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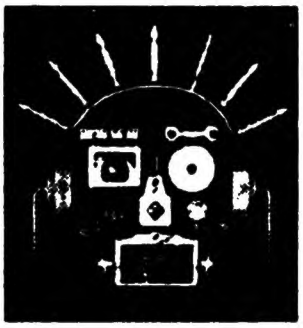
ABSTRACT

This publication contains materials for four courses in Applied Biology/Chemistry in the Applied Academics program at South Seattle Community College. It begins with the article, "Community College Applied Academics: The State of the Art?" (George B. Neff), which describes the characteristics, model, courses, and coordination activity that make up this community college applied academics program. The following materials are provided for each course: course outline (credit, lecture, and lab hours; course description; prerequisites; learning objectives and hours of instruction); course syllabus (course description; required materials; other policies); and course schedule (weekly schedules that include major topics, activities, and laboratory). The first course includes sources, uses, and problems relating to natural resources and the properties, uses, quality, and cycles of water, air, and other gases. The second course covers these topics: components of the continuity of life, food sources, effects of diet on nutrition, and disease transmission, prevention, and treatment in plants and animals. Subjects of the third course are as follows: photosynthesis and the role of nutrients in plant growth and reproduction; animal anatomy and physiology of life processes; and types, benefits, and hazards of microorganisms to humans as well as biotechnology applications of microorganisms. The fourth course addresses these topics: the sources, properties, and uses of synthetic materials; control of home, community, and industrial waste and waste management; and animals and plants sharing space and resources in a community. (YLB)



Seattle Tech Prep
Applied Academics Project

Course Materials
Applied Biology and Chemistry

- o Chemistry 111
- o Chemistry 112
- o Chemistry 113
- o Chemistry 114

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South Seattle Community College
Advanced Technology Center
Applied Academics Project

Community College Applied Academics
The State of the Art?

by George B. Neff

2-20-93

The Applied Academics program at South Seattle Community College is of interest to community college educators involved in or curious about Applied Academics at the post-secondary level and it may be the state-of-the-art. This program is being developed with support from Boeing Corporation and help from CORD (Center for Occupational Research and Development, Waco Texas). CORD assisted in defining the distinguishing characteristics of Applied Academics courses used to shape South Seattle's curriculum. South Seattle Community College's courses are based on these characteristics and are part of an Applied Academics education model developed by the college for the purpose of defining and implementing quality education programs. The Applied Academics program includes courses in: Applied Math, Principles of Technology, Applied Communications, Applied Biology and Chemistry (a new area) and a subject area unique to South Seattle; Applied Humanities. These courses are coordinated with one another and with technical courses in several ways and have been validated by a team from Boeing Corporation. This article describes the characteristics, the model, the courses and the coordination activity that make up one of the most complete and interesting community college Applied Academics programs in the country.

BACKGROUND

South Seattle Community College has been blazing a trail in Applied Academics for over two years. The college is one of four institutions that make up the Seattle Community College District. The South campus is located in a heavily industrialized part of Seattle and has developed a strong area of emphasis in vocational and technical education that round out offerings in college transfer, general studies, and continuing education. The school is viewed as an innovator in vocational and technical education with nationally recognized programs in such diverse fields as Hazardous Materials Management, Food Services, Landscape and Horticulture, and Aviation related technologies. Two years ago, with financial assistance from the Boeing Corporation, the campus began to re-examine the way in which it taught academic subjects to vocational and technical students and to consider adopting the concepts, methods, and or materials of the newly evolving, high school curriculum in Applied Academics. The first two years of this effort focused on initial mastery of the concepts and techniques of Applied Academics, the development of prototype curriculum, and the implementation of initial courses. Last summer, a team of faculty from the school met to document, analyze, and improve current offerings in Applied Academics and to develop some new courses in Applied Biology and Chemistry and in Applied Humanities. The following article describes the results of their summers work.

SECTION I - Distinguishing Characteristics of Applied Academics Courses

The term "Applied Academics" has come to refer to a national standard curriculum consisting of high school courses in Applied Math, Applied Biology/Chemistry and Principles of Technology developed and sold by CORD and similar courses in Applied Communications developed and sold by AIT (Agency for Instructional Technology).

The South Seattle Community College Applied Academics courses are based on the same distinguishing characteristics as the national standard courses and in some cases utilize materials developed by and obtained from CORD or AIT but these are most definitely local products specifically designed for community college students. The development and validation of these courses necessitated the precise definition of the distinguishing characteristics of applied academics courses and the college turned to CORD for help in this critical area.

According to Leno Pedrotti, CORD's founder of Applied Math and Principles of Technology, the distinguishing characteristics of Applied Academics courses include the following:

"Applied Academics courses are competency based, utilize context based learning, integrate academic concepts into technical courses taught in a work place setting, emphasize cooperative learning and stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The emphasis on specific competencies and on putting ideas in context was further stressed in this statement by Leno:

"Applied Academics tries to show the way in which laws, principles, formulas and proofs are used by real people, in the real world, on the job."

The distinguishing characteristics of Applied Academics are summarized as follows:

Applied Academics courses:

- *are competency based*
- *utilize context based learning*
- *integrate academic concepts into technical courses*
- *are taught in a work place setting*
- *emphasize cooperative learning*
- *stress the use of principles, laws, formulas and rules*
- *show how laws, principles, formulas and proofs are used by real people, in the real world, on the job*

The college also developed an education model that supports the implementation of the above characteristics and that defines quality education programs.

SECTION II - The Applied Academics Education Model

The education model includes an Applied Academics mission statement, goals, curriculum guidelines and tools, and instruction guidelines and tools. The purpose of the model is twofold. Not only does the model help insure and facilitate the development of an Applied Academics program that is well anchored in the distinguishing characteristics of Applied Academics, but the model also helps to explicitly define the concept of a quality education and to facilitate the development and delivery of quality education programs.

A. The Mission Statement

The Applied Academics mission statement begins to define a quality education:

"Our mission is to assist in the preparation of persons able to enjoy and discharge the rights, privileges, and responsibilities of citizens in a free society including the rights, privileges and duties of citizenship, vocation, family membership, community membership, and participation in leisure activities."

This mission is consistent with the Presidents education goals, and the SCANS (Secretary's Commission on Achieving Necessary Skills) recommendations, and generally accepted ideas in the tradition of a liberal education as discussed by John Henry Newman in his essays on "The Idea of a University" and the report of the Harvard Committee on a "General Education in a Free Society". Each of these works recognizes that quality education not only prepares good workers but also good family members, community members, and good citizens. The thrust of the current national standard Applied Academics curriculum largely ignores preparation for roles beyond the work place, which is a potentially serious quality problem. South Seattle's Applied Academics program, on the other hand, includes courses in Applied Humanities specifically designed to address preparation for roles not only in but also beyond the work place. The South Seattle Applied Academics mission statement helps focus emphasis on all the roles of a citizen in a free society, a key issue in program quality.

B. The Goals of the Applied Academics Program

The goals of the Applied Academics program are as follows:

"The goals of the South Seattle Community College Applied Academics program are to assist students in leading happy and productive lives as citizens in a free society by providing them with citizenship skills, general work place skills, and specific academic, technical, and vocational skills."

The three level approach to Applied Academics goals (Citizenship, General Work place, and Subject Specific Goals) is unique to South Seattle Community College as far as can be determined but this approach was found to be necessary and useful.

Most skills or competency models (the two terms are used interchangeably in this paper) currently under development try to lump two or more of these categories together and as a result are criticized alternately for over or under emphasis on citizenship vs. work place skills or general vs. specific skills. The three level approach makes the selection of a desirable mix among these elements much easier. The South Seattle goals are defined in more detail in the following section.

Providing Citizenship Skills - Goal 1

Citizenship skills include a knowledge of the rights and responsibilities of citizens in a free society, critical thinking skills, an understanding of work place ethics, knowledge of applied esthetics (i.e. industrial design, human factors engineering etc.), and expertise in applied history (i.e. the techniques of the historian applied to such things as the life cycles of businesses, products, materials and technologies). Esthetics and history are included as citizenship skills because they encourage the consideration of values.

Providing "Citizenship Skills" helps insure that the Applied Academics program turns out not only good workers but also good and complete citizens, a key element is South Seattle's definition of a quality education.

Providing General Work Place Skills - Goal 2

The project did not develop a new list of general work place skills but adopted those skills defined in the SCANS report including five work place competencies and three foundation skills. The SCANS skills seemed adequate for the program and similar enough to the other national general work place competency models being developed to warrant adoption at the time although the college plans to revisit this subject in 1993.

Providing students with "General Work Place Skills" insures that the Applied Academics program and other technical programs turn out individuals not only expert in some vocational or technical facts, but individuals capable of sharing existing facts, acquiring new facts as these become available, applying them in the work place, working effectively with others, assimilating technical change and other job independent, work place skills.

Providing Specific Academic, Vocational, and Technical Skills - Goal 3

Specific academic, vocational and technical skills include academic subject specific, and occupation specific skills that vary with each course of instruction. These skills are developed and documented on a course by course basis.

Providing "Specific Academic, Vocational, and Technical Skills" insure that students receive sufficient specific training to qualify for initial employment and to practice general concepts, theories, laws and pro_'s.

The Applied Academics goals are based on the mission statement and add specificity to it. The mission statement and goals help insure implementation of the principles of Applied Academics and the delivery of quality education programs but are not complete in and of themselves. What is lacking is a way to insure the incorporation of these concepts into the everyday life of the college. The following Curriculum and Instruction guidelines and tools were adopted or developed for this purpose.

