I. Writing Plan Cover Page

Please fill in the gray areas on this form.

February 27, 2017


Earth Sciences

WEC Unit Name

Earth Sciences

College of Science and Engineering

Department

College

Joshua M. Feinberg

Associate Professor

WEC Faculty Liaison (print name)

Title

feinberg@umn.edu

651-500-5839

Email

Phone

Writing Plan ratified by Faculty

Note: This section needs to be completed regardless of Writing Plan edition.

Date: 3/13/2017

If Vote: ____ / ______

# yes # total

Process by which Writing Plan was ratified within unit (vote, consensus, other- please explain):
The plan was developed and ratified through a multistage process. A draft was circulated to past WEC Liaison David Fox. Then the draft was modified in consultation with WEC Assistant Director Matt Luskey, followed by the Undergraduate Studies Committee for the Department of Earth Sciences. Finally, the proposal was circulated to the entire Earth Science Faculty for comment and approval. Not all faculty responded, but all that did supported the Writing Plan and its proposed implementation activities as appropriate.
II. **Unit Profile: Earth Sciences**  
*Please fill in the gray areas on this form.*

**Number of Tenured and Tenure-Track Faculty:**

<table>
<thead>
<tr>
<th>Faculty Rank</th>
<th>Number</th>
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<td>Professors</td>
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<td>Associate Professors</td>
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<td>Assistant Professors</td>
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<td><strong>Total</strong></td>
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</table>

**Comments about Faculty/Instructors**

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**Major(s)**  
*Please list each major your Unit offers:*

<table>
<thead>
<tr>
<th>Major</th>
<th>Total # students enrolled in major as of Fall 2016</th>
<th>Total # students graduating with major AY 15-16</th>
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<tr>
<td>BS Earth Sciences (CSE)</td>
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</tr>
<tr>
<td>BA Earth Sciences (CLA)</td>
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**WEC Implementation Process**

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<th># participated</th>
<th># invited</th>
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<td>23</td>
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</tbody>
</table>

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**Total:**

---

3
III. Signature Page

*Signatures needed regardless of Writing Plan edition. Please fill in the gray areas on this form.*

If this page is submitted as a hard copy, and electronic signatures were obtained, please include a print out of the electronic signature chain here.

**WEC Faculty Liaison**

Joshua Feinberg

WEC Faculty Liaison (print name)  

 Signature

Associate Prof. & Dir. Und. Stud., Earth Sciences  

Title

03/11/17  

Date

**Department Head/Chair**

Donna L. Whitney

Print Name  

 Signature

Professor and Head, Dept. of Earth Sciences  

Title

03/11/17  

Date

**Associate Dean**

Paul Strykowski

Print Name  

 Signature

Professor and Associate Dean  

Title

3/15/17  

Date
IV. Writing Plan Narrative, 3rd Edition

Introductory Summary:
Briefly describe the reason(s) this unit (department, school, college) become involved in the WEC project, the key findings that resulted from the process of developing this plan, and the implementation activities that are proposed in this Writing Plan, with particular attention to the following questions: what is new in this 3rd edition of the Writing Plan? What, if any, key changes have been made to the 2nd edition? What key implementation activities are proposed in this edition of the Writing Plan?

Writing in various forms is fundamental to what Earth scientists do as research scientists and academics, and we know from our professional affiliates that it is seen universally as one of the most critical skills for employees in the private sector and government agencies. It is essential that we prepare our students for future success as Earth scientists regardless of their career paths, and better writing is central to that effort. Longitudinal studies of the writing habits of our students have already demonstrated that the first and second editions of our department’s writing plan have improved the quality of student writing. In the next 2-3 years, the Department of Earth Sciences (ESCI) Undergraduate Studies Committee will begin an assessment of our current curriculum enacted in F2010. The WEC process has positioned us well to improve our undergraduate training, and the proposed WEC implementation plans for F2017-S2020 will extend that effort, provide us with even more information about our undergraduate curriculum, and establish lasting and sustainable resources for professors and graduate student TAs to use in their coursework.

The first edition of our Writing Plan sought to address a contrast between faculty dissatisfaction with the writing abilities of our students and coverage of our desired writing abilities in our courses (based on self-reporting by faculty). We addressed this contrast with two implementation activities: Curriculum mapping and teaching modules. Curriculum mapping occurred during AY13-14, when the RAs coded all assignments (exams, lab exercises, homeworks, problem sets, formal writing assignments, others) in relation to the desired writing abilities for Earth Sciences. During S2014, the RAs developed the following teaching modules: a) a guide to types of figures common in Earth Science research, b) a detailed guide specifically for making XY scatter plots, c) style and design guides for Powerpoint and poster presentations, d) a gallery of posters given by graduate students and faculty in Earth Sciences at various conferences, f) a common set of editing marks for marking papers, and g) a single five minute workshop on figures using materials collected from ESCI 4501 Structural Geology in Fall, 2012.

The second edition of our Writing Plan was ambitious and sought to increase the visibility and understanding by students of our desired writing abilities, to assess the impact of the modules on student achievement of our desired writing abilities, and to integrate ongoing assessment of student writing explicitly into the required Annual Progress Report on Assessment of Student Learning Outcomes as a means of continued assessment of writing after financial support from the WEC program is no longer available.

The third and final edition of our Writing Plan seeks to consolidate the valuable materials produced in the earlier plans and add a degree of sustainability to our previous work to ensure lasting high-quality writing instruction in the Department of Earth Sciences. Specifically, we aim to:

1. Create a single electronic archive for all WEC-related teaching modules, posters, guides, and workshop materials that is available to all Earth Science faculty, teaching assistants, and students. These materials are a sign of the success of our past WEC plans, but most of them are disseminated amongst earlier WEC RAs, participating faculty, WEC Liaisons, and web-based resources that are not open to all members of the Earth
Sciences academic community. Bringing all of these materials together into a unified, open electronic archive would dramatically increase their use and impact.

2. Integrate the use of online peer review systems, such as Peerceptiv or Eli Review, into Earth Science courses to enable faculty and teaching assistants to coach students in feedback and revision, and promote critical thinking and better writing.

3. Expand on the opportunity to combine longitudinal assessments of student writing with Assessment of Student Learning Outcomes (SLOs). Our faculty’s writing goals for Earth Science undergraduate majors and minors dovetail seamlessly with the larger University’s efforts to ensure seven critical Student Learning Outcomes. This third WEC Plan contains regularly scheduled assessment tools for student writing and communication that also serve as the basis for our department’s annual assessments on SLOs.

4. Develop TA training materials so that all Earth Science teaching staff can provide effective and consistent grading of writing assignments, can teach the technical writing abilities that students need to effectively communicate science, and can implement writing instruction that enhances students’ understanding of Earth Sciences.

This third edition of the writing plan is being driven by the Earth Sciences Director of Undergraduate Studies, Joshua Feinberg, with extensive consultation with the past Director of Undergraduate Studies, Professor David Fox. Along these lines, discussion with the Department’s Undergraduate Studies Committee, consultation with WEC representatives (Luskey and Emery), and multiple discussions amongst the faculty during development of this third edition (Oct. 2016, Feb. and Mar. 2017) suggests broad support for these implementation activities.

Section 1: DISCIPLINE-SPECIFIC WRITING CHARACTERISTICS
What characterizes academic and professional communication in this discipline?

☑ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

During the first edition of the Writing Plan, the Earth Sciences faculty generated a list of the characteristic types of writing used in the discipline both academically and in the private and state sectors. These include:

- Scholarly journal articles (primary research papers and reviews)
- Research and other grant proposals
- Reviews of journal articles and grant proposals as a referee
- Technical reports following specifications of a company or state agency (e.g., Environmental Impact Statements)
- Abstracts and Executive Summaries
- PowerPoint presentations
- Posters
- Field notes that document original field observations and ideas
- Lab notes that document lab procedures and results and ideas
- Lab report
- Figures and figure captions
- Tables and table captions
- Emails to collaborators/supervisors
- C.V.
- Job application (academic and non-academic)
- Science blogs
The Earth sciences are unique in that they require researchers to understand the historical background of a system in order to understand its current configuration and behavior and to predict its future behavior. The time dependence of many of the physical, chemical, and biological processes is such that even some modern processes can only be studied completely by including consideration of the geological record. Moreover, the configuration and behavior of the Earth and its biota as an integrated system of physical, chemical, and biological processes has evolved over 4.5 billion years, so even purely theoretical or experimental studies must often consider the temporal dimension. As writers, Earth scientists synthesize the geological history of a topic and place their own scientific examination within the context of this setting, whether the writing is in an academic mode or in the context of clients or stakeholders in the private or state sectors. In any particular instance of writing, Earth scientists commonly draw on concepts not only from many sub-disciplines of the field, but also from disparate other disciplines (e.g., physics, chemistry, mathematics, statistics, evolutionary biology, ecology, computer science). Consequently, writing in Earth sciences frequently is highly integrative. Beyond this, writing in the Earth sciences is generally similar to writing in any other branch of the physical and life sciences in terms of the typical attributes of the different types of writing. These include:

- A logical structure that links questions, hypotheses, and/or models to data and/or observations and reflects the scientific reasoning from observations to conclusions
- Concise, clear, and logical statement of the problem(s) under investigation or hypothesis being tested, including discussion of the motivation for the observations or tests
- Appropriately comprehensive summary of the current state of knowledge of the system
- Synthesis of ideas and data from disparate sources and often scientific disciplines outside of Earth sciences proper
- Concise descriptions of observational settings; field, analytical, and/or experimental methods; and results in an organized fashion using clear and precise language
- Precise, complete, and explicit description and discussion of concepts, data, relationships between patterns and processes, and interpretations
- Use of informative graphics and appropriate quantitative concepts to present and describe the questions, hypotheses, and/or models under consideration and to present and describe data and results in support of interpretations and conclusions
- Summarize contributions of a particular study and lay out future work on the problem.

