

**Combination of Two Education Models for Experience Based
Learning
Cross Credits for Science within the Vo Ag System**

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In many U. S. schools, the "Carnegie" system is the common format that was adopted to measure learning outcomes. This system of Carnegie units became firmly established in the 1950's and 1960's. This also occurred during a period of unparalleled economic growth in the U.S. In the 1970's when the US economy faltered and unemployment rose the educational process was questioned. Later school reform efforts questioned the current high school structure - especially its tracking into college bound and non-college bound programs. Beginning with a report titled "A Nation at Risk" the curricular structure of high schools was examined. Early criticism focused upon declining skills - primarily with mathematics and science. More recently, dozens of national studies and reports have emerged over the past five years and in response policy makers have increased academic requirements in hopes that more time in the content areas will increase achievement levels and assure America's competitive edge in the future. This reverses the 1970's and 1980's initiatives to bring curricular flexibility to high schools and add a greater number of elective courses. The result has been fewer electives for students, particularly in school systems that hold to a traditional six-period day. With some notable exceptions, enrollments in many of the so-called liberal arts electives and "practical" arts high school options are falling across the country, particularly if a program's reputation is marginal. It was during this period Vo Ag Centers became to consider cross crediting first as a way to hold students, secondly as a way to enhance program credibility.

However, there were students that were impacted beyond just a reduction in electives. Increased graduation requirements may pose impossible instructional hurdles because they do not function well in a traditional academic environment. For these students and for those who do not plan to immediately continue their education after high school, the answer is often a hands-on learning experience which enables them to relate academic theory to direct practical applications. Because Vocational Agriculture Education offers such an alternative, cross-credit programs incorporating the basic academic skills required for graduation were offered by a growing number of comprehensive high schools in Connecticut and by the early 1980's, including some Vo Ag Centers.

Today school reform has focused on how subjects are taught rather than what is taught. More time in a particular

subject area - if inadequately taught is meaningless. That would place Vo Ag Centers in an unique situation to demonstrate instructional practice, student learning style with skill based activities, the foundation of Vo Ag instructional practice since its inception.

More attention is now focused on teaching and student learning styles. Cross crediting is a way to capture those students who needed practical application/connection to make learning not only relevant but possible. This is being reflected in looking how skill based instructional activities can be incorporated to academic disciplines - especially for science and mathematics. In a report titled Re-Conceptualizing Connecticut's High Schools: A Blueprint For Continuous Change a commission looking at Connecticut's High School. It was chaired by then Associate Education Commissioner Betty J. Sternburg. The report stated "**Since 1994, all tenth grade students have been required to take the Connecticut Academic Performance Test (CAPT). This test was designed to assess important and challenging skills and competencies in discrete subjects - mathematics and science - and in interdisciplinary areas - reading and writing across various content areas. Testing in the Spring of 2001 represents the first year of the second generation CAPT.**

The nature of the assessment has caused many districts to modify the content of their curriculum and the mode of instruction. For example, laboratory work has become an integral part of the science curriculum as a result of its inclusion on the CAPT. Further, the interdisciplinary nature of the assessment in reading and writing cross the content areas has stimulated English, Mathematics, Science and Social Studies teachers to construct interdisciplinary experiences for students."

In the meantime, technology is changing the workplace at an incredible rate. Vocational educational programs nationwide were hit with two conflicting approaches - to embrace developing technology while sustaining an immense "back to basics" shift in public policy. In 1994 the statement on CT vocational education concluded.

"The point is this: Business, industry and just plain common sense demand that our graduates must cope with ever more complex work environments. Our job is to apply the best elements of integrated instruction using today's context and technology."

Traditional College Prep Program - Reflects the State and district curricular outcomes (framework) for a comprehensive college preparatory program. Laboratory exercises now reflect Dept. of Education performance evaluation and assessments (CAPT, etc).

