

**Division of Natural Sciences and Mathematics
Unit Plan, Approved 10 November 2015**

The Division of Natural Sciences and Mathematics (NSM) affirms the definitions and standards for evaluation of teaching (including advising), scholarship, university service, service to the profession, and professional service to the community as enumerated in *Faculty Policies and Procedures* (P&P). The purpose of this document is to provide specific standards of evaluation to fit the needs of NSM faculty as required by P&P.

The specific standards of evaluation of NSM faculty responsibilities cannot be properly understood apart from the context of the nature of the work in this division. Several distinctive characteristics of NSM faculty work are:

- The lines between teaching and scholarship and between scholarship and service are not always precise. Although contact hours with undergraduate research students are not counted when determining teaching loads for faculty, individuals engage students in performance learning by supervising undergraduate research. We want our students to engage in creative scholarly activity, and such supervision involves a considerable amount of teaching. However, the work can also result in scholarly output.
- NSM faculty teach in a variety of settings: classroom, laboratory, field, and research laboratory. These settings require different pedagogies and assessment tools and often include opportunities for performance learning.
- Non-majors are typically the majority in lower-level courses. They take the courses because their majors require them to or because they want to fulfill a requirement of the MPSL. There is an ever-increasing population of students who are unprepared for college. Data from the National Assessment of Educational Progress (NAEP, the nation's report card) show that in 2013 only 26% of 12th grade math students are rated "proficient" or better, and from the 2009 assessment, only 21% of 12th grade science students are rated proficient or better. In 2013, of the ACT-tested high school students, only 44% met the Mathematics college-readiness benchmark and just over 36% in Science. ACT defines college readiness as earning a minimum ACT score in the area to have a 50% chance of earning a B or better or about 75% or better chance of earning a C or better in a first-year (non-developmental) college course. The primary focus of NSM faculty, therefore, is to prepare all students (from diverse backgrounds and with different career aspirations) for professional success and democratic citizenship in a world in which science and technology have an increasing impact on how people live and work.
- NSM faculty research is frequently collaborative (often with undergraduate students, but also sometimes with other scholars in the field), equipment-intensive, and experimental in nature. Library resources serve only as a starting point for investigation. Much effort can be expended in acquiring and maintaining the necessary equipment for an investigation. There is no guarantee that the investigation itself will result in a publishable outcome.

- NSM faculty must consider the physical safety of students when planning classroom and laboratory activities.

Increasingly, strong undergraduate programs in mathematics and the various fields of science will be recognized as primary indicators of institutional quality. Adherence to the following guidelines will enable Millikin to maintain a strong NSM division.

For the purposes of this document, “mathematics” is understood to include the disciplines of actuarial science and statistics, and “laboratory” is understood to include computer laboratories.

TEACHING AND ADVISING

NSM agrees with Dr. Debra R. Rolison, Director of Advanced Electrochemical Materials at the Naval Research Laboratory, who believes that the greatest rewards should go to faculty “who excel at training and challenging students.”¹ The evaluation of teaching is quite detailed in P & P, and NSM faculty are expected to follow those requirements. NSM faculty should also strive to develop students who can formulate and solve problems and who can integrate their knowledge within and across disciplines in ways that enable them to assist others in the application of science, mathematics, and/or technology.

The question of technology is highly specific to this division. Excellence in teaching requires adequate equipment and facilities and reasonable student access to those facilities. It is the responsibility of the institution to provide or assist in the provision and maintenance of this equipment in the same way that it is responsible for supplying classrooms, student seating, boards, projectors, etc. If the lack of equipment and facilities is the primary reason for incomplete fulfillment of course goals or for student dissatisfaction, the faculty member should not be penalized in the evaluation of his or her teaching. A faculty member who actively seeks external funding for equipment should not be penalized but rather should be rewarded. Departments should have budget allocations for equipment acquisition and upkeep.

NSM expects its faculty to be innovative in their courses and encourages its faculty to implement a wide variety of pedagogies to deliver course content. Most faculty work with students to develop opportunities for Performance Learning. NSM also expects that the institution will support faculty who are creative in the classroom and that faculty will not be penalized for reasonable innovation. Reasonable innovation is typically adapted from published reports in peer-reviewed research literature, but it might also involve implementation of a novel concept that, in the judgment of the faculty member, is likely to improve student success.

Because many students in NSM courses come to Millikin with negative attitudes toward mathematics and science and would not elect to take the courses if they were not required, and because many NSM courses include a laboratory component, student response survey data alone are not necessarily reliable for a complete assessment. Student response survey data should be supplemented with other information, such as internal peer review (particularly in the evaluation by the department chair), external peer review, evaluation (other than student response surveys) by current students, evaluation by research students, evaluation by former students, standardized examination scores, and job/graduate school/professional school placement data.

