

1. Writing Plan Cover Page

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8.03.10

First Edition of Writing Plan

Subsequent Edition of Writing Plan: previous plan submitted SEM/YR, First edition submitted SEM/YR

College of Biological Sciences (undergraduate majors)

WEC Unit Name	
Micro, BMBB, GCD, Neurosci, Plant Bio, Bio	College of Biol. Sci and Med School
Department	
Leslie Schiff and Robin Wright	College
WEC Faculty Liaison (print name)	
schif002@umn.edu; wright@umn.edu	Professor
Title	
	612-624-9933; 612-624-2244
Email	
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Writing Plan ratified by Faculty

Date: November 19, 2010 If Vote: 12 / 12
yes # total

Process by which Writing Plan was ratified within unit (vote, consensus, other- please explain):

The plan was emailed to all CBS faculty, instructors and students with a request for feedback. The draft was discussed at the CBS Educational Policy Committee meetings in October and November, and ratified unanimously by the EPC representatives (Directors of Undergraduate Studies) for each of the majors.

2. Unit Profile: CBS (undergraduate majors)

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Number of Tenured and Tenure-Track Faculty:

<u>71</u>	Professors
<u>45</u>	Associate Professors
<u>22</u>	Assistant Professors
<u>145</u>	Total

These numbers reflect faculty surveyed in CBS teaching units. Some individuals have extensive interactions with undergraduates and the undergraduate curriculum. Others participate more peripherally by mentoring directed research experiences. Not listed, but included in the total, are 7 teaching professors/education specialists.

Major(s) <i>Please list each major your Unit offers:</i>	Total # students enrolled in major as of Fall 2010	Total # students graduating with major AY 09-10
<u>Biology</u>	<u>415</u>	<u>180</u>
<u>Microbiology</u>	<u>75</u>	<u>41</u>
<u>Biochemistry</u>	<u>251</u>	<u>71</u>
<u>Genetics, Cell & Developmental</u>	<u>174</u>	<u>90</u>
<u>Plant Biology</u>	<u>8</u>	<u>2</u>
<u>Neuroscience</u>	<u>168</u>	<u>32</u>
<u>Ecology, Evolution & Behavior</u>	<u>56</u>	<u>21</u>
Total:	<u>1827</u>	<u>437</u>

WEC Process	Date	# participated	/	# invited
<u>Intro mtgs for all CBS programs</u>	<u>December 2008</u>	<u>20</u>	<u>/</u>	<u>20</u>
<u>WEC survey: students, fac, affiliates</u>	<u>1/26/2009-2/16/2009</u>	<u>410</u>	<u>/</u>	<u>2704</u>
<u>Meeting 1: all CBS programs</u>	<u>3/24/2009</u>	<u>30</u>	<u>/</u>	<u>145</u>
<u>Meeting 2: all CBS programs</u>	<u>7/8/2009</u>	<u>30</u>	<u>/</u>	<u>145</u>
<u>Meeting 3: all CBS programs</u>	<u>10/15/2009</u>	<u>15</u>	<u>/</u>	<u>40</u>
<u>Meeting 3.5: Microbiology</u>	<u>2/10/2010</u>	<u>9</u>	<u>/</u>	<u>10</u>
<u>Meeting 3.5: Biology</u>	<u>3/26/2010</u>	<u>12</u>	<u>/</u>	<u>13</u>
<u>Meeting 3.5: GCD</u>	<u>4/12/2010</u>	<u>8</u>	<u>/</u>	<u>10</u>
<u>Meeting 3.5: Plant Bio</u>	<u>5/18/2010</u>	<u>4</u>	<u>/</u>	<u>4</u>
<u>Meeting 3.5: Biochemistry</u>	<u>6/17/2010</u>	<u>3</u>	<u>/</u>	<u>3</u>
<u>Meeting 4 survey: all CBS programs</u>	<u>8/18/2010-</u>	<u>73</u>	<u>/</u>	<u>145</u>

3. Signature Page

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Electronic signatures may be submitted in lieu of this page. If this page is submitted as a hard copy, please include a print out of the electronic signature chain here.

