



# Blended & Flipped Learning: Theory Overview

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# Our Presenters



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Host: **Laura Sanchez**



# Objectives

**Objective 1:** Develop a common understanding of *blended* learning terminology and technology.

**Objective 2:** Explore how to develop *blended* approaches to instruction.

**Objective 3:** Consider how to implement blended learning using active learning, such as *inquiry based* learning.

**Objective 4:** Apply instructional design principles to *blended learning*.



CYBERSECURITY STUDENTS DEPLOY ROUTING, SWITCHING, AND VIRTUAL NETWORKING. Source: [www.atecenters.org](http://www.atecenters.org)



## Blended Learning Poll

- When you hear the term Blended Learning, you think:
- A. That is something I am doing right now.
  - B. I probably incorporate blended learning without realizing it.
  - C. I wish I understood blended learning concepts in more detail.
  - D. My college does not provide resources in the area of blended learning.





# Blended-What Do We Mean?

Blended learning is the thoughtful fusion of face-to-face and technology mediated learning experiences.



STUDENTS AT THE MARICOPA COMMUNITY COLLEGES EXPERIMENT WITH A FIELD-PROGRAMMABLE GATE ARRAY ACTIVITY OBTAINED FROM THE MATEC NETWORKS DIGITAL LIBRARY. Source: [www.atecenters.org](http://www.atecenters.org)







# Basic Principle

- Oral and written communication, as well as interaction and engagement with many different types of resources
  - audio, video, graphics, simulations, immersive environments, etc.
  - blended into a unique learning experience congruent with the context
- Most importantly, blended learning is a fundamental redesign that transforms the structure of, and approach to, teaching and learning.



STUDENTS CREATE AND TEST ROBOT PROGRAMS WITHIN THE ROBOTICS LAB. Source: [www.atecenters.org](http://www.atecenters.org)





## Key Assumptions

- Thoughtful integration of face-to-face and technology mediated learning
- Fundamentally rethinking the course design to optimize student engagement
- Restructuring and replacing traditional class contact hours
- Optimizing technology resources; not-adding an additional expensive layer







# Conventional Approach: Acid Base Titration

## In Class

- Acid Base Reactions
- Calculation of Normality
- Concept of a Titration and End-Point

## At Home

- Home Work Problems

## In Lab

- Lab Exercise





# Blended Approach: Acid Base Titration

## In Class

- Examples of how Acid Base Titrations are used in the real world.

## Online

- View Videos
  - <http://www.youtube.com/watch?v=sFpFCPTDv2w&feature=related>
- Practice Simulation
  - [http://faculty.concordia.ca/bird/java/Titration/Titration\\_demo.html](http://faculty.concordia.ca/bird/java/Titration/Titration_demo.html)

