Agriculture, Environmental Science, and Information Technology

Fedro S. Zazueta
Professor and Director
Academic Technology Office
University of Florida
Cultivation of the fields
Plant

Water

Atmosphere

Soil
Agriculture as environmental production system

- Plant
- Soil
- Water
- Atmosphere

Physical
Chemical
Biological
Agriculture as environmental production system

Diagram showing the interaction between Plant, Water, Soil, and Atmosphere.
Agricultural production systems are open.
Making decisions and taking actions in a complex sustainable production system.
The Land Grant University

- Create Knowledge
- Preserve Knowledge
- Transmit Knowledge
Technology for the XXI Century

- Information related technologies
- Biology related technologies
Technology and Social Transformation
Technology as a Transformation Agent
Men Wanted!!

THE UNDERSIGNED WISHES TO hire ten or a dozen men, familiar with the management of horses, as hostlers or riders on the Overland Express Route via Salt Lake City. Wages $50 per month and found. I may be found at the St. George Hotel during Sunday, Monday and Tuesday.

William W. Finney
Appropriate Use of Technology
Lessons on Technology

- It is a change agent
- Change is inevitable
- Use is paramount
- Transforms our world vision
Transformation

- Improve what we did in the past
- Do what we could not do before
Transformation

• Deliver timely knowledge to stakeholders
• Transform management
Extension Information Management

• EDIS
  – A single comprehensive source for extension information.

• Started 1982
  – Object Oriented Technology
  – Artificial Intelligence
Valves in Irrigation

Dorota Z. Haman, Forrest I. Smith

The term "valve" applies to a device for regulating flow, control, modulation of the discharge, and control of the flow. It can be used as a safety device to prevent excessive pressure within the system or as a means of making changes in the flow without shutting off the flow. Valves are an important part of the irrigation system and the various devices used for regulating flow. They are needed for the application of water in a variety of ways. The most common type of valve is the one-way valve, which allows water to flow in one direction only.

ON-OFF SERVICE

Turf Irrigation With a Hose and Sprinkler

F.S. Zazula and Grady Miller

Irrigating with a hose and sprinkler can be equally or more efficient than irrigating with a professionally designed irrigation system. All it requires is some understanding of how an irrigation system works, and committing the time and effort needed to make good use of a sprinkler and hose.

How do sprinklers work?

Although in Florida we receive enough rainfall to meet turfgrass water needs, only a small fraction of it is effective. Its distribution over time and the low capacity of our soils to hold water result in most of rainfall being lost to runoff or percolation. Sprinklers are a tool to supplement water during periods in which not enough rainfall occurs.
Lesson Learned

To make effective use of technology the business process must change (change the paradigm).
Global Climate Modeling
Collaboration Among

- Argentina
- Costa Rica
- México
- USA
Fresh Vegetables: Winter Tomato and Bell Pepper Yields (1929-95)

- Yields suppressed during El Niño

Source: James Hansen
Damage Produced by el Niño in Florida (1/12/97 a 2/22/98)

<table>
<thead>
<tr>
<th>Category</th>
<th>Damage (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crop Production</td>
<td>$140,000,000</td>
</tr>
<tr>
<td>Animal Production</td>
<td>$183,500,000</td>
</tr>
<tr>
<td>Forestry</td>
<td>$493,000,000</td>
</tr>
</tbody>
</table>
Models

Mean Date (50% Probability of First (32 °F) Freeze Occurrence

Source: James T. Bradley, Freeze Probabilities in Florida
Bulletin 777 (technical)
Institute of Food and Agricultural Sciences
University of Florida, Gainesville, FL
El Niño, La Niña, & Florida's Climate: Effects on Agriculture and Forestry
A Florida Consortium Report

Rainfall Anomalies

Mouse over any zone in the Florida map to view a graph of rainfall anomalies for that zone. Graphs show percentage difference from normal precipitation.

On the graph, red lines signify El Niño years, green lines show neutral years, and blue lines La Niña years.