C. Curriculum Guidelines and Tools

The following guidelines assume simple definitions of the terms curriculum and instruction. Curriculum is defined as "what you teach", instruction is defined as "how you teach it".

Curriculum elements in the Applied academics model include a program course mix guideline, a course skills mix guideline, and a standard course outline tool.

Guideline 1 - Course Mix

This guideline insures that technical programs prepare students who are good workers but also good citizens.

"All programs of technical instruction should provide students with a suitable mix of courses in citizenship skills, general work place skills and specific academic, vocational and technical skills."

Guideline 2 - Skills Mix

The second curriculum guideline insures the implementation of the Applied Academics principles of context based learning in general and the principle of the integration of academic materials into technical courses in particular.

"Academic concepts should not only be taught in separate academic courses but should also be integrated into all technical courses."

The Standard Course Outline

The model includes a curriculum tool used to measure the mix of skills included in given course or program, the standard course outline. The standard course outline supports the analysis of program and course level skills mix by spreading total course hours among those citizenship skills, general work place skills and specific academic, vocational and technical skills included in the course.

The hours of instruction identified in each course outline may be added together to evaluate the overall mix of instruction provided in any existing or proposed program of study. This approach provides a general control over course and program mix.

D. Instruction Guidelines and Tools

Instruction elements included in the model are a Context Based Instruction Guideline, a Cooperative Learning Guideline, a Utility Guideline and a Course Syllabus Tool. These elements implement the distinguishing characteristics of Applied Academics.

Guideline 1 - Context Based Instruction

Applied Academics courses, more than anything else, teach abstract ideas by putting them in "context".

"Applied Academics courses should be taught in the context of real world settings including the work place, home, and community."

Guideline 2 - Cooperative Learning Techniques

Today's work place puts heavy emphasis on team work. This emphasis is reflected in the Applied Academics program.

"Applied Academics courses should emphasize cooperative learning as a primary instruction model where appropriate."

The college also emphasizes capstone team projects in year two of technical degree programs.

Guideline 3 - Utility

The utility guideline is a key in transforming traditional academic courses into Applied Academics courses.

"Applied Academics courses should stress the use of principles, laws, formulas, and rules in the real world as opposed to the proof of principles and laws, the derivation of formulas, or the evolution of rules."

Guideline 4 - Competency Based Instruction

Competencies or Skills (the terms are used interchangeably in this document), are a key in tieing together instruction between high school and the community college or between related courses in a series of courses.

"Applied Academics courses will provide instruction in clearly defined Citizenship Skills, General Work Place Skills, and Subject Specific Skills."

The Standard Course Syllabus

The above instruction guidelines are reflected in the standard course syllabus. The standard syllabus encourages instructors to consider and to describe the implementation of the above instruction guidelines when creating or selecting teaching methods for Applied Academics courses.

The above Applied Academics education model, including the mission statement, goals, curriculum guidelines and tools and instruction guidelines and tools support the development and implementation of quality Applied Academics programs at South Seattle Community College.

SECTION III - Impacts of the Model on Instructors

Instructors have had a variety of feelings and experiences in attempting to deal with the subject of applied academics and to understand and use the concepts and tools described in this article. Some general patterns appear to be as follows.

In the initial phases of Applied Academics some of the teachers trained in classic academic disciplines felt suspicious about the heavy work place emphasis of the program and doubtful about course and program quality and intent.

In an effort to deal with these initial concerns academic teachers were drawn together with technical faculty and representative of the business community for twice monthly meetings during the summer of 1992.

This project known as the Applied Academics Task Force operated with funding support from the Boeing Corporation and had as its goal the definition of the Education Model described in this article, the development of the Applied Humanities and Applied Biology and Chemistry courses and the analysis and documentation of the college's existing courses in Applied Math, Principles of Technology, and Applied Communications.

The project provided academic and technical teachers with an opportunity to get together outside the press of the academic year, to develop some additional rapport and empathy and to take control, in a sense, of what had been a potentially troublesome topic. This process in and of itself helped teachers feel more in control of things.

The isolation of the distinguishing characteristics of Applied Academics and the reduction of these concepts to some practical guidelines and tools for course development, curriculum and instruction also helped individuals in their understanding of and comfort with this subject.

A related pattern also emerged. It became clear that every teacher involved in the project was already teaching Citizenship Skills, General Work Place Skills and Specific Skills in every course without being asked to do so and, in some cases, without really focusing on this fact. Once the three part skills structure (Citizenship Skills, General Work place Skills and Specific Skills) was defined the teachers quickly saw the pattern in their courses. The fact that all the teachers, academic and technical, shared an interest in all three skills areas helped bond the group.

The structure also was a challenge to the instructors when it came to allocating course hours to skills. It was often the case that more then one kind of skill was taught in a single course activity, for instance, presenting a project to the class could involve not only speaking skills but also an understanding of technical facts related to the project, thinking, speaking, listening, and teamwork skills. These structural challenges were ultimately met with some creative solutions by the team members.

In summary, instructors finished the project with a better appreciation of one another and a new confidence in their ability to define and deliver Applied Academics courses.

SECTION IV - Courses in the Applied Academics Program

The Applied Academics program at South Seattle Community College includes three courses in Applied Math, three in Principles of Technology, four in Applied Communications, four in Applied Biology/Chemistry, and four in Applied Humanities.

The courses in Applied Humanities are unique to South Seattle and include Applied Civics, Applied Philosophy, Applied History and Applied Art. Some detail regarding these courses is provided below because they are unique to South Seattle

A feel for the content of the program is provided in the following course highlights:

Applied Math

Applied Math is currently a three course series. The first course in the series introduces students to applied algebra, geometry, trigonometry, and statistics. This course includes algebraic operations, exponents, roots, scientific notation, dimensional analysis, significant digits, the metric system, first degree equations, plane and solid geometry, solution of right triangles, functions, graphs, descriptive statistics, calculator fundamentals, and applications. This course is designed to be compatible with the modules used in CORD's Applied Mathematics curriculum.

Principles of Technology

The first course is a blend of technology principles with lab practices that involve Mechanical, Fluid, Electrical, and Thermal Systems that are used by technicians in their everyday work.

The second course is a continuation of applied physics with accentuation on rate, energy, power, momentum, resistance and force transformers.

The third course is a continuation of applied physics with accentuation on energy converters, transducers, vibrations and waves, time constants, radiation, and optical systems.

Applied Communications

The first course is designed for technical students and serves as an introduction to communication skills in the work place. Students assess, practice, and improve their oral and written skills in a variety of business formats. This course is coordinated with a computer application course to encourage integration of writing and computer skills.

The second course involves the preparation of a detailed career plan by each student and results in the production of a document in a formal business report format with front matter, a body and complete back matter. This course interfaces with the schools counseling and career services functions, uses skills and careers data banks and library business reference functions, and involves extensive use of the computer.

The third course is coordinated with the students technical program and focuses on communications issues related to second year technical capstone projects. During the year students develop project plans, status reports, research plans, conduct research, do project reports and make speeches. At the end of the year the technical projects, reports and speeches are presented to business advisors and prospective employers in formal end of the year meetings.

Applied Biology and Chemistry

This is a four course series. In these courses biology and chemistry are treated as a unified science.

The first course includes the sources, uses, and problems relating to natural resources and the properties, uses, quality and cycles of water, air and other gases. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

The second course includes components of the continuity of life including genetics, reproduction, and evolution. Food sources and effects of diet on nutrition and disease transmission, prevention, and treatment in plants and animals are also discussed.

The third course included photosynthesis and the role of nutrients in plant growth and reproduction; animal anatomy and physiology of life processes; and types, benefits and hazards of microorganisms to humans as well as biotechnology applications of microorganisms.

The fourth course includes the sources, properties, and uses of synthetic materials; control of home, community and industrial waste, and waste management; and animals and plants sharing space and resources in a community.

Critical Thinking and Ethics in the Work Place (Applied Philosophy)

Critical Thinking and Ethics in the Work place is an introduction to critical thinking, logic and scientific reasoning with applications to other courses, everyday life and work. It is been created with technical education students in mind; whenever possible topics are related directly to the programs of study and future careers of technical education students.

Responsibilities and Rights of Citizenship (Applied Civics)

This course examines individual rights and responsibilities in a free society in the practical context of and individual's roles as a citizen and resident of various levels of government, family member and employee or employer. The course distinguishes between legally enforceable rights and obligations and those rights and responsibilities that are considered essential to a free society. The course assists students in thinking clearly about these issues and adds the dimension of values to the process of this critical thinking.

Lifecycles of Business, Products, and Technologies (Applied History)

This course enables students to use history: its content, analytical process, research methods, analytical methods and writing techniques to anticipate, understand and benefit from changing technology. The course provides the student with insight into the nature of the life cycles of products, materials and processes using the techniques of research, analysis, and writing of history.

Industrial Design And Human Factors (Applied Art)

This course assists the student in developing an esthetics approach to technology and the world of work. The concepts of quality, beauty, good design, and a good work environment are explored from a variety of viewpoints including the philosophical, multi-cultural, psychological, economic, and technological. The course considers esthetics values, the psychology of perception, social values, economics and design, production, materials, and vocational applications.