## In Class

- Practice Calculations in Small Groups

## In Lab

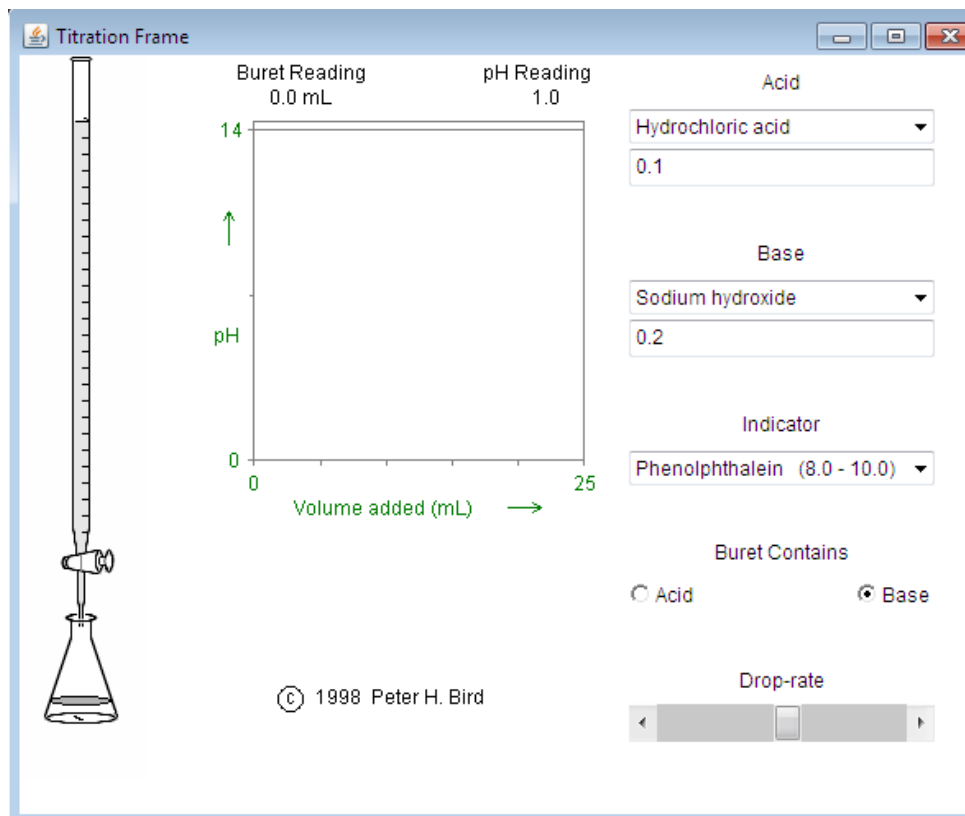
- Performance Assessment





# View Acid Base Simulation

<http://www.youtube.com/watch?v=B3Phu2HUENA&feature=g-upl>



This desktop screen cast was developed with Screen Flow.

- <http://www.telestream.net/screen-flow/>



# Keys to Success with Blended Inquiry Learning



**Eva Erdosne Toth, Ph.D.**

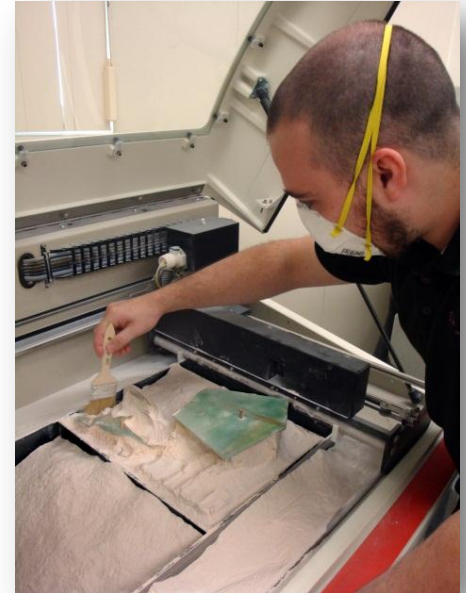
***Assistant Professor of Science Education***

***West Virginia University***



## Questions We Will Consider

- What ways can we optimize existing technology resources for learning?
- What is inquiry learning?  
What are “levels” of inquiry?
- What are instructional design decisions that complement interactive simulations & virtual laboratories?



WITH BRUSHES AND A VACUUM STUDENTS FINALIZE PARTS CREATED WITH 3-D TECHNOLOGIES THAT USE POWDER AND LASERS.

Source: [www.atecenters.org](http://www.atecenters.org)





