

# Integrating Technology with PBL



*Institute for Transforming  
Undergraduate Education*

*University of Delaware*



PBL2002: A Pathway to Better Learning

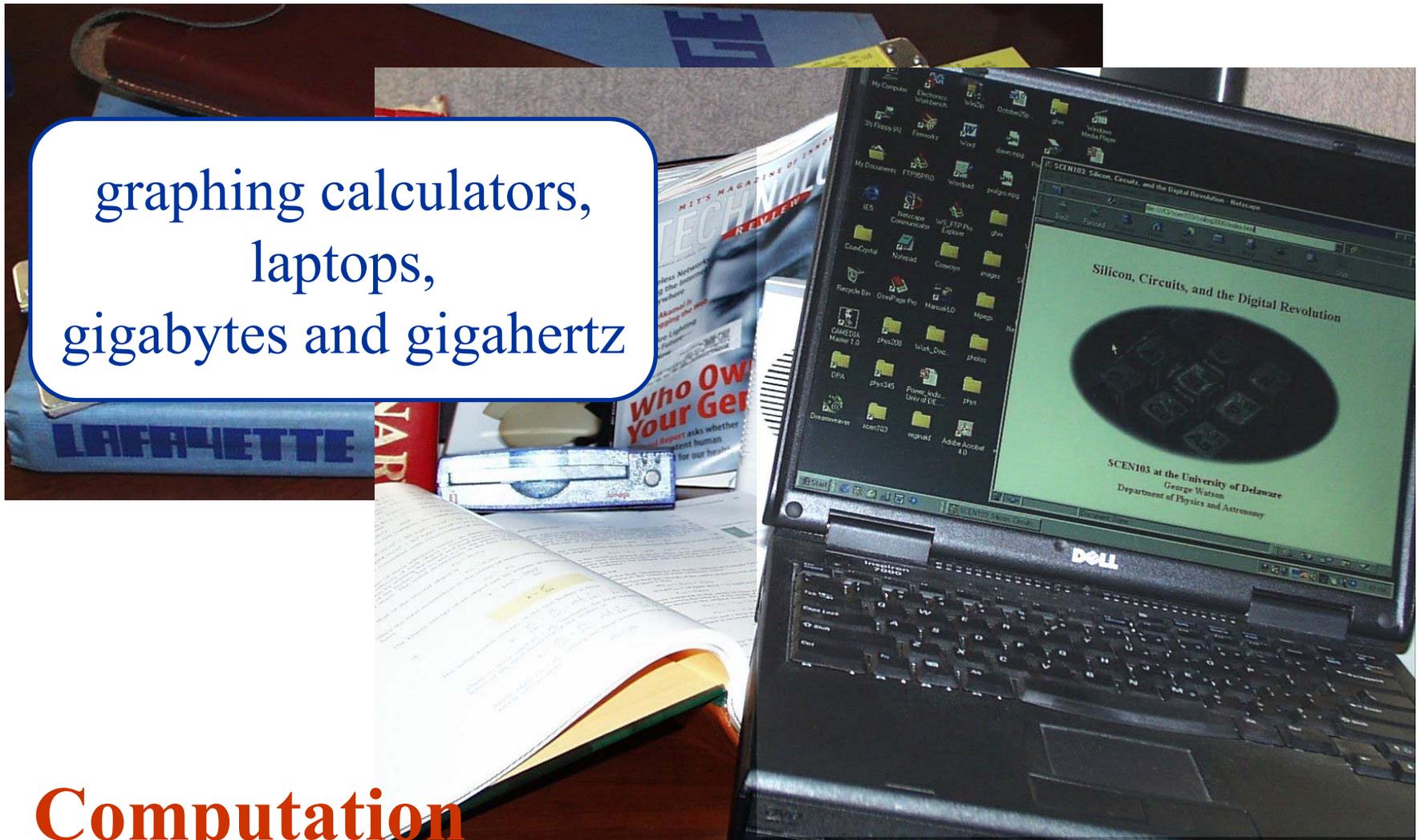
June 16-20, 2002

# The Way It Was...

1973

2000

graphing calculators,  
laptops,  
gigabytes and gigahertz



Computation

# The Way It Was...

1973

2000

e-mail,  
voice-mail,  
chatrooms,  
FAX,  
pagers,  
cell phones  
instant messaging,  
wireless connectivity



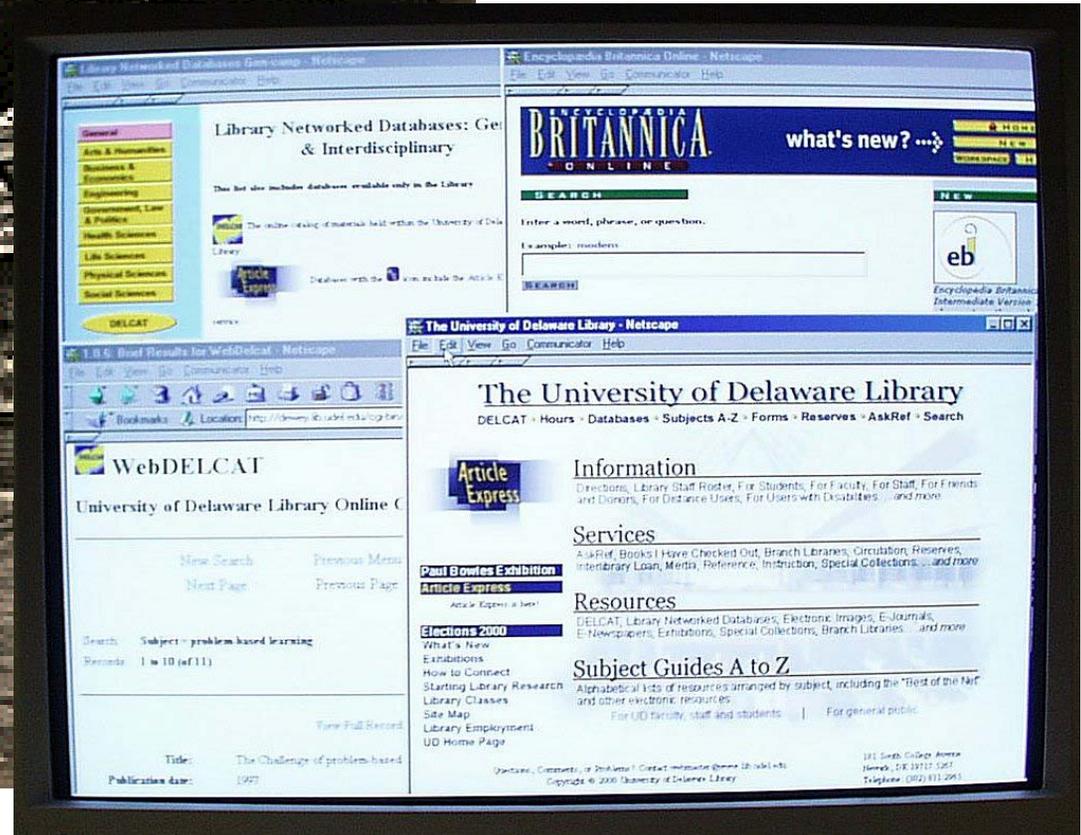
Communication

# The Way It Was...

## 1973

## 2000

**Online Information:**  
web catalogs,  
networked databases,  
Britannica Online,  
online newspapers,  
course websites,  
CMS