SECTION V -Inserting New Applied Academics Courses into Established Programs

An interesting set of problems occur when considering how to insert new courses in Applied Academics into existing technical programs. The first fact usually associated with this process is that there is never any extra time for additional courses. The inevitable consequence of this is that new courses must be used as substitutes for existing courses. All the courses described above were developed as substitutes for existing traditional academic courses, some of which were required some electives. But course substitution can be a real pandora's box.

Usually, instructors of current academic courses are schooled in traditional academics and are not hired to be experts in the nuances of the work place. These instructors sometimes see work place preparation as something separate from academics and sometimes beneath traditional academics and may or may not be inclined toward change in any event. Even in the best of cases, where academic instructors are expert in the ways of the work place, enthusiastic about the mission of work place preparation and natural innovators they may not be conversant with the distinguishing characteristics of Applied Academics and the underlying methods of Applied Academics and will therefore be unable to develop and deliver suitable applied courses.

The solution to these problems are not easy to implement but they are simple conceptually. The first decision to make is "can the instructor of an existing traditional academic course develop and deliver a substitute Applied Academics course?". If the answer is not a resounding unqualified yes, then the best approach is recruiting. The second decision to make, if the answer is yes, is "what kind of help will that instructor need in developing and implementing the course?". Some answers to this second question from South Seattle's experience are:

- Provide compensated time outside the press of daily affairs for training and course development.
- Assign instructors to work in teams that include academic instructors, technical instructors and business people.
- Discuss underlying education values.
- Provide an Education Model or some other form of structure within which course development occurs and that insures conformance to agreed upon concepts and values.

The processes of developing Applied Academics courses and of inserting them into existing technical programs present some real challenges but success is possible given the right approach.

SECTION VI - The Coordination of Applied Academics Courses

The distinguishing characteristics of Applied Academics courses suggest that much can be gained from demonstrating the application of academic concepts by relating the concepts to technical subjects.

South Seattle's experience in this area began with the development and implementation of two coordinated courses, an Applied Academics course in Communications, and a course in Computer Applications. In these coordinated courses, students were taught concepts in written and oral communications, and research in the Communications class and were then given a chance to apply these concepts using computer tools (i.e. word processors, presentation graphics and aides, CD-ROM and on-line data bases). This effort met with great success and has led to the coordination of new Applied Communications courses with campus career services and with second year, capstone technical projects.

One of the difficulties in developing and implementing such coordinated courses is the extra time it takes instructors to develop the course and coordinate delivery. The college is fortunate in being able to use faculty development funds to provide stipends to two instructors each quarter, to develop and deliver one new set of coordinated courses.

SECTION VII - Business Validation

The South Seattle Community College Applied Academics program is being validated by the Boeing Corporation as part of their ongoing support to the project. A team of Boeing executives representing corporate business practices, pre-employment screening, and management development, were asked to evaluate all the Applied Academics courses at a high level and to evaluate the Applied Humanities courses in detail. The Boeing team found that the overall Applied Academics program design was on target and that the proposed courses in Applied Humanities were in some cases necessary and in some cases desirable. The Boeing team also proposed some changes on a course by course basis that are being incorporated in the design.

SECTION VIII - Summary

South Seattle's Applied Academics program is still evolving and is by no means complete at this time but the existence of a formal Applied Academics Education Model coupled with community college courses in the newer areas of Applied Communications, Applied Biology and Chemistry and Applied Humanities make it one of the most complete and innovative programs of its type, it may be the state-of-the-art.

Some major issues in Applied Academics have yet to be explored by the college and are targeted for future inquiry. On question is "Do employers really want students who think for themselves and who have highly developed ethical sensitivities?". Another is "Are students who have spent time mastering citizenship competencies and general work place competencies at a disadvantage in competing for entry point jobs with students who do not have these skills but have more occupation specific skills. The question will be explored with the help of a team of Boeing Executives in the coming months.

Another question is the relationship of Applied Academics to English-as-a-Second Language (ESL), and Adult Basic Education (ABE) programs. The Applied Academics courses are required courses for students in a wide range of technical programs. Students taking courses in ESL, ABE might benefit from the principles of teaching in applied context, making it easier for special population of students to access college-level education.

These are but a few more interesting issues to be explored in the further development and refinement of Applied Academics at South Seattle Community College in the future.

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Applied Technology/Science
COURSE TITLE:	Applied Biology and Chemistry
COURSE NUMBER:	CHE 111
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5
LECTURE HOURS:	33
LAB HOURS:	44
CLASS SIZE:	35
COURSE DESCRIPTION:	Biology and chemistry are treated as a unified science. The sources, uses, and problems relating to natural resources and the properties and uses, and quality and cycles of water and air and other gases are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.
COURSE HISTORY:	Originally developed by Joan Stover in 1992
PREREQUISITES:	Basic algebra

LEARNING OBJECTIVES: HOURS OF INSTRUCTION

A. CITIZENSHIP KNOW-HOW:

1. RIGHTS AND RESPONSIBILITIES OF CITIZENS	0.5
2. WORKPLACE ETHICS	0.5
3. APPLIED ART	0.5
4. APPLIED HISTORY	0.5
5. CRITICAL THINKING	See Section B.3

COURSE OUTLINE (CONT.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
B. WORKPLACE KNOW-HOW:	
FIVE WORKPLACE COMPETENCIES	
1. Resources:	
1) Time	0.5
2) Money	0.5
3) Material and Facilities	0.5
4) Human Resources	0.5
2. Interpersonal:	
1) Participates as Member of a Team	3
2) Teaches Others New Skills	2
3) Serves Clients/Customers	0
4) Exercises Leadership	3
5) Negotiates	3
6) Works with Diversity	3
3. Uses Information:	
1) Acquires and Evaluates Information	4
2) Organizes and Maintains Information	4
3) Interprets and Communicates Information	4
4) Uses Computers to Process Information	2
4. Systems:	
1) Understands Systems	4
2) Monitors and Corrects Performance	4
3) Improves or Designs Systems	3
5. Technology: (See Section C)	
THREE FOUNDATION SKILLS	
1. Basic Skills:	
1) Reading	3
2) Writing	3
3) Arithmetic/Mathematics	3
4) Listening	3
5) Speaking	2
2. Thinking Skills:	
1) Creative Thinking	2
2) Decision Making	3
3) Problem Solving	3
4) Seeing Things in the Mind's eye	2
5) Knowing How to Learn	2
6) Reasoning	3

COURSE OUTLINE (CONT.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
3. Personal Qualities:	
1) Responsibility	1
2) Self-Esteem	1
3) Sociability	1
4) Self-Management	1
5) Integrity/Honesty	1

C. SPECIFIC ACADEMIC, VOCATIONAL, TECHNICAL COMPETENCIES:

1. Decide whether or not a natural resource will be available in the future
2. Give examples of how natural resources are used to produce energy, make products, provide food and shelter, and improve the quality of life
3. Analyze problems that result from obtaining and using natural resources
4. Propose solutions to problems resulting from obtaining and using natural resources
5. Relate jobs to natural resources
6. Evaluate the effect of different water uses on water quality and water quantity
7. Analyze the role of water in maintaining life: as a transporter of nutrients, in biochemical reactions, in maintaining water balance and in regulating temperature
8. Express the concentration of solutes in a solvent appropriately according to the occupational context
9. Carry out titration procedures such as might be used in an occupational setting
10. Analyze neutralization reactions and reactions involving buffer solutions such as those that might be carried out in an industrial setting
11. Interpret pH readings and use the pH scale as an indicator of waters acidity or alkalinity.
12. Explain tests to determine water quality, including pH, biochemical oxygen demand, total solids, and concentrations of various solutes in water
13. Link water-treatment methods to different types of wastewater contamination that treatment is intended to address
14. Suggest several different methods to prevent water pollution during personal or domestic use of water and handling of wastes
15. Analyze the pressure, volume and temperature relationships of gases in biological and chemical systems
16. Analyze the importance of each component of the atmosphere to plant and animal life
17. Evaluate the economic, environmental, and personal impact of commercial uses of gases
18. Predict the effects on animal and plant life of industrial and agricultural activities that produce different types of atmospheric pollutants

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SYLLABUS

GENERAL INFORMATION:

Course Number: CHE 111

Course Title: Applied Biology and Chemistry

Instructor: Dr. Stover

Office Location: RS 179

Office Phone: 764-5371

Office Hours:

Room Number:

COURSE DESCRIPTION

Biology and chemistry are treated as a unified science. The sources, uses, and problems relating to natural resources and the properties and uses, and quality and cycles of water and air and other gases are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

REQUIRED MATERIALS:

Three texts published by the Center for Occupational Research and Development: Natural Resources; Water; Air and Other Gases,
Laboratory Notebook, Safety Goggles

COURSE SCHEDULE:

See following Course Schedule

GRADING PROCEDURE:

Your course grade will be determined from attendance and participation, written questions, various quizzes, laboratory exercises, and your final exam. There are 1000 possible points that can be earned this quarter. They are distributed in the method described below:

Participation and attendance	100
Written questions	100
Laboratory exercises	200
Video quizzes	100
Chapter exams	250
Final exam	250
Total Possible	1000

COURSE SYLLABUS (Cont.)

Your numerical grade for the term will be determined by the percentage of the possible points you earn.

100 - 90	4.0 - 3.5
89 - 80	3.4 - 2.5
79 - 60	2.4 - 1.5
59 - 50	1.4 - 0.7

If there are any questions or anticipated difficulty in meeting these requirements, please contact your instructor immediately.

OTHER POLICIES:

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The academic material is woven into the activities and laboratories of the course to make the learning practical and relevant. Work place, home, and community problems are focused upon in all learning efforts.