Section 2: DESIRED WRITING ABILITIES

With which writing abilities should students in this unit’s major(s) graduate?

☑ There have not been substantial revisions to this section of the Writing Plan.
☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

The desired writing abilities with which majors in Earth Sciences should graduate are a combination of desired pedagogical outcomes from our curriculum, preparation of writing skills that will be valuable for continued education and research in an academic setting as a graduate student or professor, and/or preparation of writing skills that will be valuable for work in either the private sector or with government agencies. These include:

1. Synthesize information and ideas from multiple and/or disparate sources to gain information about the world around us and explain this understanding to readers. Students should be able to combine ideas into a novel combination to describe the evolution of a system in geological time and, ideally, answer a question or test a hypothesis or model rather than simply list individually ideas from various sources.
2. Communicate Earth Science concepts and information to diverse audiences, including other scientists, general public, government officials, and various stakeholders in a given issue involving Earth science.

3. Write explicitly, precisely, and intentionally to the potential reader(s) so as to minimize alternative or ambiguous meanings or readings (except as intended).

4. Communicate clearly in writing what they did and observed (in the field and/or lab), read (in an article, book, and/or website), or heard (in class, lab, and/or the field) so that the observations are understandable to someone who was not present.

5. Explain in words the meaning of data and figures so that they are understandable to a reader who does not have the data or figures.

6. Explain in words the meaning of complex equations that describe processes or concepts beyond simply stating the identity of each variable or component of an equation.

Section 3: INTEGRATION OF WRITING INTO UNIT’S UNDERGRADUATE CURRICULUM

How is writing instruction currently positioned in this unit’s undergraduate curriculum (or curricula)? What, if any, course sequencing issues impede an intentional integration of relevant, developmentally appropriate writing instruction?

☑ There have not been substantial revisions to this section of the Writing Plan.

☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

After the completion of two editions of Writing Plans, it is heartwarming to see that faculty and graduate students are now starting to use writing more deliberately within the Earth Sciences curriculum, and we have observed significant improvement in the quality of student writing in longitudinal studies of upper division writing assignments of graduating majors. Prior to our department’s involvement in the WEC program, our attention to writing was uneven and focused mainly on courses that aimed to satisfy the requirements for the Writing Intensive designation.

The underlying structure of our undergraduate curriculum has not changed significantly since 2010. We have one required core course (ESCI 3303W: Geochemical Principles), one upper division elective core course (ESCI 4971W: Hydrogeology Field Course), two upper division elective courses (ESCI 4102W: Vertebrate Paleontology; ESCI 4103W: Fossil Record of Mammals), and one graduate level course open to upper division undergraduates (ESCI 5504W Neotectonics) that satisfy the Writing Intensive requirement. Our current curriculum was not originally designed in a way that explicitly considers the uses of writing, the types of writing assignments, and the sequence of assignments and writing abilities across the curriculum as a whole. However, our involvement in the WEC program has raised awareness of writing instruction amongst the faculty and graduate student instructors. Our curriculum is by design rather flat and students take seven required courses through the fall of the third year and then choose from among a variety of upper division electives spread across six broad sub-disciplines of Earth Sciences. We do not currently have a single course that obviously stands as a capstone course.

Despite our recent progress in achieving our writing goals, the types of writing used and the expected student abilities are distributed across our courses in a way that reflects the goals and intentions of instructors on an individual basis and not yet as part of a unified effort to use writing most effectively to achieve desired student outcomes. However, the initial WEC survey in Fall, 2012 indicated that most faculty in Earth Sciences have strong desires to incorporate more in-class writing activities (7 of 14 or 50%) and to design more effective, course-relevant writing assignments (10 of 14 or 71%). These feelings were repeated during a faculty meeting in October 2016 to discuss the longitudinal writing results, with a special interest in developing the use of online peer review systems, such as Peerceptiv and Eli Review, to help train students to use feedback and revision to achieve better writing.
Surveys of the faculty have indicated that all faculty members who responded (19 out of 22) consider writing to be either extremely important or very important to the scholarly and professional work done in Earth Sciences. The survey results from professional affiliates and discussions over the last year with professional affiliates from various areas of the private sector and government agencies both indicate strong agreement with the importance of writing to their work. However, the survey of faculty in particular indicated considerable dissatisfaction with the writing abilities of our students, with six respondents expressing dissatisfaction, nine neutrality with regard to satisfaction, and only four expressing satisfaction; no faculty expressed extreme satisfaction. In terms of strength of student writing abilities, a majority of faculty rated as weak the abilities of our students to create concise summaries of ideas, texts, or events (11 of 18 or 61%), to analyze and/or evaluate ideas, texts, or events (10 of 18 or 56%), and to report complex data or findings (9 of 18 or 50%). Additionally, large pluralities reported as weak the abilities of our students to synthesize disparate ideas (8 of 17 or 47%), create precise descriptions of processes, objects, findings, environments, etc. (8 of 19 or 42%), and use writing to develop and deepen thinking (7 of 17 or 41%).

Under the first edition of our Writing Plan (2013-2014), we undertook a detailed curriculum mapping at the assignment level (1,808 questions scored), including all exams, problem sets, lab assignments, formal writing assignments, and other types of assignments in the seven required courses and X elective courses in the major. Each assignment was scored for how explicitly it addressed or called for our desired writing abilities in Section 2. Overall, the results indicate that, on average, most of our writing abilities are explicitly addressed in our course assignments to some degree, but that the connection between our desired writing abilities and our assignment instructions weakens from 2xxx courses to 4xxx courses. Thus, it appears that we were generally informing our students of our desires with regard to writing in our assignments, although we needed to make this more explicit at all levels in our curriculum. During the second edition of our Writing Plan (2015-2016), we have addressed this issue and longitudinal observations have shown a steady improvement in nearly all evaluation criteria.

One issue that still remains a challenge even after two editions of Writing Plan is a disconnect between faculty satisfaction with overall writing abilities and the integration of writing instruction into our curriculum. The types of writing assignments in our courses are not currently sequenced through the curriculum according to a plan that would lead to incremental increases in the sophistication of assignments. Consequently, different students in the same course might have had different combinations of writing assignments in previous courses and therefore not all be similarly prepared for the assignments in their current courses. This situation results in part from the structure of our current curriculum, which has few enforced prerequisites at any level. Additionally, the assignments themselves may not adequately and explicitly express the intention behind the assignment nor the expectations of how the assignment should be completed. Minor progress was made during the second edition of our Writing Plan (2015-2016), but there is still significant room for improved integration.

The second edition of our Writing Plan provided tangible tools to help improve the quality of writing instruction in the Earth Sciences. Teaching modules were developed for use in courses with specific emphases on five minute workshops using content from individual courses and peer-review exercises. An RA worked with a number of individual instructors to evaluate the results of the curriculum mapping and proposed ways to improve specific assignments and/or modify assignments so as to insure a better progression of expectations for student achievement of our desired writing abilities across the curriculum. However, the materials associated with these modules, guides, and exercises have not yet been collected into a single venue for future use that is suitably accessible to everyone in the department. This is one of our main goals moving forward.

The third and final edition of our Writing Plan seeks to add a degree of sustainability to our previous work to ensure lasting high quality writing instruction in the Department of Earth Sciences. Specifically, we aim to (1) collect all WEC-related teaching modules, posters, guides, and workshop materials into a single electronic resource that will be available to all Earth Science faculty, teaching assistants, and students; (2) integrate the use of online peer
review systems, such as Peerceptive or Eli Review, into Earth Science courses to enable faculty and teaching assistants to coach students in feedback and revision, and promote critical thinking and better writing; (3) combine assessments of student writing with Assessment of Student Learning Outcomes, in order to increase the thoroughness of our longitudinal assessment of writing instruction; and (4) develop TA training materials so that all Earth Science teaching staff can provide effective and consistent grading of writing assignments, can teach the technical writing abilities that students need to effectively communicate science, and can implement writing instruction that enhances students’ understanding of Earth Sciences.

Thus, while we do not yet have any formal plans for large scale structural changes to our curriculum (instituted in its current form in 2010), we will use the previous efforts at mapping our curriculum and interacting with faculty to adjust assignments and expectations across the existing curriculum to achieve better student outcomes and greater faculty satisfaction with regard to our desired writing abilities. This work will take place over F2017 through S2020 and could possibly result in a decision to expand an existing 4xxx course or add a new course to the curriculum that could be a formal “capstone” course that could bring together most or all of the writing abilities desired for our students.

Section 4: ASSESSMENT OF STUDENT WRITING

What concerns, if any, have unit faculty and undergraduate students voiced about grading practices?

Please include a menu of criteria extrapolated from the list of Desired Writing Abilities provided in Section II of this plan. (This menu can be offered to faculty/instructors for selective adaptation and will function as a starting point in the WEC Project’s longitudinal rating process.).