Advising Mission

Whereas a Millikin education is the preparation for professional success, democratic citizenship, and a personal life of meaning and value, advising is central to delivering the educational mission of Millikin University as (1) a collaborative system shared by students, faculty, administration, and staff attuned to departmental needs for professional development, and (2) an ongoing process of exploration, discovery, reflection, and growth. As such, advising adds to a Millikin education by facilitating and integrating reasoned choices that promote the student's personal and professional growth within multiple global communities.

Just as the curriculum helps departments achieve goals for student learning outcomes and helps students actualize their plans of study, so too does the advising process. Thus, according to P&P, advising "represents one of the most important teaching roles of the faculty." Advising in NSM facilitates and integrates reasoned choices that promote the student's growth as a person and as a major. In order to realize this mission, we try to help students

1. Develop plans of study for successfully achieving their degree and career goals, including opportunities for performance learning,
2. Select courses each semester to progress toward fulfilling their plans of study,
3. Use the resources and services on campus to assist in fulfilling their plans of study, and
4. Graduate in a timely manner.

Although advising is evaluated within the area of teaching in promotion, tenure, and annual review processes, it is diverse enough that additional criteria for rating will offer clarity to the evaluation. Assessment of the advising system takes place at the department level as part of the annual self-study report.

For purposes of this plan, the term "advising" refers to academic advising, research advising, pre-professional advising, and advising organizations.

Ratings

Extraordinary: Extraordinary teaching and advising in NSM is defined as that which exceeds the standards of excellence. Peer review, in the form of evaluations and/or awards, is necessary to demonstrate this rating. In general, the extraordinary teacher's student response survey ratings will exceed the university averages.

Excellent: The excellent teacher and advisor exceed the standard for competence. Pursuant to section 4.10.1.1 of P&P, there are five aspects to be considered when evaluating teaching: content knowledge, rigor, organization, clarity, and attention to individual needs of students. In general, as per P&P, course organization and clarity will be based largely on student evaluations, and the excellent teacher in NSM will maintain student response survey ratings that are consistent with division averages in the areas of Course Organization and Communication. Attention to the individual needs of students, including the use of performance learning (where appropriate), should be reflected in the NSM faculty member's self-evaluation narratives. With regard to section 4.10.1.2 of P&P, faculty within NSM are encouraged to employ innovations in

pedagogy, and appropriate reflections on these implementations should be in the faculty members' self-evaluations.

Syllabi, course assignments, and assigned readings are items that are commonly used to demonstrate content knowledge and rigor. Listed below are examples of activities NSM faculty may be engaged in to demonstrate excellence in the five aspects to be considered in evaluating teaching. This list is intended to serve as a guide to NSM faculty for evaluation purposes as potential ways to demonstrate how they may meet the requirements for teaching as listed in P&P. This list is not exhaustive, and not every item in the list will be addressed by all NSM faculty.

- the teaching of advanced elective courses in the major (content knowledge, rigor),
- the teaching of courses at the 200-level or higher that are required for other majors/programs (content knowledge, rigor, attention to students),
- the teaching of courses outside the major at the 200-level or higher (content knowledge, rigor, attention to students),
- the teaching of interdisciplinary courses in the MPSL (attention to students),
- innovation in the use of new or existing equipment (content knowledge, attention to students, innovations in pedagogy),
- development of new course materials (e.g., textbooks, laboratory manuals, electronic texts, etc.) or significant revisions to pre-existing materials (content knowledge, attention to students),
- creation of new courses (content knowledge, attention to students),
- incorporation of new technologies into traditional courses (content knowledge, attention to students, innovations in pedagogy),
- providing performance learning opportunities for students, as appropriate (content knowledge, attention to students, innovations in pedagogy),
- mentoring new faculty advisors on the advising system (attention to students),
- contributing to the on-going professional development of other faculty advisors (attention to students),
- advising for a specialized program, such as a pre-professional area (attention to students),
- serving as research advisor or providing expert technical assistance by students who choose a research project (content knowledge, rigor, attention to students),

- advising one or more JMS research project(s), Leighty summer research project(s), Summer Undergraduate Research Fellows and/or students in the Undergraduate Fellows Program (content knowledge, rigor, attention to students),
- serving as minor advisor for one or more students (attention to students),
- orienting and mentoring new students with respect to the university experience (attention to students),
- orienting and mentoring students from outside the major with respect to the major experience (attention to students).
- teaching of developmental or remedial courses (attention to students)
- advising course assistants course (content knowledge, attention to students)