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SCHEDULE

CHE 111
APPLIED BIOLOGY and CHEMISTRY

Biology and Chemistry are treated as a unified science. Three units (Natural Resources; Water; and Air and Other Gases) will be studied in this course. Three primary types of learning activities will be used. These include hands-on laboratories, text-based activities, and video-assisted activities. Each unit will be introduced with a 5 - 7 minute video that presents applications and role-models as well as present problems and issues for exploration. Each unit is divided into subunits that the teacher will use to lead the class to discover the principles and concepts included by completing text-based activities, doing hands-on laboratories and proposing responses to problems presented via video or evolving from activities. Most often the questions and activities are designed to extend thinking beyond the expectation for easy answers and pat solutions and the teacher will avoid asking students to display evidence of rote learning. When possible laboratories have direct occupational relevance. Laboratories reinforce principles and concepts that are used in various occupational settings, and they may help students develop occupationally relevant laboratory skills. It is the intent of this course that concepts and applications be taught in tandem. About 40% to 50% of instructional time will be spent in hands-on activities that allow students to have experiences in laboratory and field situations similar to or related to those encountered at work, in the home, in the community, or in the environment. Each subunit is completed with a review of objectives that includes the principles and concepts and their applications. Practical and written subunit tests in addition to authentic evaluation methods will be used to assess student learning.

NATURAL RESOURCES

WEEK 1:

Introduction to Natural Resources

Major Topics: Natural resources identified, limited and unlimited resources, nonrenewable and renewable resources, depletion, degradation, relationship of jobs to natural resources, value of natural resources.

Activities: Imagining Earth's twin planet, identifying natural resources required to make common items, calculating time before lignite coal runs out, classifying resources as limited/unlimited and renewable/nonrenewable, interviewing an environmental and chemical analysis technician, researching a job and describing how it relates to natural resources, interviewing a person who works directly with natural resources, placing a value on natural resources not used to make products

Laboratory: How is a resource depleted?

Fossil Fuels

Major Topics: Types of fossil fuels, fossil fuels as energy source, fossil fuels as raw material, chemical composition of fossil fuels, amount of energy stored in fossil fuels, combustion reaction, fossil fuels as limited, nonrenewable resources, pollution related to fossil fuels, alternates to fossil fuels

Activities: Choosing a mining method; reading a graph "Uses of Fossil Fuels", Determining structural and chemical formulas of butane; calculating calories released during combustion of butane; determining products of hydrocarbon combustion; calculating quantity of lignite coal to supply your family's electricity for one year; identifying major industries in community and how they might be impacted by fossil fuel shortages; investigating alternate energy sources; conducting solar energy experiment; prioritizing fossil fuel uses

Laboratory: How do we measure the energy stored in a fossil fuel?

COURSE SCHEDULE (Cont.)

WEEK 2:

Air and Our Atmosphere

Major Topics: Composition of air;air supports life; air supports combustion; air pollution problems: acid rain, pH, smog, ozone, global warming; preventing air pollution

Activities: Interpreting a pie chart; researching problems with particulates; interviewing a respiratory therapist; determining the problem with fuel-to-air ratio; discussing Mexico City and Seattle scenarios; examining neutralization reaction; putting data in a usable form and answering questions about it; determining responsibility for costs of recycling Freon; researching global warming; generating auto activity log and analysis

Laboratory: What is the normal pH of rain?

Water as a Natural Resource

Major Topics: Water cycle, groundwater, aquifers, properties of water: solvent, specific heat; problems of water: quality and quantity; possible solutions to solving water problems

Activities: Map interpretation and evaluation of cause, effects and problem prevention at City Light; personal uses of water; classifying water as a limited or unlimited resource; analysis of the properties of water that make it useful; experiment: dissolved solids in tap water; analysis of Los Angeles and Seattle scenarios; analysis of effects of holding ponds on Metro's effluents; interpretation of water rationing chart and brainstorming water conservation measures

Laboratory: How do plants control water loss? How does acid rain affect water quality? How efficient is a water filter?

WEEK 3:

Soil as a Natural Resource

Major Topics: Soil formation; soil composition; soil nutrients; biogeochemical cycles; problems: erosion, nutrient depletion, pH changes; possible solutions to problems

Activities: Information needed to develop a reclamation plan; size and characteristics of soil particles; selection of soil type for ash containment; a backyard composting operation; chart illustrating nutrient deficiencies in plants; interpretation of fertilizer labels; activities that lead to erosion and ways to control erosion; observation of area where soil has been disturbed over time; selection of crops that grow in soils of a given pH; jobs and their relationship to soil

Laboratory: Why is soil texture important? How are soils conditioned to grow plants?

WEEK 4:

Living Resources: Plants and Animals

Major Topics: Species; human uses of plants and animals; photosynthesis; respiration; food web; carbon dioxide-oxygen cycle; problems: pests, productivity, extinction; possible solutions

Activities: Write letters to editor; research source of given medicines; write guidelines for avoiding spreading oak wilt; identify locally endangered plants and wildlife; research and create a display showing how some pollutant or additive interferes with plant or animal survival; consider different occupations in developing a reclamation plan for the Black Diamond coal mine site

Laboratory: Does the effect of acid rain on crops depend on soil factors? How should we manage our game species?

COURSE SCHEDULE (Cont.)

WATER

WEEK 5:

Why is Water Important?

Major Topics: The water cycle; phases of matter - solid, liquid, and vapor; mixtures - suspensions, colloidal suspensions, solutions; chemical formulas - empirical, molecular, and structural; polarity of molecules

Activities: Investigate sources of water in the community; evaluation of dependence of community on sources of water; obtain permission from landowner to use creek or pond for water habitat study; conduct poll of water uses in the workplace, compile results and report to class; compare air conditioners and evaporative coolers as to efficiency and cost; role of water as coolant in the automobile; evaluate differences in mayonnaise and salad dressing (colloidal suspensions); identify solutes in various solutions; find density of various mediums compared to density of water; develop guidelines for predictions (objects float in water); calculate empirical formula; calculate molecular formula of water; calculate molecular formula of ethane

How Does Water Support Life?

Major Topics: Heat capacity; heat of vaporization; temperature regulation; diffusion of material; osmosis of material; circulation of blood; balancing chemical equations; water balance

Activities: Visit water habitat study site; investigate how organisms respond to environmental temperature changes; share information with class; investigate dye behavior in water; investigate salt solution behavior in water; investigate starch solution behavior in water; investigate plants watered with water and salt solution; balance chemical equations; recognize chemical formulas representing life processes; investigate water balance in fresh water and salt water animals; develop plan for providing year-round water supply to herd of cattle

Laboratory: Movement of molecules across a membrane

WEEK 6:

How is Water Used?

Major Topics: Competing uses of water; dissolving process; hydrogen bonding; the action of soap; concentration; dilution; boiling point elevation and freezing point depression; density

Activities: Develop questionnaire about water usage; maintain water-use log in the home for 2 days; find factors that account for water withdrawn for agricultural uses that is not returned to its source; make plan of action for a trout farmer's partner to respond to state demands; investigate industry use of water; interview industry representative; construct models of water molecules and hydrogen bonds; conduct investigation of use of water as solvent; create storyboard for a commercial advertising a soap product; describe how to make 1500 ml of a 0.35 N NaCl solution; calculate mass of various elements; describe how to make 4000 ml of a 0.03 N $Ca(OH)_2$ solution; describe how to make 500 grams of a 10% by weight sugar solution; describe how to make 6 liters of a 5% by volume germicidal solution; describe and calculate how to dilute solutions; take readings at water habitat study site

Laboratory: When should I sweeten my tea? How does antifreeze work? Part 1: freezing point depression, Part 2: boiling point elevation; How is density measured?

COURSE SCHEDULE (Cont.)

WEEK 7:

What are Acids and Bases and How are They Used in Solutions:

Major Topics: Ionization; acids and bases; hydrogen ion concentration and pH; equilibria and equilibrium constants; acid-base neutralization; buffers

Activities: Inventory acids found in food products; survey antacids and find if they contain hydroxides; explain ion-exchange system used to purify water; use equilibrium constant equation to work problems; sample water at you habitat study site; calculate log functions on calculator; use litmus paper to test for acid or alkaline; interview plant safety officer at industry using acids in manufacturing; interview radiologist to find out how barium sulfate is used in diagnostic tests; investigate swimming pool maintenance

Laboratory: How does pH affect hydroponic plant growth? How is pH lowered? How is pH raised? What do buffers do?

WEEK 8:

How Can We Protect the Quality of Water?

Major Topics: Pollution of water; pollutants of water; prevention of water pollution; water quality testing; water treatment

Activities: Interview power plant operations supervisor and find out about water treatment processes in a power plant; interview solid waste department manager and find out how solid waste is disposed of in the community; contact farmers, landscapers, groundskeepers, etc. and find out how fertilizers and pesticides are used; analyze graphs to determine data; design product label that will help users of insecticide to keep from contaminating water supplies; research water bill and come up with ways to reduce usage in the home; calculate solids in a sample; perform dissolved oxygen tests on water samples; investigate effectiveness of water filtering

Laboratory: Testing water quality

AIR AND OTHER GASES

WEEK 9:

What is Air?

Major Topics: Gas as a phase of matter; atoms, molecules, ions; composition of atmosphere; vertical profile of the atmosphere; introduction to pressure and its relation to altitude

Activities: Examining the different "shapes" of air; forming a human oxygen molecule; studying a topographical map; examining compressed air at a service station

Laboratory: How can we tell one gas from another? How do we measure atmospheric conditions?