## Consider this Common Classroom Lab

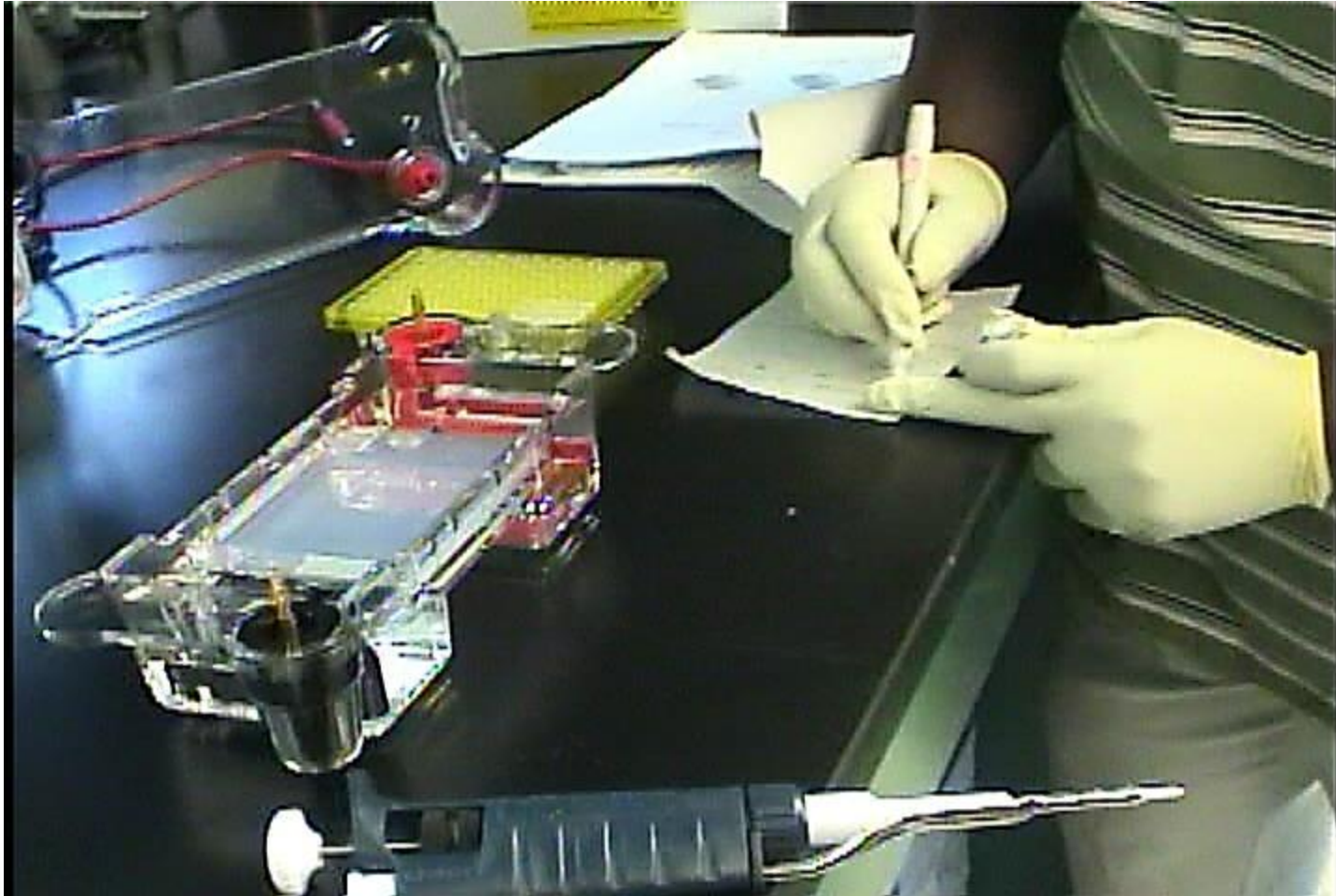
Give the materials at your station, use the following protocol (handout given) to perform DNA Gel Electrophoresis.







# Example HOL: Gel Electrophoresis





# Active Inquiry Poll

Is this activity Inquiry Learning?

- A. Yes, Because students are doing hands-on work.
- B. Yes, because students can check the quality of the outcome gel and learn how well you did the process.
- C. No, because the activity does not have a clearly stated research question to guide data collection and analysis.





