presenter

TEMPLATE *Add pictures, text to this slide (see notes)*

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TEMPLATE

Theme: Your work and how you arrived at it. Tell students about the work you do. Describe how your interests drove your education and work choices. If you had a formative experience in youth that influenced you, describe that as well. If you followed an alternate path, or if your work bridges technical and other domains, describe. Slide idea - Add picture of yourself in middle school! If desired, add a duplicate of this slide and more information on the theme: Your work and how you arrived at it.

Work Life: About My Work

TEMPLATE *Add pictures, text to this slide (see notes)*

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TEMPLATE

Theme: Tell about your your job and workplace. Describe the primary business, education, or research niche it fills, and tie this to something students might be familiar with. Add pictures of your workplace, If If you can, show pictures of you working collaboratively with others, working with devices, in interesting settings. (Avoid: 'this is me sitting at my computer' pictures.) You may want to add a duplicate slide showing your outside-of-work life so students think of you as a multidimensional person with interests, a family, etc.

Thank You!

For in-depth information on programs, camps, competitions, online classes, virtual web experiences, programmable devices, printable resources, and more, visit:
[URL TBD]

Credits

The Women@SCS Outreach Roadshow: Diversifying the Images of Computer Science, Women@SCS, Carnegie Mellon University.

http://women.cs.cmu.edu/

Computing Degrees and Careers brochure, ACM

http://csta.acm.org/

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Outreach-in-a-Box: Discovering IT
Extensions and Website Resources

If time allows or if you can meet with students a second time, consider these interactive extension activities that will inform and inspire the students. They include programming activities, robotics, and career exploration. The amount of time each takes depends on the activity, the number of students involved, and the depth into which you go. You may wish to test the activities in advance, or walk through them with the teacher.

Note: If you cannot complete these additional activities, please share them with the teacher. He or she may wish to use them to extend your program.

You may also refer the teacher and students to **(URL TBD)** for a large list of web-based resources, including activities, crafts, camps, clubs, and career information.

Programming
SCRATCH and ALICE are two programming languages suitable for young students. Each website below has information for teaching these programming languages.

ICE – Georgia Tech
The Institute for Computing Education (ICE) at Georgia Tech offers has slide sets and teaching guides to help you introduce either Alice or Scratch programming languages. See: Summer Camps for Middle School Students 2006: **http://coweb.cc.gatech.edu/ice-gt/447**

SCRATCH
Scratch is a programmable toolkit that enables kids to create their own games, animated stories, and interactive art -- and share their creations with one another over the Internet. Scratch is being developed by the Lifelong Kindergarten research group at the MIT Media Lab, in collaboration with KIDS research group at the UCLA Graduate School of Education & Information Studies. The Scratch Web site supports adult use of Scratch with kids: **http://weblogs.media.mit.edu/llk/scratch/educators.html**

ALICE
Middle school to college-age students learn to program interactive 3D graphics with Alice v2.0. Alice is an object-oriented, Java-based computer-programming environment created by Carnegie Mellon University researchers. The Alice website and Alice Community Forum support the use of Alice with kids. **http://www.alice.org/**

Robotics
If you have the means to bring PicoCrickets, Lego Mindstorms, a Roomba vacuum, or other robotic devices into the classroom, consider these steps for a robotics activity.

1. Simply put the device to work and ask, What do you think this is? What is it responding to? How does it sense the world? How would you describe its "brain?" What makes it go?

2. Explain that a robot is a mechanical computer. It functions through a processor, responds to programming instructions, and interacts with the world with sensors. Robots are fun but they are useful, too. If a work task is repetitive or hazardous, a robot is probably performing it.

3. Show students how you change one instruction to make the device function differently. Describe the other things it can do (PicoCrickets can "dance" twirl, and jump.)

4. Have students form small teams to plan a secret function they want the robot to perform. They will get three tries to make it perform as desired. As each group interacts with the robot the rest of the class watches, asking questions about what they are trying to make it do and offering suggestions for changing its behavior.

5. Discuss the ways in which working with the robot is similar to the "programming" activity they did prior.

6. Answer questions about the devices.

7. Remind students that the NCWIT outreach website has information about "virtual" robotics on the web, and robots they can buy.

Careers

University of Washington Careers Videos: **http://www.cs.washington.edu/WhyCSE**

1. Show one or several of these videos from University of Washington Computer Science & Engineering department, so students can see people working and talking about their work in IT. The videos answer the questions, Why do people choose computer science and engineering as their field? What takes place during a day in the life of a person working in the software or Internet industry?