How Does Air Support Life?

Major Topics: Gas cycles - carbon, nitrogen, oxygen; photosynthesis and nitrogen fixation; gas exchange in plants and animals; diffusion, partial pressure, and solubility of gases (Henry's Law); structure and function of mammalian respiratory systems; energy and ATP as related to respiration and photosynthesis, oxidation and reduction reactions

Activities: Analyzing commercial fertilizers versus planting to enrich the soil; researching environmental needs for plants; demonstrating oxygen diffusion; showing the effects of smoking on the respiratory system; demonstrating the function of the lungs; comparing color changes in indicator solution caused by different gases; oxidizing an organic dye with chlorine

Laboratory: How are plants affected by carbon dioxide levels? How do we measure the amount of oxygen available to aquatic life?

COURSE SCHEDULE (Cont.)

WEEK 10:

How are Gases Used Commercially?

Major Topics: Pressure-volume-temperature relationship of gases (Gas Laws); applications of the gas laws in industrial settings; gases as fuels; gases industrial chemical reactions; safe handling of gases

Activities: Presenting a demonstration of a pneumatic device; measuring temperature in industry; applying Charles' law for specific applications; applying the combined gas law for specific applications; visiting a welding class; surveying local businesses to see what type of gases are used

Laboratory: How do gases respond to changes in temperature and pressure? How are gases dried?

WEEK 11:

How Can We Maintain Air Quality?

Major Topics: Role of density and molecular weight in dispersion of gases (Graham's law); sense of smell in animals; gas analysis; sources of air pollution; major air pollution problems - acid rain, global warming, ozone depletion

Activities: Researching the Bhopal accident; calculating the molecular weights of two gases; identifying scents of different oils; researching the use of a gas spectrophotometer; making smog in a jar; researching levels of pollution in your area; measuring pH of rain water; ranking your own home as a contributor to the ozone problem; surveying attitudes about global warming

Laboratory: Do auto emissions affect plant growth? How does our sense of smell depend on the properties of gases?

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Applied Technology/Science
COURSE TITLE:	Applied Biology and Chemistry
COURSE NUMBER:	CHE 112
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5
LECTURE HOURS:	33
LAB HOURS:	44
CLASS SIZE:	35
COURSE DESCRIPTION:	Biology and chemistry are treated as a unified science. Genetics, reproduction, and evolution as components of the continuity of life; food sources and effects of diet relating to nutrition; and transmission, prevention, and treatment of disease and wellness in plants and animals are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.
COURSE HISTORY:	Originally developed by Joan Stover in 1992
PREREQUISITES:	Basic algebra

LEARNING OBJECTIVES: **HOURS OF INSTRUCTION**

A. CITIZENSHIP KNOW-HOW:

1. RIGHTS AND RESPONSIBILITIES OF CITIZENS	0.5
2. WORKPLACE ETHICS	0.5
3. APPLIED ART	0.5
4. APPLIED HISTORY	0.5
5. CRITICAL THINKING	see Section B.3

COURSE OUTLINE (Cont.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
B. WORKPLACE KNOW-HOW:	
FIVE WORKPLACE COMPETENCIES	
1. Resources:	
1) Time	0.5
2) Money	0.5
3) Material and Facilities	0.5
4) Human Resources	0.5
2. Interpersonal:	
1) Participates as Member of a Team	3
2) Teaches Others New Skills	2
3) Serves Clients/Customers	0
4) Exercises Leadership	3
5) Negotiates	3
6) Works with Diversity	3
3. Uses Information:	
1) Acquires and Evaluates Information	4
2) Organizes and Maintains Information	4
3) Interprets and Communicates Information	4
4) Uses Computers to Process Information	2
4. Systems:	
1) Understands Systems	4
2) Monitors and Corrects Performance	4
3) Improves or Designs Systems	3
5. Technology: (See Section C)	
THREE FOUNDATION SKILLS	
1. Basic Skills:	
1) Reading	3
2) Writing	3
3) Arithmetic/Mathematics	3
4) Listening	3
5) Speaking	2
2. Thinking Skills:	
1) Creative Thinking	2
2) Decision Making	3
3) Problem Solving	3
4) Seeing Things in the Mind's eye	2
5) Knowing How to Learn	2
6) Reasoning	3

COURSE OUTLINE (CONT.)

LEARNING OBJECTIVES:	HOURS OF INSTRUCTION
3. Personal Qualities:	
1) Responsibility	1
2) Self-Esteem	1
3) Sociability	1
4) Self-Management	1
5) Integrity/Honesty	1

C. SPECIFIC ACADEMIC, VOCATIONAL, TECHNICAL COMPETENCIES:

1. Relate the continuation of life to the cell's chemical code: DNA
2. Relate the male and female reproductive systems to their reproductive functions
3. Compare how well different methods of birth control prevent pregnancy
4. Predict the special needs of the expectant mother and the developing fetus during different stages of pregnancy and birth
5. Explain what animal breeders need to know about genetic inheritance in animals to produce more economically valuable breeds
6. Compare the results of natural selection in wild populations to the results of artificial selection in similar domesticated species
7. Outline methods of altering the genetic makeup of an organism
8. Predict how genetic engineering might affect society during your lifetime
9. Determine the presence of key nutrients in foods by conducting laboratory tests
10. Analyze the components and functions of nutrients in an optimal diet and an optimal feed ration
11. Evaluate the nutritional value of popular foods, advertised diet plans, and your own dietary intake
12. Relate symptoms of unbalanced diets/rations to the function of nutrients in humans and animals
13. Appraise the advantages and disadvantages of different methods of food processing and feed milling
14. Evaluate the benefits and problems associated with different types of food/ration additives and supplements
15. Recommend food storage, handling and preparation methods to ensure food quality and health in food-handling operations, both commercial and domestic
16. Link digestive-system anatomy and physiology in humans and other animals to their food or feed requirements
17. Formulate and evaluate solutions to nutritional problems
18. Report on some major health threats and leading causes of disease in the United States
19. Recommend methods of disease prevention and control according to what is known about how diseases originate
20. Analyze how the body defends itself against disease
21. Compare and contrast bacterial and viral infections, their treatment, and prevention
22. Evaluate facts and beliefs about different types of abused chemicals and their effects on the body

COURSE OUTLINE (CONT.)

23. Prepare a plan for reducing your health risks and improving or maintaining your health
24. Appraise health-care careers according to these criteria: the role performed (prevention, control, diagnosis, care and treatment, and support); level (entry, technical, and professional); and requirements for employment.

Submitted by: _____ Date: _____

Approved by: _____ Date: _____

COURSE SYLLABUS

GENERAL INFORMATION:

Course Number: CHE 112

Course Title: Applied Biology and Chemistry

Instructor: Dr. Stover

Office Location: RS 179

Office Phone: 764-5371

Office Hours:

Room Number:

COURSE DESCRIPTION:

Biology and chemistry are treated as a unified science. Genetics, reproduction, and evolution as components of the continuity of life; food sources and effects of diet relating to nutrition; and transmission, prevention, and treatment of disease and wellness in plants and animals are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

REQUIRED MATERIALS:

Three texts published by the Center for Occupational Research and Development: Continuity of Life; Nutrition; and Disease and Wellness

Laboratory Notebook
Safety Goggles

COURSE SCHEDULE:

See following Course Schedule

GRADING PROCEDURE:

Your course grade will be determined from attendance and participation, written questions, various quizzes, laboratory exercises, and your final exam. There are 1000 possible points that can be earned this quarter. They are distributed in the method described below:

Participation and attendance	100
Written questions	100
Laboratory exercises	200
Video quizzes	100
Chapter exams	250
Final exam	250
Total Possible	1000

COURSE SYLLABUS (Cont.)

Your numerical grade for the term will be determined by the percentage of the possible points you earn.

100 - 90	4.0 - 3.5
89 - 80	3.4 - 2.5
79 - 60	2.4 - 1.5
59 - 50	1.4 - 0.7

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Submitted by: _____ **Date:** _____

Approved by: _____ **Date:** _____

COURSE SCHEDULE

CHE 112
APPLIED BIOLOGY and CHEMISTRY

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CONTINUITY OF LIFE

WEEK 1:

How Cells Grow and Reproduce

Major Topics: Cells, organelles and their function, DNA, protein synthesis, mitosis, cancer: mitosis out of control

Activities: Viewing cells under the microscope, building DNA model, comparing human and bovine DNA base sequences for insulin production, using a table to translate DNA base sequences to amino acid sequences, use a model of DNA to demonstrate protein synthesis, using pipecleaners to model mitosis, using a microscope to view mitosis

Laboratory: Why are membranes important to cells? How can DNA be obtained from cells?

How Organisms Reproduce

Major Topics: Sexual reproduction, meiosis, human reproductive systems: male and female, hormones in human and animal reproduction: menstrual cycle and estrous cycles, fertilization, artificial insemination and in vitro fertilization, birth control

Activities: Researching animal reproduction, modeling meiosis with pipecleaners and string, sequencing meiosis slides, investigating secondary sex characteristics in males and females, comparing animal reproductive systems to human reproductive systems, determining mean and median ages for puberty from a population sample, interviewing veterinarian or other about estrous cycles in animals, identifying hazards to frog eggs that might prevent fertilization, investigating local availability and requirements for in vitro fertilization, investigating options for pregnant teenager and how they might affect her life, identifying birth control options, analyzing what parts of the reproductive anatomy are affected by different means of birth control

Laboratory: How is the growth of microorganisms controlled? How must semen for artificial insemination be treated?