# What is Inquiry Learning?

“Inquiry learning is an approach that provides learners opportunities to actively develop skills that enable them to **locate, gather, analyze, critique and apply information** in a wide range of contexts as they develop understanding.”

*<http://ictnz.com>*





# What is Inquiry Learning?

Processes are:

- Set goals / ask questions to answer with data
- Design experiments / design ways to collect data
- Analyze data results and form explanations / rationales

**BUT: How to implement in practice ?? -> levels of inquiry**





# What Are The Levels Of Inquiry?

<b>Levels of Inquiry</b>	<b>Question given</b>	<b>Method given</b>	<b>Solution given</b>
<b>1. Confirmatory</b>			
<b>2. Structured</b>			
<b>3. Guided</b>			
<b>4. Open Inquiry</b>			



(Rezba, 1999; R. Bell et al. , 2005; A. Coburn, 2004.)



## Two Examples to Illustrate:

- Inquiry support by existing software tools
- What learning goals would you be able to set for the use of this virtual laboratory/interactive simulation?
- How would you know whether you reached these learning goals?
  - What assessments would you be able to use?







# Example 1: GSLC Gel Electrophoresis VRL

**BIOTECHNIQUES LAB**

## GEL ELECTROPHORESIS

STEP 1: Make the gel  
STEP 2: Set up the gel apparatus  
STEP 3: Load the DNA sample into the gel  
STEP 4: Hook up the electrical current and run the gel  
STEP 5: Stain the gel and analyze the results

The diagram illustrates the components for gel electrophoresis. On the left, a micropipette is shown with labels for 'Loading buffer', 'DNA sample', and 'DNA size standard' pointing to three small vials on a rack. In the center is a 'Gel box with buffer and gel'. On the right is a box of 'pipette tips'. Navigation arrows labeled 'BACK' and 'FORWARD' are at the bottom of the diagram area.

BACK FORWARD

You're ready to load the DNA sample into the gel. Here's what you'll need: Loading buffer, the tube of DNA, the DNA size standard, a micropipettor, the electrophoresis box containing buffer and the gel, and pipette tips. (Press FORWARD to continue)

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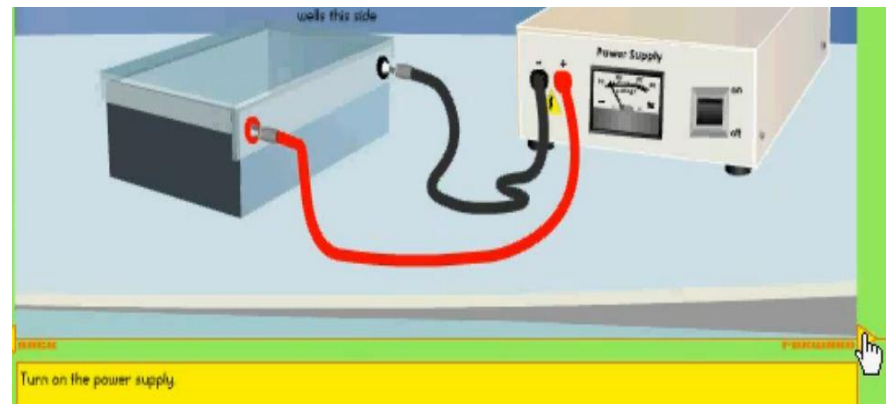
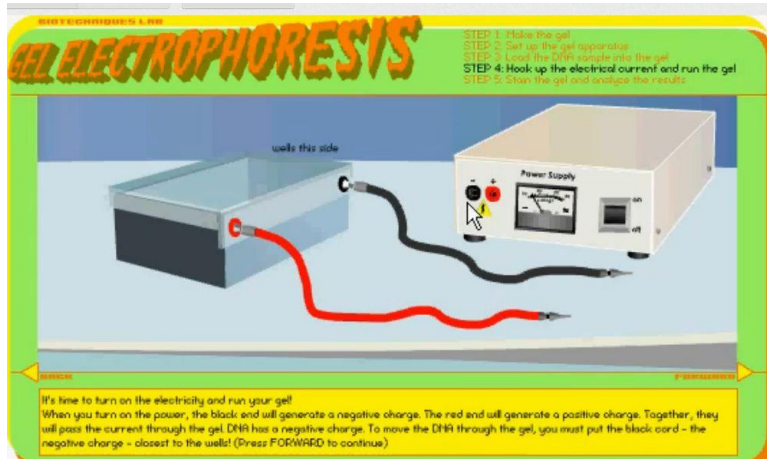
Funding was provided by a Howard Hughes Medical Institute Precollege Science Education Initiative for Biomedical Research Institutions Award