# Collections

# **Problem-Based Learning and the Cs of Technology:**

**Computation and Calculation**

**Communication and Collaboration**

**Collections and Connections**

# The Way It Was...

## 1973

8-track tapes and LPs

Student theater

Dorm keys

Cash and money orders

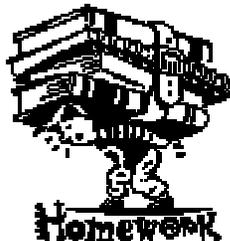


Chalkboards

Textbooks

Bookstores

Registration lines



## 2000

Compact Disks and MP3

DVDs

PDI access

ATM and Flex

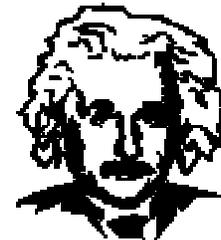


Multimedia

CD ROMs & web

.com

SIS+



**The question for this session:**

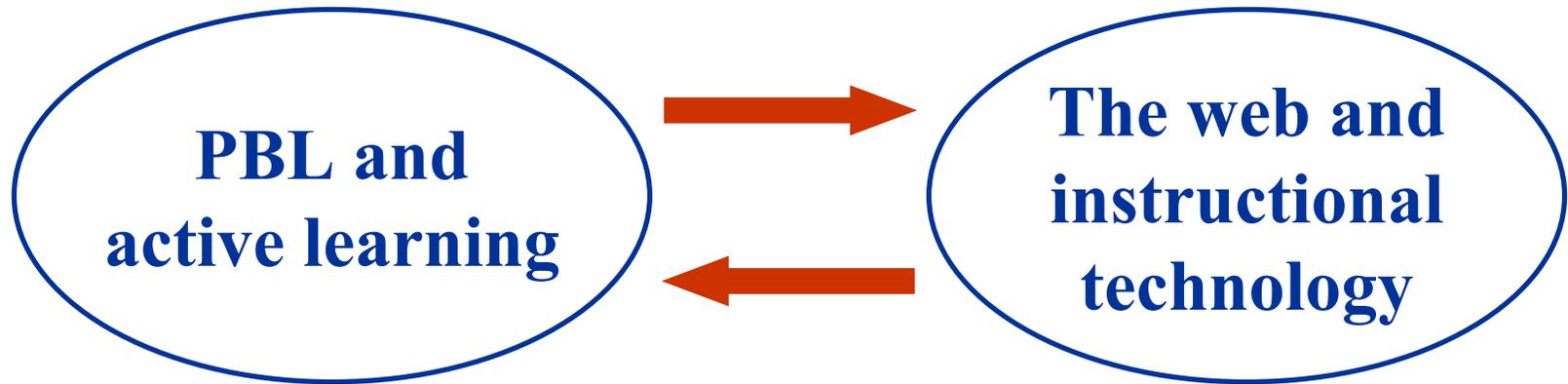
**Given the amazing advances in  
technology**

**and the dramatic change in the first-  
year experience,**

**Can we afford to continue teaching  
the way we were taught?**



# “Marriage” of PBL and technology



**How can technology aid student learning in a PBL course?**

**How can PBL aid students in using technology to learn?**



## **Silicon, Circuits, and the Digital Revolution**



[www.physics.udel.edu/~watson/scen103/](http://www.physics.udel.edu/~watson/scen103/)

**SCEN103 at the University of Delaware**  
**George Watson**  
**Department of Physics and Astronomy**



Syllabus

Announcements

Assignments

Classes

# PHYS345 -- Fall 1999

## ELECTRICITY and

[www.physics.udel.edu/~watson/phys345/](http://www.physics.udel.edu/~watson/phys345/)

## ENGINEERS

Department of Physics and Astronomy

UNIVERSITY OF DELAWARE

Archived course pages from Fall 1998

Comments, suggestions, or requests to [ghw@udel.edu](mailto:ghw@udel.edu).

"<http://www.physics.udel.edu/~watson/phys345/>"

Copyright George Watson, Univ. of Delaware, 1998.



Syllabus

Announcements

Assignments

# PHYS208 -- Spring 1998

## Fundamentals of Physics II



[www.physics.udel.edu/~watson/phys208/](http://www.physics.udel.edu/~watson/phys208/)

Resources



Fall 1997

UNIVERSITY OF DELAWARE

Department of Physics and Astronomy

Comments, suggestions, or requests to [ghw@udel.edu](mailto:ghw@udel.edu).

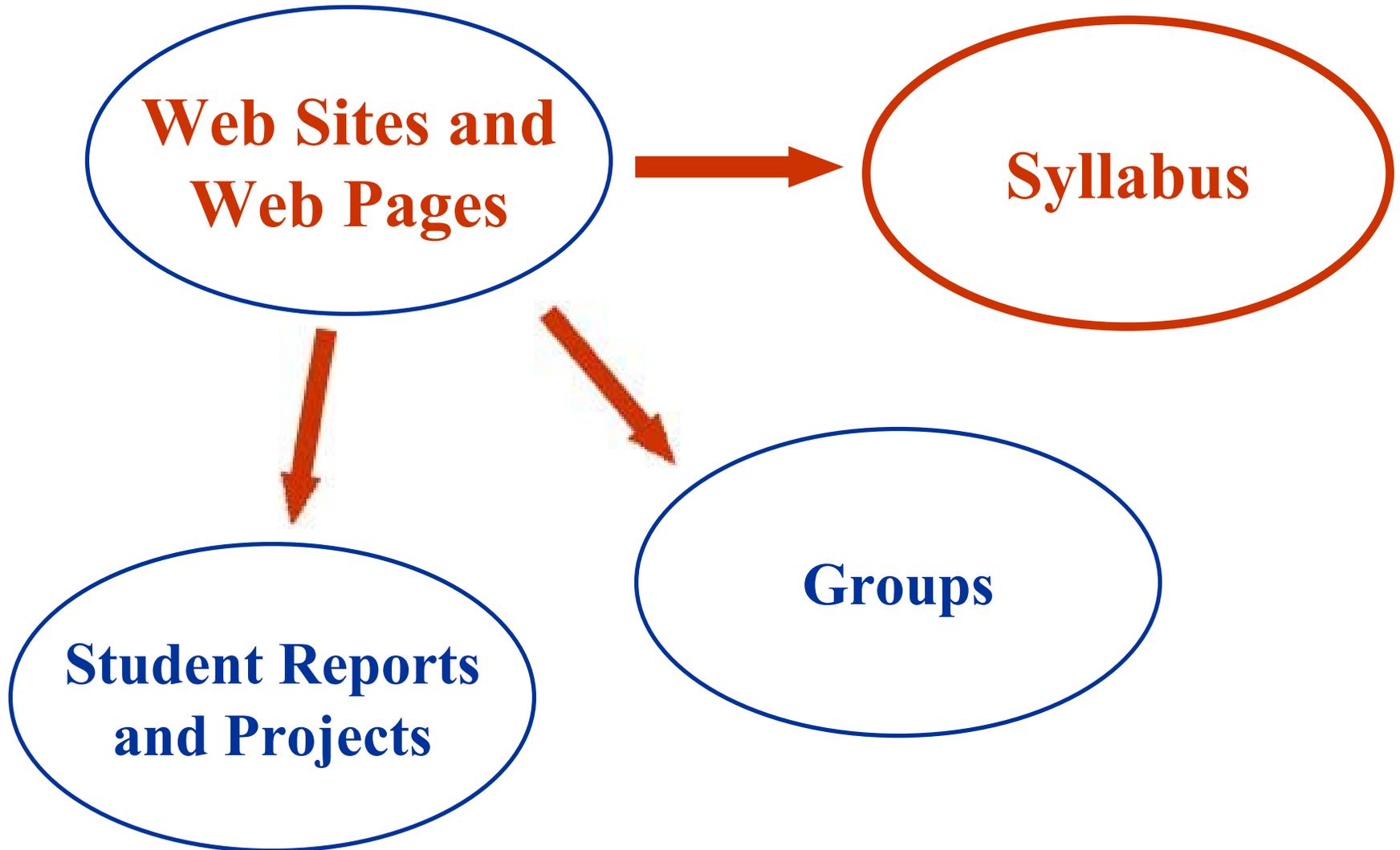
"<http://www.physics.udel.edu/~watson/phys208/>"  
Copyright George Watson, Univ. of Delaware, 1997.