- There have not been substantial revisions to this section of the Writing Plan.

☐ There have been substantial revisions to this section of the Writing Plan. (Discuss these explicitly.)

Overall, the initial survey of faculty and students in Earth Sciences during our first year in the WEC program did not identify major concerns about current grading practices. A majority of faculty in Earth Sciences expressed a desire to explore further ways to provide more useful feedback in drafts of writing assignments (7 of 14 or 50%), organize effective peer review activities (7 of 14 or 50%), and grade writing in ways that are efficient and fair (9 of 14 or 64%). Most students in the program who responded (16 of 22 or 73%) indicated that they are satisfied with the methods used to respond to and/or evaluate their writing, but most (12 of 23 or 52%) also indicate only some consistency in the approach to writing and writing instruction across the curriculum.

Given the concerns among the faculty described in Section #3 regarding student writing abilities, it is safe to say that the faculty are not satisfied that the students understand expectations. The results of our curricular mapping under the first edition of our Writing Plan suggest that this is at least in part a result of poorly expressed expectations from the level of individual assignments to the role of writing in the curriculum as a whole and even the discipline. However, in the initial survey, 5 of 19 faculty (26% of respondents) were not confident or not very confident in their abilities to help students meet writing expectations in the major prior to the initiation of the WEC process. Publication of the approved Writing Plan in the department’s handbook for undergraduate students and as part of the online teaching modules will help disseminate the overall expectations of writing in the major. In addition, all editions of the Writing Plan will be included in the online electronic archive.

The menu of grading criteria that can be used by faculty and by WEC staff in the longitudinal rating is included as an appendix. This menu of criteria was approved with the first edition of the Writing Plan. The list was subsequently updated in minor ways under the second edition of the Writing Plan and in September of 2016 after the results of the first longitudinal comparative study became available. We will work with individual instructors to implement
some or all of the menu in how they assess student writing in their courses. We hope that better dissemination of
the expectations to students and use of the menu of grading criteria, which are expressly tied to the desired
abilities, will also improve student writing outcomes and increase faculty satisfaction with student writing abilities.

**Section 5: SUMMARY OF IMPLEMENTATION PLANS, including REQUESTED SUPPORT, RELATION TO PREVIOUS
IMPLEMENTATION ACTIVITIES, and SUSTAINABILITY PLANS**

What does the unit plan to implement during the period covered by this plan? What forms of instructional support
does this unit request to help implement proposed changes? What are the expected outcomes of named support?

How do the implementation plans of the 3rd edition Writing Plan relate to implementation activities from the 1st and
2nd edition Writing Plans? What has been successful? What was not successful? How do implementation plans build
on what was learned from the first year of implementation? How do implementation plans anticipate the ongoing
application of this final edition Writing Plan?

How will the unit move toward ownership of the implementation process after the end of eligibility for WEC
funding? When needed, what will be sources of funding and resource support? How will ongoing evaluation and
improvement of the Writing Plan take place?

The third and final edition of our Writing Plan seeks to add a degree of sustainability to our previous work to ensure
lasting high quality writing instruction in the Department of Earth Sciences. Over the period covered by the third
edition (F2017-S2019) we aim to:

1. Create an electronic archive for all WEC-related teaching modules, posters, guides, and workshop materials
   that is available to all Earth Science faculty, teaching assistants, and students. This archive will be
   progressively expanded to include all WEC materials from the 1st and 2nd editions of the Department’s
   Writing Plan, as well as new materials described in more detail below. This archive will expand the access
   and visibility of these tools for future students and teachers. The archive will also included all approved
   versions of the Writing Plan.
2. Integrate the use of online peer review systems, such as Peerceptiv or Eli Review, into Earth Science courses
   to enable faculty and teaching assistants to coach students in feedback and revision, and promote critical
   thinking and better writing.
3. Continue to combine assessments of student writing with Assessment of Student Learning Outcomes, which
   we now must report annually.
4. Develop TA training materials so that all Earth Science teaching staff can provide effective and consistent
   grading of writing assignments, can teach the technical writing abilities that students need to effectively
   communicate science, and can implement writing instruction that enhances students' understanding of
   Earth Sciences.

To achieve these objectives, we are requesting the equivalent of salary, tuition, and fringe benefits for a 25% time
graduate research assistantship for the Fall 2017 and Spring 2018 semesters. For a variety of reasons, we plan to
hire graduate students in advanced standing to fill the research assistantships. Graduate students in advanced
standing tend to have greater teaching experience, which makes them more familiar with the demands and
expectations associated with undergraduate education at the University of Minnesota, and makes them better
suited to helping implement the WEC program. Additionally, graduate students in advanced standing are less
expensive to fund than junior graduate students, which will allow the department to fund the RA frugally
throughout the third edition of the Writing Plan.

Joshua Feinberg is both the DUGs and WEC Liaison for Earth Sciences and will supervise the RA each semester. They
will meet regularly (weekly to biweekly) to discuss progress and problems. Feinberg and the RA will review, assess,
strategize the implementation efforts across the department (e.g., construction of the electronic archive, TA training workshops, and development of new materials) and within individual courses (e.g., implementation of student peer-review software). The RA will also meet with faculty instructors, at times alone and at times with the WEC Liaison, to provide training for the student peer-review software and to collect feedback on TA training and other WEC-related activities.

A summary table of the implementation schedule is shown below, and additional details, such as specific activities, planned means of assessment, and personnel in each semester, are discussed at the end of the section.

**Meeting the first objective.**
The first objective, planned for F2017, is to compile an online resource (possibly although not necessarily Moodle given the likelihood that the University will ultimately move away from Moodle) that is readily available to faculty, graduate student instructors, and students that contains an organized array of online teaching modules, guides, and templates designed to educate and improve forms of writing with the Earth Sciences. This goal is meant to aggregate and better distribute the material generated during the 1st and 2nd Writing Plans. The majority of content for this online resource was created during these earlier plans; however, a few modules and guides are still in various forms of preparation, and it is difficult for teachers and students to obtain access to existing materials. Earlier editions of the Writing Plan included plans to develop a relatively large number of teaching modules and associated materials. In retrospect, our plans were too ambitious, particularly given the fine-grained detail we achieved with our curriculum mapping during the first Writing Plan. Online implementation was originally planned for Summer, 2014, but drastic changes in the IT support for Earth Sciences began in S2014, disrupting technical support. With the support from the first and second editions of the Writing Plan, we developed:

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### Earth Sciences 3rd Edition Writing Enriched Curriculum Implementation Schedule

Please note that RA support is requested for only the first two semesters. All WEC work in years 2 and 3 will be managed directly by the WEC Liaison and are indicated in italics.

<table>
<thead>
<tr>
<th>Semester 1: Fall 2017, with Graduate RA</th>
<th>Semester 2: Spring 2018, with Graduate RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create an electronic archive of teaching materials related to writing (modules, guides, exercises, etc.)</td>
<td>Maintain and further develop the WEC electronic archive.</td>
</tr>
<tr>
<td>Begin the incorporation of online peer review software into existing Writing intensive courses.</td>
<td>Review the initial use of the online peer review software and coordinate with the next set of courses.</td>
</tr>
<tr>
<td>Begin assembling the materials for half-day workshops on TA training.</td>
<td>Run the first half-day training workshop for TAs.</td>
</tr>
<tr>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
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<table>
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<tr>
<th>Semester 3: Fall 2018</th>
<th>Semester 4: Spring 2019</th>
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<tbody>
<tr>
<td>Maintain and further develop the WEC electronic archive.</td>
<td>Maintain and further develop the WEC electronic archive.</td>
</tr>
<tr>
<td>Review the third semester of online peer review software.</td>
<td>Review the 4th semester use of online peer review software.</td>
</tr>
<tr>
<td>Run the second half-day training workshop for TAs.</td>
<td>Run the third half-day training workshop for TAs.</td>
</tr>
<tr>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
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</table>

<table>
<thead>
<tr>
<th>Semester 5: Fall 2019</th>
<th>Semester 6: Spring 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintain and further develop the WEC electronic archive.</td>
<td>Maintain and further develop the WEC electronic archive.</td>
</tr>
<tr>
<td>Review the 5th semester use of online peer review software.</td>
<td>Review the 6th semester use of online peer review software.</td>
</tr>
<tr>
<td>Run the fourth half-day training workshop for TAs.</td>
<td>Run the fifth half-day training workshop for TAs.</td>
</tr>
<tr>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
<td>Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes</td>
</tr>
</tbody>
</table>
1. A guide to types of figures common in Earth Science research and a decision tree guiding the choice of one type of graph over another,
2. A detailed style guide for making XY scatter plots that was tested in ESCI 4971W,
3. A style and design guide for Powerpoint presentations,
4. A styled and design guide for scientific poster presentations,
5. A collection of posters given by graduate students and faculty in Earth Sciences at various conferences as a gallery that students can use for ideas about designing their own posters,
6. A set of editing marks that we will propose all instructors so that papers are marked consistently across the curriculum and students have a resource that explains the marks on their papers, and
7. A single five-minute workshop on figures using materials collected from ESCI 4501 Structural Geology as examples that can be used in that course or otherwise.

