COMPUTING IN THE CLOUD...

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Lesson Focus

Lesson focuses on cloud computing, another buzz word that has come up in today's world of computers. Though there are dozens of definitions on cloud computing, there seems to be no consensus on what a cloud is. This lesson strives to help students understand the concept of cloud computing and its possibilities.

Lesson Synopsis

This lesson starts with an early history of cloud computing, describing its early forms, and how it has been transformed to its present state. This lesson provides guidelines for students to use some cloud facilities such as CloudMe, a file sharing utility, and also teaches them how to install multiple guest OS in a host OS to introduce virtualization i.e. the key concept behind cloud computing.

Age Levels

8-18

Objectives

✦ Learn about cloud computing.
✦ Learn about the current trend in computing and its future scope.
✦ Learn how to install multiple guest OS in a host OS (virtualization)
✦ Learn about a file sharing utility.

Anticipated Learner Outcomes

As a result of this activity, students should develop an understanding of:

✦ Cloud computing.
✦ How to install multiple guest OS in a host OS using VMware player to introduce virtualization; the key concept behind cloud computing.
✦ How to create an account in a file sharing utility such as CloudMe.

Lesson Activities

Students learn how cloud computing impacts the present world. This lesson plan enables students to use cloud facilities like CloudMe, and teaches them to install and run multiple operating systems in a host OS. They also work in groups and share their experiences with the class.

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Resources/Materials
✦ Teacher Resource Documents (attached)
✦ Student Worksheets (attached)
✦ Student Resource Sheets (attached)

Internet Connections
✦ Wikipedia-http://en.wikipedia.org/wiki/Cloud_computing
✦ IBM cloud computing-http://www.ibm.com/cloud-computing/us/en/
✦ Salesforce-http://www.salesforce.com/cloudcomputing/
✦ How Stuff Works-http://computer.howstuffworks.com/cloud-computing/cloud-computing.htm
✦ PC Magazine-http://www.pcmag.com/article2/0,2817,2372163,00.asp

Recommended Reading
✦ Cloud computing bible (ISBN-978-0-470-90356-8)
✦ Cloud Computing for dummies (ISBN-978-0-470-48470-8)
✦ The cloud at your service (ISBN-978-1-935182-52-8)

Optional Writing Activity
✦ Write an essay or a paragraph exploring the early history and future applications of cloud computing.

Credits
✦ Lesson developed and submitted by Roshan Issac, IEEE Kerala Section Student Member.

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◆ **Lesson Goal**

Students explore how technology can positively impact the world by learning about cloud computing. Students explore virtualization, the key technology behind cloud computing, by using VMplayer. They learn how to install multiple guest OS in a host OS, explore current applications, and work as part of an "engineering team" to brainstorm other applications of cloud computing which could solve world problems. Student teams present their new applications to the class.

◆ **Lesson Objectives**

✦ Learn about cloud computing.
✦ Learn about the current trends in computing and its future scope.
✦ Learn how to install multiple guest OS in a host OS (virtualization, key concept behind cloud computing).
✦ Learn about a file sharing utility.

◆ **Materials**

• Student Resource Sheets
• Student Worksheets
• Personal computer or laptop with internet connectivity.

◆ **Procedure**

1. Show students the student reference sheets. These may be read in class or provided as reading material for the prior night's homework.

2. Divide students into groups of 2-3. Provide each group with a computer or laptop with Internet connectivity.

3. Groups should complete the following steps to gain familiarity with virtualization and cloud computing.

Installing VMware player.

Step 1: Download VMware Player (Go to https://my.vmware.com/web/vmware/free#desktop_end_user_computing/vmware_player/5_0) to download the latest version of VMware Player. (It takes 10 to 15 minutes for downloading)

Step 2: Install VMware Player 5.0

• Double click on executable file (VMware-player.exe) to start installation

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- Click "Next" to continue.

- Click "Next" to install VMware Player to the default folder.

- Click "Next" and then click "Install" to start installation

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- Click "Finish" to complete your installation successfully.

Step 3: Check the installation

Go to Start -> Programs -> VMware -> VMware Player

Installing a guest OS (suppose our host OS is windows XP)

Step 1: Open VMware player.