<http://learn.genetics.utah.edu>





# Some Images from this tool





# Some Images from this tool

**GSLC-VideoPartTwo**

## GEL ELECTROPHORESIS

STEP 2: Set up the gel apparatus  
STEP 3: Load the DNA sample into the gel  
STEP 4: Hook up the electrical current and run the gel  
STEP 5: Stain the gel and analyze the results

Enter Size Estimates Here

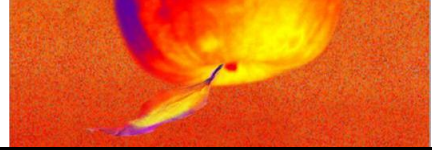
DNA Sample	DNA Size Standard
<input type="text" value="6000"/> bp	6000 bp
<input type="text" value=""/>	5000
<input type="text" value=""/>	4000
<input type="text" value=""/>	3000
<input type="text" value=""/>	2000
<input type="text" value="0000"/> bp	1000

← BACK      FORWARD →

One or more of your estimated length values is zero.

Please enter estimated lengths for all of the bands in your DNA sample to the input boxes to the left of the gel, then press FORWARD.





## In the following video - Watch for...

- What inquiry supports did this software tool provide?
- What learning goals would you be able to set for the use of this virtual laboratory/interactive simulation?
- How would you know whether you reached these learning goals?
  - What assessments would you be able to use?





# Video

<http://www.youtube.com/watch?v=KGFQLkntPsQ>





# What Inquiry characteristics did you see here?

<b>Levels of Inquiry</b>	<b>Question given</b>	<b>Method given</b>	<b>Solution given</b>
<b>1. Confirmatory</b>			
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**AUDIO & VIDEO**

NetWorks Admin

Talk Video

**PARTICIPANTS**

NetWorks A...  
Moderator

MAIN ROOM (3)

NetWorks Admin  
Moderator (You)

**CHAT - Supervised**

Room Moderators

New Page Delete Page Fit Page Public Page 1

What learning goals would you be able to set for the use of this virtual laboratory/interactive simulation?



# Example 2: Consider Another Way of Learning...

## Sorting DNA Molecules

To sort pieces of DNA by size, we place the DNA in a molecular gel. A gel is composed of water and long, chain-like molecules that intertwine to create a 3-D matrix.


We make the gel with a substance called agarose, which provides the molecular "chains" of the gel matrix. An agarose gel looks like a flat slab of cloudy Jello, about half an inch thick.

[...More Info ->](#)