Based on our earlier successes with the five-minute workshops in the 2nd edition of the Writing Plan, we aim to develop more five minute workshops on topics including instructions for peer reviews and guides to writing grading rubrics. The longitudinal use of all Writing Plan materials will be tracked electronically based on numbers of times materials are accessed on the online archive.

Additionally, the RA will develop course-specific, five-minute training workshops for faculty, TAs, and students. Beginning in the first semester of the third Writing Plan (F2017), the RA will meet with instructors of core curriculum courses, identify assignments in the course that correspond to one or more of our writing types (Section 1) and/or abilities (Section 2), and design a five-minute workshop using preexisting course materials that emphasizes departmental expectations for writing. The instructor will save student materials (without identifiers) for the assignment or assignments that include examples of correspond to poor, adequate, and exceptional writing that can then be used later that semester and/or in subsequent years in that course. The RA will also work with the instructors to identify assignments that are appropriate for peer review exercises and devise a schedule and a grading scheme for those assignments that can be implemented in F2017 or in subsequent years. This effort will continue with core curriculum courses offered in S2018 and into the second and third years of the Writing Plan as some of our 4xxx courses are only offered every other year.

To support this effort, we will request support from the WEC program staff to help with demonstrations to faculty, other instructors, and interested graduate teaching assistants on an as needed basis.

The outcome of this effort will be a set of tools for teaching with writing that are tailored not only to Earth Sciences generally, but to the content and assignments of specific courses in our curriculum. The modules will be stored on an online open website that will also serve as the repository for the various editions of the Writing Plan, the poster gallery, and other materials related to the WEC program in Earth Sciences. Again, a Moodle site may be a natural forum for electronic access to these materials, but given the multiple updates of Moodle technology that have occurred over the last eight years and the likelihood of migration to a new platform, we would like to weigh alternative online storage strategies that offer more long-term security, such the University’s Digital Conservancy program, or a subset of the ESCI Department’s own website.

Meeting the second objective.
The second objective, incorporating online peer-review software into our courses, will build on requests from our faculty offered during departmental discussions in F2016 about the longitudinal performance of the WEC program in general. More specifically, faculty recognized the importance of providing meaningful feedback on student writing, but expressed frustration at the extensive time required to provide such valuable instruction. Many felt that it was impossible to balance the demands of such high quality instruction with the competing demands made
of UMN faculty for research and service. To address this request, we would like to explore the use of online peer review systems that provide a highly organized environment for students to learn about providing constructive reviews of writing, and provide easily understandable metrics for how often and how deeply students are engaging in their writing. While the existing Moodle platform has some rudimentary peer review mechanisms, one of the attractive aspects of certain commercial platforms, like Eli Review and Peerceptiv, is that high-quality, pre-made training modules are already available for students and faculty to use, which removes a major energy hurdle for incorporating such software into our existing curriculum.

Initially, such online peer review systems will be targeted towards the three courses that are already designated as Writing Intensive, ESCI 3303W Geochemical Principles and ESCI 4102W Vertebrate Paleontology in F2017, 4971W Hydrogeology Field Course in S2018). ESCI 4012W and ESCI 4103W Mammal Evolution which are taught in alternate years, both already use peer-review without an online system as part of the process for a semester long, long-format, formal writing assignment. Additionally, in the process of discussing the five-minute training modules with individual instructors, the RA and faculty can identify ways in which such online peer review systems may be used in additional 2xxx, 3xxx, and 4xxx level courses, where appropriate. The assignments in these courses can be designed so that peer review takes place in more than just the writing intensive courses, and the expectations of writing abilities are sequenced across the curriculum and the assignments in the higher level courses refer explicitly to those in the lower level required courses. This type of integration of assignments and explicitness of expectations will help students see our curriculum as an integrated whole, rather than as a series of independent courses.

Efforts to achieve the second objective will be spread out over all three years of the 3rd edition of the Writing Plan (F2017-S2020). In the second year of the Writing Plan, we will revisit the instructors who piloted the peer-review software and discuss ways to make further improvements. Additionally, we will begin to encourage the use of online peer review across a broader range of ESCI courses. There is a cost associated with using commercial software and this must be taken into account when considering how such software will be used after the third edition Writing Plan is completed. We see two potential long term solutions for the use of commercial software: (1) Incorporate a course fee to cover the cost of the software, or (2) purchase a department site license for the software. In an ideal world, the College of Science and Engineering would procure a college-wide site license to allow all units to use the software effectively. Alternatively, we can also work with WEC staff to create a long term solution using Moodle, or an alternative open source software, that will allow faculty and TAs to continue to incorporate online peer review into their coursework. The commercial software that will be used during the third edition Writing Plan, will be an important transitional step that serves to educate teaching staff about the pros and cons of such an approach.

Meeting the third objective.
The third objective, leveraging assessments of student learning outcomes to simultaneously assess student writing, is an extension of work that was started during the second Writing plan. This idea has been implemented for a handful of pilot courses, but still needs to be expanded further into the department’s curriculum, and likely will benefit from conversations between WEC staff and other WEC liaisons. Over the course of the third edition of the Writing Plan, we would like to incorporate our assessments of student writing abilities, as judged by the menu of grading criteria for individual assignments in courses, into how we assess Student Learning Outcomes. This work will specifically target how to assess ESCI SLO 4: “Students can communicate scientific information and ideas effectively to various audiences in appropriate modes (writing, verbally, visually)”. All departments are required to submit an Annual Progress Report (APR) on Assessment of Student Learning, which effectively serves as a draft version of what we will do going forward. This year and going forward, the Undergraduate Studies Committee in Earth Sciences will work with the instructors of most of the same courses we mapped in the first edition of the Writing Plan to revise our process to focus on assignments other than exams that will be more useful for assessing the SLOs going forward. SLO 4 and the overall assessment process for the APR have obvious parallels to the need for ongoing
assessment of writing abilities, and improving student achievement in our desired writing abilities logically should improve achievement on SLO 4.

The DUGS is responsible for writing the APR, and the WEC RA will contribute to this process by gathering graded assignments archived by faculty for use in the APR. A likely approach will be for the Undergraduate Studies Committee to assess writing assignments from a selection of courses each year using the menu of grading criteria used by the outside rater, providing an ongoing parallel process. Our goal by the end of the third edition of the Writing Plan is to implement continued assessment of student writing via the required APR. As the APR process becomes a more routine task of faculty in the department, so will the regular assessment of writing abilities above the individual course level. Achieving this somewhat open ended objective will likely involve continued discussion with WEC staff both to define the problem more clearly and devise ways to combine assessment of writing and assessment of the SLOs. That consultation likely will take the form of meetings with the DUGs, the RA, and also with the Undergraduate Studies Committee.

Meeting the fourth objective.
The fourth and final objective involves running half-day training workshops for student Teaching Assistants, twice a year before the start of Fall and Spring semesters to provide a unified perspective on departmental educational goals and strategies, and to encourage the use of materials generated by the department’s earlier, successful WEC Writing plans. This will require the RA to compile materials and create presentations that clearly communicate our writing goals, strategies for successful teaching and grading (including the minimal marking method), and advertise departmental writing resources that otherwise may go unused. The department currently offers no such training to our student Teaching Assistants, and so this represents an easy opportunity to improve the quality of our student teachers, while also increasing the pedagogical cohesion of our undergraduate major. It is also worth mentioning that several faculty members expressed an interest in learning new grading techniques that would improve the effectiveness of teaching writing. Thus, it is likely that at least initially, there will be participation by some faculty members in these training workshops.

The RA and DUGS will ask for assistance from WEC program staff in gathering resources about best-practices for teaching writing, and for training about techniques like minimal marking method. Additionally, we will aim to provide instruction on the design of grading rubrics for writing that incorporate the menu of grading criteria for writing abilities and that can improve the efficiency and fairness of grading. It is unlikely that a graduate RA will have sufficient teaching experience to do this work on their own. The DUGS will work closely with the RA in this regard, and we will coordinate with WEC staff to identify the best means of assistance.

The gathering of resources and preparation of presentation materials for these training workshops will be conducted during F2017. The first of these workshops will be given immediately prior to Spring semester 2018, and will be offered prior to each successive semester for the duration of the Writing Plan. Feedback from the training workshops will be gathered in the form of post-workshop surveys and used to improve successive workshops. After the initial cost of creating the materials for these workshops, this training mechanism for TAs will require no additional funding and will continue long after the third edition of the Writing Plan is complete.

Work scheduled for implementation of third edition of Writing Plan Semester 1 (F2017)

Activity 1 - Create an electronic archive of teaching materials related to writing (modules, guides, exercises, etc.)

- The RA will compare and discern the most effective means for storing and organizing materials created during the previous two WEC Writing Plans. In particular, evaluate the pros and cons of using Moodle, the departmental website, or the University of Minnesota Digital Conservancy program. Once a decision has been
made about which electronic environment is most appropriate for our departmental needs, then the RA will add the teaching resources to create a well-organized, and modifiable site that will be accessible to faculty, TAs, and students. Personnel: The Graduate RA will be responsible for compiling materials and structuring the electronic archive. Feinberg will supervise and review the archive as it is developed.

- The RA and WEC Liaison will meet with instructors of courses this semester at least once to discuss whether there are needs for additional five-minute workshops, modules, or guides, and schedule when these modules will be developed and with whom. Personnel: The Graduate RA will be responsible for development and editing of modules and for compiling data on access and use of modules. Feinberg will consult and supervise and review modules as they are developed.