# Organizing the Course

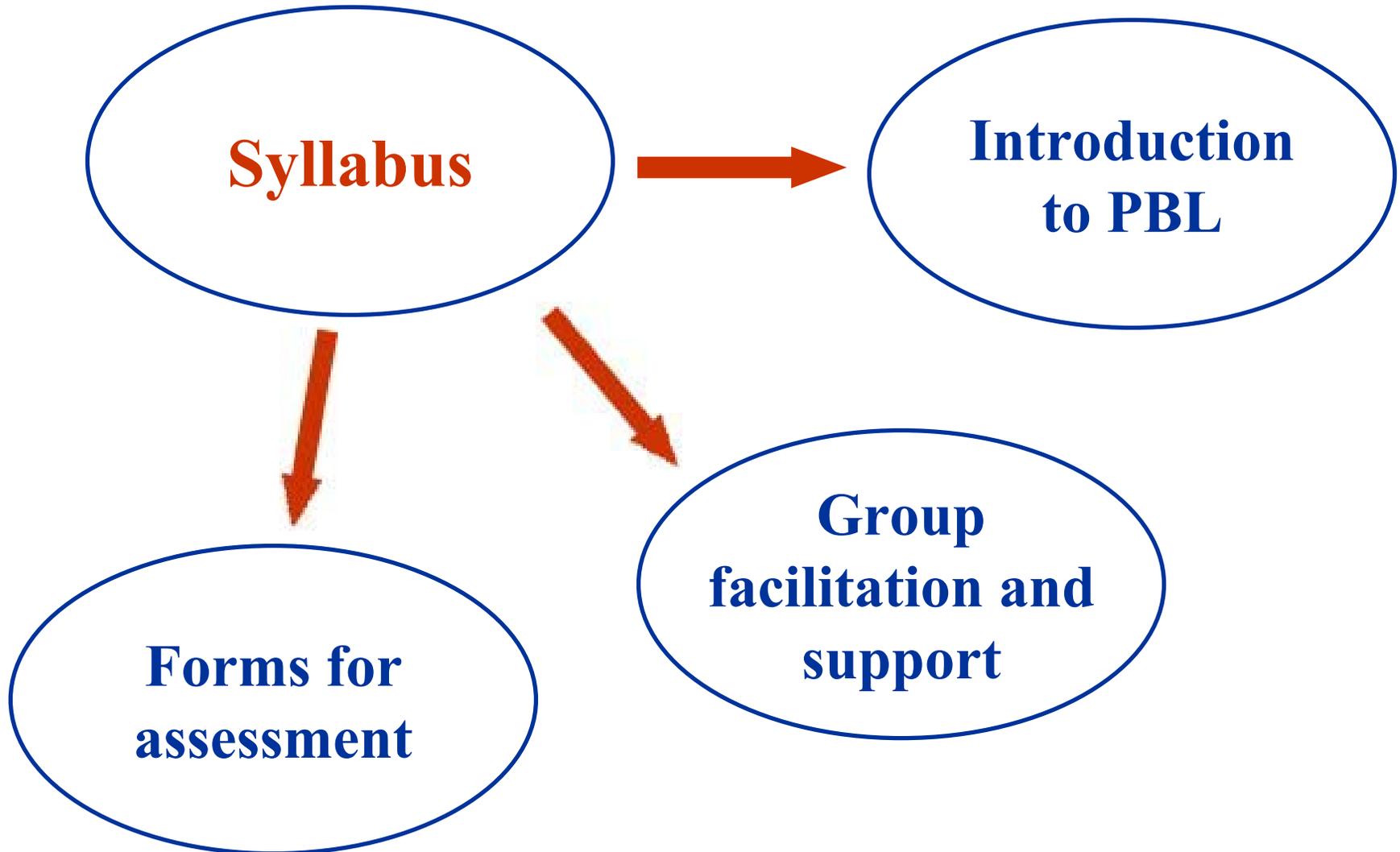
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## Utilizing Online Resources

# Organizing the Course



# Organizing the Syllabus



# Silicon, Circuits, and the Digital Revolution

## Spring 2000

Technology -- a means to an end, not an end in itself...

This Honors colloquium introduces first-year students to some of the science behind high technology. Designed to promote scientific and computer literacy and awareness, it gives students an opportunity to leverage their interests in everyday devices and high-tech objects into a study of fundamental science concepts. Live demonstrations, in-class group explorations of technology applications, and daily work with the Internet are essential elements of this course. A key feature of the writing-intensive work for this colloquium will be the students' setup and development of a personal website. Working in small groups, students will also be creating websites devoted to a science and technology topic.

This year's colloquium has also been designed as a pilot **Pathways Course** during the discussion of General Education Reform at the **University of Delaware**. Much of the learning this semester will be done with **problem-based learning**.

Search this site:



**Instructor:****George Watson**

ghw@udel.edu

**Office:**

Sharp Lab 232

**Phone:**

(302) 831-6677

**Peer Tutors:****Diana Waxman**

dgw@udel.edu

**Scott Moser**

smoser@udel.edu

**Office Hours:**

I will generally try to be available in my office on Tuesday 1:30-2:30pm and Thursday 10:30-11:30am; other times are possible by prior arrangement. Please contact me via e-mail to confirm that I will be available during the scheduled office hours. I check my e-mail several times during the day and evening, so often a simple question can be answered without a visit. I am available to discuss course material, issues in science and technology, and university life in general.

**Spring 1999 Course Pages****My Instructional Philosophy****Course Objectives****Pathways Courses and General Education Reform at UD****Problem-Based Learning****Working in Groups****Assessment of Individual Performance in Groups**

# Silicon, Circuits, and the Digital Revolution

## Problem-Based Learning

This course relies heavily on problem-based learning (PBL). You will work on and solve real world problems. By using PBL in SCEN103, you will learn to find and evaluate scientific and technical information, and communicate that information and technology to others. Discussions led by the course instructor, plus group work, will give a context and conceptual framework to the problems.

The rate of generation of new information in the scientific and technical fields is increasing rapidly. Information becomes outdated rapidly and is updated constantly; much of the information in the workplace following graduation has not been generated yet! Thus identifying what information is needed, where to find it, how to analyze it, and how to communicate it effectively are essential skills to learn in college. An important result of PBL is that while problems are used to identify what to learn, the process of learning "how to learn" is also developed. This method of instruction has been chosen to help you develop skills important for success both in your undergraduate education and in your professional life following graduation.

Effective learning is much more than memorizing information to answer questions on examinations.

"Learning (is) a process that culminates in the ability:

- to ask the right questions and frame good problems,
- to acquire information and evaluate sources of information,
- to critically investigate and solve problems,
- to make choices among many alternatives,
- to explain concepts to others (both orally and in writing), and
- to generalize to new situations."

Ganter SL & Kinder JS, editors. Targeting Institutional Change: Quality Undergraduate Science Education for All Students. *Targeting Curricular Change: Reform in undergraduate education in science, math, engineering, and technology*. A report of the 1998 AAHE Conference on Institutional Change. The American Association for Higher Education.

## Introduction to PBL

# Silicon, Circuits, and the Digital Revolution

## Working in Groups

An important element in the success of this problem-based course is the use of student groups and how they function. Use of cooperative working groups in a science class fosters the development of a learning community and lessens the sense of isolation that students may otherwise feel. Research has shown that student achievement is enhanced when students work together in a cooperative learning environment, as opposed to students who try to learn the same material individually. Cooperative learning also increases the motivation to learn, and the interest to solve more complex problems. Social and team skills learned in student groups are important for success in the working world today. If this is your first time working in a learning group, or even if you have had many previous experiences, you will probably have questions or reservations about the process. Here are some examples of questions that you might have about working in groups, along with responses that may address those concerns.

1. I don't like to do all the work and let others take the credit. How can I prevent this?
2. I've been in groups before, and I don't like being shooed out by group members. OR  
I'm not really good in this subject and I'm afraid I'll let my group down.  
How can I change this?
3. What can I do to get group members to do their share of the work?
4. How can a group be fair about dividing up the work?
5. I'm trying to get into grad school, so grad school is my goal.  
What if I'm in a group with students that don't have the same goal?

