

College of Saint Mary
Rule 24 Section 3:
Use of Related Data and Information for
Continuous Program Improvement of Endorsement Program

Endorsement Program: Science 7-12

Biology Changes

Biology Secondary Education students major in science with a minor in education; therefore, changes relating to biology majors pertain to them as well. In the last seven years the program has made changes and improvements in course offerings, opportunities, and infrastructure. Courses added include a First Year Seminar focusing on plant pathology and food security, 200-level personal nutrition, 200-level ecology, 200-level entomology, 300-level anatomy and physiology, 400-level intermediate physiology, 400-level gross anatomy, and a 100-400-level seminar series (scientific method, scientific literacy, and scientific communication). Equipment and instrumentation have been added as well as increased student opportunities to participate in research and internships. The program has purchased an environmental chamber, biosafety cabinet, additional microscopes, Vernier equipment, an anatomage table, and a variety of molecular biology instruments. Currently, the university has a one-bed cadaver lab and is in the process of building an eight-bed cadaver lab. The university built a 500 gallon fresh water aquarium that holds native Nebraska fish, and is in the process of building a 100 gallon aquaponics system to serve as a nursery for the aquarium. Preexisting courses have been modified to increase students' experiential learning (e.g., inquiry-based activities in cell biology and botany, field research in zoology).

Faculty changes include the addition of a forensically-trained entomologist, a molecular biology/microbiologist, and a parasitologist/anatomist. Faculty are developing individual research projects that will give students opportunities to engage in authentic disciplinary research. There are many opportunities for students to be involved professionally in the discipline. The INBRE (IDeA Networks of Biomedical Research Excellence) program, funded by NIH (National Institutes of Health), supports up to four students per year to do disciplinary research, first at a research institution, and then at their home institutions. An NSF (National Science Foundation) grant provides assistantship money for students engaging in research on campus. Students have also pursued a variety of internships at Henry Doorly Zoo, University of Nebraska Medical Center, and regional veterinary and dental practices.

NASA Nebraska has funded students to do biology research and to participate in an elementary science outreach program, bringing STEM activities to area schools. The main objective of the Elementary Science Outreach Program is to provide as many elementary school students as possible with hands-on enriching science activities and to involve CSM undergraduate volunteers in the delivery of the activities. This year 33 students from Biology, Human Biology, and Education volunteered to visit 13 local elementary schools. As of now, they have made 31 different classroom visits. The elementary school teachers choose which activity he/she wants the students to teach and the top three this academic year were "States of Matter," "Properties of Water," and "Ecosystems." The total number of elementary school students impacted was 1,113, with the largest group falling in first grade at 390 students. That is a 200+ increase in students from last year.

As an extension of the Elementary Science Outreach Program, CSM has initiated a Teachers' Science Workshop for area elementary teachers who want to develop their expertise in teaching elementary school science. This year 19 K-6 teachers completed the program. Two CSM science faculty prepare background information and activities that the teachers take back to their classrooms, and an education faculty member leads the pedagogy training.

Communication between biology and education faculty has increased and interactions will be facilitated under a new organizational structure. The biology program director met with education advisers to explain the content and appropriateness of various biology courses for education majors. This conversation helped education faculty direct their advisees to courses that would most effectively prepare them for the classroom, and it helped the biology program director make scheduling decisions to meet students' needs.

Chemistry

The Chemistry program implemented the following changes to improve education experience of all the students including the secondary education minors seeking the science endorsement.

Course Curriculum

Fundamentals of Chemistry Course: The following curriculum changes were made to improve students' understanding of fundamental concepts in chemistry:

- a. CHM 100L Lab course was added to enhance student hands on learning experience;
- b. Higher level Math prerequisite requirement was introduced (Math 098 to Math 112);
- c. CHM 101 recitation course was added as an optional course to help the students with the lecture content;
- d. Implemented uniform course syllabus and grading rubrics in multiple sections of the same Fundamentals of Chemistry course.

Earth Wisdom (CHM 245) and Science and sustainability (FYS 110): First Year Seminar and Earth wisdom courses were developed to explore the current state of the global environment and the concept of sustainability. In these courses students learn the concepts of environmental sustainability. In the final project of the course students collaborate in interdisciplinary teams and investigate opportunities to reduce negative environmental impacts and formulate innovative improvements.

Instrumental Analysis Lecture/Lab (CHM 365/366): Instrumental analysis lecture and lab course was developed to improve student's laboratory and research skills. In this course student gets hands-on an experience with modern analytical instruments such as GC-MS, HPLC, UV-Vis and IR spectrophotometer.

Recitation courses: To reinforce the difficult concepts in chemistry, optional recitation courses were added the requirements for first year and second year chemistry courses. The development of these courses led to significant improvement in students' performance in the chemistry course assessments.

Laboratory Facilities:

The program upgraded the laboratory facilities such as fume hoods, bench space in all the chemistry labs. The following modern analytical instruments for qualitative and quantitative analysis have been purchased and the instruments are integrated in chemistry laboratory and research course curriculum.