**Activity 2 – Begin the incorporation of online peer review software into existing Writing Intensive courses.**

- At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of ESCI 3303W, ESCI 4971W, and to discuss the ways in which an online peer review system can be incorporated into their courses. A brief, 5-minute presentation will be made at a departmental faculty meeting advertising the goals and capabilities of the software. Personnel: The Graduate RA will act as a resource for faculty in the writing intensive courses as they begin the work of incorporating this technology into their courses. Feinberg and the RA will collect feedback at the end of the semester.

**Activity 3 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes**

- Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. This work was begun during the second Writing Plan but is not yet finished. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.

**Activity 4 – Begin assembling the materials for half-day workshops on TA training.**

- Meet with the WEC staff to identify and compile materials for a half day workshop for TAs on best practices for teaching writing in the Earth Sciences. Workshops will also include information about non-writing topics, that will help provide a unified perspective on undergraduate teaching. Personnel: Graduate RA will compile and organize workshop materials. Feinberg will supervise and coordinate the scheduling of the first workshop for immediately before the start of Spring Semester 2018.

**Semester 2 (S2018)**

**Activity 1 – Develop and implement electronic teaching archive.**

- At end of the semester, gather student teaching materials that will be used for developing five-minute workshops and/or peer review exercises for courses this semester, so that they can be added to the electronic archive. Personnel: Graduate RA will be gather and store the materials.

- Develop additional modules demonstrating effective writing as suggested by faculty during meetings, edit existing modules, track usage through the electronic archive and through surveys of students. Personnel: Graduate RA will be responsible for development and editing of modules and for compiling data from the archive on access and use of modules. WEC Liaison will consult and supervise and review modules as they are developed.
• Assessment and Sustainability. As with most websites, the use of ESCI’s WEC electronic archive will be automatically monitored, and reports will be generated that document how often the site is visited, and which files are most frequently used. In addition to these usage reports, the electronic archive will be assessed via a survey of the ESCI faculty and teaching staff at the end of Fall semester 2017 for feedback. The electronic archive should be sufficiently dynamic such that updates and additions are straightforward, and can be managed by the Director of Undergraduate Studies. No further financial support will be needed to sustain the archive.

**Activity 2 – Review the initial use of online peer review software.**

• At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of ESCI 3303W (Geochemical Principles) to discuss their impressions of the successes and limitations of the online peer review system. Identify detailed action items that describe clear steps that can be taken to improve the experience for future courses. Identify the next round of courses and instructors that are likely to want to use online peer review. Personnel: The Graduate RA will compile the list of potential improvements and continue to act as a resource for faculty in the writing intensive courses, as they continue to incorporate this technology into their courses. Feinberg will again collect feedback at the end of the semester.

**Activity 3 – Run the first half-day training workshop for TAs.**

• Prior to the beginning of the semester, the RA and WEC Liaison will run the first half-day training workshop for TAs that will be active during Spring 2018. Personnel: The Graduate RA and Feinberg will run the workshop, and will also consult with the Director of Graduate Studies for ESCI. The Graduate RA will conduct a post-workshop survey to determine the effectiveness of the workshop and gather ideas for improvements.

**Activity 4 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes**

• Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.

**Semester 3 (F2018)**

**Activity 1 – Continue to develop and implement electronic teaching archive.**

• At end of the semester, gather student teaching materials that will be used for developing five minute workshops and/or peer review exercises for courses this semester. Personnel: Graduate RA will gather and store the materials.

• Develop additional modules suggested by faculty during meetings, edit existing modules, track usage through the electronic archive and through surveys of students Personnel: Graduate RA will be responsible for development and editing of modules and for compiling data from the archive on access and use of modules. WEC Liaison will consult and supervise and review modules as they are developed.
• The assessment and sustainability of ESCI’s WEC electronic archive will continue as described in previous semesters.

Activity 2 – Review the third semester of online peer review software.

• At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of participating ESCI courses to discuss their impressions of the successes and limitations of the online peer review system. Identify detailed action items that describe clear steps that can be taken to improve the experience for future courses.
• Work with a select group of professors that are willing to incorporate online peer review in their courses. Personnel: The Graduate RA will compile the list of potential improvements and continue to act as a resource for faculty in the writing intensive courses, as they continue to incorporate this technology into their courses. Feinberg will again collect feedback at the end of the semester.
• The Graduate RA and WEC Liaison will begin to interact with the Moodle staff to develop realistic, proven online peer review tools that will allow the department to continue to use the technology without having to pay subscription fees for commercial software. The detailed lists of potential improvements collected during previous semesters will be important for guiding this stage of the Writing Plan.

Activity 3 – Run the second half-day training workshop for TAs.

• Prior to the beginning of the semester, the RA and WEC Liaison will run the second half-day training workshop for TAs that will be active during Fall 2018. This iteration of the workshop should incorporate improvements suggested by the feedback from the previous workshop. Personnel: The Graduate RA and Feinberg will run the workshop. The Graduate RA will conduct a post-workshop survey to determine the effectiveness of the workshop and gather ideas for improvements.

Activity 4 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes

• Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.
• Gather and archive graded course materials not being saved by faculty already that can be used to assess writing broadly speaking (i.e., SLO 7) in the APR. Personnel: Graduate RA, WEC Liaison

Semester 4 (S2019)

Activity 1 – Continue to develop and implement electronic teaching archive.

• At end of the semester, gather student teaching materials that will be used for developing five minute workshops and/or peer review exercises for courses this semester. Personnel: Graduate RA will gather and store the materials.

• Develop additional modules suggested by faculty during meetings, edit existing modules, track usage through the electronic archive and through surveys of students. Personnel: Graduate RA will be responsible for development and editing of modules and for compiling data from the archive on access and use of modules. WEC Liaison will consult and supervise and review modules as they are developed.
Activity 2 – Review the fourth semester use of online peer review software.

- At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of participating ESCI courses to discuss their impressions of the successes and limitations of the online peer review system. Identify detailed action items that describe clear steps that can be taken to improve the experience for future courses.
- At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of ESCI 3303W (Geochemical Principles) to plan their second use of the online peer review system.
- Work with a select group of professors that are willing to incorporate online peer review in their courses. Personnel: The Graduate RA will compile the list of potential improvements and continue to act as a resource for faculty in the writing intensive courses, as they continue to incorporate this technology into their courses. Feinberg will again collect feedback at the end of the semester.
- The Graduate RA and WEC Liaison will continue to interact with the Moodle staff to develop realistic, proven online peer review tools that will allow the department to continue to use the technology without having to pay subscription fees for commercial software. The detailed lists of potential improvements collected during previous semesters will be important for guiding this stage of the Writing Plan.

Activity 3 – Run the third half-day training workshop for TAs.

- Prior to the beginning of the semester, the RA and WEC Liaison will run the third half-day training workshop for TAs that will be active during Spring 2019. This iteration of the workshop should incorporate improvements suggested by all feedback from the previous workshops. Personnel: The Graduate RA and Feinberg will run the workshop. The Graduate RA will conduct a post-workshop survey to determine the effectiveness of the workshop and gather ideas for improvements.

Activity 4 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes

- Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.
- Gather and archive graded course materials not being saved by faculty already that can be used to assess writing broadly speaking (i.e., SLO 7) in the APR. Personnel: Graduate RA, WEC Liaison

Semester 5 (F2019)

Activity 1 – Continue to develop and implement electronic teaching archive.

- At end of the semester, gather student teaching materials that will be used for developing five minute workshops and/or peer review exercises for courses this semester. Personnel: Graduate RA will gather and store the materials.
- Develop additional modules suggested by faculty during meetings, edit existing modules, track usage through the electronic archive and through surveys of students. Personnel: Graduate RA will be responsible for development and editing of modules and for compiling data from the archive on access and use of modules. WEC Liaison will consult and supervise and review modules as they are developed.
Activity 2 – Review the fifth semester use of online peer review software.

- At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of participating ESCI courses to discuss their impressions of the successes and limitations of the online peer review system. Identify detailed action items that describe clear steps that can be taken to improve the experience for future courses.
- Work with a select group of professors that are willing to incorporate online peer review in their courses. Personnel: The Graduate RA will compile the list of potential improvements and continue to act as a resource for faculty in the writing intensive courses, as they continue to incorporate this technology into their courses. Feinberg will again collect feedback at the end of the semester.
- The Graduate RA and WEC Liaison will continue to interact with the Moodle staff to develop realistic, proven online peer review tools that will allow the department to continue to use the technology without having to pay subscription fees for commercial software.

Activity 3 – Run the fourth half-day training workshop for TAs.

- Prior to the beginning of the semester, the RA and WEC Liaison will run the third half-day training workshop for TAs that will be active during Fall 2019. This iteration of the workshop should incorporate improvements suggested by all feedback from the previous workshops. Personnel: The Graduate RA and WEC Liaison will run the workshop. The Graduate RA will conduct a post-workshop survey to determine the effectiveness of the workshop and gather ideas for improvements.

Activity 4 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes

- Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.
- Gather and archive graded course materials not being saved by faculty already that can be used to assess writing broadly speaking (i.e., SLO 7) in the APR. Personnel: Graduate RA, WEC Liaison

Semester 6 (S2020)

Activity 1 – Continue to develop and implement electronic teaching archive.