**Group  
facilitation and  
support**

**Credits:** In these sections on working in groups, I have borrowed liberally from the writings and SCEN102 syllabus of Barb Duch (*Math/Science Education Resource Center*).



Comments, suggestions, or requests to [ghw@udel.edu](mailto:ghw@udel.edu).

"<http://www.physics.udel.edu/~watson/scen103/colloq2000/workingingroups.html>"

Last updated Feb 11 2000

## Assessment of Individual Performance in Groups

**Name of Person You Are Assessing:**

**Your Name:**

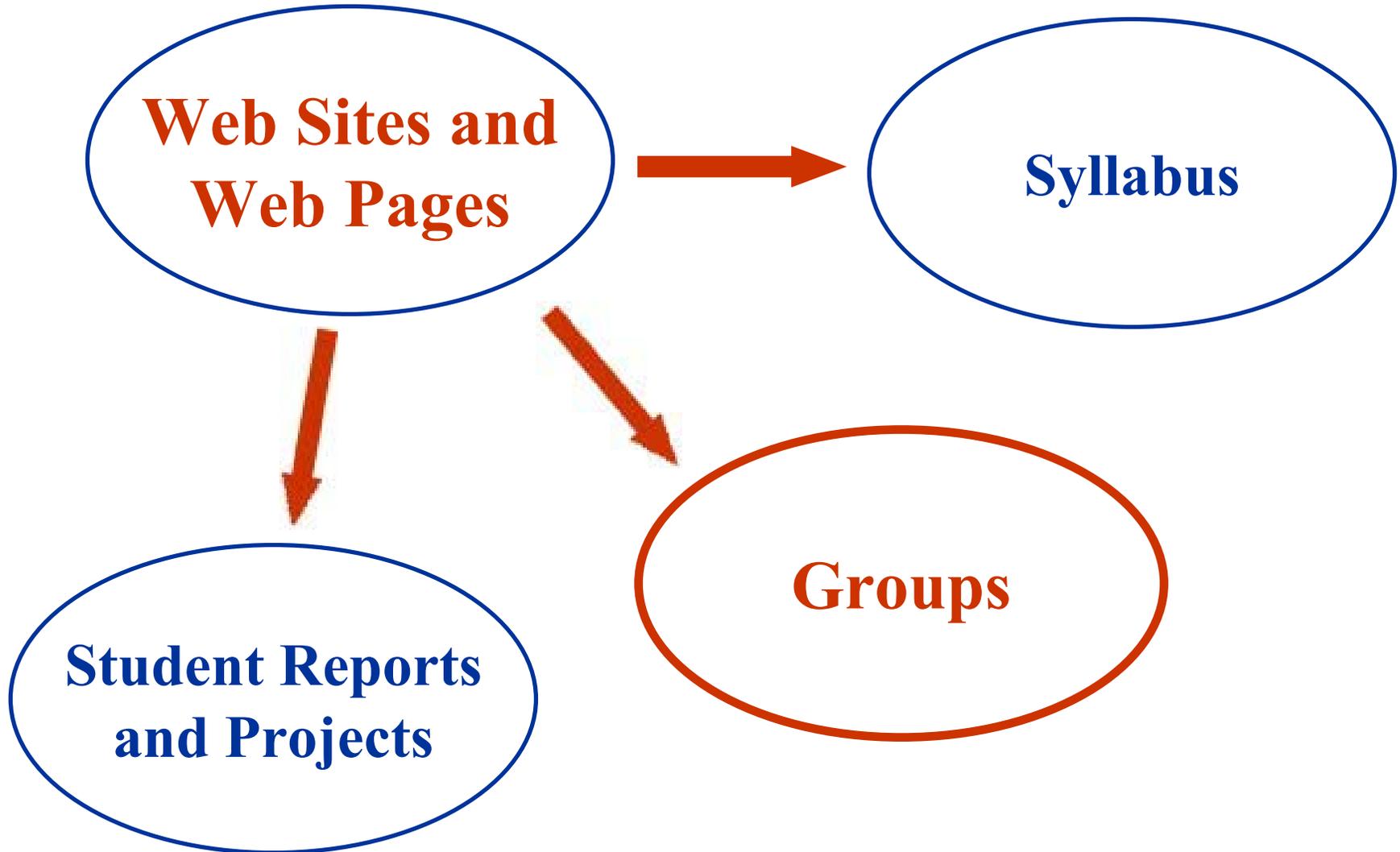
**Group Name:**

For each of the assessment categories below, place an "X" in the box that best indicates the extent to which you think that statement describes the person you are assessing. Fill one out for each member of your group *and* one for yourself. Forms are due at the start of class on the date given in the syllabus.

		strongly disagree	disagree	somewhat agree	agree	strongly agree
1.	Does not miss out on group activities by being absent.					
2.	Does not miss out on group activities by being late.					
3.	Finishes all jobs assigned by the group on time.					
4.	Comes to class having read the material necessary for advancing group discussion.					
5.	Listens well to others' presentations.					
6.	Contributes to the group's discussion.					
7.	Does not dominate the discussion.					
	Provides information to the group's					
	researching presentations.					
	ents.					
	clearer and deeper					
12.	and information clearly.					

Forms for assessment

# Organizing the Course



# Organizing Groups

**Groups**

```
graph TD; A([Groups]) --> B([Identity: Rosters, photos, addresses]); A --> C([Vehicles for collaboration]); A --> D([Vehicles for communication]);
```

**Identity:  
Rosters, photos,  
addresses**

**Vehicles for  
collaboration**

**Vehicles for  
communication**

# Silicon, Circuits, and the Digital Revolution

## Spring 2000 Groups

### *Instructor:*

George Watson      ghw

### *Peer Tutors:*

Scott Moser          smoser

Diana Wa

**Identity:  
Rosters, photos,  
addresses**



0926

***xdogs.com***

photo -  
gallery

Sec 80,  
Group A

XDGS

- Art Bookout      \* \* abookout
- Sarah Edward    \* \* sedwards
- Nick Renzette    \* \* nickrenz
- Jessica Seitchik \* \* jrabbit
- Cami Tarasewich \* \* camit



0960

***Blonder Tongue***

photo-  
gallery

Sec 81,  
Group A

BDR

- Evan Glien            \* rufnek
- Lindsay James      \* \* lajames
- Tim Lane              \* \* tlane
- Adam Whitlock      \* \* awhitloc



0958



0964

[Syllabus](#)[Announcements](#)[Assignments](#)[Classes](#)[Laboratory](#)[Sections](#)[Guidelines](#)[Schedule](#)[Resources](#)