Vo Ag Scope and Sequence - Vo Ag program provides direct career experiences with skill based activities (practicals) during a 1 and 2 year exploratory program. Students perform industry applications with industry level equipment in industry compatible situations as they proceed with 3rd year intermediate and fourth year intensive scope and sequences. All levels linked to Supervised Occupational Experiences. As Vocational Agriculture is state regulated and meets federal content standard and performance guidelines. Vo Ag has also State of Connecticut State Board of Education approved Performance Standards and Competencies (NOCTI).

Integration Outcomes - Integration of the two education models is accomplished by implementing course laboratory exercises that utilize marine and terrestrial organisms, life processes, scientific explorations, instructional methods merging theory with content, and lesson plans containing applications of scientific principles with an aquaculture or agriculture theme.

* Source- May 16, 1989 Vocational Education Cross-Crediting Offerings in Connecticut - 18 pages.
Connecticut State Department of Education Division of Vocational, Technical and Adult Education Bureau of Vocational Services, Middletown, Connecticut.

Science Cross Crediting for Vo Ag Requirements for Course Development

Vo Ag Centers traditionally reflected regional employment needs trends - Consulting Committees and Industry participation reviewed regional need assessments with scope and sequence working groups. Together a process is required to fully understand the specialized instruction with Vo Ag namely,

*Vocational Assessments - Educational Specifications - Vo Ag program of studies - units for Vo Ag Scope and Sequence for activities/applications - reflected in each course syllabus that lists specific skills and student outcomes. Needs to be aligned with national NOCTI examinations.

*Vo Ag is equipment and laboratory based (activities and applications). It is the only public school that provides for industry level equipment (vessels, marine tractors). Students need to perform industrial applications - competency is course dependent.

*Supplies need to be integrated with the equipment for each application. Teachers need in service and technical support for new industry applications.

*Vo Ag applications require greater amounts of supplies, safety protocols and laboratory operations for a proper scope and sequence, it's takes about four years to fully establish curriculum map with job titles, the skill based activity and performance assessment.

- Cross credits for mathematics is more difficult but deserves consideration - lacks applications (many content courses are beginning to include practical or industrial applications).
- Cross crediting for science is possible within State Department of Education guidelines.
- District teacher evaluation policies reflect science districts (supervisors) goals/Vo Ag program requirements as per State Regulation and BOE policies. The combination of both district and state goals needs to be fully recognized.

Areas to look for increasing cross credit possibilities

1) Laboratory Exercises (experiments) closely resemble Vo Ag activities that develop specific skills that are utilized later with industry applications (Chemistry for example, Histology to Pathology). These laboratory practicals would be designed to meet both vocational and academic goals.

2) Vo Ag Units of Instruction are grouped around defined activities and applications which could link critical thinking/reasoning/estimation and problem solving skills. These higher order skills have been identified to important career and educational outcomes for young people - CT Common Core of Learning.

3) Content/Theory based education models often lacks connecting learning activities (links) to practical applications of content material to everyday life and work in an increasingly complex society. The presence of "connecting activities" (vocational terminology skill based activity) has been shown to increase retention and recall from long term memory. They could useful examples for academic programs especially for writing prompts.

4) Academic teachers educated in the delivery of one educational model could develop specific laboratory exercises utilizing marine or terrestrial organisms, life processes, scientific exploration methods, etc with appropriate thematic materials and supplies that connect to occupational career experiences in the vocational program (Appropriate Research/Industry Contacts).

5) To reflect a combined theme the new course name would combine both the comprehensive subject area and Vo Ag industry activity/application "Tag" such as Aquaculture Chemistry/Fish Nutrition, the fish nutrition being the "Vo Ag Tag" industry applications would have direct relationships between the chemistry and nutritional processes with fish culture.