- At end of the semester, gather student teaching materials that will be used for developing five minute workshops and/or peer review exercises for courses this semester. Personnel: Graduate RA will gather and store the materials.
- Develop additional modules suggested by faculty during meetings, edit existing modules, track usage through the electronic archive and through surveys of students Personnel: Graduate RA will be responsible for development and editing of modules and for compiling data from the archive on access and use of modules. WEC Liaison will consult and supervise and review modules as they are developed.

Activity 2 – Review the sixth semester use of online peer review software.

- At the beginning of the semester, the RA and WEC Liaison will meet with the instructors of participating ESCI courses to discuss their impressions of the successes and limitations of the online peer review system.
Identify detailed action items that describe clear steps that can be taken to improve the experience for future courses.

- Work with a select group of professors that are willing to incorporate online peer review in their courses. Personnel: The Graduate RA will compile the list of potential improvements and continue to act as a resource for faculty in the writing intensive courses, as they continue to incorporate this technology into their courses. Feinberg will again collect feedback at the end of the semester.
- The Graduate RA and WEC Liaison will continue to interact with the Moodle staff to develop realistic, proven online peer review tools that will allow the department to continue to use the technology without having to pay subscription fees for commercial software.

Activity 3 – Run the fifth half-day training workshop for TAs.

- Prior to the beginning of the semester, the RA and WEC Liaison will run the third half-day training workshop for TAs that will be active during Spring 2020. This iteration of the workshop should incorporate improvements suggested by all feedback from the previous workshops. Personnel: The Graduate RA and WEC Liaison will run the workshop. The Graduate RA will conduct a post-workshop survey to determine the effectiveness of the workshop and gather ideas for improvements.

Activity 4 – Continue to integrate the assessment of writing with the evaluation of Student Learning Outcomes

- Meet with the Undergraduate Studies (US) Committee to make minor adjustments to the mechanisms that the department uses to monitor both writing instruction and student learning outcomes. Personnel: WEC Liaison and Graduate RA will meet with the US Committee to identify any areas that need adjustment in the existing APR.

Gather and archive graded course materials not being saved by faculty already that can be used to assess writing broadly speaking (i.e., SLO 7) in the APR. Personnel: Graduate RA, WEC Liaison

Section 6: PROCESS USED TO CREATE THIS WRITING PLAN

How, and to what degree, were a substantial number of stakeholders in this unit (faculty members, instructors, affiliates, teaching assistants, undergraduates, others) engaged in providing, revising, and approving the content of this Writing Plan?

A draft of the Writing Plan was written by Joshua Feinberg, the Director of Undergraduate Studies and WEC Liaison for Earth Sciences, based on discussions with the graduate and undergraduate RAs supported by the second edition of the Writing Plan during AY 2015-2016. The underlying ideas in the draft were discussed at a departmental faculty meeting in October 2016, where general approval was given to proceed. The draft was also circulated to members of the department’s Undergraduate Studies Committee, and again to the department at large in March. General comments were all very positive and supportive. Approval was not based on an explicit vote but was inferred from support for the draft version.

Section 7: CONNECTION TO STUDENT LEARNING OUTCOMES

Briefly describe how the ideas contained in this Undergraduate Writing Plan address the University’s Student Learning Outcomes (http://www.slo.umn.edu).

University SLO: Can locate and critically evaluate information

ESci SLO2: Students demonstrate the ability to locate and collect data relevant to problems in Earth Sciences and to analyze those data in an appropriate manner.
During the second edition Writing Plan we developed a module that specifically addresses methods for finding sources for research papers and projects that will help students learn how to locate and evaluate information. We plan to continue to use this module to address this SLO.

**University SLO: Have mastered a body of knowledge and mode of inquiry**

_ESci SLO 3: Students will demonstrate the ability to apply knowledge of Earth Sciences, including the processes of the integrated Earth system and the history of the Earth system, at an appropriate level of sophistication and rigor._

The intent of the modules we developed under the first edition and the current edition of the Writing Plan is to provide our students with tools that will help them improve their writing abilities. We expect that better writing skills will help them to increase their mastery of Earth Sciences.

**University SLO: Can communicate effectively**

_ESci SLO 4: Students can communicate scientific information and ideas effectively to various audiences in appropriate modes (writing, verbally, visually)._  

The modules we developed under the second Writing Plan improved our students’ abilities to communicate in writing and by poster and PowerPoint presentations.

**University SLO: Have acquired skills for effective citizenship and life-long learning**

Good communications skills are critical for effective citizenship as they allow Earth Scientists working in academia, in the private sector, or in government to communicate critical information about the Earth and our environment to others.
V. WEC Research Assistant (RA) Request Form

This form is required if RA funding is requested. If no RA funding is requested please check the box below.

☐ No RA Funding Requested

RAs assist faculty liaisons in the WEC Writing Plan implementation process. The specific duties of the RA are determined in coordination with the unit liaison and the WEC consultant, but should generally meet the following criteria: they are manageable in the time allotted, they are sufficient to their funding, and they have concrete goals and expectations (see below).

RA funding requests are made by appointment percent time (e.g., 25% FTE, 10% FTE, etc.). Appointment times can be split between two or more RAs when applicable (e.g., two 12.5% appointments for a total of 25% FTE request). Total funds (including fringe benefits when applicable) need to be calculated in advance by the liaison, usually in coordination with administrative personnel.1

Please note that, outside of duties determined by the liaison, WEC RAs may be required to participate in specific WEC activities, such as meetings, Moodle discussion boards, and surveys.

RA Name (Use TBD for vacancies): TBD
RA Contact Information: email_____, phone_____
Period of appointment (Semester/Year to Semester/Year): Fall/2017 to Spring/2018
RA appointment percent time: 25%

Define in detail the tasks that the RA will be completing within the funding period:
Please see the RA details explicitly described in Section 5.

Define deadlines as applicable (please note that all deadlines must be completed within the funding period):
Please see the RA deadlines explicitly described in Section 5.

Describe how frequently the RA will check in with the liaison:
Weekly to biweekly

Describe in detail the RA’s check-in process (e.g., via email, phone, in-person, etc.):
In-person meeting or Skype meeting if and when travel is required by either the WEC Liaison or RA.

1 An example for determining funding for appointments can be found on the WEC Liaison Moodle. This is for planning and example purposes only and cannot be used to determine final budget items for the Writing Plan.
<table>
<thead>
<tr>
<th>Category</th>
<th>Desired writing ability</th>
<th>Grading criterion</th>
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</table>
| Synthesis and summarization           | 1. Synthesize information and ideas located across multiple and/or disparate sources  
2. Summarize observations, data, and information in abstracts or executive summaries   | • Includes multiple/disparate sources and is not overly narrow in scope  
• Includes original thought and analysis, goes beyond simple agglomeration of facts  
• Uses appropriate economy of language  |
| Addressing the target audience        | 3. Communicate Earth Science concepts and information to diverse audiences, including other scientists, general public, government officials, and various stakeholders in a given issue involving Earth Science | • Consistently uses language, content, and formats appropriate for target audience  
• Demonstrates technical competence and follows professional guidelines [scientific audience]  
• Effectively distills complex information into accessible content without use of jargon. Technical details are simplified and condensed without sacrificing meaning or accuracy [non-scientific audience]  |
| Clarity and organization              | 4. Write explicitly, precisely, and intentionally to the potential reader(s) so as to minimize alternative or ambiguous meanings or readings (except as intended)  
5. Communicate clearly what was performed or observed (field/lab), read (article/book/website), or heard (class/lab/field) so that observations are understandable to someone who was not present  
6. Write clear and informative sentences and paragraphs in a logical order to answer a question or make a point  
7. Write concisely without losing meaning, avoiding superfluous information or phrases | • Communicates clearly and unambiguously  
• Describes what is seen (in the field/lab), read (in an article/book/website), or heard (in class/lab/field) so that the observations and information is understandable to someone who was not present  
• Answers a question or makes a point using logically sequenced, clear, and informative sentences  |
| Flow and transition                   | 8. Incorporate effective transitions between subjects and statements                                                                                                                                                | • Word choice and order provide continuity between sentences and paragraphs  |
| Figures, captions, and equations     | 9. Explain in words the meaning of data and figures so that they are understandable to a reader who does not have the data or figures  
10. Explain in words the meaning of complex equations that describe processes or concepts beyond simply stating the identify of each variable or component of an equation  
11. Design and create graphs and diagrams that communicate information and concepts clearly, economically, and efficiently | • Explain in words the meaning of data and figures so that they are understandable to someone who does not have the data or figures  
• Moves beyond identification of the variables or components of an equation to explain the meaning of equations in terms of processes and/or concepts  
• Communicates information, data, and concepts in figures, graphs, and/or diagrams clearly with adequate labels and complete captions and without extraneous or distracting elements  |
| Mechanics                             | 12. Use proper grammar, spelling, and punctuation                                                                                                                                                                     | • Avoids biased or unscientific information, or appeals to false authority  
• Internal citations and reference lists follow an established scientific format  |
| Sources and citations                 | 13. Identify and use appropriate, credible sources that are germane to the topic at hand  
14. Apply internal citations properly  
15. Create a reference list that follows an established scientific format |
<table>
<thead>
<tr>
<th>Category</th>
<th>Task</th>
<th>Evaluation area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research papers</td>
<td>• Write a research paper or scientific report on a specific topic, question, problem, hypothesis, or model in the style of an article in a scientific journal (including abstract, introduction, background, results, discussion, conclusion, proper citations). • Conduct original analysis of new data from field or laboratory exercises</td>
<td></td>
</tr>
<tr>
<td>Scientific review</td>
<td>• Summarize and explain a journal article or body of scientific work • Judge/critique the scientific work or analysis or other individuals • Evaluate alternative hypotheses or competing perspectives (comparative analysis) using multiple sources</td>
<td>• Logical reasoning and scientific understanding are effectively employed to judge plausibility of claims</td>
</tr>
<tr>
<td>Science translation</td>
<td>• Describe and evaluate the communication of scientific information (accuracy, effectiveness, style) in the popular press or other nontechnical platforms • Write about a scientific subject in the style of a newspaper/magazine article, press release, or memo, translating complex information into content suitable for an educated lay audience</td>
<td>• Translates technical knowledge into content suitable for nonscientific audiences</td>
</tr>
<tr>
<td>Professional communication</td>
<td>• Write articulate, professional correspondence when required and know when to do so</td>
<td>• Relays information using professional correspondence</td>
</tr>
</tbody>
</table>
X-Y Scatter graphs (Excel)

The X-Y scatter plot allows us to view and compare the trends of two different data series relative to some other variable they have in common.