# PHYS345 Electricity and Electronics

## Section 32, Thursdays 1:00-3:00pm



### Group 1

CLARK, Kim

hogger

GROSSER, Rich

skier

KOBETIS, Alex

akobetis

McDERMOTT, Daniel

bigblue



### Group 2

BIBB, Edgar

18247

BOGGS, Kenneth

speedrac

LABOY, Celestina

boricua

PETERKIN, Jermaine

peterkin



### Group 3

GORDON, Jeffrey

gordon

PUCHTLER, Michael

puck

SIMPSON, Daniel

ddsimpso

# Organizing Groups

**Groups**

**Student to  
student**

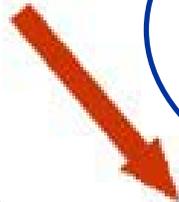
**Student to  
professor**

**Professor to  
group**

**Vehicles for  
communication**

**Student to  
group**

**Professor to  
student**



# Organizing Groups

**Groups**

bulletin boards,  
newsgroups

**Group to  
group**

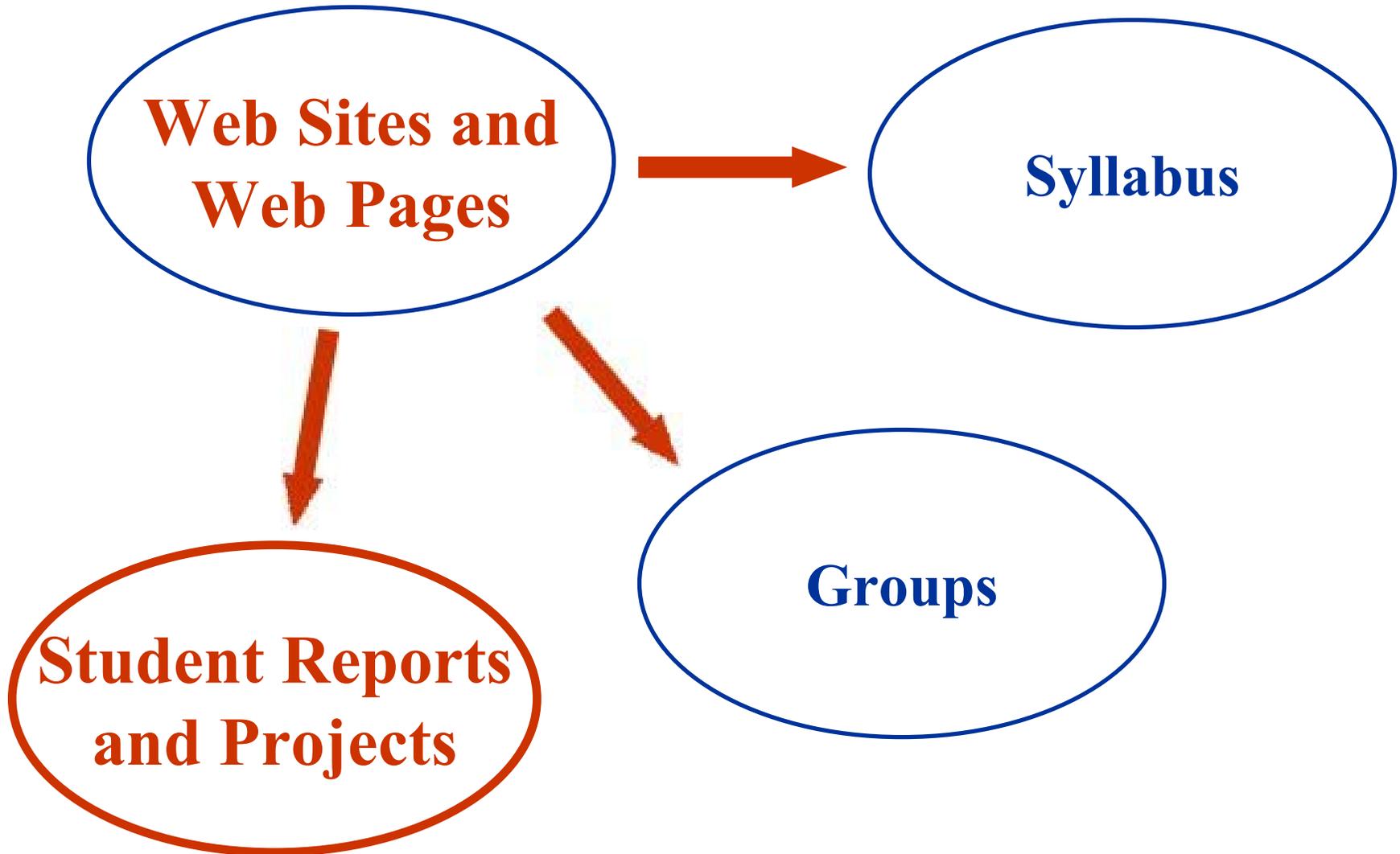
**Egroups.com**  
chatrooms,  
filesharing,  
scheduling meetings

**Vehicles for  
collaboration**

**Group to  
professor**

**CMS: WebCT**  
controlled discussion forums,  
collaborative space,  
whiteboarding

# Organizing the Course



# Big Brother Is Watching You



## Privacy

VIEWTECH

HACKING

&

PHH

BRYAN FAL

JEREMY

The Creators

lock

n

nes

e

tory



...s and are akin to piracy and

...public, and lawmakers are pretty well split over the issue of  
...e outcome may be, one thing is for sure, and that is that  
...music. Click the links below to learn more....

Technology  
and Social Context  
and Services  
sy Over MP3's

...was Used for this Project

## ZING Presents

Apollo

SkyLab

Apollo-Soyuz

Space Shuttle

Mercury

Mir

Gemini

Spin-off Technology



NASA

## Space Technology

# Organizing the Course

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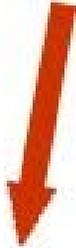
## Utilizing Online Resources

# Utilizing Online Resources

**Web Sites and  
Web Pages**



**Ingredients for  
writing problems**



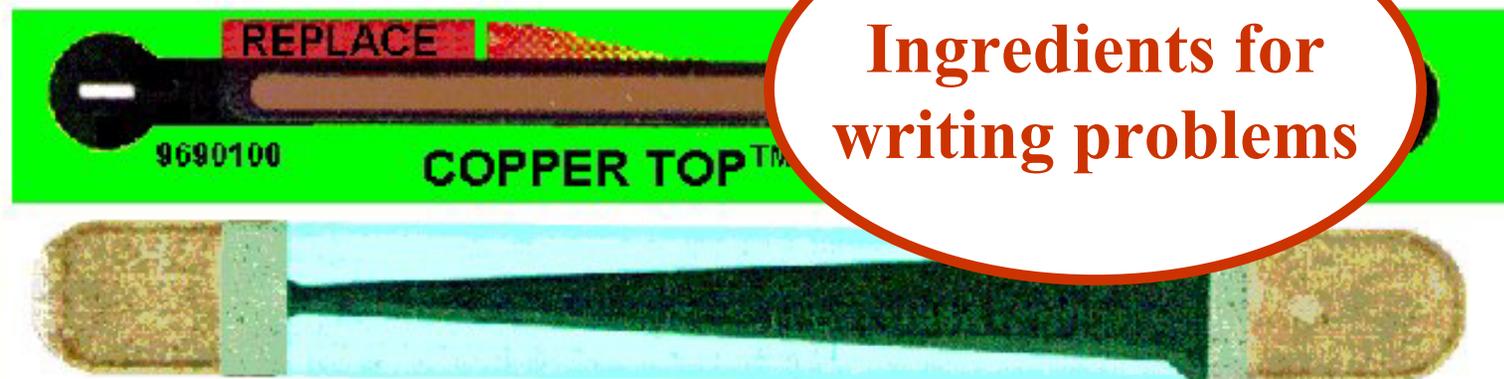
**Information for  
solving problems**



**Inspiration for  
designing problems**

## PHYS208 Fundamentals of Physics II

### Group Exercise 1: Battery Testers



Ingredients for  
writing problems

The underside of a Duracell Copper Top AA battery tester is shown in the magnified image above, along with the temperature display that is directly above it. Using simple circuit concepts, explain how this battery tester works.

For a related challenge, explain how the **9V tester** works.

### Related Resources:

[Duracell](#)  
[Energizer](#)



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Recitation

Resources

## PHYS208 Fundamentals of Physics II

### Group Exercise -- Punkin' Chunkin'



This weekend marks the 13th year of the Punkin' Chunkin' contest held in Sussex County, Delaware. The object of this contest is to propel, without use of explosives, an 8 to 10 pound pumpkin as far as possible; the 1996 record was 2,710 feet set by an air cannon from Illinois. This **record** was retaken by Delaware's Universal Soldier in 1997 with a launch of 3718 feet. There are several categories available: catapult, centrifugal, human-powered, youth, and longest overall toss.

Source: Wilmington News Journal, Sunday, Oct. 26, 1997.