**step 2**: Upon starting VMware, click on the "New Virtual Machine" button

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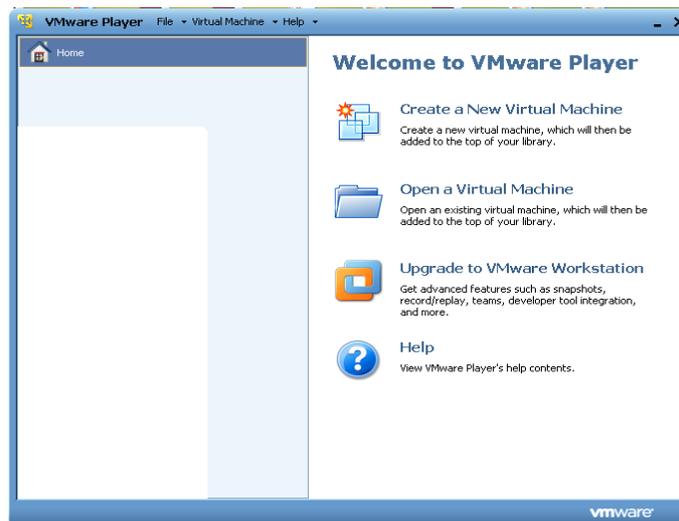
Step 3:
When the wizard opens up, select the source of the ISO image of the operating system. (here I am installing lupu-linux a light weight OS, the ISO image of it can be downloaded from (http://puppylinux.org/main/Download%20Latest%20Release.htm#lucidpuppy)
Then click "Next".
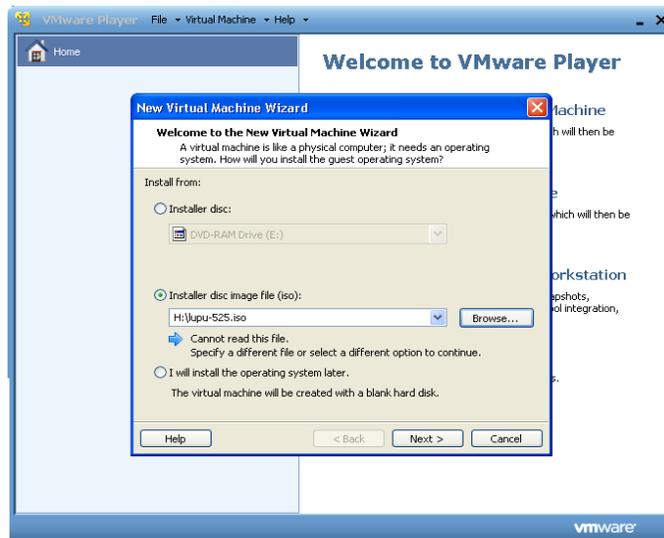
Step 4:
Select which operating system you are installing and also its version. Here I am installing lupu, so the guest operating system is Linux.
Then click "Next"

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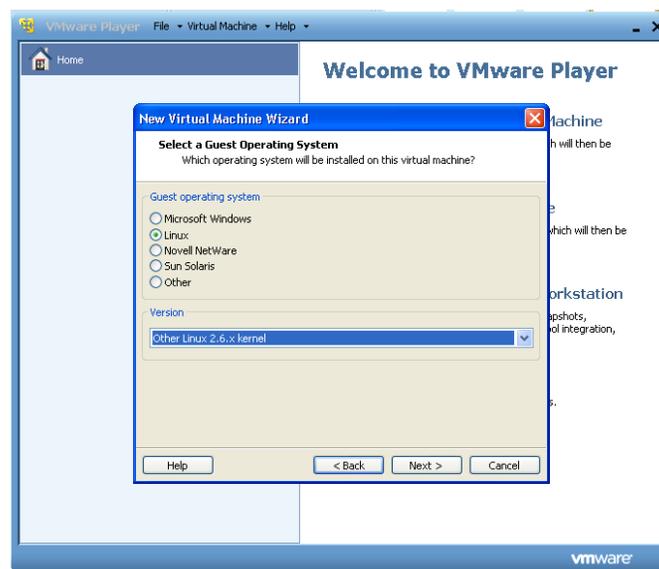
Step 5:
Give a name to the OS and the path in which the guest OS should be installed.
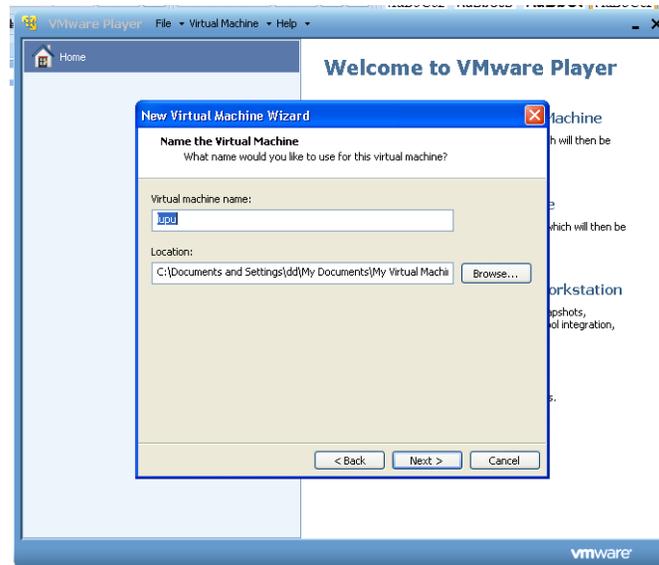
Step 6:
Select the disk size, and select "store virtual disk as a single file".