The spreadsheet below contains data of four series, relative to the common variable ‘mesh size.’ On the default X-Y Scatter graph generated from this data, the common variable (the first column, mesh size) plots on the horizontal or x-axis, while four data series (beta, gamma, alpha and an unnamed series) are plotted on the vertical or y-axis. Changing the default graph to a well-labeled, clear X-Y Scatter of only the Beta and Gamma series can be accomplished through a variety of steps described in this module.

When Excel is the active program, the menubar across the top of the monitor presents a variety of dropdown options and serves as a portal to the program. Additionally, open files have a set of tabs across the top of the file window, and each tab opens a ribbon of options through which to interact with the program. In many cases, actions can be initiated through either the menubar or the ribbon bar. The menubar, tabs and ribbons are dynamic – changing as appropriate when a file is open and an object or cell is active (selected.) If things aren’t working as described, first check that you have selected the item you want to be working on. The look of the interface differs slightly among Excel versions and operating systems. If you find this to be the case, click around within your menubar, tabs and ribbons and you’ll find what you need.

The spreadsheet

The way you organize your spreadsheet data can affect the ease of generating and formatting a graph. Though not necessary, X-Y Scatter graphs are most easily generated from data laid out in columns, with your X-axis values in the first column, and labels across the first row.

To generate a default Excel graph, select the spreadsheet data cells as well as the header cells, as shown here in light blue. With these cells highlighted, choose menubar: INSERT > CHART and the Chart ribbon will be displayed. Click on the INSERT CHART icon, and scroll through the options to find and choose MARKED SCATTER.

A default graph will appear. In order for it to clearly reflect the information you want it to, you will need to modify it – maybe add or delete a data series (spreadsheet data column) to/from the graph, add labels to the axes and graph, make changes to the axes values and data point symbols, add lines or error bars, or change the background color. The next page addresses how to do these.
Adding / deleting data from the graph

Adding new data
With the graph selected, choose menu bar: ADD DATA. In the dialogue box that opens, click the small icon to the right of the RANGE field. Go to the spreadsheet and click and drag across the data and header cells you want to add. Go back to the dialogue box and press RETURN, then OK.

Deleting unwanted data
With the graph selected, choose menu bar: CHART > SOURCE DATA. In the dialogue box that open, the data series (spreadsheet columns) will be listed. Click on the unwanted series, press REMOVE.

Adding features to a graph

Labels, axes and gridlines
To add or change labels, axes or gridlines, select the whole graph, then choose the tab CHART LAYOUT. This example shows how to find the option to add a y-axis label. The new axis label will read ‘Axis title.’ To change it, click once in the text box and change it.

Trendlines and error bars
To add error bars or trendlines to a series of data points, select them, then choose the tab CHART LAYOUT. Once trendlines or error bars have been added, format them by double-clicking on them and choosing the attribute you want to format. The option to add trendline equations and r^2 values is found in the OPTIONS attribute.
Modifying graphs

To reformat or change how a graph looks, double-click on the feature of the graph that you want to make changes to. A dialogue box specific to that feature will open, showing a list of attributes that can be changed. Choose the attribute, and apply changes as desired in the dialogue box fields.

Text boxes can be moved by selecting with the 4-way cursor and moving the box.
Bar charts are used to display and compare the number, frequency, or any other measure (e.g., mean, median, standard deviation) of discrete, distinct categories that are qualitative in nature.

The $x$-axis (or horizontal axis) discrete group types. The $y$-axis records the measure for each of these group types, so it consists of scale based on the unit of measurement. The axes can sometimes be reversed, where the categories appear along the vertical axis and the length of the bar corresponds to the categorical measurements.

Below is a simple example of a vertical bar chart:

![Eruption Frequency vs Eruption Explosivity](http://geology.com/stories/13/volcanic-explosivity-index/)

The number of eruptions of each category follow the same scale. This allows the discrete categories to be easily compared.
Grouped bar charts allow for comparison for different subgroups in a category, and comparing subgroups across categories. Each categorical group may have two or more bars.

The example below shows the number of different types of wells in Kansas (the categories) by year (the subgroups):

![Wells in Kansas chart](http://www.kgs.ku.edu/PRS/wellStats.html)

However, it is difficult to observe the difference in total between categories in grouped bar charts. This is where stacked bar charts are useful. In each category, different subgroups are stacked atop of each other, which shows a combined result for the category. This allows for a visual comparison of the total measure for each category.

The example below shows the average monthly variation in fine particle concentrations in Mammoth Cave National Park. The total measure for each category can be clearly seen, but the proportion of each subgroup becomes less clear.

![Mammoth Cave, NP chart](http://www2.nature.nps.gov/air/monitoring/vismonresults.cfm)
Line charts

Line charts are most useful to showing *changing data trends* with respect to an independent variable. This can include time, spatial measurements (like depth or width), or abundance measurements.

Individual data values that are marked on the chart are connected by lines that join the points together. This allows for trends to be clearly seen from point to point, as well as the overall trend of the group of data values.

The first example below shows the relative abundance of different rare earth elements in the crust. The second example shows the types of wells that were constructed in Kansas over a period of time.

*Source: http://www.rareearthelements.us/ree_geology*

*Source: http://www.kgs.ku.edu/PRS/wellStats.html*
**Scatter plots**

Scatter plots are similar to line charts in that they both record *individual data values* as data points on a graph from the relationship of *two variables*. While data points are joined together by straight lines in a line chart to display *changing trends*, the researcher attempts to find a *single trend* that is expressed by the pattern of the individual points.

Scatter plots is most commonly used in scientific data representation due to its ability to display *causative* or *correlative relationships* between variables. To look at causative relationships, the *independent variable* is commonly plotted on the x-axis, while the *dependent variable* is recorded on the y-axis. When there is no dependent variable, either variable can be recorded on either axis, and the scatter plot could illustrate a correlative relationship instead.

The example below shows the relationship between calculated and measured sediment load concentration. The researcher was able to draw *lines of best fit* through the data points based on its tight cluster. This indicates that a *positive correlative relationship* exists between the two variables.

Guidelines for designing scientific presentation slides
(adapted from Alley & Neeley, 2005* and Garr Reynolds Presentation Design Tips, 2013^)

The two most basic rules for creating presentation slides are to design with simplicity and to design with intent. Always keep in mind that your slides should supplement your topic, and should never distract the audience by being too cluttered or colorful. No presentation should ever have elements that are superfluous or redundant.

Style

Use a sentence headline to begin every slide (excluding the title slide) that states the slide's main assertion; left justify the headline in the upper left corner.

For the body, visually present the supporting evidence in the form of images, graphs, figures, or flowcharts.

Avoid low-quality (stretched-out, blurry, or grainy photographs) and cheesy (ClipArt!) graphics.

Avoid excessive use of animations and slide transitions.

Typography

Use a typeface that is readable when projected (e.g., Arial, Helvetica, Cambria)

Use ~28 point type for the headline and 18-24 point type for body text.

Use a uniform typeface for the entire presentation.


**Layout**

Be generous with *white space!* To avoid cluttering of text, allow for some white space between blocks of text and graphic elements as opposed to white space along the slide’s borders.

Reduce blocks of text to *one or two lines.*

Reduce list lengths to *three or four items.*

Avoid squeezing too much data (or *chart junk*) on to a single slide.

**Organization**

For the title slide, include an image or graphic that is related to the talk’s *subject.*

*Limit the number of slides* so you can spend at least 1 minute narrating each slide.

End with the *conclusion slide* (not with a blank or ‘filler’ slide) as it summarizes the key points of the talk.

---

This list of guidelines is certainly not finite nor absolute, and some of these guidelines may not work for everyone. However, always keep in mind that the audience’s clear understanding of your message is the top priority.