COURSE SCHEDULE (Cont.)

WEEK 2:

Pregnancy and Birth

Major Topics: Pregnancy, embryonic and fetal development, birth defects and their causes, nutritional requirements during pregnancy, birth process

Activities: Discuss parenting, research gestation periods for different animals, invite speaker to discuss development of child during pregnancy, investigate various factors - environment, diseases - that contribute to birth defects; develop guidelines to ensure healthy baby and prevent birth defects, discussion aborting a fetus with birth defects, formulate diet for pregnant woman, interview midwife about process of childbirth

Laboratory: How do animals develop from a single cell?

Genetic Inheritance in a Family

Major Topics: Dominant and recessive genes, sex dominance, hereditary disease, pedigrees, mutations and their causes

Activities: Examine karyotype and summarize findings, develop Punnet square, explain phenotypes and genotypes, research possible genetic basis of eye color with classmates, determine facial traits by recording phenotypes and genotypes, debate consequences of marriage between two persons each carrying a recessive gene for a genetic disease, analyze pedigrees and predict characteristics of offspring, research causes of mutations in human beings

Laboratory: How do we inherit our biological characteristics?

WEEK 3:

Genetic Inheritance in a Population

Major Topics: Natural selection, artificial selection, elephant matchmaking

Activities: Write explanation of difference between beneficial and harmful mutations, predict coloring of peppered moth due to environmental factors, develop breeding program for new breed of dog, research theories about the extinction of dinosaurs, present findings, discuss how DNA fingerprinting could help trace flow of illegal ivory, discuss possibilities of human extinction

Laboratory: How does natural selection work?

WEEK 4:

Genetic Engineering and Other Biotechnologies

Major Topics: genetic engineering, recombinant DNA, monoclonal antibody technology, benefits of genetic engineering, environmental, legal, and ethical concerns

Activities: Write recommendation to either approve or reject B. t. Cotton, demonstrate insertion of a human gene for insulin production into a bacterial cell, research and illustrate latest advances being made in genetic engineering, debate ethical and moral issues associated with genetic engineering and other biotechnologies

Laboratory: How are organisms genetically engineered? How can we be fingerprinted through our DNA? Part 1: Running gel electrophoresis Part: Staining and analyzing DNA bands

COURSE SCHEDULE (Cont.)

NUTRITION

WEEK 5:

Different Diets for Different Needs

Major Topics: Six nutrient classes, food energy - calories, BMR, SDA, physical activity needs, human life cycle nutrient requirements, animal life cycle nutrient requirements, conditions that influence human and animal food selection

Activities: Discuss dietary needs and factors that influence them, calculate BMR, calculate SDA, calculate student total calorie needs, calculate calorie needs of pregnant homemaker, develop ration for selected animals, examine and compare dog food labels, interview persons whose religious beliefs influence their diet selection, write and send letter requesting the diet of famous athlete, research weight reduction diets, develop 1-day diet plan for selected health conditions

You Really Are What You Eat

Major Topics: Nutrition related elements, types and purpose of: water, carbohydrates, lipids, protein, vitamins (both human and animal function charts), minerals (both human and animal function charts), RDA, Basic 4 Food Groups and animal diet plans

Activities: Reading the labels and listing of elements found in common foods, compiling 3-day food diary, discussing chemical equation of photosynthesis, examining 3-day food diary, discussing nutrition value listed on various snack food labels, demonstrating the chemical composition of various amino acids, investigating nutritional value of fast food offerings, researching of megavitamin therapy issues, analyzing 3-day food diary for Basic 4 Food Group servings, discussing nutritional composition of a particular feed ration

Laboratory: What nutrients do our foods contain? What factors affect the vitamin content in food?

WEEK 6:

How is Food Digested and Absorbed?

Major Topics: Human digestive system components, animal digestive systems: carnivores, herbivores, omnivores, digestion of food in humans and animal, nutrient transport, nutrient absorption

Activities: Modeling of human digestive system in clay, researching a specific animal's diet and digestive system, examining ulcer patient's diet and role play of his meeting with a nutritionist, labeling a digestive system chart as to where nutrient absorption takes place

Laboratory: How do digestive enzymes work? How do we digest and absorb nutrients from food?

COURSE SCHEDULE (Cont.)

WEEK 7:
Food Technology

Major Topics: Common foodborne illnesses and the microorganisms that cause them, temperature measurements and conversion, temperature's influence on microorganisms, food additives, enzyme action, food preservation methods, irradiation, food packaging, animal feed processing, new product development

Activities: Role play a food service director at a press conference for addressing a foodborne illness outbreak, write a letter for information on food/feed safety inspections, draw and describe microorganisms viewed under microscope, develop a proposal for cause of food borne illness in scenario, calculate temperatures in pizza parlor scenario, make chart of time and activities listed in food borne illness scenario, list and write purpose of additives found on food/feed labels, asking additive-related questions of agriculture producer/feed mill operator, research and list pros and cons of food additives, listen to government extension specialist about home canning procedures, compare nutritional value and cost of one food processed in various ways, investigate irradiation processing, tour a grocery store in small groups to locate foods developed for people with special needs

Laboratory: How is growth of mold inhibited in baked goods? What causes milk products to sour?

WEEK 8:
Dietary Problems

Major Topics: Hunger and malnutrition, nutrient imbalance, vitamin and mineral imbalances for humans and animals, evaluation of nutrient health status, eating disorders

Activities: Investigation and recommendations by four committees on hunger and malnutrition in a local community, development of nutritional guessing game, comparison of nutritional deficiencies in humans and in animals, estimation of nutritional health and weight of animals on a livestock farm, examination of popular magazines for body type and/or image messages, analysis of the nutritional value of various diets or diet products, investigation of the eating habits of selected animals

Laboratory: Why are preservatives desirable in our food? What the big worms eat

COURSE SCHEDULE (Cont.)

DISEASE AND WELLNESS

WEEK 9:

How Do Health-Care Providers Help Us Deal With Disease?

Major Topics: Cardiovascular disease, Oncology, Pediatrics, Immune disorders and disease, geriatrics, therapeutic services, medical unit, diagnoses, trauma unit

Activities: Researching a disease and explaining your findings, determining your pulse rate, listing your thoughts about cancer, researching your family's medical history, designing AIDS awareness posters, simulating geriatric ailments

Laboratory: What's your type? How does the medical laboratory diagnose disease? Blood smear

How Do Our Bodies Defend Against Invaders?

Major Topics: Pathogens, viruses, bacteria, fungi, protozoans, parasitic worms, vaccinations, immune system and its response to pathogens, disease transmission, immune disorders; AIDS; allergies

Activities: Identifying stress, researching pathogens, investigating diseases to see what type of pathogen causes them, researching vaccinations needed by our livestock, researching different bacteria and the diseases they cause, investigating the causes of food poisoning at a picnic, discussing ways to save children in underdeveloped countries, building a model of a white blood cell, investigating infectious diseases, researching sexually transmitted diseases in cattle, researching zoo noses, investigating infectious diseases in animals, researching the different treatments for AIDS, identifying common allergies and their symptoms

Laboratory: How does the medical lab diagnose disease? Gram stain How does an epidemic spread?

WEEK 10:

What Are the Major Health Threats That We Face Today?

Major Topics: Major health threats: accidents, homicides and suicides, heart disease, cancer, stroke, diabetes, mental health, environmental hazards and disease

Activities: Researching the leading causes of disease and death among teenagers in your area, interviewing a heart attack victim, investigating congenital heart defects, researching different types of cancer, researching mental illness, displaying environmental health hazards, investigating disease caused by chronic exposure, investigating disease caused by environmental contamination

Laboratory: How is urine used to detect serious disease? How can we check for lead contamination in our environment?

COURSE SCHEDULE (Cont.)

What is The Connection Between Chemical Addiction

Major Topics: Chemical addiction, scientific method, street drugs: stimulants, depressants, opiates, hallucinogens, marijuana, anabolic steroids, legal drugs: alcohol, tobacco, caffeine, and prescription drugs, drug abuse, treatment of addictive diseases

Activities: Investigating the facts of drugs, recording information you hear about drugs, researching the drug cocaine, forming a hypothesis about drug users, writing about why a person uses drugs, making a graph of drugs that ar used locally, discussing facts about marijuana, discussing anabolic steroids with athletes, displaying ads for alcohol, observing drunken behavior at a party, interviewing tobacco users, interviewing people who have stopped smoking, recognizing addictive behavior, investigating treatment facilities in your area

Laboratory: How do drugs affect our heart rate? How are drugs and poisons from a crime scene identified?

WEEK 11:

How Do We Become And/Or Stay Healthy?

Major Topics: Health assessment, healthy diet, exercise benefits, sleep, stress management, mental health, warning signals

Activities: Calculating your health status, keeping a diary of what you eat, calculating the breakdown of nutrients of what you eat, interviewing a vegetarian, identifying foods high in cholesterol and saturated fats, researching recommended dietary allowances (RDAs), identifying various food types in supermarkets, planning an exercise program for yourself, recording sleep patterns, investigating sleep disorders, deciding what is stressful about your life, dealing with stress in your life, researching the relationship between nutrition and cancer, investigating cancer in animals, developing a lifetime plan for fitness

Laboratory: How healthy are you? How does exercise affect metabolic rate?