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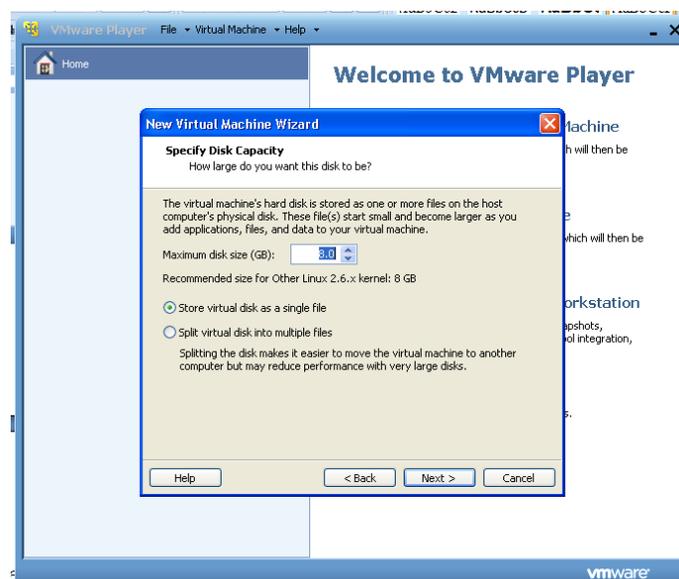
Step7:

Click "Finish"
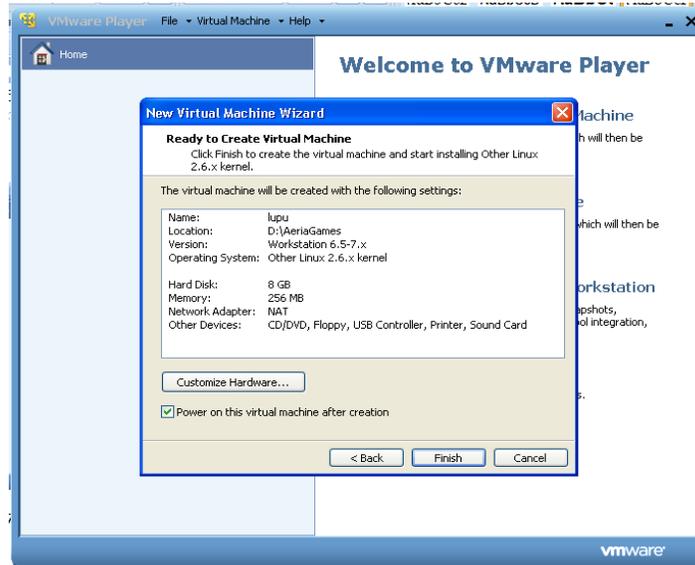
Step 8:
Wait for the installation to complete. Then you will get a window like below.

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Opening an installed guest OS.