2. Have students write a reflection on this prompt: Use your imagination - If you could change the world and use technology to do it, what would you do? What would you invent or improve? Encourage students to be imaginative and have fun, and tell them there are no right or wrong answers.

3. Have students share their reflections and discuss how their ideas might relate to IT fields.

4. Encourage students to keep their eyes open, talk to people who do what interests them, and follow their passion.

Outreach-in-a-Box: Discovering IT
Takeaway Tech – Resources for Learning and Fun

Excited about computer science and information technology? Here's a list of cool resources – virtual experiences on the web, robotics kits, camps and clubs, and career exploration sites – you can use anytime. You can find it and a bigger list of activities, clubs, camps, kits, career ideas and more at (URL TBD).

Fun with Programming and Robotics

Interactive Robotics - Museum of Science, Boston
Get busy online and build your own virtual robot. Requires Shockwave
http://www.mos.org/exhibits/robot/index.html

LEGO® Mindstorms™
Design and program real robots that do what you want them to do. Create a light-sensitive intruder alarm, or a robotic rover that can follow a trail, move around obstacles, and even duck into dark corners.
http://mindstorms.lego.com/eng/products/ris/index.asp

PicoCrickets
Plug lights, motors, and sensors into a Cricket, then write computer programs to tell it how to spin, light up, and play music. Create musical sculptures, interactive jewelry, dancing creatures, and other artistic inventions with Crickets.
http://www.picocricket.com/index.html

Computer Science Activities, Clubs, Camps and Workshops

If all the technical camps offered each year were listed in this brochure it would be the size of a phone book. Visit (URL TBD) for a list of programs around the country. Or check with the nearest university or ask a school computer science teacher for ideas.

Creative Media and Computing
Embroider your skateboard, light up your clothing, felt an iPod cocoon, stitch a robot, and more! Craft is the first project-based magazine dedicated to the world of out-there and edgy crafts. Get do-it-yourself advice from the 'zine or on the Craft Web site.
http://craftzine.com/magazine/

Leah Buechley's LED shirt
Use silver-coated thread and a microprocessor to create your own version of Leah's light-up tank top, and learn computing basics at the same time. Free pdf from Craft magazine.
http://craftzine.com/images/craft/01/electrictanktop.pdf

Make
Make magazine celebrates your right to tweak, hack, and bend any technology to your own will. Get do-it-yourself advice from the 'zine or on the Make Web site.
http://www.makezine.com/

Sally Ride Science Toy Challenge
Inventing toys is a great way to learn about science, engineering, and the design process. Accept astronaut Sally Ride's Toy Challenge you and your friends might just win a weekend VIP tour of NASA's Kennedy Space Center in Florida!
http://www.toychallenge.com

Switch

Switch is a do-it-yourself Web show that combines design, fashion and technology. Watch designers at work and check out lots of projects in the Learning Library.
http://iheartswitch.com

Future Scientists and Engineers of America (FSEA)

Want to start your own tech club? This national nonprofit organization supports after school technology clubs.
http://www.fsea.org

Girls Go Tech

Girl Scouts of the USA offers camps and programs where girls can explore their interests in science, math and technology.
http://www.girlsgotech.org/

Sally Ride Science Club

This science club for girls in grades 4 - 8 reflects astronaut Sally Ride's effort to interest young girls in science, math, and technology. The club features mentors, online chat, newsletters, and science festivals.
http://imaginarylinesinc.com

Career Exploration

Career Ideas for Kids Who Like Computers (book)

Take a quiz and learn if your future lies in the high-tech world of computers. Career Ideas for Kids Who Like Computers gives you the scoop on exciting careers including Artificial Intelligence, Computer Game Design, Computer Programming, Hardware Engineering, Multimedia, and more.
http://www.careerideasforkids.com/computer.htm

GetTech

Planning for your future will involve technology. As you plan your career, be aware of all the choices and options. Explore what GetTech has to offer you.
http://www.gettech.org/default2.asp

What Do You Like? Exploring Career Exploring Career Information

Bureau of Labor Statistics, 2006-07 Edition
Scout out careers in every field – including technical ones.
http://www.bls.gov/k12/

The Fun Works

Match your interests to fun and interesting careers in math, science, and technology. Explore different careers or take a quiz to see which is best for you.
http://thefunworks.org/