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Applied Technology/Science
COURSE TITLE:	Applied Biology and Chemistry
COURSE NUMBER:	CHE 113
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5
LECTURE HOURS:	33
LAB HOURS:	44
CLASS SIZE:	35
COURSE DESCRIPTION:	Biology and chemistry are treated as a unified science. Photosynthesis and the role of nutrients in plant growth and reproduction; animal anatomy and physiology of life processes; and types, benefits and hazards of microorganisms to humans and biotechnology applications of microorganisms are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.
COURSE HISTORY:	Originally developed by Joan Stover in 1992
PREREQUISITES:	Basic algebra

CORD has completed but not distributed the materials briefly described in this outline. Receipt of the materials is expected during September 1992. After receipt of these texts, this material must be reviewed, edited and completed.

LEARNING OBJECTIVES AND COMPETENCIES BEING DEVELOPED

COURSE SYLLABUS

GENERAL INFORMATION:

Course Number: CHE 113

Course Title: Applied Biology and Chemistry

Instructor: Dr. Stover

Office Location: RS 179

Office Phone: 764-5371

Office Hours:

Room Number:

COURSE DESCRIPTION:

Biology and chemistry are treated as a unified science. Photosynthesis and the role of nutrients in plant growth and reproduction; animal anatomy and physiology of life processes; and types, benefits and hazards of microorganisms to humans and biotechnology applications of microorganisms are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

REQUIRED MATERIALS:

**Three texts published by the Center for Occupational Research and Development:

Plant Growth and Reproduction; Life Process; and Microorganisms
Laboratory Notebook
Safety Goggles

**These texts have been prepared by CORD and are being distributed September, 1992.

COURSE SCHEDULE: See following Course Schedule

GRADING PROCEDURE:

Your course grade will be determined from attendance and participation, written questions, various quizzes, laboratory exercises, and your final exam. There are 1000 possible points that can be earned this quarter. They are distributed in the method described below:

Participation and attendance	100
Written questions	100
Laboratory exercises	200
Video quizzes	100
Chapter exams	250
Final exam	250
Total Possible	1000

COURSE SYLLABUS (Cont.)

Your numerical grade for the term will be determined by the percentage of the possible points you earn.

100 - 90	4.0 - 3.5
89 - 80	3.4 - 2.5
79 - 60	2.4 - 1.5
59 - 50	1.4 - 0.7

If there are any questions or anticipated difficulty in meeting these requirements, please contact your instructor immediately.

OTHER POLICIES:

Class and laboratory attendance is required for a full understanding of the course. Laboratory requires hands on experience. Class attendance is vital to a full understanding of biological and chemical concepts and problem solving techniques. Due to problems of scheduling laboratory and providing staff, no laboratory make-up periods are possible. In order to prevent a necessary and unavoidable absence from adversely affecting your grade, the lowest laboratory score will be dropped. If you miss a laboratory, it will automatically count as the dropped laboratory.

Due to scheduling problems of films and/or videos, it will not usually be possible to make-up a missed one.

No make-up quizzes will be given unless the absence was the result of an unavoidable serious accident, a death in the family, or a serious illness. Exceptional circumstances must be verified by an appropriate third party, i.e., a police report, a funeral notice, or a note from the student's doctor stating the patient's inability to take the test.

Study questions and analysis exercises must be turned-in on the date due. Late homework will not be accepted for grading unless verified exceptional circumstances exist.

In order to prevent an unavoidable absence from a quiz adversely affecting a student's grade, the lowest score on a video quiz or a text quiz will each be dropped. If a student misses a quiz, that would automatically count as his/her dropped quiz.

In order to make it possible for every student to hear, no conversations, comments, or other background noise creating activities are allowed. However, there will be many organized opportunities for small group discussions as well as large group discussions.

Student misconduct is defined in Seattle Community College District Procedure 375.20 (WAC 132F-120-110). Attention is called to paragraphs d and e which identify the intentional obstruction or disruption of teaching and physical and/or verbal abuse of any person on campus premises as misconduct. Disciplinary sanctions for misconduct may include dismissal from the campus. By Procedure 375.40.4 an instructor has the authority to exclude a student from any class session in which the student is disorderly or disruptive. The Policy and Procedures Manual is available for reading in the campus library.

COURSE SYLLABUS (Cont.)

During an examination you will need a pen or pencil and an electronic calculator. All paper will be provided. You are never to have any books, paper or other materials on the desk. You must do your own work. If you are caught plagiarizing, you will, at a minimum get a zero for the paper, and I will write a memo to the dean documenting the case. The dean may assess further penalties such as disciplinary probation, dismissal from this class, or dismissal from South Seattle Community College. Plagiarism is a serious offense, and one that I, College Transfer Division, and South Seattle Community College are determined to eliminate.

Laboratory work is an important part of a biology and chemistry course. An effort has been made to select exercises that will demonstrate basic principles and techniques currently in use by chemists. The exercises will be completed by small assigned groups. Each student should read and study the manual before the laboratory period. The lab period will begin with a brief introduction to each exercise in anticipation of techniques that may be confusing, unfamiliar or difficult. Particular emphasis will be placed on laboratory safety. With prior preparation, laboratory exercises can be completed in a single laboratory period. Some of the above laboratory periods may begin with a quick quiz over the assigned exercise. The quiz will be graded.

Two two-hour periods a week will be allowed for the student to work in the laboratory. No additional laboratory time will be permitted. In most cases there will be sufficient time to complete the exercise and the calculation during the laboratory time.

Safety goggles must always be worn when a student is in the laboratory. A few extra pairs of goggles are present in the laboratory and you are welcome to borrow and use the limited number of goggles that are available. If you do not already own a pair of goggles, they may be purchased in the bookstore. If you are not wearing safety goggles over your eyes at all times during the laboratory period, you will be required to leave the laboratory.

Your instructor is always available by appointment and often available for drop-in meetings in RS 179. Check the office door for your instructor's quarterly class schedule.

Because this instructor is convinced that quality learning is enhanced by an environment of open communication between students and instructor, I may periodically use techniques drawn from classroom research, SGID (Small Group Instructional Diagnosis), and/or written student surveys to promote representative communication.

CONFORMANCE TO STANDARDS:

"All Applied Academics courses will be taught in the context of real world settings including the work place, home, and community."

Biology and Chemistry are integrated components of the real world. This course treats biology and chemistry as a unified science. When possible laboratories will have direct occupational relevance. About 40% to 50% of instructional time will be spent in hands-on activities that allow students to have experiences in laboratory and field situations similar to or related to those encountered at work, in the home, in the community, or in the environment.

"All Applied Academics courses will emphasize cooperative learning as a primary instruction model."

Activities and laboratories will emphasize students working in teams of small assigned groups. The members of the groups will be responsible to one another for the success of their team. Both head and hand skills will be worked on cooperatively.

COURSE SYLLABUS (Cont.)

"All Applied Academics courses will stress the use of principles, laws, formulas and rules in the real world as opposed to focusing on proofs of principles and laws, the derivation of formulas, or the evolution of rules."

The academic material is woven into the activities and laboratories of the course to make the learning practical and relevant. Work place, home, and community problems are focused upon in all learning efforts.

Submitted by: _____ **Date:** _____

Approved by: _____ **Date:** _____

COURSE SCHEDULE

CHE 113
APPLIED BIOLOGY and CHEMISTRY

Biology and Chemistry are treated as a unified science. Three units (Plant Growth and Reproduction; Microorganisms; and Life Processes) will be studied in this course. Three primary types of learning activities will be used. These include hands-on laboratories, text-based activities, and video-assisted activities. Each unit will be introduced with a 5 - 7 minute video that presents applications and role-models as well as present problems and issues for exploration. Each unit is divided into subunits that the teacher will use to lead the class to discover the principles and concepts included by completing text-based activities, doing hands-on laboratories and proposing responses to problems presented via video or evolving from activities. Most often the questions and activities are designed to extend thinking beyond the expectation for easy answers and pat solutions and the teacher will avoid asking students to display evidence of rote learning. When possible laboratories have direct occupational relevance. Laboratories reinforce principles and concepts that are used in various occupational settings, and they may help students develop occupationally relevant laboratory skills. It is the intent of this course that concepts and applications be taught in tandem. About 40% to 50% of instructional time will be spent in hands-on activities that allow students to have experiences in laboratory and field situations similar to or related to those encountered at work, in the home, in the community, or in the environment. Each subunit is completed with a review of objectives that includes the principles and concepts and their applications. Practical and written subunit tests in addition to authentic evaluation methods will be used to assess student learning.

The following was prepared on the basis of draft information released by CORD describing and sampling these units. These three units will be finalized and released during September 1992. After receipt of the finished texts, this material must be reviewed.

PLANT GROWTH AND REPRODUCTION

WEEK 1:

Introduction to Plants

Major Topics: Roots, stems, and leaves, flowers, seeds and fruits, How can you tell if plants are healthy?

Activities: Examine growth of roots, stems and leaves for seeds, identify parts of woody stem and determine age, identify flower parts and stage of reproduction, examine germination requirements for different seeds, collect and examine plant parts for arthropod infestations

Laboratory: Extracting and using chemical compounds from plants. How can flowers be made to loom at a given time of year?

COURSE SCHEDULE (Cont.)

Growing and Caring for Ornamental Plants

Major Topics: How are plants used in and around the home? What is soil and how does it affect plant growth? What nutrients do plants obtain from the soil and why are they essential? How are plant nutrients maintained in the soil? How are plants started from seed?