Step1:
Open VMware player, select lupu and click on "play virtual machine".
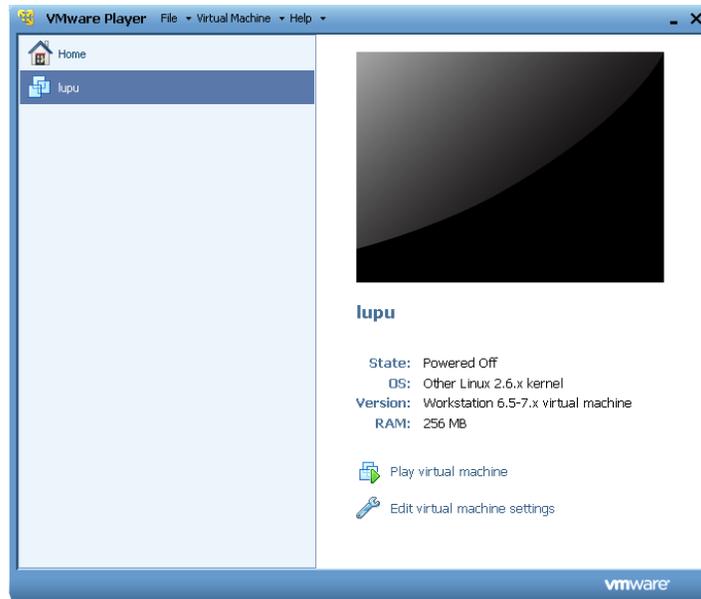
Creating an account in CloudMe (Internet connection needed)

Step1:
Go to the link http://www.cloudme.com/en

Step2:
On that page click on "free sign up".

Step3:
Enter the required details.

Step4:
Then click on "sign up".

Step 5:
When it's all done, you can then sign in with your username and password to experience the world of cloud computing and its services.

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4. Student teams should work together to brainstorm the disadvantages of cloud computing and some possible solutions.

5. Student teams should then complete a presentation plan, present their recommendations to the class, and evaluate the ideas of other teams in the class. At the presentation, depending upon the software available in your classroom, the students might create PowerPoint presentations or posters outlining their proposal.
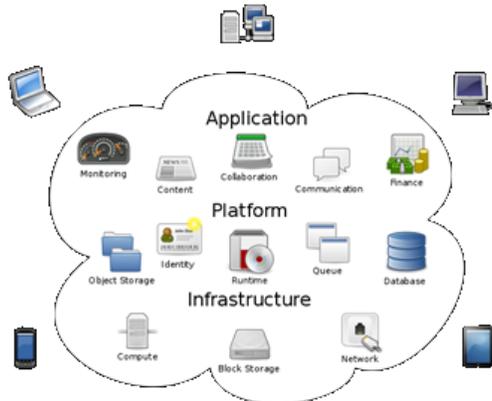

◆ **Time Needed**

✦ One hour session.

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Computing in the Cloud...

Cloud computing is the emerging buzz word in information technology. It consists of a virtual pool of resources such as storage, CPU, networks and memory to fulfill users' resource requirements and provides on demand (pay per use) hardware and software without barriers. It is also called dynamic computing because it provides resources when required (dynamically). Internet services are available in a distributed manner. To be able to use these services feasibly is a concern, because when resources become idle, they are costly and increase the budget of an organization. The solution to this problem is cloud computing, especially now when the world is facing financial crises. Using cloud computing, an organization can run their applications on a shared data center. Start-up is quick and costs are reduced because there is no need for: servers are storage, technical teams to keep it up and running, or upgrades. To use an application that is run on the cloud, all that needs to be done is to login with a username and password, customize it, and start using it. That's the power of cloud computing.

Cloud computing can be used for business applications, which is called enterprise cloud computing. Businesses run all kinds of applications on the cloud, including custom built applications. The cloud is economical since there is not a need to pay for people, products, and facilities to run it. They are also more scalable, reliable and secure. This is because cloud computing is based on an architecture called multi tenancy. With multi tenancy everyone shares one application, but it can be customized to individual users' specific needs. Applications do not need to be purchased, but are rolled up into a monthly subscription. Only services that are used are paid for.

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Student Resource:
Different types of cloud:

A:Private cloud

A private cloud is a proprietary architecture subscribed to by an organization. It provides hosted services to the users within the organization. This is protected by the firewall to form a barrier against the outside the world to access hosted services from the private cloud.

B. Public cloud

A public cloud is not proprietary of any organization. The services provided in these clouds can be accessed by any organization.

C. Hybrid cloud

In a hybrid cloud, the services are offered to a limited and well defined number of parties. A hybrid cloud allows the Internet to be used as a desktop.