I propose a new category -- electromagnetic... principles of PHYS208 (and PHYS207), design a punkin' chunkin'... Be as specific as possible, taking into consideration... ballistics as realistic as possible, and energy sources and... *we will be firing in the middle of a cornfield...*

**Inspiration for designing problems**

### Project Guidelines

### A Few Additional Resources:

[World Championship Punkin' Chunkin'](#) -- official homepage

[Snapshots of Punkin' Chunkin'](#)



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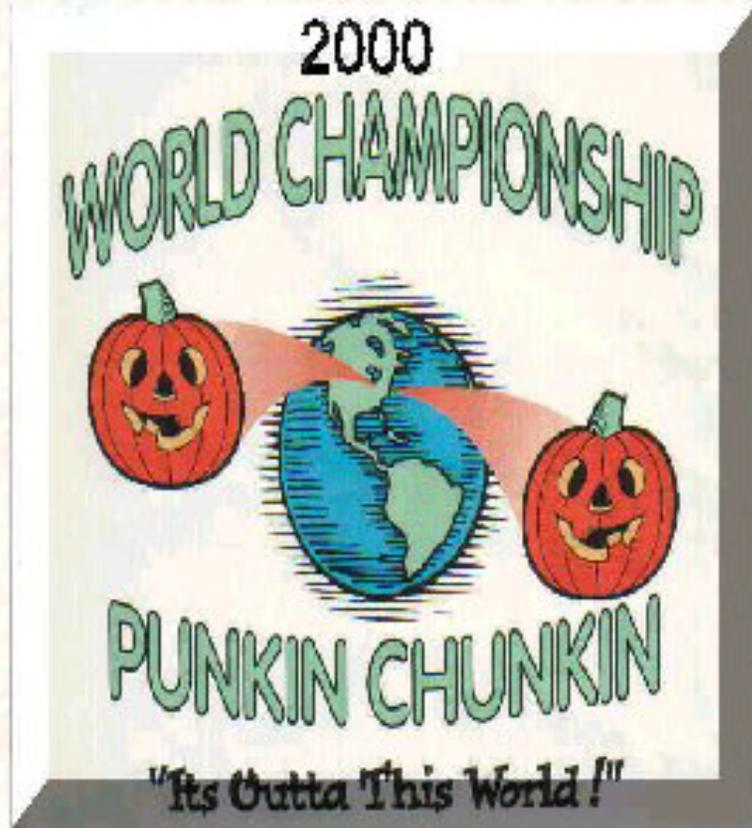
Recitation

Resources

# World Championship Punkin Chunkin

**November 3, 4 & 5, 2000**

- [2000 Schedule of Events](#)
- [1999 Results "see below for champs!"](#)
- [1999 Scenes](#)
- [Accommodations](#)
- [Directions](#)  
"Sussex County Delaware"  
"Hollyville Rd. & Harmony Rd near Millsboro"
- [Machine Registration](#)
- [Official Rules](#)
- [World Records from 1986-2000](#)
- [The Champions](#)



**Information for solving problems**

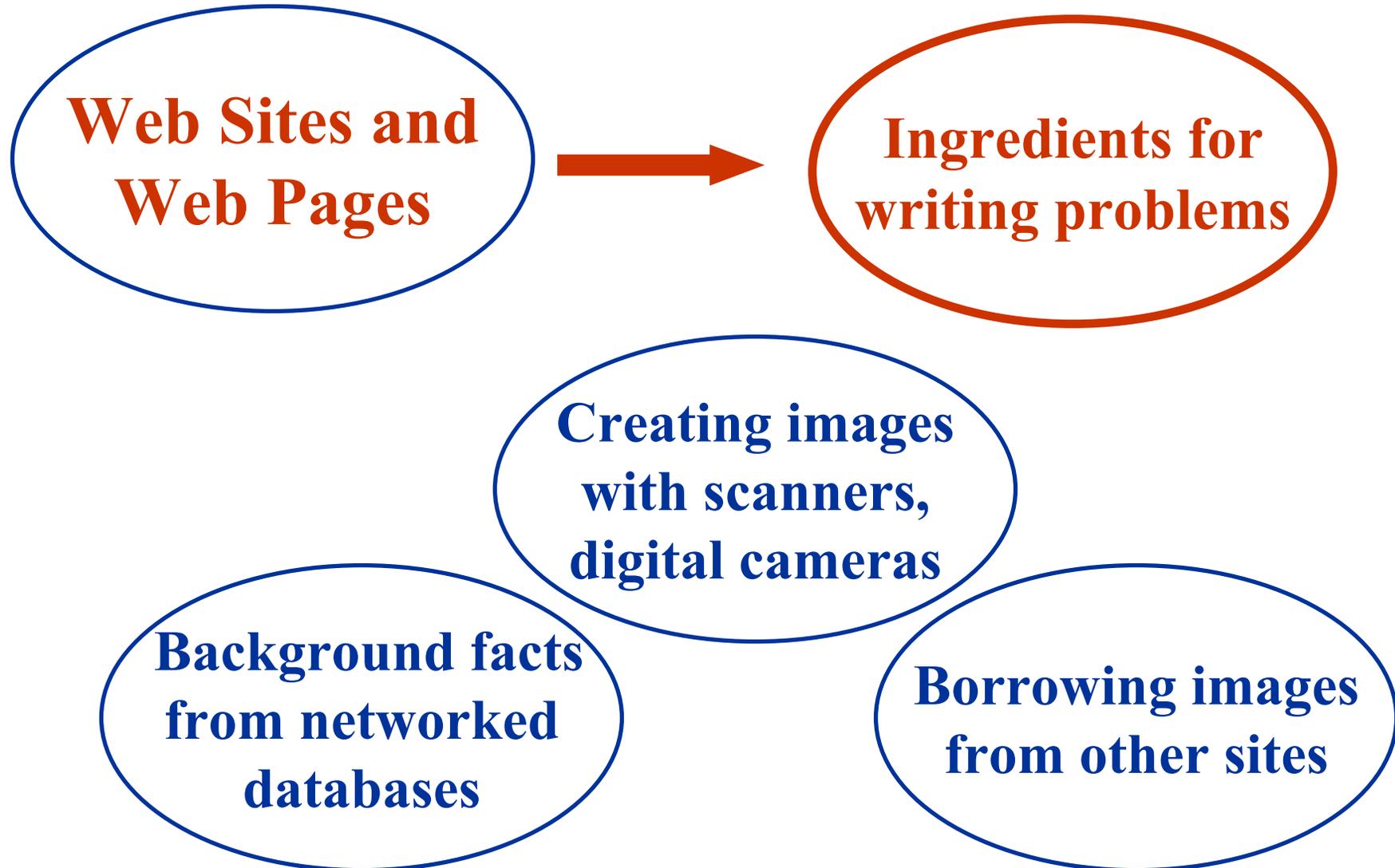
The Champions:

Air category: "Bad to the Bone"

Centrifugal: "Gene's Machine"

Catapult: "Gene's Machine"

