

## Interdisciplinarity@WMU- Phase One planning Template

- 1. Brief Overview:** Provide a brief overview of the proposed interdisciplinary initiative. What types of questions would the initiative ask? What types of complex problems would it seek to solve?  
Interdisciplinary Science Master's Programs

Tackling complex, fundamental, and societally relevant challenges such as climate change, environmental concerns of pollution and drinking water contamination, and public health will require a science workforce with interdisciplinary expertise. At the undergraduate level, most students major in one or perhaps two distinct scientific disciplines thereby gaining a deep understanding of their chosen STEM field(s). We see an opportunity to expand interdisciplinary experiences at the graduate level by developing a suite of 30 credit hour, non-thesis Master's programs (MS and/or MA) housed in various CAS science departments. For example, these programs might include interdisciplinary fields such as biological chemistry, material science, instrumentation and analytical techniques, geochemistry, geophysics, biophysics, environmental chemistry, and biogeochemistry. Instead of focusing study on one discipline at the graduate level, students will be able to tailor their coursework to their specific interests. As far as we are aware, no other Michigan institutions have programs like this, which will make WMU uniquely attractive to graduate students seeking an interdisciplinary program. Graduates of these programs will be positioned to enter the STEM workforce in industry, government, or non-profit organizations, or to pursue further study in doctoral programs and take up leadership positions.

- 2. Impacted units:** What existing units, programs, and colleges would be involved in the proposed initiative? What other possibilities for collaboration across campus or in the broader community might exist now or in the future?

Main units

CAS – Biological Sciences

CAS – Chemistry

CAS – Geological & Environmental Sciences

CAS – Physics

Other units, such as CAS – Mathematics, CAS – Statistics, and departments in CEAS, could also develop programs as part of this suite.

- 3. Impact on teaching, learning, and curricula:** Describe the anticipated impact of the proposed initiative on teaching, learning, and curricula. How might this initiative help to grow enrollment, including by reaching new audiences of learners through continuing education, dual enrollment, or professional certification? How will the proposed initiative positively impact the training of undergraduate and graduate students? How does it enhance our institutional commitment to diversity, equity, and inclusion?

There are several target audiences for this initiative. One audience is our own undergraduate students, who may wish to stay and earn an advanced degree. For this audience, we could develop accelerated versions of these programs, similar to the accelerated graduate degree programs already offered in Biological Sciences, Geological & Env Sciences, and Chemistry. Another target audience is working professionals. With many science and technology employers in Southwest Michigan (e.g., Pfizer, Stryker, Zoetis, environmental consulting firms, government agencies), a program like this may be attractive to employees who desire a Master's degree to advance in their occupations, or who are retraining for a different career. For this reason, many of the courses will be offered in online, hybrid formats, or offered during evening hours to accommodate working students. The third audience is "traditional" graduate students who have completed an undergraduate degree and need an advanced degree to enter or advance in their desired profession. A program like this, especially if courses were offered online, could attract international students who are often sponsored by their government to earn an advanced degree. Many science industry and government agency employers will preferentially hire workers with advanced degrees. Each program will include the option for students to take up to 3 credits of Internship experience, which will benefit graduate students by preparing them for a competitive STEM job market. Several of our departments have ties to local STEM employers through strong alumni or advisory groups (e.g., Chemistry's Industrial Advisory Board, Geological & Env Sciences Advisory Council). Last, but not least, there has been, and will always be, a high demand for specialists in the STEM fields (chemists, biologists, physicists, mathematicians), and earning a joint Master's degree from two of our STEM units will make our graduates more competitive in the job market.

- 4. Impact on research and creative activity:** Describe the anticipated impact of the proposed initiative on research and creative activity. How will this initiative promote discovery and creative scholarship? How might it result in increased external funding?

Although these are proposed as non-thesis programs, we firmly believe that graduate students benefit from involvement in original research. Each program will include up to 3 credits of independent study which may be used for students to work directly with faculty in their labs or fieldwork. This in turn benefits faculty research productivity by having additional students available to work on their ongoing projects. In addition, having students in interdisciplinary programs working in faculty labs may encourage faculty to engage in more interdisciplinary research with their science colleagues at WMU. We will be creating a platform that facilitates interactions between faculty from various STEM units, interactions that could lead to development of research projects of mutual interest and opportunities for securing external funding.

- 5. Efficiencies and/or cost savings:** How might the proposed initiative contribute to increased efficiencies and/or cost savings, for example by reducing administrative positions (e.g. chairs/directors), sharing staff support services and/or by sharing facilities?

The proposed initiative is designed to leverage existing coursework in CAS science departments. Each program will be flexible, with a core of required coursework in the hosting units, and a suite of electives. For example, an interdisciplinary geochemistry MS could include the core courses of Geochemistry (GEOS 5550), Instrumental Methods (CHEM 5200), Inorganic Chemistry (CHEM 5150), and Stable Isotope Geochemistry (GEOS 6170), plus a suite of

electives. Each program will be housed in one science department, with advising responsibilities assumed by that department's graduate advisor.

- 6. Impact on course offerings and workload:** At present, proposed initiatives will only be feasible and sustainable if they can be supported by existing resources, including instructional capacity, faculty and staff time, and facilities. Will the proposed initiative streamline existing course or program offerings? Could the initiative help create more equitable and sustainable workload for faculty, for example, by reducing the need to offer under enrolled courses, reducing the frequency of course offerings or eliminating the need to teach some courses?

The proposed program should not initially require additional hiring (faculty/TAs) in any of the science departments as it makes use of existing courses and advising capacity. The suite of non-thesis MS program is anticipated to draw additional students to WMU, which will increase enrollment in 5000- and 6000-level courses across all units. Furthermore, we envision that many courses could be co- or team-taught across multiple units, thereby relieving staffing constraints. For example, a course in Instrumentation Techniques could be co-taught by faculty from Geological & Env Sciences, Chemistry, Physics, and Biological Sciences. The program would increase workload for departmental graduate advisors/directors and would create additional administrative oversight for units that house each program.

- 7. Additional Information:** What additional information would you like to provide in support of this proposal?

This suite of interdisciplinary MA/MS (non-thesis) programs would have no parallel in the state and probably very few in the country. The program will draw on the expertise of faculty from all of the science departments in CAS and could be expanded to include Mathematics, Statistics, and Engineering programs. Given the success of the interdisciplinary undergraduate major in Geochemistry and the substantial growth in the Biochemistry undergraduate major, we are very confident that these programs would attract students to WMU with appropriate marketing.

- 8. Contact**

Heather Petcovic, Geological & Environmental Sciences  
Megan Kowalske, Chemistry