Activities: Research trees and shrubs used as barriers as leave school, examine soil sample to determine type, determine surface area covered by soil particles, research composting, examine fertilizer label for nutrient contents, test cultivated soil for temperature, pH, moisture content, examine crop guide to determine how well broccoli would do in the area, research the modern American lawn and garden and compare to other landscapes worldwide, research xeriscaping

Laboratory: How do nutrients in the soil become available for plants? How is seed for sale certified? Seed germination lab

WEEK 2:

How do Plants Reproduce?

Major Topics: How do some plants reproduce without seed or spores? (asexual reproduction vegetative propagation, micropropagation) How do some plants reproduce by means of flowers? (meiosis, plant breeding, genes)

Activities: Scientific method used to study hypothesis that chemical compounds that move between plant tissues regulate some aspect of plant growth, prepare sterile plates for micropropagation, investigate through the Ag agent problems as a result of genetic uniformity, Punnett Square, genetic crosses to obtain normal and dwarf seedlings, genotype and phenotype of watermelon cross

Laboratory: A sexual reproduction lab, How are plants produced by tissue culture?

WEEK 3:

Growing Plants for Food and Feed

Major Topics: What is yield and what factors affect yield? How do farmers and growers condition the soil? How do farmers manage available water for crops? How do farmers control pests? How do farmers harvest and process their crops?

Activities: Track commodity price for several weeks, read and discuss article on family farms, interview farmers, build model of soil under cultivation and examine techniques to prevent soil erosion, examine fertilizer label for micronutrient and mixing procedures, work out a strategy for growing a crop on the local soil, examine water regulations for farmers using surface and subsurface waters for irrigation, design a water irrigation and/or drainage system for crop selected, make an "Unwanted" poster for an insect pest, plant disease, noxious weed, or fungus, research pesticides available with and without permits, compare commodity price to price in the store

Laboratory: How are herbicide sprays prepared for application?

WEEK 4:

Plants for Wood, Wood Products, and Fiber

Major Topics: Wood and wood products, growth of trees, growth of the crown, growth of roots, tree products, harvesting wood, properties of wood, plants for fiber

Activities: Tree growth patterns, twig growth patterns

Laboratory: How is wood turned into pulp to paper? How can fibers be identified?

COURSE SCHEDULE (Cont.)

MICROORGANISMS

WEEK 5:

Microorganisms Are All Around Us

Major Topics: Roles different microorganisms can play, basic features of microorganisms, needs of microbial life, microbial reproduction and adaptation, changes in microbial populations over time

Activities: Occupations involving microcrganisms, visit methane production facility at waste treatment agency, DNA structure model, slides of microorganisms, research where microbes live and design experiments for testing minimum requirements, Winogradsky Column, teach others sterile technique, affect of pH on microbe growth, drawings of osmotic changes in a cell, carry out preservation technique on food item, examine budding in yeast cells

Laboratory: Identification of bacteria, Sensitivity testing

What are the Natural Roles of Microorganisms?

Major Topics: Conversion of energy by microbes to useable form, cycling of matter by microbes, associations between microbes and other organisms

Activities: Draw a food chain within an ecosystem, research human use of algae, research a carbon cycle question, research methane use and use of other alternative energy sources, contact representative of gas industry concerning H_2S corrosion, calculate pounds of nitrogen needed on a field, contact Ag extension agent to determine natural pathogens being used to control pests

Laboratory: Culturing algae for the aquarium, leaching metals with Thiobacillus bacteria

WEEK 6:

How Are Microorganisms Being Genetically Manipulated?

Major Topics: Manipulation of microorganism genes, production of pharmaceutical and other therapeutic substances, curing hereditary disease, help improve crops

Activities: Assemble DNA strands with cards representing bases, human insulin production simulation, panel discussion of ethical issues of gene therapy in humans, research genetic engineering in crops

Laboratory: Separating DNA fragments, mapping a plasmid

Some Microorganisms Serve Us

Major Topics: Fermentation in foods, extraction of natural resources, indicate environmental quality, process waste

Activities: Examine dough made with yeast, make sauerkraut

Laboratory: Making yogurt, waste decomposers

COURSE SCHEDULE (Cont.)

WEEK 7:
Some Microorganisms Can Be Harmful
Major Topics: Infection of livestock, infection of humans, infection of crops, destruction of food, destruction on nonliving materials
Activities: Interview a beef farmer about infectious disease outbreaks, interview a poultry farmer about infectious disease outbreaks, interview a swine farmer about infectious disease outbreaks, research the impact of various diseases in the past and today, research health threats associated with working as a social worker in a country with cholera, examine your childhood immunization records, examine slide of protozoan that causes malaria, investigate the incidence of several infectious diseases, contact Ag extension service and report on a disease threatening a crop in the area, conduct fungal endophyte tests, research plant diseases, investigate plant resistance to disease using a seed catalog, spoilage of milk, food preservation techniques, research action to control attack of pulp or paper by microbes
Laboratory: Is your soap a good antiseptic? disinfectants

LIFE PROCESSES

(This unit cannot be completed until its release by CORD in September, 1992.)

WEEK 8:
Keeping Our Bearings in the Environment

Energy Level and Body Mass

WEEK 9:
Fluid Balance

Waste

WEEK 10:
Staying Warm in the Cold; Staying Cool in the Heat

WEEK 11:
Body Changes During Infancy, Childhood and Adolescence

COURSE OUTLINE

DEPARTMENT:	Technical Education Division
CURRICULUM:	Applied Technology/Science
COURSE TITLE:	Applied Biology and Chemistry
COURSE NUMBER:	CHE 114
COLLEGE TRANSFER:	No
TYPE OF COURSE:	Allied Supporting & Vocational General Education
CREDIT HOURS:	5
LECTURE HOURS:	33
LAB HOURS:	44
CLASS SIZE:	35
COURSE DESCRIPTION:	Biology and chemistry are treated as a unified science. The sources, properties, and uses of synthetic materials; control of home, community, and industrial waste and waste management; and animals and plants sharing space and resources in a community of life are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.
COURSE HISTORY:	Originally developed by Joan Stover in 1992
PREREQUISITES:	Basic algebra

CORD has completed but not distributed the materials briefly described in this outline. Receipt of the materials is expected during September 1992. After receipt of these texts, this material must be reviewed, edited and completed.

LEARNING OBJECTIVES AND COMPETENCIES BEING DEVELOPED

COURSE SYLLABUS

GENERAL INFORMATION:

Course Number: CHE 114

Course Title: Applied Biology and Chemistry

Instructor: Dr. Stover

Office Location: RS 179

Office Phone: 764-5371

Office Hours:

Room Number:

COURSE DESCRIPTION:

Biology and chemistry are treated as a unified science. The sources, properties, and uses of synthetic materials; control of home, community, and industrial waste and waste management; and animals and plants sharing space and resources in a community of life are included. This course is designed to be compatible with the modules used in CORD's Applied Biology/Chemistry curriculum.

REQUIRED MATERIALS:

Three texts are in the finishing stages and will be published by the Center for Occupational Research and Development during the Spring of 1993: Synthetic Materials; Waste and Waste Management; and Community of Life
Laboratory Notebook
Safety Goggles

COURSE SCHEDULE: See following Course Schedule

GRADING PROCEDURE:

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COURSE SYLLABUS (Cont.)

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The academic material is woven into the activities and laboratories of the course to make the learning practical and relevant. Work place, home, and community problems are focused upon in all learning efforts.

Submitted by: _____ **Date:** _____

Approved by: _____ **Date:** _____

COURSE SCHEDULE

CHE 114
APPLIED BIOLOGY and CHEMISTRY

Biology and Chemistry are treated as a unified science. Three units (Synthetic Materials; Waste and Waste Management; Community of Life) will be studied in this course. Three primary types of learning activities will be used. These include hands-on laboratories, text-based activities, and video-assisted activities. Each unit will be introduced with a 5 - 7 minute video that presents applications and role-models as well as present problems and issues for exploration. Each unit is divided into subunits that the teacher will use to lead the class to discover the principles and concepts included by completing text-based activities, doing hands-on laboratories and proposing responses to problems presented via video or evolving from activities. Most often the questions and activities are designed to extend thinking beyond the expectation for easy answers and pat solutions and the teacher will avoid asking students to display evidence of rote learning. When possible laboratories have direct occupational relevance. Laboratories reinforce principles and concepts that are used in various occupational settings, and they may help students develop occupationally relevant laboratory skills. It is the intent of this course that concepts and applications be taught in tandem. About 40% to 50% of instructional time will be spent in hands-on activities that allow students to have experiences in laboratory and field situations similar to or related to those encountered at work, in the home, in the community, or in the environment. Each subunit is completed with a review of objectives that includes the principles and concepts and their applications. Practical and written subunit tests in addition to authentic evaluation methods will be used to assess student learning.

The following was prepared on the basis of draft information released by CORD describing and sampling these units. These three units will be finalized and released during the Spring of 1993. After receipt of the finished texts, this course schedule will be completed.

SYNTHETIC MATERIALS

WEEK 1:

WEEK 2:

WEEK 3:

WEEK 4:

WASTE AND WASTE MANAGEMENT

WEEK 5:

WEEK 6:

WEEK 7:

WEEK 8:

COMMUNITY OF LIFE

WEEK 9:

WEEK 10:

WEEK 11:

END

U.S. Dept. of Education

Office of Educational
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Office of Educational Research and Improvement (OERI)
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