

ICORE : Emerging Pathogens
Proposal for Action Research Project 2012 – 2013
By Lloyd A Wade

* **Title :** Finding the Key Protein Difference Between Heirloom and Wilt-Resistant Tomato Plants.

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* **Abstract**

In the Florida panhandle, a challenge that has plagued tomato production has been tomato wilt. Agricultural research's best solution has been the development of wilt-resistant plant varieties. This has resulted in the production of a healthier tomato crop.

An interesting discussion in the home garden community centers on the comparison of wilt-resistant plants and open pollen heirloom varieties. One side of this controversy contends that wilt-resistant varieties have sacrificed some of the natural features such as taste and robustness. The opposing group argues that any loss in quality is a fair trade for the development of a disease resistant plant. This high school biology project will use dot-blot lab technology to simulate the process used to isolate and identify the tomato plant protein that differs in a diseased open pollen plant from a wilt-resistant plant. This project will attempt to help students relate plant health to protein presence. A three part lab component will be used featuring pipetting skills, e-gel processes, and dot-blot techniques.

* **Description of teaching unit** (include expected outcomes).

One of the overshadowing influences in Florida high school biology has become end of course exams. Forty-seven percent of this high stakes test covers botany. When learning about plant function and physiology, it is important that students be able to connect information concerning genomics, protein production, and plant pathogens. The learning gains achieved in the plant unit will be greatly related to student mastery of other biology areas.

The introduction of plant diseases and pathogens will begin with this project. Through a carefully planned process of assessment, information presentation, and lab activity, students will be encouraged to link what they have learned about protein production, cell physiology and pathogens. It is anticipated that at the conclusion of the lab simulation that students will gain a perspective to the connection between proteins and invasive pathogens. It is also desired that students will be able to visualize the role of biotechnology in finding solutions for critical plant issues.

*** Data Collection techniques.**

This project will produce data through surveys, assessments, and the production of lab instruments. Pre and post survey instruments will be used to provide indication of overall class learning gains. While survey scores will be included as an assessment of the accomplishments of this program, they will in no way impact student grades. In the course of this project, students will be asked to participate in reading and vocabulary assignments. Structured quizzes and tests will be used to provide evaluation of student learning. A reflective assignment will be included in the lab procedure providing an insight into the development of higher order thinking skills as a result of this overall procedure.

*** Student assessments.**

In this project, student assessment will be used as a tool to motivate learning and provide students with indicators of acquisition of knowledge. As assessment applies to this research, student grades will be used to support statistical analysis.

Short extended response quizzes will be used to reinforce student participation in reading and vocabulary activities. When taking quizzes, students will be allowed to use hand written notes, therefore, motivating students to read for content, study vocabulary for meaning, and write more detailed notes. Quizzes will be valued at half the percentage of tests.

At the next assessment level, tests will include a variety of multiple choice and short response questions. The intent of the tests will be to challenge student understanding through the use of a combination of high and middle order questioning. The goal of testing will be to satisfy state standards and demonstrate mastery of plant health and pathogens.

The most telling form of student assessment will be the reflective paper that will accompany the lab procedure. Students will be given a set of

prompting questions that will guide them to responses reflective of their understanding of the link between proteins and pathogens. Assessment of student reflective work will focus on the synthesis of advanced learning. For the purpose of this project, advanced learning will be viewed as the creation of cognitive links that project connections beyond the project and classroom. The greatest accomplishment in the reflective process would be indications that students had gained understanding of the relationship between proteins and pathogens.

The lab activities included in this research project will include a pipette training activity, e-gel electrophoresis component, and a drop-blot lab. My biology class will be able to conduct these activities through the generous ICORE equipment support. My plans will require the use of the following components . . .

- * Six pipettes, tips and wells.
- * Six e-gel devices, gels, e-gel reader, and simulation chemicals
- * Six dot-blot kits.

*** ICORE summer institute elements included.**

The most valuable component that ICORE will contribute to my project will be access to the expertise and experience presented by the ICORE staff. Houda, Julie, Drew, and Chuck represent a tremendous access to ability, learning and skills from the University setting. One of the keys to the success of my research project is my ability to modify some of the ICORE activities. I am confident that I can count on the support of my friends at ICORE.

This being my third University of Florida summer experience, I have received multiple trainings in the process of electrophoresis procedures. I have been allowed to use a variety of materials and bio equipments for analysis purposes. My abilities are very basic, but with help of ICORE I will be able to share a biotechnical experience with my students that otherwise would not have happened.

*** New Pedagogies.**

One of the pedagogical rationales included in this project will be an emphasis on formative assessment. Some of the activities that students will

be asked to do will introduce many of them to a different way of connecting lab activities and

*** Literature Review.**

The underlying learning strategy that guides this project is the area of constructivist theory. Piaget's constructivist ideas concerning learning shares four main ideas (Crane, 2005) :

- * Learning is an internal process.
- * Learning can be encouraged through facilitation in contrast to the master teacher model.
- * Incongruities need to be dealt with.
- * Students need an environment conducive to learning.

In the context of this project, cognitive development in the area of science will be promoted by the use of Piaget's ideas.

Another important feature of this project will be the teacher modeling lab techniques before the students. According to Albert Bandura, one of the important strategies in learning is modeling (Crane, 2005). Bandura's work portrayed learning as a social cognitive function where students internalized and selectively duplicated what they saw. Many times students find new lab procedures challenging and are best able to perform them when partnered with a student who has experience with those tasks.

An important pedagogical component of this project will be the consideration of student self-actualization. According to the work of Abraham Maslow, the highest order of human needs involves the need to self-actualize (Schunk, 2008). Maslow described the self actualizing student as the individual who had taken possession of their learning and valued the experience. By building this experience around the tomato plant which many of my students are familiar with and take interest in, I hope to provide an experience that will promote self-actualization.

When doing what is best for students, it is always good to remember John Dewey's ideas about educational pragmatism. In the late 1800's Dewey entered an educational system designed to benefit an elite group of upper and upper middle class student body. Course content in those days was classical liberal arts. Dewey sensed that many of his students were the product of the industrial revolution and were not being served by this learning program. As a result of this, Dewey saw the need for education to shift its emphasis toward a system that better served the student body. Dewey concluded that there was a new truth in education. According to

Dewey, the educational system should serve the needs of the student (Dewey, 2004).

Crain, W.,(2005). *Theories of development concepts and application* (5th ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.

Dewey, J., (2004). *Democracy and education*. Mineola, N.Y. : Dover Publications, Inc.

Schunk, D., (2008). *Learning Theories an educational perspective* (5th ed.). Upper Saddle River, New Jersey: Pearson Education, Inc.

*** Budget.**

Through the generosity of ICORE, I am able to cover most of my expenses through the lab locker program. Items that will not be covered will be the following:

- * (25)Thumb drives to store research and lab data (approx \$250.00)
- * Rubber gloves and misc supplies (\$100.00).

The \$200.00 stipend provided by ICORE will cover some of this expense. The remaining portion will be covered by my annual school supply money.