**POWER SUPPLY**

**45 Volts**

**Set Voltage:**  
Decrease    Increase



**On**    **Off**

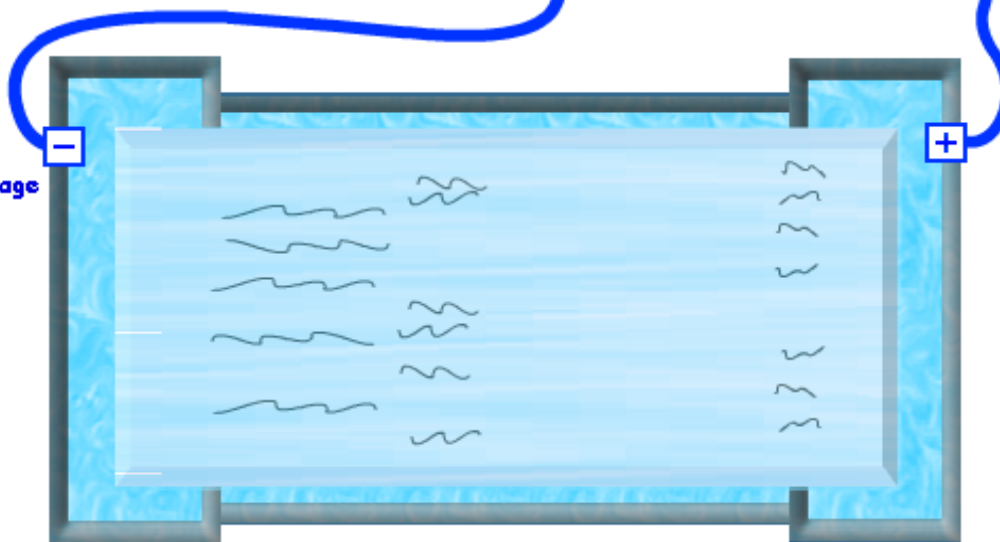
Select the percentage of agarose:

0.6 %

1.2%

2.0%

New Gel





# Video

<http://youtu.be/cAvGAPGrgaE>





# What Inquiry characteristics did you see here?

<b>Levels of Inquiry</b>	<b>Question given</b>	<b>Method given</b>	<b>Solution given</b>
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**AUDIO & VIDEO**

NetWorks Admin

Talk Video

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What learning goals would you be able to set for the use of this virtual laboratory/interactive simulation?



# Possible Structure For Blended Inquiry:

- Step One: Confirmatory inquiry with GSLC VRL
  - Can DNA fragments separated via gel electrophoresis?
  - Focus on reasons for processes
    - what is the mechanism of separation?
- Step Two: Use MyDNA to determine effect of CC & V
- Step Three: Use HOL to verify previous findings with VRL in hands-on setting
  - Focus on protocol precision, unbiased decision, avoiding contamination, evaluating output.





Next...

Let's examine a software tool in a  
different domain...







## Example 3: RF Energy Simulation

Using a simulation, you will conduct six experiments to demonstrate different conditions for creation of a plasma.





# SIMULATION

Demonstrate the relationship between pressure and energy needed to initialize a plasma

The simulation interface is divided into two main sections: 'Controls' and 'Plasma observation'.

**Controls:**

- Pressure:** Includes 'Increase Pressure' and 'Decrease Pressure' buttons. The current value is 10 Torr (10 - .0001).
- Power:** Includes 'Increase Power' and 'Decrease Power' buttons. The current value is 0 Watts (50 Watts Max).

**Plasma observation:** A black window showing a white outline of a chamber with a rounded top and a flat base. No plasma is currently visible inside.





## What did you see in the simulation?

- What learning goals?
- How can you structure?
- What assessments?





## CONCLUSION: Optimize Student Engagement

- Start with learning **goals** for the blended learning activity
- Select software tool for **level of inquiry** that is suitable for students
- Complement software features with instructional design
  - Set goals, add guiding questions
  - provide methods for data analysis
  - require student explanation and reasoning for solution
- Design assessments to determine whether you reached your learning goals – possible future topic for webinar?



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# Short Survey

## How Can We Better Serve You?

Whether you are joining us live or watching the recorded version of this webinar, please take 1 minute to provide your feedback and suggestions.

<http://http://www.questionpro.com/t/ABkVkZJxRd>



**Thank You!**

Thank you for attending the NetWorks webinar:

**Blended and Flipped Learning:  
Theory Overview**





# Webinar Resources

To access this recording, slides, and handout visit

[www.matecnetworks.org](http://www.matecnetworks.org),

Keyword Search:

**webinar blended and flipped learning theory overview**