Discussion of El Niño, La Niña and precipitation

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Questions or comments? Email The Florida Consortium
Example Benefits

Potato

• 1997-98 Winter Growing Season, South Florida
• 100% losses by farmers who did not form their fields, clean ditches for increased drainage
• High yields by those who did increase drainage
Learning Object (LO)

Any module or entity digital or non-digital that can be used, reused or accessed during learning.

SCORM
Dublin Core
And many more...
The Need for Rapid Prototyping of LOs

• Centrally managed resource
• Shelf life
• Reusability
The Opportunity for Rapid Prototyping of LOs at University of Florida

- Ontology based DB (Howard Beck)
- Adaptive Instruction (Stanley Su)
- Invested in Technology (Fedro Zazueta)
## Ontology

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Asset Type</th>
<th>Shorthand</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ti: Description</td>
<td>Text</td>
<td>T_i</td>
<td>A block of text describing a concept.</td>
</tr>
<tr>
<td>Di: Description</td>
<td>Diagram</td>
<td>D_i</td>
<td>A line diagram usually consisting of an abstraction of a complex system.</td>
</tr>
<tr>
<td>Il: Description</td>
<td>Illustration</td>
<td>I_i</td>
<td>An illustration, generally used to complement or reinforce another asset.</td>
</tr>
<tr>
<td>Ai: Description</td>
<td>Activity</td>
<td>A_i</td>
<td>An activity related to the subject matter used to illustrate, reinforce, or discovery of a concept by the student.</td>
</tr>
<tr>
<td>VI: Description</td>
<td>Video Clip</td>
<td>V_i</td>
<td>A video clip.</td>
</tr>
<tr>
<td>Pi: Description</td>
<td>Animation</td>
<td>A_i</td>
<td>An animation.</td>
</tr>
<tr>
<td>Pl: Description</td>
<td>Problem Statement</td>
<td>P_i</td>
<td>The statement of a problem</td>
</tr>
<tr>
<td>PSi: Description</td>
<td>Problem Solution</td>
<td>PS_i</td>
<td>The solution to a given problem statement</td>
</tr>
<tr>
<td>AcDescriptionType</td>
<td>Assessment question and type</td>
<td>A_i</td>
<td>An item used in the assessment of the student and its type (True/False, multiple choice, numerical problem, essay, etc.)</td>
</tr>
</tbody>
</table>

### Diagram:

- **Learning Objective**
- **Learning Asset**
- **Assessment Asset**

**Provide Primary Content.** Connect the learning asset that provides the primary content to the learning objective.

**Support.** Connect a complementary learning asset to a primary learning asset that provides primary content (right to left).

**Evaluate.** Connect an assessment asset to a learning objective.
Implementation of the LO

Bienvenido!

In this webpage you will find information related to surface tension, contact angles, tensioactive materials and capillary rise.

Overall Objectives

Using this resource, the student shall:

- Explain the causes of the surface tension phenomenon
- Explain the connection between surface tension and capillarity
- Recognize the effects of surface tension and capillarity in agricultural systems

Technical Requirements

- This project includes interactive elements that require Flash Player 5.0. If you do not have this plug-in you can download it at no cost from Macromedia Flash.
- This project also includes documents that you can download to your computer, view and print using Adobe Acrobat Reader. You can download this software at no cost from Adobe.
- Videos in this project were developed using QuickTime. To derive the best benefit from these materials you must have the most recent version of QuickTime. If you do not have it installed in your machine you can download it from QuickTime.

START HERE
Methodology for the Production of the Learning Objects (Sepulveda)

- Based on Curriculum Taxonomy
- Learning Objectives (Bloom’s Taxonomy)
- Learning Styles
- Assessment
- Rapid development
- Reduced cost
Technology for the XXI Century

- Information related technologies
- Biology related technologies
Automats
Times of Change
Beyond Novelty...

Context

• Social needs
• Technology evolution
• Resource availability
• Transfer and adoption
• Sustainability
Where are we going?

Investments we make
Acceptance
Adoption
Rejection
It’s a Social Choice
Thank you!