- Nicolet* iS*50 FT-IR Spectrometer
- HPLC with Photodiode Array Detector

- Shimadzu GC-MS
- Agilent Cary-60 UV-Visible Spectrophotometer
- ATAGO Polax-2L Polarometer
- 600E Potentiostat/Galvanostat Electrochemical analyzer/workstation
- IKA C1 Bomb calorimeter

Undergraduate Research Projects

Faculty are developing individual research projects to enhance students understanding of scientific methods and research. This year's education minor will be working on National Science Foundation funded Nebraska EPSCOR grant titled " Quantitative and qualitative analysis for simultaneous detection of curcumin and resveratrol for the development of a synergistically acting novel drug delivery system". After completion of the project, the student will present her research work in spring 2017 at the CSM Scholar's Day. The presentation will be evaluated by science and non-science faculties and the evaluations will be based on clarity of presentation, the level of scientific sophistication, the use of statistics, and overall competency.

Community outreach projects:

The chemistry program faculty worked on the science enrichment project for the elementary teachers with the generous support of the Claire M. Hubbard Foundation. In the workshop, K-5 teachers in the Omaha Metro area explored science concepts and different hands-on science instructional strategies with CSM Science and Education faculty. The topics covered in the workshop (State of Matter/Living vs. Nonliving, Measurements/Ecosystems, Weather and Climate, Objects in the Sky and Universe, Energy Sources and Earth's Materials and Processes) aligned with the Nebraska State Science Standards.

Service Learning activities:

The program also focused on developing environmental stewardship related service learning activities. The activities were designed to enhance student leadership skills and increase CSM community outreach efforts. Examples of some of the activities are:

- Keystone Trail clean up event in partnership with Keep Omaha Beautiful, Inc;
- Free Electronic recycling event open to local community, in partnership with local electronic recyclers;
- Community vegetable garden project on campus.

Physical and Earth Science

Course Curriculum Changes

Introduction to Physical Science and Lab (PHY 100 and 101): We have planned and equipped new lab experiments, allowing students to do more hands-on procedures.

Physical Geology (PHY 160): The program has changed this course to a 4-credit class with lecture and lab combined. This way, lecture and/or lab can be used during any class meeting as needed. Also, the program has greatly increased our collection of rock samples and have added strong Films On Demand resources in this area.

Physics Lab I and II (PHY 203 and PHY 205): The program has purchased additional equipment that enables the science program to have more groups working in the lab, thus keeping the groups smaller. This change greatly increases the time each individual student gets to work with the equipment. Upgrades have been made to some of the more expensive equipment, including oscilloscopes and signal generators. In addition, new lab experiments have been tried and refined.

PHY 245 Earth Wisdom (GCD): The main objective of adding this course is to understand our planet and to explore how today's human societies can endure in the face of global change, ecosystem degradation and resource limitations. This course will introduce a variety of topics from different disciplines; examples are the roles of developing and developed nations in climate change, the roles of societal and cultural practices in modifying the environment, the impact of globalization in different cultures, and cultural sustainability. In addition, students will work in teams and investigate ways of achieving sustainability on local, regional and global scales. (Also listed as CHM 245.)

What future changes are planned?

Going forward a new organizational structure will be implemented in which the Division of Professional Studies (includes education program) and Division of Arts and Sciences (includes biology program) will be combined into one division overseen by an associate dean. Consequently, faculty from these previously independent groups will meet together monthly for division meetings. The additional interaction will foster conversations between faculty, thereby increasing understanding programmatic needs and facilitating collaboration between programs.

What are implications for overall unit improvement initiatives to the endorsement program?

Several programmatic changes in the Unit have had an impact on the endorsement program.

- These include use of the statewide Clinical Practice evaluation format, updated CSM Student Outcomes, the Case Study project requirement and changes in Praxis II requirements.
- The use of the statewide NDE Clinical Practice Evaluation had impact upon this endorsement program. The evaluation is built on InTASC Model Core Teaching Standards. The CSM Student Outcomes have been aligned with the InTASC standards.
- The Case Study project was developed to provide an authentic assessment tool in addition to the clinical evaluation. This additional tool provides opportunity to use multiple measures of student performance in assessing, planning, implementing and evaluating students. Students complete the case study during Clinical Practice.
- The standard lesson plan template used by the program for many years was revised to two formats: a Lesson Plan with Analysis and Lesson Plan with Reflection. It was developed in fall 2013 to be used across methods courses program-wide when students are able to plan, implement and evaluate lessons in field experience settings. There have been limited opportunities for students to conduct lessons that allow for collection of data and detailed analyses. This has resulted from restricted opportunities for students to take leading roles in classroom instruction due to reluctance of classroom teachers to relinquish responsibility to students, because of the pressures of testing. The unit plans to solicit partnerships with specific

schools and classrooms to allow students to complete at least one detailed Lesson Plan with Analysis as part of their preparation.

- The requirement that all teacher education students must pass the Praxis II content exam for certification has had an impact on the Teacher Education program. Teacher Preparation faculty have collaborated with content area faculty to ensure that course content is consistent with the content of the exam.
- Teacher Preparation Faculty keep directors of secondary content areas informed of changes in endorsement requirements. Decisions will be made in collaboration between the content area program director and Teacher Preparation Faculty. Shared advising of students by content program faculty and Teacher Preparation Faculty ensures that students complete all requirements for both programs.
- There has been continual work on dispositional reflection by all individual Teacher Education candidates as well as faculty input on dispositions from across the coursework prior to clinical practice.
- Short and long form field experience evaluations have been adopted. The long form evaluation reflects standards used in the NDE Clinical Practice evaluation and also addresses professional characteristics/dispositions.
- The Clinical Practice application was updated and now includes disposition reflection and assessment of strengths and weakness in dispositional areas.