# Utilizing Online Resources



# Utilizing Online Resources

**Web Sites and  
Web Pages**

**International  
newspapers for  
global view**

**Film and TV  
sites for scripts  
and characters**

**Inspiration for  
designing problems**

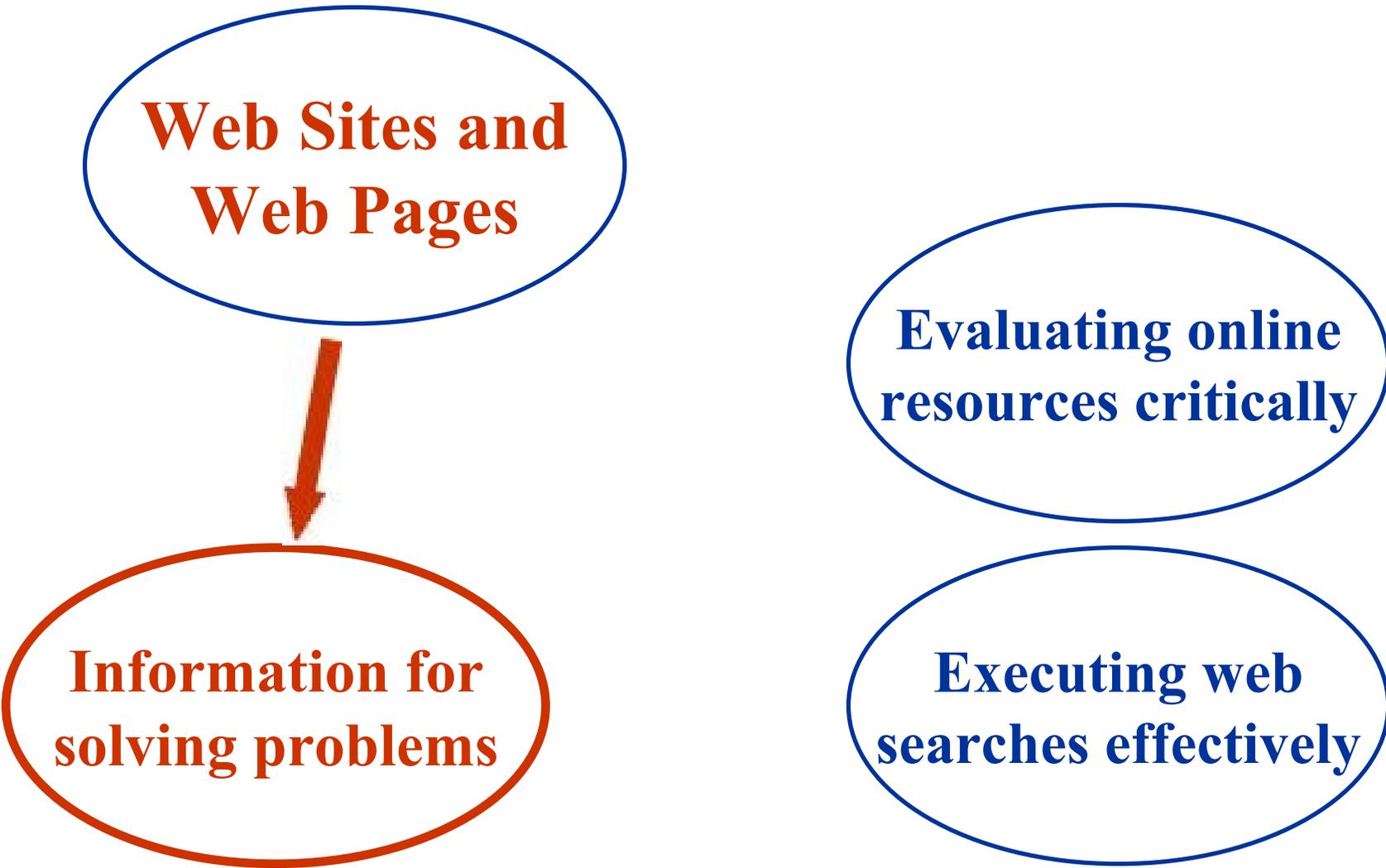
**Online regional  
newspapers for  
local perspective**

**Quack websites  
for “raw”  
material**



# Utilizing Online Resources

**Web Sites and  
Web Pages**



```
graph TD; A([Web Sites and Web Pages]) --> B([Information for solving problems]); C([Evaluating online resources critically]); D([Executing web searches effectively]);
```