**Shortened Scope and Sequence Showing Progression of Vo Ag
Applications/Skills
The Sound School Aquaculture Center**

(Bacteriology Lab)

Senior Vector Analysis (special topics) Disease
 Transmission in Production Facilities
Junior Bacteriology Applications (Pasteurization
 Infection and Sterilization such as HACCAP)

Sophomore Media prep/methods Bacteriology (Activity and some
 application skills/protocols)

(Pathology Lab)

Senior Patho/Biology (Special Topics) Research in
Lobsters/Shellfish
Junior Pathology - Fish and Shellfish Diseases - Tissue
 Blocks and Glass Slides
Sophomore Histology - Histology methods/prep skills
protocols - preparing class slides

(Genetics Lab)

Senior Research Projects (Special Topics) Minnows,
Toxicology Systems
Junior Genetics - (Applications GFP, BioRad/BioTech)
Sophomore Electrophoresis - Methods/Prep some applications
 skills/protocols "clean room" practices, etc.

(Genetics Research/Quarantine)

Senior Environmental/Regulatory (life support quality
 assurance) - Special Topics - Laboratory
 Protocols, Permits and Regulations
Junior Bio Security Disease Quarantine 30 day, 60
day protocols
Sophomore Isolation methods/prep depuration skills protocols
(OPMAN)

(Toxicology)

Senior Regulatory Environmental Science - Special Topics
- Water Quality Tests/Trials
Junior Toxicology - Applications (Responses and trials
according to Industry Standards)

Sophomore Life Support systems methods skills protocols,
mortality response best practices.

(Fish Culture)

Marine Vet Science - Necropsy Prep - Special Topics
Fish Culture - Equivalent egg room - hatchery science
protocols
Algal Culture - Media prep and food preparation for modules
sterilization skills and industry protocols.

Special Purpose Labs (3)

(Fish/Animal Nutrition) - Diet and feed formulation, vitamin
mixes, test diets growth/nutrition studies.

(Water Chemistry Lab) - Analytical Research, Test for
Industry Standards, Monitoring research - EPA, water quality
tests and criteria.

(Water Monitoring) - Instrumentation for real time
monitoring, some read and write programs. Independent
module (1) system analysis historian - environmental record
(permits). Laboratory log in sheets and effluent checks.

Please note - each industry lab has a grade level equivalent
use as student progressed in the Vo Ag scope and sequence -
skills learned as Sophomores would be needed to perform
industry applications as Juniors. The Junior level industry
applications would enable students to explore research areas
for special projects as Seniors. The Vo Ag curricular
structure utilize vertical and horizontal skill mapping to
ensure each job title was explored and skills based
activities performed. Job titles can be added or deleted as
suggested by the teachers industry working group.

As the educational program progressed, each level - freshman
to seniors had a "industry connection" that when combined
provided a complete review of the Aquaculture Industry using
a generic integrated production model approach similar to
agriculture - Environment, Reproduction, Growth
Nutrition/Genetics Strain Selection. FFA Career Awareness
reviews the business aspects of Aquaculture. Supervised
Occupational Experiences, Directed Lab, Cooperative
Placement or Employment Agreements support integration
between career expectations, laboratory practicals and
instructional practice.

Level	Course	Industry
Integration		
Freshman	Science and Natural Resources	Role of environmental
	relationship/food	impacts ecology conversions production inputs - nitrogen carbon and water cycles.
Sophomore	Biology/Hatchery Systems	Role of
reproductive		Biology in Aquaculture, egg production, egg viability etc. Sterile conditions.
Juniors	Aqua Chemistry Fish Nutrition	Junior
Advanced - See		Scope and Sequence
	Aqua Chem. Water Quality	
Sequence	Aqua Life and Science/Aqua	See Scope and
	Production	
Sequence	Aqua Biotechnology/Genetics	See Scope and
Seniors	Aqua Chem. Fish Nutrition/	See Ag
Program of Studies	Special Topics	
	Aqua Chem. Water Quality/See Ag	Program of
Studies	Special Topics	
	Aqua Life Science (fish Culture)/	See Ag
Program of Studies	Special Topics	
	Aqua Bio Tech/Special Topics	See Ag Program
of Studies		

