

Press release - long version - for Washington, DC. ACS Meeting 8/94  
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To: Marvin Coyner, Mgr, ACS News Service

From: Frank Gadek, 7/23/94

Subject: Your request for a nontechnical summary of my paper on interdisciplinary course challenges for traditional and nontraditional age students during the 19 year evolution of the Science of Enology (winemaking) course for the August 1994 208th ACS National Meeting in Washington, DC

**Interdisciplinary course challenges for traditional and nontraditional age students during the 19 year evolution of the Science of Enology (winemaking) course.**

[Long version]

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## Approach

The science of enology [winemaking] is among the current innovative and creative ways of teaching some of the more practical and useful chemistry, along with complex decision making processes, important in society today. A wide spectrum of different students have taken these courses. They ranged from first year college students to members of the Eastern USA wine industry, some traveling from more than **20 states**, besides Canada and Jamaica.

This unique approach is in dramatic contrast to traditional chemistry courses that many remember as involving memorization of the periodic chart and balancing equations concerned with more conventional theoretical chemistry.

A variety of customized and specialized courses had to be developed and taught for the very diverse individual needs and interests of the many different groups of participants curious about enology. These courses extended from traditional 3 credit lab science courses to specialized 3 day weekend Summer courses for sophisticated members of the wine industry. They were given thru the College and private organizations, at a variety of settings including campus, motels/hotels, wineries and private facilities in Pennsylvania, Virginia and West Virginia. Apparently, there are no other "hands-on" scientific, technical lab courses in the science of enology regularly offered outside of California.

## Origin

These courses began in **1973** in response to the need for a practical, industry oriented approach to the science and technology of enology [winemaking] suitable for local small wineries, amateur winemakers and college students. This interest was originally stimulated by the passage in **1968** of the pioneering Pennsylvania Limited Winery Act, which encouraged small family owned farm vineyards and wineries. Today, there are almost 50 farm wineries in Pennsylvania and a strong Pennsylvania Wine Association [c/o Howard Miller, Pennsylvania Wine Association, 103 South Duke Street, Lancaster, PA 17602, Phone 717/291-5111, FAX 717/291-2042]..

While the Eastern USA wine industry is small on a wine volume basis compared to other areas of the world, the hundreds of small, local wineries are significant in many other ways. Grape growing [viticulture] and winemaking [enology] supplement the regional economy by providing jobs, tourist attractions and tax contributions, besides offering an attractive alternative to more traditional land development options. Thus, owners of small family farms can explore the farm winery option in order to try to maintain their land in agricultural pursuits in very competitive commercial development areas.

In addition, a new College wide curriculum review required all students to take a lab science course. Since few appropriate and attractive courses were available, students tried to avoid fulfilling that requirement. Also, science students expressed persistent interest in more of the practical applications of their theoretical chemical knowledge.

## Outcomes

Over **600 people** have been taught in **37 courses of 18 different types** since **1973**. College students from more than a dozen different majors ranging from first year students to seniors, both in the day and evening sessions, elected to take the basic 3 credit lab science of enology course. Non college participants included people from **20** different states, besides Canada and Jamaica. About **20%** of them were from commercial Eastern USA wineries.

**Five** major publications, some involving student-faculty research, resulted from these activities, along with numerous presentations and articles for trade journals.

A commercially available VCR tape was produced that features one of these courses ["The Art and Science of Home Winemaking," available from Michael P. Reinhart, President, Imagi-Vision, , along with the American Wine Society, c/o Angel E. Nardone, Executive Director, 3006 Latta Road, Rochester, NY 14612, Phone/FAX 716/225-7613, P.O. Box 284, Devon, PA 19333, \$24.95 plus \$2.00 shipping charges].

## Details

All of these courses compare and contrast the science and technology of the Eastern USA winemaking process with chemical analysis and sensory [tasting, "organoleptic"] results. The focus involves "making better wine more consistently" in order to increase the chances of making a profit on a commercial winery basis.

Eastern USA winemaking challenges are emphasized [e.g., French hybrid grapes, reducing high acidity, pH control, etc.]. In the early 1970's, the Eastern wine industry was relatively young and inexperienced with these challenges of making commercially acceptable wine under local conditions. Also, small regional wineries do not have the greater and more established resources of the larger more nationally oriented wineries. In addition, some states limit wine production to only locally grown grapes. Therefore, a number of student-faculty research projects were initiated during a one semester sabbatical leave to begin addressing these issues. The results of this student-faculty research are incorporated in all of these courses. Students have participated in making experimental wines, in their chemical analysis and in their sensory evaluation.

## Specifics

The essential inter- and multi-disciplinary technical material [e.g., microbiology, botany, government regulations, etc.], including the necessary chemistry, is presented on "a need-to-know basis" as the exploration of the winemaking process unfolds. Emphasis on a variety of "hands-on lab experience" involving traditional chemical analyses, fermentation, distillation, microscope work, sensory analysis, etc. assist nonscience students in more fully appreciating and understanding the continuing need for scientific laboratory exploration for success in the wine industry. Science students, of course, gain a more fully developed appreciation and understanding of how their theoretical knowledge directly relates to a local industry that they can readily visit and experience on a first hand basis.