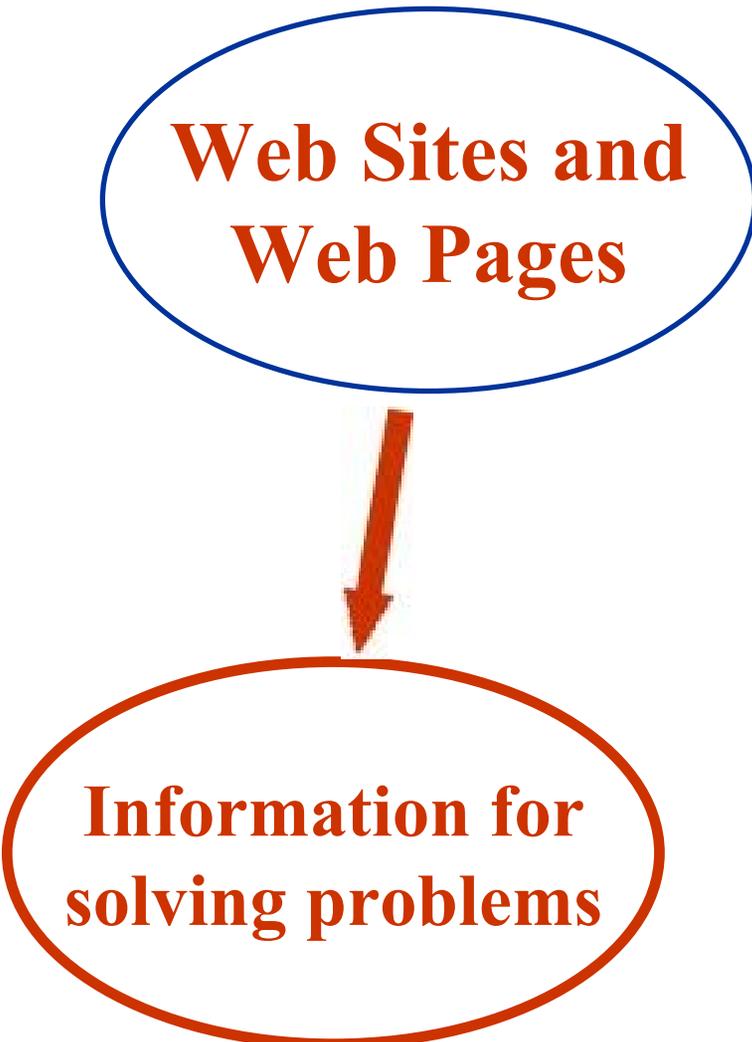
**Information for  
solving problems**

**Evaluating online  
resources critically**

**Executing web  
searches effectively**

# Utilizing Online Resources

**Web Sites and  
Web Pages**



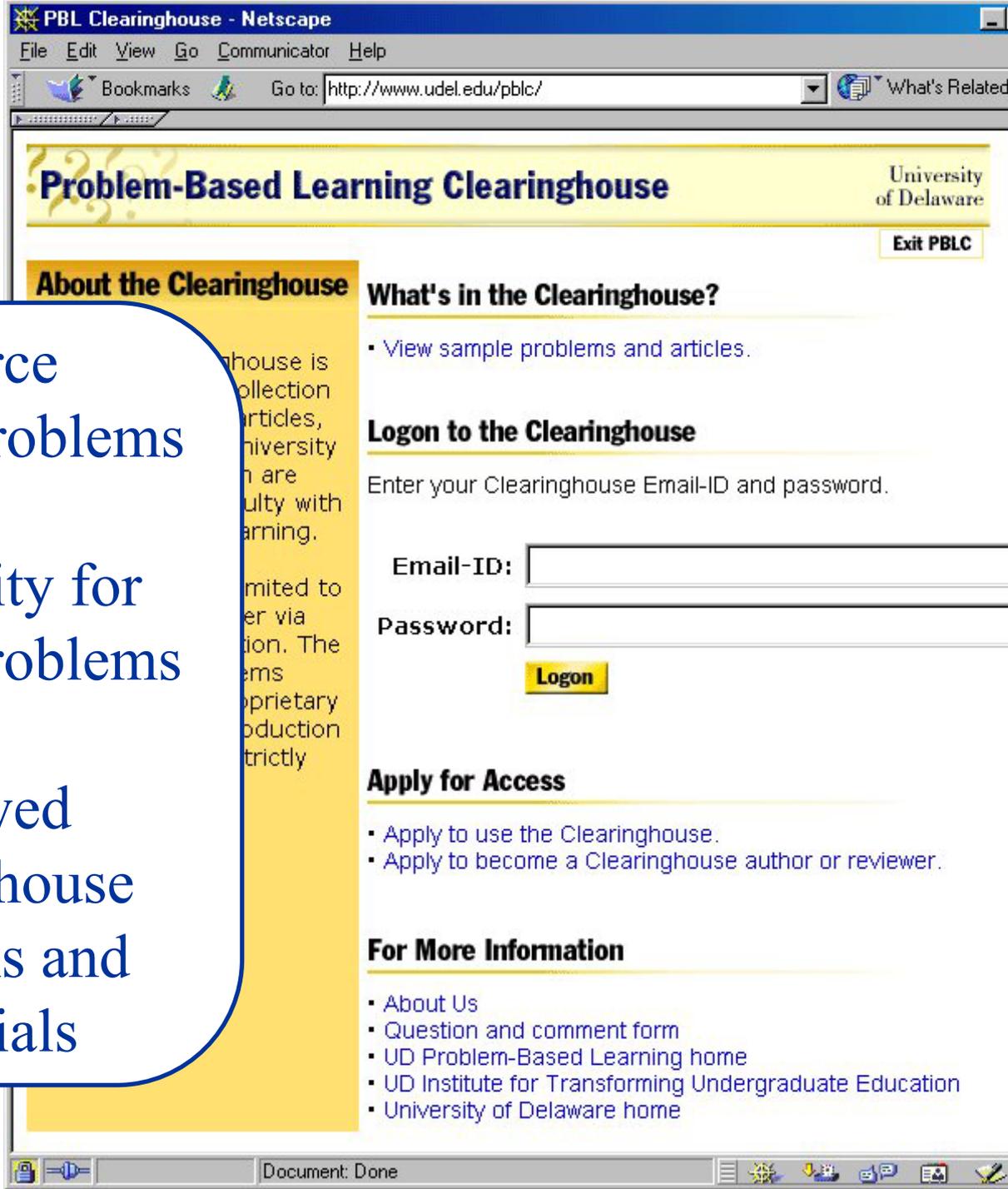
**Information for  
solving problems**

**Old thinking:**

The web is full of  
misinformation and  
biased representation  
Stay away!

**New thinking:**

Engage and develop  
critical thinking skills.  
The Internet Challenge!



A new resource  
for finding PBL problems

A new opportunity for  
publishing PBL problems

A peer-reviewed  
Online Clearinghouse  
of PBL problems and  
support materials

University of Delaware Problem-Based Learning Clearinghouse - Netscape

File Edit View Go Communicator Help

Bookmarks Go to: <http://www.udel.edu/pblc/> What's Related

# Problem-Based Learning Clearinghouse

University of Delaware

[Exit PBLC](#)

## Featured Problem



### A Day in the Life of John Henry, Traffic Cop

Last Friday at 13:20, a frantic call was received at the local police station. A serious automobile accident had occurred at the intersection of Main St. and State St., with injuries involved. Lt. John Henry arrived at the scene 10 minutes after the phone call and found that two cars had collided at the intersection.

## Search the Clearinghouse

for  by

Enter search string:

[GO](#)

Search entire text of problem or article for this string

## Browse the Clearinghouse

Choose one... Choose one...

**by Keyword**

**by Discipline**

**by Author**

A B C D E F G H I J K L M N  
O P Q R S T U V W X Y Z

## Et cetera

- [What's new in the Clearinghouse?](#)
- [Manage my Clearinghouse activities.](#)
- [View my favorites.](#)
- [Apply to become a Clearinghouse author or reviewer.](#)
- [Submit the question and comment form.](#)

[www.udel.edu/pblc/](http://www.udel.edu/pblc/)

# Computer Simulations

A wide variety of educational games exist that represent a PBL approach to learning <[www.legacyinteractive.com](http://www.legacyinteractive.com)> :

emergency room

[www.trauma.org](http://www.trauma.org)

virtual hospital

[www.vh.org](http://www.vh.org)

archaeological dig

[dig.anthro.niu.edu](http://dig.anthro.niu.edu)

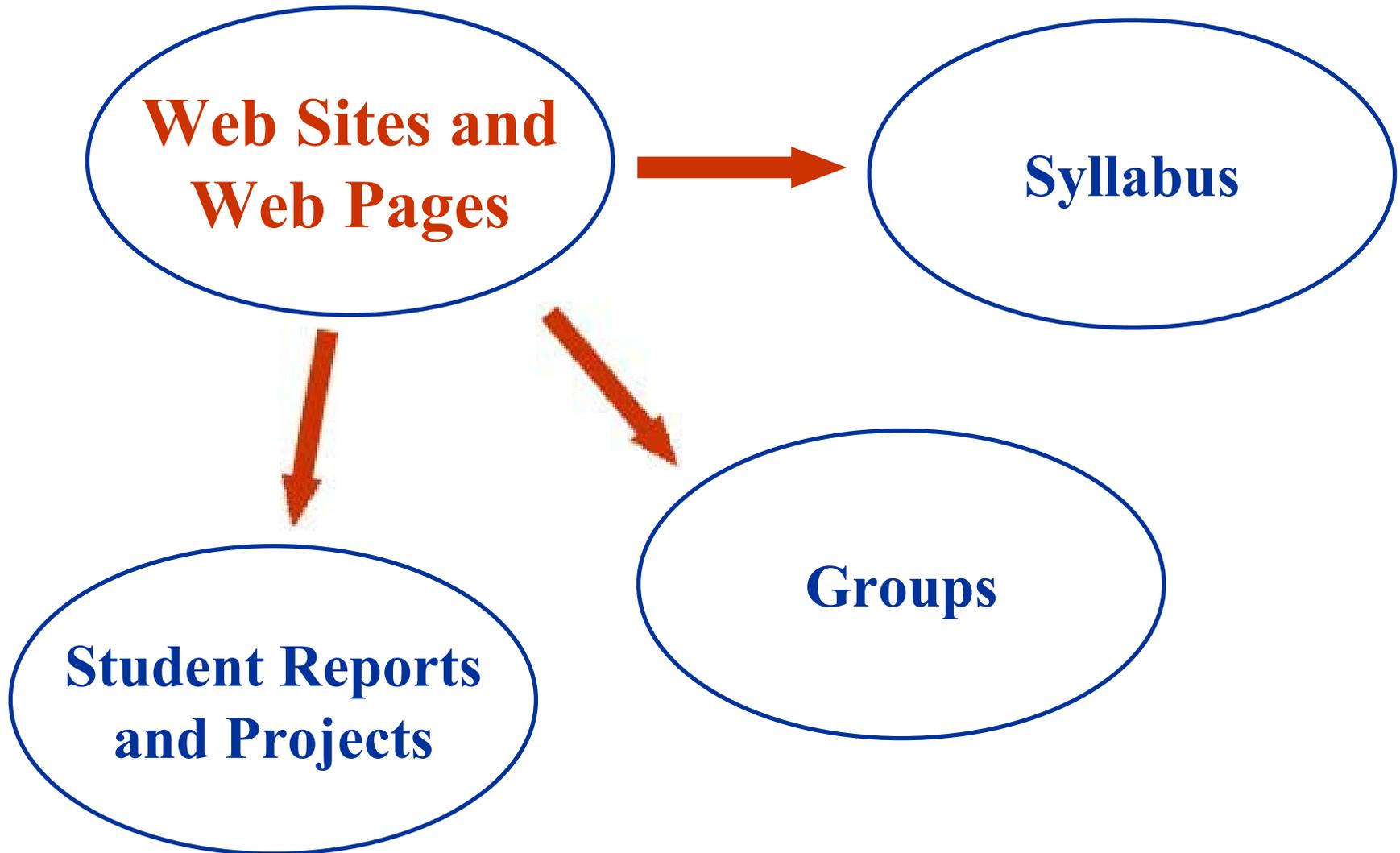
halls of justice

[www.objection.com](http://www.objection.com)

Interactive Java applets and Flash animations are also an excellent way to bring the power of technology to the PBL classroom.

One of my own is a Flash Circuit Simulator that emulates a laboratory for studying the properties of electric circuits.

# Organizing the Course

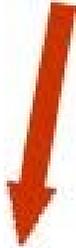


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**Web Sites and  
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**Inspiration for  
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