Competent: The competent teacher and advisor satisfactorily contributes to the achievement of departmental and university goals. Note that rating of competent for teaching is not sufficient for promotion and/or tenure. Such contributions may include, but are not limited to:

- the advising of students (attention to students),
- availability for student conferences (attention to students),
- the teaching of courses required for the major (content knowledge, rigor),
- maintenance of existing equipment (content knowledge),
- understanding how to use MU Online, CAPP, electronic portfolios, and other online resources (attention to students),
- explaining requirements for the major, areas of emphasis or concentration, the minor, university studies, and the college (attention to students),
- reviewing advisees' plans of study, portfolios, etc. at least once a semester (attention to students),
- attending discipline-related research meetings and seminars (attention to students),
- being available for student conferences during the pre-registration period each semester (attention to students).

Marginal: Marginal teaching and advising in NSM is defined as that which does not meet the standards of competence. The marginal teacher demonstrates effort in this area of responsibility, but the effort is limited, sporadic, and/or unsuccessful.

Unsatisfactory: Unsatisfactory teaching and advising in NSM is defined as that which does not meet the standards of marginal teaching and advising.

SCHOLARSHIP

NSM affirms the definition of scholarship given by Lee Shulman, President of The Carnegie Foundation for the Advancement of Teaching:

For an activity to be designated as scholarship, it should manifest at least three characteristics: it should be public, susceptible to critical review and evaluation, and accessible for exchange and use by other members of one's scholarly community.²

This definition includes pure and applied research within the academic disciplines represented in NSM; scholarship of education, history, or philosophy within the academic disciplines represented in NSM; grantsmanship; review of the scholarship of other professional colleagues; and efforts to remain current in fast-changing, highly technical fields. Scholarship may include activities that also meet the definition(s) of teaching and/or service.

Scholarship is expected to be a continual and on-going activity. In evaluating a faculty member's scholarly activity, the number of actual productions will be balanced against the quality of the forums for which they were produced.

Scholarship within NSM can be a shared activity between faculty and students. A goal of scholarship for faculty within the division is to mentor students on projects that result in professional or near-professional presentations subject to scrutiny by the researchers' peers. Through scholarly collaborations with students, faculty within NSM support the university's commitment to performance learning. Faculty in each department within NSM regularly collaborate with students on research activities, whether they take the form of a senior research project, research conducted as part of a course, work done by Leighty Scholars, SURF grants, JMS projects, independent or directed studies, or other opportunities. Presentations include, but are not limited to, research posters at conferences, oral seminars, and/or published manuscripts in peer-reviewed journals. Conferences may be local, regional, or national. Journals may range in scope from regional to international.

Scholarly activities in NSM are ongoing and iterative processes. In order to complete a research project, one must gather background information, identify a question, design experiments, or develop methods to explore the question, analyze any data collected on the question, and revise beginning ideas if the data collected do not answer the question initially asked. The length of each phase can vary considerably because of the novelty of the investigation, the number of experiments or trials that need to be conducted, the number of data sets that need to be collected,

and other factors. This process requires time, and the dissemination of correctly interpreted quality results cannot be rushed.

Ratings

Extraordinary: Extraordinary scholarship exceeds the standards of excellence, primarily with respect to frequency and audience. The extraordinary scholar will typically be recognized through awards, invitations to serve as keynote or plenary speaker at (a) conference(s), frequency of citation by other authors, publication or presentation at the national level, and/or by a high frequency of external dissemination of research results through publications or presentations at professional meetings (above state level).

Excellent: Excellent scholarship exceeds the standards of competence by extending discipline-specific knowledge beyond the local setting and requires some form of peer review. Such activities may include, but are not limited to:

- publication of an article or book review in a refereed journal,
- presentation at a state, regional, or national meeting,
- successful obtainment of external funding,
- publication of a discipline-specific chapter or book,

In general, an excellent scholar should expect these activities to average one per year with a publication every three years over an extended period of time. This production assumes that the University maintains faculty development funds required to reimburse costs of professional meetings and page charges over an extended period of time.

Competent: Competent scholarship satisfactorily meets departmental goals and is primarily confined to the local and personal levels. Such activities may include, but are not limited to:

- preparation and submission of manuscripts and/or grant proposals,
- attendance at state, regional, or national meetings,
- the reading of current primary literature,
- successful completion of short-courses, courses, or workshops,
- presentation of results of scholarship at Millikin or other local settings,
- preparation of course materials (e.g., textbooks, laboratory manuals, electronic texts, tutorials, etc.) for use only at Millikin,

- the advising of undergraduate research students.

Marginal: Marginal scholarship in NSM is defined as that which does not meet the standards of competence. The marginal scholar demonstrates effort in this area of responsibility, but the effort is limited, sporadic, and/or unsuccessful.

