

Helpful Hints/Recommendations from the OTM Natural Sciences Panel

January 11, 2010

Courses submitted for consideration as Natural Science courses in the Ohio Transfer Module (OTM) will be evaluated in one of the following three categories: (i) lecture-only courses, (ii) laboratory-only courses, or (iii) lecture-plus-laboratory courses.

Courses may be approved in one of two ways:

- (i) The course satisfies the requirements for a Natural Science OTM course including the laboratory component of the Natural Sciences OTM requirement;
- or
- (ii) The course satisfies the requirements for a Natural Science OTM course but is not appropriate for satisfying the laboratory component of the Natural Sciences OTM requirement.

Provided below are 1) guidelines for the submission of all Natural Sciences OTM courses, and 2) guidelines specifically related to the submission of Natural Sciences OTM courses that include a laboratory component.

1) General Guidelines for All Natural Sciences OTM Courses

In order to be considered for approval as a Natural Sciences OTM course, each course must satisfy at least one of the Learning Outcomes that are general for the Transfer Module (learning outcomes 1-5; entries 1a-1e in the CEMS review) and **ALL** of the guidelines specific to the Natural Sciences component of the Transfer Module (entries 2-13 in the CEMS review).

The materials submitted for review should clearly and concisely delineate the ways in which the submitted course meets these learning outcomes. When completing the required CEMS documentation, it is important that the **faculty in the discipline** (and not an administrator with little or no experience in the discipline) provide succinct responses which **directly** address each learning outcome for that course. It is **not** appropriate to “cut and paste” generic statements into these response boxes. When providing CEMS responses, please remember that their purpose is to convince the natural sciences faculty review panel that this course specifically fulfills each learning outcome.

Since each submitted course is evaluated on its merits, it is important that CEMS responses address **only** that particular course and not another course which may typically be taken in parallel. For example, if a lecture-only course is submitted for review, it is not appropriate to provide CEMS responses which refer to a separate laboratory course, even if this lab course is typically taken with the lecture course. Separate lecture and lab courses will often be submitted at the same time for review. Nevertheless, since each course submission is reviewed independently on its merits, any responses provided should specifically address how that particular course (only) addresses each learning outcome. [Note: it is appropriate (and indeed necessary) to refer to **pre-requisite** courses when completing the CEMS responses.]

Submitted courses which historically have not been approved for the Natural Sciences OTM have often been highly descriptive in nature and did not include sufficient emphasis on scientific

inquiry, critical thinking and deductive reasoning. In addition, such courses were sometimes rejected because they were too narrowly focused and/or included insufficient emphasis on the core scientific principles vis-à-vis societal, health and social science aspects.

2) Specific Guidelines for Natural Sciences OTM Courses that Include a Laboratory Component

To complete the Transfer Module, all students must take at least one Natural Sciences OTM course that includes a laboratory component. This can be accomplished via a laboratory-only course, or through a course that includes both lecture and laboratory components. In order to be appropriate as an OTM Natural Sciences laboratory course,

- the course must include at least one credit hour dedicated to the laboratory component of the course;
- for each credit hour dedicated to the laboratory component of the course, students are expected to spend at least two hours each week throughout essentially the entire semester (or quarter) on in-lab experimental activities.

It is important that the attached syllabus for all laboratory courses provides a **detailed week-by-week course outline which includes full titles of the experiments to be performed and the number of laboratory sessions that will be dedicated to each experiment.** The length of each laboratory session should also be clearly indicated. If experiments are drawn from a standard text, it is still necessary to provide this detail.

It is generally expected that students will perform experiments in the laboratory for the vast majority of weeks in the term. For institutions transitioning from quarters to semesters, it is important to show that this expectation will be fulfilled in the new semester-long OTM laboratory course offerings.

The disapproval of laboratory course submissions is often due to some or all of the following factors:

- (i) it is unclear how many hours per week are dedicated to experimental work in the laboratory;
- (ii) insufficient time throughout the term is dedicated to *bone fida* experimental work vis-à-vis non-experimental activities;
- (iii) no titles and details of the experiments to be performed are provided;
- (iv) the activities proposed for the laboratory course do not sufficiently emphasize scientific inquiry, the observation of physical phenomena, and/or the collection and analysis of scientific data.

As laboratory course submissions are developed, it is important to carefully consider the following expectations pertaining to the teaching of the laboratory component of all courses that will meet the OTM natural sciences laboratory requirement. These considerations will be particularly important for those courses which might involve the “non-traditional” teaching of the laboratory component of a Natural Sciences OTM course.

- a) *The laboratory component of Natural Sciences TM courses must include, as relevant to the subject, manipulation, observation and/or measurement of actual physical materials and phenomena, data collection and analysis.*

Experimentation, including the manipulation, observation and measurement of physical objects and phenomena is central to understanding and practicing science. A scientific theory stands or falls on its agreement with objective verifiable experiments. Therefore, it is essential for students who may get their only college-level instruction in science through a Natural Sciences TM course to have a *first-hand* experience with scientific experimentation through a *bone fida* laboratory experience. There may be circumstances in which new technologies can be used to at least partially fulfill this laboratory requirement. However, in cases where such non-traditional means of course delivery are employed, the onus is on the submitting institution to clearly demonstrate through their submitted materials that the course provides students with a laboratory experience consistent with the above requirements. It should be noted that courses which involve, in large part, the *simulation* of scientific experiments using computer technology would not be appropriate for satisfying the laboratory portion of the Natural Sciences TM requirement.

b) *The lab course should provide for effective supervision and interactive feedback by the science instructor.*

In the traditional laboratory setting, direct real-time supervision and feedback is provided by the on-site science laboratory instructor. In cases where a non-traditional means of laboratory course delivery is proposed, the onus is on the submitting institution to clearly demonstrate through their submitted materials that their course will provide for “effective supervision and interactive feedback” by the science instructor. For example, this might be achieved through real-time supervision of students at a remote site using webcam technology and video “chat” software. In the absence of clear evidence that “effective supervision and interactive feedback” from the science instructor will be available, a course will not be considered appropriate for satisfying the laboratory portion of the Natural Sciences TM requirement.