Many organizations like Amazon, Google, and Microsoft have started implementing cloud computing. In cloud computing, various service providers participate to provide services like storage, network, CPU, hardware and software etc. If a user doesn't have storage on a personal computer, storage on the cloud can be utilized. The same type of service is provided by Flickr.com, which can be used to upload images on Flickr's server. The service can be used on a desktop, but the Internet is required when images are to be processed on the desktop. Google Apps is used to create documents online. These types of services are available on the cloud. Some sites like result sites are busy at specific times. They consume resources and may fail because of increasing load handled by limited computing power. These services can be provided through clouds. If they are free, then their resources could be used somewhere else. But when they are busy, they can use the resources of the cloud to avoid a failure situation. Cloud computing is not limited to specific data centers because it can use many data centers distributed in various geographical locations.

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A. SaaS

SaaS stands for Software as a Service. Service providers provide software services in the cloud. Users access these services as software and can do work without installing the same on the local machine. Google Apps provides such services to create documents and spreadsheets online without having to install any document or spreadsheet application. Salesforce.com also provides software as a service.

B. PaaS

Platform as a Service allows users to use cloud computing for developing any application using a development kit provided by cloud computing. Users are not required to install the development kit on a local machine. Installed software or a development kit can be used in cloud computing to develop any program. Oracle involves providing platform as a Service.

C. IaaS

Infrastructure as a Service enables the installation and execution of software. Here, users can gain access to a virtualized server. IaaS targets operating systems, hardware, CPUs and embedded systems, networks and storage. This enables a homogenous virtualized environment, where specific software can be installed and executed. Amazon is one company that provides infrastructure as a service.

Advantages:

• Faster, simpler and cheaper services

• Highly elastic because resources are easily released or occupied on the basis of demand.

• Optimized utilization of computing resources.

• Users have more resources such as unlimited storage etc.

• Everything is provided as a service.

• Less power consumed on hardware and software

• High availability and scalability

• No data loss

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Virtualization, in computing, is the creation of a virtual (rather than actual) version of something, such as a hardware platform, operating system, a storage device or network resources. Virtualization is one of the key enablers of cloud computing. Virtualizing hardware and applications and consolidating them, aims to reduce IT Infrastructure costs (which includes purchasing hardware and maintaining it), and allowing easier management of resources in the data center. The IaaS model of the cloud deals with provisioning of computing capacity, storage and networking resources. Infrastructure costs are reduced by virtualizing hardware, thereby avoiding under-utilization of resources. As a result, multiple applications can be virtualized over the same physical hardware ensuring optimal usage of resources. The other terms that we often hear in w.r.t cloud computing are 'on-demand' and 'elasticity'. These two terms go hand-in-hand; on-demand refers to a 'pay-as-you-go' model. You need to pay only for the resources you use, and elasticity refers to scaling up/down the resources at will. In the context of cloud computing, the virtualization lifecycle comprises a set of technical assessment activities which are governed by business and operational decisions. Technical assessment for virtualizing candidates revolves around meeting end-user Service Level Agreements (SLA's), reducing IT costs, and designing an optimized data center. Every phase in the virtualization lifecycle for cloud computing is highly challenging with a wide variety of complex and open problems which are currently being tackled.

VMware Player is a free desktop application that lets you run a virtual machine on a Windows or Linux PC. VMware Player provides an intuitive user interface for running preconfigured virtual machines created with VMware Workstation, GSX Server, and ESX Server. VMware Player includes features that let you configure virtual machines for optimal performance and take advantage of host machine devices. VMware Player makes your VMware virtual machines accessible to colleagues, partners, customers, and clients who do not own VMware products. By downloading VMware Player, anyone can open and run compatible virtual machines. VMware Player is available as a free download for both Windows and Linux PCs.

CloudMe (formerly **icloud**) is an online computer, like an operating system running in the cloud with an AJAX-based remote web desktop. The CloudMe service is owned and developed by Xcerion, a Swedish company. It is accessible from both desktop operating systems and mobile operating systems using WebDAV. CloudMe is compatible with a variety of web browsers like Internet Explorer, Firefox and Google Chrome. The desktop and its applications are translated by its users to 30 languages . CloudMe is a free web-based file storage service that you can access directly from your mobile or your browser. This cloud-based service is focused on giving you anywhere access to your files online, thus the name - CloudMe.

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You are a team of engineers who is exploring concept of cloud computing.
You will brainstorm within your group to identify the disadvantages of cloud computing and find innovative solutions to them. You will then present your ideas on cloud computing using presentations and posters.