Unsatisfactory: Unsatisfactory scholarship in NSM is defined as that which does not meet the standards of marginal scholarship.

SERVICE

Ratings for University Service

Extraordinary: Extraordinary university service is defined as that which exceeds the standards of excellence. Faculty who receive this rating have been recognized by administrators and peers as having made significant contributions to NSM, the College of Arts and Sciences, and/or the university. Such contributions may include, but are not limited to:

- service as Chair of NSM, Chair of Department, or chair of a University council,
- creation of (a) significant department, division, college, or university document(s),
- the sustained and successful extracurricular or interdisciplinary advising and/or teaching of students.

Excellent: Excellent university service is defined as that which exceeds the standards of competence. Such contributions may include, but are not limited to:

- service on a university council or committee,
- service on an ad hoc department, division, college, or university committee,
- service as faculty advisor to a student organization,
- preparation and submission of (a) proposal(s) for (an) external grant(s),
- recruitment of prospective students.

Competent: Competent university service is defined as that which meets the minimum expectations as described in P & P.

Marginal: Marginal university service in NSM is defined as that which does not meet the standards of competence. The faculty member demonstrates effort in this area of responsibility, but the effort is limited, sporadic, and/or unsuccessful.

Unsatisfactory: Unsatisfactory university service in NSM is defined as that which does not meet the standards of marginal university service.

Ratings for Service to the Profession³

Extraordinary: Extraordinary service to the profession exceeds the standards of excellence and requires outside documentation. Such contributions may include, but are not limited to:

- service as an editor for a professional journal,
- service as keynote or plenary speaker at a state, regional, or national meeting,
- organization of a state, regional, or national meeting.

Excellent: Excellent service to the profession exceeds the standards of competence, primarily through frequency of involvement and size of audience. Such contributions may include, but are not limited to:

- service as a panelist at a state, regional, or national meeting,
- organization of a symposium at a state, regional, or national meeting,
- review of manuscripts for a professional journal,
- review of grant proposals for a funding agency,
- preparation of abstracts of articles for a journal or professional index,
- evaluation of programs at other institutions,
- service as an officer in a state, regional, or national association of mathematicians or scientists,
- professional consultation.

Competent: Competent service to the profession is defined as active involvement on a limited basis. Such contributions may include, but are not limited to:

- attendance at state, regional, or professional meetings,
- service as a judge for a mathematics or science competition,
- review of textbooks or other materials for publishers,

- provision of expert opinion at the request of media outlets,
- organization of and/or participation in local events, including service learning projects, that promote mathematics and/or science.

Marginal: Marginal service to the profession in NSM is defined as that which does not meet the standards of competence. The faculty member demonstrates effort in this area of responsibility, but the effort is limited, sporadic, and/or unsuccessful.

Unsatisfactory: Unsatisfactory service to the profession in NSM is defined as that which does not meet the standards of marginal service to the profession.

Ratings for Professional Service to the Community³

Extraordinary: Extraordinary professional service to the community exceeds the standards of excellence and requires outside documentation. Faculty in this category will typically be recognized through awards, invitations from other communities to serve in a similar capacity, requests to testify as an expert witness, or similar mechanisms.

Excellent: Excellent professional service to the community exceeds the standards of competence, primarily through frequency of involvement.

Competent: Competent professional service to the community is defined as active involvement on a limited basis at the community level. Such contributions may include, but are not limited to:

- service as a judge for a mathematics or science competition,
- organization of and/or participation in local events, including service learning projects, that promote mathematics and/or science,
- addresses to elementary or high school groups on current trends or career prospects in the faculty member's discipline,
- provision of expert opinion at the request of local media outlets,
- service as an officer in a local association of mathematicians or scientists,
- professional consultation.

Marginal: Marginal professional service to the community in NSM is defined as that which does not meet the standards of competence. The faculty member demonstrates effort in this area of responsibility, but the effort is limited, sporadic, and/or unsuccessful.

Unsatisfactory: Unsatisfactory professional service to the community in NSM is defined as that which does not meet the standards of marginal professional service to the community.

ENDNOTES

¹Rolison, D.R. *Chemical & Engineering News* (American Chemical Society), 13 March 2000, p. 5.

²Rothman, F.R.; Narum, J.L. *Then, Now, and in the Next Decade: A Commentary on Strengthening Science, Mathematics, Engineering, and Technology Education*. Washington, D.C.: Project Kaleidoscope, 1999, p. 25.

³Service to the profession, including professional service to the community, may also include service that is not discipline-specific but is valued by those served because of the faculty member's position as an academic or intellectual.