These courses also give nonscience and science students opportunities to explore a new and attractive area of science and technology together. Both groups benefit by these intense interactions on specific issues, since they experience how they each approach problems in different ways [e.g., Myers-Briggs Personality Type Indicators]. These experiences can substantially improve science literacy, along with improving public attitudes about science. Such interactions show how interdependent the nonscience and science communities are on each other. These inter- and multi-disciplinary opportunities can generate new insights and approaches to problems that have resisted conventional methods of attack. This can assist in minimizing the very human, natural and understandable tendencies towards the "tragedy of the commons" syndrome. In addition, such courses can help to better "make the case" for the need and the value of inter- and multi-disciplinary approaches to societal problems that involve diverse cultures.

Students even have the opportunity to use some of their own sensory and chemical analyses results to illustrate how the basic commercial winemaking process must be prudently adjusted to make better wine more consistently in order to increase the chances of making a profit. Naturally, participants who are not 21 years of age or who do not want to participate in alcoholic beverage sensory analyses, taste wine component samples in water and without alcohol.

Students quickly become very impressed with the great diversity of individual responses with respect to these sensory analyses, where students "make use of their own senses as analysis instruments to determine the acceptability of a particular food product - wine." The facile rank total method is used to determine if there are any statistically significant differences among the samples in each tasting. The difficulty of adequately and reliably relating such tasting results to the winemaking process and the data from traditional chemical analyses, further enhances the appreciation of students for the limits and capabilities of science

The course ends with "blind" tastings of commercial wines in order to synthesize and integrate all that has been learned in the course. The inclusion of some chemical analyses and price information on each wine with the results of these tastings adds to the complexity of determining which is the so called "best" wine. These tastings statistically confirm that the more popular wines are many times preferred by the participants in these courses over the "more sophisticated."

As the course progresses, the participants come to a more cultivated and mature appreciation of wine as a complement to food and as part of the "good life," rather than as just another alcoholic beverage.

In addition, extensive use of "discovery," inquiry-based and cooperative learning in a variety of informal group settings, encourages students to confront the complex decision making processes necessary for commercial wineries to become financially successful.

Students must balance a variety of scientific and technological aspects of the winemaking process with the demands of society, including politics, religion, economics, health concerns, public relations, etc., in order for a winery to continue to be successful financially. This assists students in further developing the skills necessary for informed decision making, risk/benefit analysis and determining intelligent choices, rather than attempting simple answers, to complex societal problems.

A substantial science term paper [minimum of 10-15 pages and 10-15 references] required at the end of the traditional 3 credit lab science course, provides students with a formal opportunity to explore, in depth and in a sophisticated way, a particular aspect of the course with respect to its impact on society [e.g., sulfur dioxide ingredient labeling, alcohol and health, effect of the decline of consumption on the tax base, gasohol and the need for more oxygenated fuels, etc.]. The specific requirements involved with doing a science term paper are a new experience for most students, since they involve more current references [e.g., magazines, newspapers, TV, radio, interviews, electronic databases, etc.] rather than just books, since science and technology change so rapidly.

These courses have attracted students from over a dozen different majors outside of the sciences. This makes these courses especially challenging to teach compared to traditional chemistry courses that usually attract only a few different science majors, mostly from biology, nursing and engineering.

The "dynamic interaction" of traditional college age students with nontraditional age participants, especially if the latter are from the wine industry, as they explore the world of winemaking together, is another difficult challenge for the instructor to meet. A variety of teaching styles/techniques, audio visual aids [e.g., slides, overheads, VCR/audio tapes], demonstrations, printed materials, displays, etc. are required, depending on the specific needs of these participants.

The vast amount of assessment data [diagnostic tests, student performance profiles, high school statistics, course grades, Hill Opinion Poll, etc.] accumulated from these courses since 1973 is presently being statistically analyzed using a number of different computer software packages. It is anticipated that a few strong correlations and trends will emerge, as they have for other courses, to assist in the further refinement of these enology courses. Publication is anticipated in a number of appropriate journals and conferences.

## Evolution

The enology courses have undergone numerous phases of evolution to better meet the fluctuating needs and interests of the present rapidly changing college student market, especially with respect to the traditionally larger numbers of nonscience majors compared to science majors. The dramatic developing needs and interests of the Eastern wine industry have also guided this evolution.

From the extensive experience with these enology courses, a 3 credit consumer science lab course evolved that focused on food in general, rather than wine in particular. The sensory and chemical analysis component in this course involves lemon-lime sodas. The consumer science course provided a second option for students to fulfill their curriculum requirements. This was especially important for those students who desired a lab science course that did not involve alcoholic beverages, since they were under the 21 years of age required to consume alcoholic beverages or because of strong personal beliefs.

The present phase of evolution of these courses involves the exploration of substantial outside funding sources to further assist in their development, along with significantly reforming the way chemistry is taught and to whom chemistry is taught. Since these enology and consumer science courses can serve as references and models for similar courses at other institutions, a major thrust for this outside funding will be for exploring the flexibility, adaptability and "transferability" of these very popular and successful courses with respect to other colleges and universities, including related private organizations.