One more important rule of design is to always analyze the *context and situation* of your presentation, and adjust your designs accordingly.
The art – and science – of making effective posters

1. **The FIRST concern (or: what's the purpose, anyway?)**
   The purpose of a science poster is to present some important aspect of your research. It is not a journal article, and cannot – and should not be expected to – relay all of the information of a journal article. Though it is tempting to include many details and a great amount of data in a poster, a poster is better thought of as a 'visual abstract.' It should illustrate one or a couple of key points of your work, make clear its relevance and importance, and invite the one-on-one discussion that is the reward of a well-done poster – just as a written abstract does these things in a journal article.

   As is true of busy scientists reading a journal abstract to determine whether to invest the time in reading the article, conference participants will decide which posters to pause in front of by how well the poster does these three functions: illustrate your key point, make clear its importance, and invite discussion.

   To achieve this, your poster will have to capture and hold the attention of your audience. Your good science will be lost on potential viewers who don’t stop to read it.

2. **The TWO cardinal rules: Legibility & readability**
   - **Legible means POSSIBLE to be read.**
   - **Readable means EASY to be read.**

   Examples of poor legibility: black letters on a dark image, blue text on a bright red background (poor light-dark contrast; conflicting colors making the viewer work to distinguish the words from the background.)

   Examples of poor readability: breaking a sentence up with a graph or image (readers have to hunt for the jump), graphs with data points for two different series in the same color and shape (series indistinguishable.)

3. **The THREE central principles: Simplicity, transparency, & your audience**
   - **SIMPLICITY** Make every aspect of your poster – colors, fonts, graphs, and every word – serve your purpose. Resist the temptation to use gimmicks, clip-art and excessive complexity – extraneous material distracts from your message.
   - **TRANSPARENCY** The one thing you want noticed about your poster is its message. Again, consider how each element (image, graph, color, font...) serves your purpose. Good design does not draw attention to itself, but rather clarifies your message.
   - **CONSIDER YOUR AUDIENCE'S TIME** There are often many more posters than time to take them all in. A poster that is engaging and easy to follow will draw attention and enable viewers to extract your message quickly.

### **SUGGESTED APPROACH**

1. **Start with a CLEARLY FORMULATED TAKE-HOME MESSAGE.** What do you want folks to think about and remember?

2. **CHOOSE ELEMENTS that clearly contribute to the message.**

   - **MINIMALIST HEADLINE**
   - **MINIMAL INTRODUCTORY TEXT**

3. **SKETCH A LAYOUT that:**
   - includes ALL elements
   - visually prioritizes them

4. **CENTRAL VISUAL IMAGE** (visual of take-home message)

5. **DOMINANT TITLE** (at top, largest font)

6. **INTRODUCTORY TEXT** (words, provide context)

7. **SUPPORTING ELEMENTS**
   - Figures & graphs
   - Text blocks

8. **THINK OF YOUR POSTER AS A STORY that engages your reader – make your core idea visually and draws viewers into the text, instead of requiring that the words be read to make sense of the visuals.

9. **GRAPHS & FIGURES**
   - Graphs need to be LEGIBLE and NECESSARY. Keep coming back to your key point. Eliminate everything that doesn’t support that point.
   - Include a CAPTION, labeled appropriately and legibly, for each image, graph and figure, explaining its relevance to the point of the poster.

10. **MAKE THE DATA READABLE.** Use a font consistent with your poster text font – either the same font, or one of its family (for instance, the bold version of your text font.) Label axes and cover the range appropriate for making your point. Clearly distinguish data series (by color, shape...)

### **SOME DETAILS**

- Make every content and design decision CONSCIOUSLY and DELIBERATELY. For instance, don’t use your software’s default font or color scheme without actively choosing them over others. Don’t include unreadable or ambiguous graphics.
- Use TECHNICAL LANGUAGE appropriately but not unnecessarily. Keep in mind that people unfamiliar with your field may find your poster interesting. Don’t make it inaccessible to them. Keep your words as simple as possible without compromising your message.
- BE CONCISE, and EDIT TIGHT! Try bulleted points and the fewest number of words possible.
- REPLACE TEXT with a layout that illustrates your thought process, and guides the viewer through your poster.
- BE VISUAL! The background, technical details and a conclusion may need to be read, but an ideal poster expresses your core idea visually and draws viewers into the text, instead of requiring that the words be read to make sense of the visuals.

### **REFERENCES**

- **DON'T USE CONTRASTING FONTS** unless you have a reason to. Use fonts sizes intentionally, to clarify relative prioritization of elements.
- To be readable everything needs to be LARGER THAN YOU EXPECT.
- **ACKNOWLEDGEMENTS**, typically at the end of the flow, are in the smallest font.

---

**REFERENCES**


VI. WEC Writing Plan Requests

Unit Name: **Earth Sciences**

**Financial Requests** *(requests cannot include faculty salary support)*  
*drop-down choices will appear when a cell next to "semester"is selected*

**Total Financial Request:** **$24,984.00**

<table>
<thead>
<tr>
<th>Item</th>
<th>Semester 1 Total: <strong>$10,292.00</strong></th>
<th>Semester 2 Total: <strong>$10,292.00</strong></th>
<th>Semester 3 Total: <strong>$1,100.00</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Assistant</td>
<td>$9,192.00</td>
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</tr>
<tr>
<td>Online Peer Review Software</td>
<td>$1,000.00</td>
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</tr>
<tr>
<td>Funding for TA training workshops</td>
<td>$100.00</td>
<td>Funding for TA training workshops</td>
<td>$100.00</td>
</tr>
</tbody>
</table>

Rationale for costs and their schedule of distribution

We seek WEC support for a research assistant who will help execute and expand on the elements in our implementation plan (Section 5): construction of our WEC electronic archive, creation of our TA training workshops, and implementation of online peer review software into the ESCI core curriculum.

**Service Requests** *(drop-down choices will appear when a cell in the "service" column is selected)*

<table>
<thead>
<tr>
<th>Service</th>
<th>Qty</th>
<th>Service</th>
<th>Qty</th>
<th>Service</th>
<th>Qty</th>
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<tbody>
<tr>
<td>Consultation</td>
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<td>Consultation</td>
<td>1</td>
<td>Consultation</td>
<td>1</td>
</tr>
<tr>
<td>Workshop</td>
<td></td>
<td>Workshop</td>
<td></td>
<td>Workshop</td>
<td></td>
</tr>
</tbody>
</table>

Description and rationale for services

ESCI WEC Electronic Archive: we would seek advice on how the archive might be made useful to units outside of ESCI, and whether there are materials...
ESCI WEC Electronic Archive: we would seek advice on how the archive might be made useful to units outside of ESCI, and whether there are materials outside of ESCI that may be wise to incorporate into our own collection. Workshops: we would seek advice on the structure and resources associated with the TA training workshops. Implementation of online peer-review software: we would seek advice on best-practices associated with the use of services such as Eli and PeerCeptive, which are both being evaluated as part of a collaborative NSF project involving members of the WEC team.
## Semester 4: Fall 2018

<table>
<thead>
<tr>
<th>Item</th>
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<th>Cost</th>
<th>Item</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Online Peer Review Software</td>
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**Semester 4 Total:** $1,100.00

## Semester 5: Fall 2018

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**Semester 5 Total:** $1,100.00

## Semester 6: Fall 2018

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<th>Item</th>
<th>Cost</th>
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**Semester 6 Total:** $1,100.00

## Services

<table>
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<th>Semester 6: Fall 2018</th>
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</thead>
<tbody>
<tr>
<td>Service</td>
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<tr>
<td>Consultation</td>
<td>1</td>
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</tr>
<tr>
<td>Workshop</td>
<td>1</td>
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</table>

**Services Table:**

<table>
<thead>
<tr>
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<tbody>
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<tr>
<td>Workshop</td>
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</table>
The Department of Earth Sciences recently requested the following funding to support its Writing Enriched Curriculum:

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2017 Research Assistant</td>
<td>$9,192.00</td>
</tr>
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<td>Spring 2020 Funding for TA training workshops</td>
<td>$100.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$24,984.00</td>
</tr>
</tbody>
</table>

All items for the 2017-18 academic year (highlighted above) have been approved by the Office of Undergraduate Education, for a total of $20,584.00.

The Office of Undergraduate Education is supportive of your proposed efforts and is prepared to approve the additional funding for 2018-19 and beyond, pending receipt of assessment data from 2017-18. In order to receive future funding, please plan to address the following queries:

- What did you accomplish and what are the indicators of success?
- What did you learn that makes you want to continue the same model for a second year and beyond? What, if any, important changes would you make?
- If the online peer review software pilot is deemed a success, what is your plan for funding purchase of the software beyond 2020? Have you, for example, communicated with other units on campus that could also use (or are already using) and help fund the software? How will you construct your assessment in a way that will be beneficial to future stakeholders?
The assessment data can be submitted directly to the WEC office, and copied to Rachel Rodrigue (webe0354@umn.edu). Thank you again for your thorough utilization of the WEC process, and your continued work to enrich the writing experience for students in Earth Sciences.

Please email Pat Ferrian (ferri004@umn.edu) and Molly Bendzick (mollyb@umn.edu) within 30 days of the receipt of this letter with the EFS account string in your department that will receive these funds. Pat will transfer $20,584.00 at the start of FY18.

CC: Molly Bendzick, Dan Emery, Pat Ferrian, Pamela Flash, Doug Johnson, Matt Luskey, Lisa Norling, Jennifer Reckner, Rachel Rodrigue, Leslie Schiff