◆ **Research/Preparation Phase**

1. Review the various Student Reference Sheets to learn all about Cloud computing.

2. Visit the cloud tutorial website (http://thecloudtutorial.com) that
   illustrates the Cloud computing technology.

◆ **Investigation Phase**

1. Explore the applications of cloud computing by:

   • Finding out the different companies that provide cloud services.

   • Finding out the different applications of cloud computing.

   • Finding out the early history of cloud computing and how it came to the form it is in today. Incorporate any notes in the box below.

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◆**Investigation Phase (continued)**

- Answer the following questions -- be sure to discuss as a group!

1. Name some companies you know of that provide cloud services.

2. Explain what type of cloud services they are providing, e.g. SaaS, PaaS or IaaS?

3. What were the early forms of cloud computing and how did they evolve into the present state?

◆**Brainstorming as a Team**

1. Meet as a team to brainstorm the disadvantages of cloud computing and some possible solutions.

Sl.no	Disadvantages	Your innovative solutions

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Student Worksheet (continued):

◆**Presentation Preparation**

Prepare a presentation on cloud computing and present it in class. You can create posters which illustrate the use of cloud services websites like CloudMe.

◆ **Evaluation**
Complete the evaluation questions below:

1. What was the best application of cloud computing that you heard during your class presentations? Why?

2. How important of an invention do you think Cloud computing is? Why?

3. Can you think of other engineering achievements that have impacted the world? Which do you think has had the most positive impact on people?

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Note: All lesson plans in this series are aligned to the Computer Science Teachers Association K-12 Computer Science Standards, the U.S. Common Core State Standards for Mathematics, and if applicable also to the National Council of Teachers of Mathematics' Principles and Standards for School Mathematics, the International Technology Education Association's Standards for Technological Literacy, and the U.S. National Science Education Standards which were produced by the National Research Council.

◆ Standards for Technological Literacy – All Ages
The Nature of Technology

✦ Standard 2: Students will develop an understanding of the core concepts of technology.

✦ Standard 13: Students will develop abilities to assess the impact of products and systems

✦ Standard 17. Students will develop an understanding of and be able to select and use information and communication technologies.

◆CSTA K-12 Computer Science Standards Grades K-3 (ages 5-8)
5.1 Level 1: Computer Science and Me (L1)

✦ Computational Thinking (CT)
4. Recognize that software is created to control computer operations.

✦ Collaboration (CL)
1. Gather information and communicate electronically with others with support from teachers, family members, or student partners.
2. Work cooperatively and collaboratively with peers, teachers, and others using technology.

✦ Computers and Communication Devices (CD)
1. Use standard input and output devices to successfully operate computers and related technologies.

◆CSTA K-12 Computer Science Standards Grades 3-6 (ages 8-11)
5.1 Level 1: Computer Science and Me (L1)

✦ Collaboration (CL)

✦ Computer Practice and Programming (CPP)
1. Use technology resources (e.g., calculators, data collection probes, mobile devices, videos, educational software, and web tools) for problem-solving and self-directed learning.
7. Use computing devices to access remote information, communicate with others in support of direct and independent learning, and pursue personal interests.
8. Navigate between webpages using hyperlinks and conduct simple searches using search engines.

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◆**CSTA K-12 Computer Science Standards Grades 3-6 (ages 8-11)**

5.1 Level 1: Computer Science and Me (L1)

✦ Computers and Communication Devices (CDD)
1. Demonstrate an appropriate level of proficiency with keyboards and other input and output devices.
4. Identify that information is coming to the computer from many sources over a network.

✦ Community, Global, and Ethical Impacts (CI)
3. Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and biases that occur in electronic information sources.

◆**CSTA K-12 Computer Science Standards Grades 6-9 (ages 11-14)**

5. 2 Level 2: Computer Science and Community (L2)

✦ Collaboration (CL)
3. Collaborate with peers, experts, and others using collaborative practices such as pair programming, working in project teams, and participating in group active learning activities.
4. Exhibit dispositions necessary for collaboration: providing useful feedback, integrating feedback, understanding and accepting multiple perspectives, socialization.

✦ Computers & Communications Devices (CD)
1. Recognize that computers are devices that execute programs.

✦ Community, Global, and Ethical Impacts (CI)
4. Evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems.

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