Both the enology and consumer science courses are presently involved in the interdisciplinary initiative for one of only 14 [out of 112 proposals] \$50,000 National Science Foundation [NSF] Planning Grants for systemic change in the teaching of chemistry, which were announced in December 1993. This is a new emphasis by NSF for undergraduate chemistry education designed for fundamental, global changes, especially affecting inter- and multi-disciplinary chemistry courses nonscience majors take or might be attracted to. This initiative is specifically intended to improve scientific literacy and the attitudes of the general public toward science.

The enology and consumer science courses are now even part of a much larger comprehensive curriculum development proposal for a 5 year, \$5,000,000 National Science Foundation Grant. Funding decisions for this larger NSF grant initiative are anticipated sometime during the Fall of 1994. These NSF grants are specifically to encourage new approaches to teaching chemistry which can catalyze such systemic changes in undergraduate chemistry education.

A further recent evolutionary phase of these attractive, popular and successful enology courses involved an evening business degree program for working people from the local community which required all students to fulfill a curriculum requirement involving a science course with a lab component. This was very challenging at one satellite campus, since there were no formal lab facilities available. Therefore, the sensory analyses took on a much greater role. Such organoleptic analyses may be an attractive option to try to fulfill the lab component in science courses that are taught at locations with little or no formal lab facilities, because of only the minimal and generally available materials that they require.

Since many of the course participants in this evening degree program were from the local business community, the effect of science and technology on the economic and financial aspects of viticulture and enology could be presented in more depth. In addition, this material could be readily and easily related by the students to their major and to very familiar situations in the companies that they worked for.

## **Enology Activities of Dr. Gadek**

The extensive activity by Dr. Gadek in the American Society of Enology and Viticulture/Eastern Section [ASEV/ES, as Board Member, Secretary and eventually Chair (President)], along with regularly being selected as a commercial wine judge [e.g., Pennsylvania, New Jersey, Virginia, etc.], greatly assisted in bringing the industrial perspective to these courses.

Dr. Gadek continues to maintain this perspective by working with a few select small, local farm wineries and giving specialized short courses to meet their more immediate needs, thru Enology Education Services, which he and his wife, Lois, established in the early 1980's for this purpose.

Lois is an Associate Professor in the English Department of Allentown College and teaches a wide variety of courses, both in the day and evening degree programs, involving business communications and technical writing, besides the usual composition and literature courses. She has had experience running a family compressed gas business for many years and is currently President of Animals In Distress, a no kill animal shelter, in addition to her duties at the College. Her Ph.D. and M.A. degrees in

English are from Rutgers University and she has a second M.A. degree from Lehigh University. She is also the Secretary of the local township Planning Commission, which is very receptive to owners of small family farms trying to maintain their land in agricultural pursuits in a very competitive commercial development area. They have co-authored numerous articles and presentations on a variety of topics in enology and some outside of enology.

Dr. Gadek has been invited to give presentations on his enology activities at several centers for enology research including the University of California at Davis, CA and the New York State Experiment Station at Geneva, NY.

A major university publisher and a Canadian publisher have recently expressed interest in publishing the laboratory manual, "Simplified Wine Analysis Techniques: A Practical Approach," that he uses to teach many of his enology courses for members of the Eastern wine industry.

Dr. Gadek is featured as part of "The Supporting Cast" in the book "Wine: East of the Rockies," by Hudson Cattell and Lee Miller [Available from L& H Photojournalism, 620 North Pine Street, Lancaster, PA 17603, phone: 717/393-0943].

He was a tenured Full Professor of Chemistry at Allentown College, Center Valley, PA, where he had taught a wide variety of chemistry courses for over 25 years.

From a simple home winemaking kit given to him by his wife as a "novelty" type Christmas gift when they were first married in **1970**, his enology activities developed in many unanticipated ways over the past 25 years. The numerous personal contacts he has made thru these wine activities continue to regularly send him wine associated news items and wine related matters involving their commercial or amateur winemaking endeavors.

## Summary

Since 1973, the use of enology as an innovative way to teach laboratory chemistry has continued to evolve to meet the needs of an ever changing diverse audience. Both nonscience and science undergraduate students in the day and evening programs have had an attractive and useful course to fulfill their required or elective curriculum requirements.

Commercial and amateur winemakers, along with those more seriously interested in wine, from the larger community outside of the normal college clientele, have benefited by having their more sophisticated science and technology enology needs fulfilled in specialized courses that were taught in a manner appropriate to their desires.

Numerous major and minor publications and presentations resulted from these courses. Even a commercially available VCR featuring one of these courses was produced.

Dr. Gadek's current activities are now extending into the area of other presently popular food items, specifically nonalcoholic beverages [e.g., coffee, tea, soda, etc.], chocolate, herbs and spices. The results of this work will be published in appropriate chemical education journals and conferences. He has even been asked to participate in another NSF funded project involving the publication of a book highlighting the more practical aspects of chemistry in order to increase student interest in chemistry.