WEC Faculty Liaison

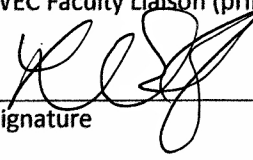
Leslie Schiff

Professor, Department of Microbiology

WEC Faculty Liaison (print-name)

Title

Signature



11/21/10

Date

Department Head/Chair

Robert Elde

Dean, College of Biological Sciences

Print Name

Title

Signature



11/22/2010

Date

Associate Dean

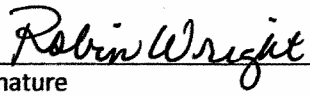
Robin Wright

Assoc. Dean for Faculty Affairs

Print Name

Title

Signature



11/27/10

Date

For College of Liberal Arts units only:

CLA - Curriculum, Instruction, and Advising Committee approved Writing Plan on

Date

Print Name

Title

Signature

Date

4. Writing Plan Narrative

The unit. The College of Biological Sciences (CBS) is the largest and most complex unit to be involved in the Writing Enriched Curriculum (WEC) pilot project. The CBS undergraduate program consists of 7 majors, over 1800 students, and 145 faculty. Almost 40% of the undergraduates in the college are lower division students who are completing core foundational courses, but have not yet declared a major. CBS undergraduate degree-granting majors include: Biology (a large major with no specific departmental home); Plant Biology; Genetics, Cell Biology and Development (GCD); Biochemistry; Microbiology; Neuroscience; and Ecology, Evolution and Behavior (EEB).

For historical reasons, the CBS curriculum is delivered by faculty members whose tenure homes lie in two different colleges. Faculty in Microbiology and Neuroscience are tenured in the Medical School, while those in GCD and Biochemistry may have tenure homes in either CBS or the Medical School. The distinction can impact departmental culture as it relates to teaching. In some departments there can be a smaller cadre of faculty members who interact extensively with undergraduates (either in the classroom or a laboratory course), and a larger group who interact with undergraduates occasionally, as directed research mentors.

CBS became interested in joining the WEC project as a whole college for a number of reasons. As detailed below, we recognize the need to more effectively train our undergraduates in various aspects of scientific communication. This recognition is tempered by a strong feeling among CBS faculty that they are not particularly qualified to “teach writing” and further, that they would have to sacrifice too much content to do so. Teaching with writing is challenging in CBS, because TA support is lacking. The majority of our graduate students are supported on federal research grants and neither the college nor the individual departments have the resources to increase the number of teaching assistants assigned to courses involving substantial writing. Finally, the vertical and distributed nature of the curriculum presents challenges to department-level curricular reform. The CBS undergraduate curriculum is characterized by a significant developmental core, dressed with upper division major-specific requirements. Thus, the college as a whole needed to be involved in any sort of developmental approach to writing. A departmental or major-specific focus on the upper division curriculum could lead to “passing the buck” about who should be responsible for introducing and/or developing particular scientific writing abilities in our students. For this reason, even though EEB is involved in the WEC project as an individual department (focusing on their departmentally controlled curriculum), Sarah Hobbie (the EEB WEC liaison) and EEB faculty members have participated in the CBS-wide WEC meetings. As discussed below, we envision moving through future iterative WEC processes (planning, implementation and assessment) as a single, college-wide unit.

The data. Although some students may gravitate towards a major in the biological (or other) sciences, because they perceive it as a discipline that involves less writing than do majors in fields within the humanities, 91% of CBS affiliates and 91 % of the CBS faculty who responded to the WEC survey indicated that writing is extremely/very important to the successful fulfillment of their work responsibilities. Faculty members know implicitly what makes “good” scientific writing, but they feel generally unqualified to teach writing (even in the discipline), and they worry about having to compromise content in order to carve out class time for skill development.

“I shouldn’t have to teach writing. I should be teaching synthetic thinking in the field”¹

The facilitated WEC meetings helped attendees recognize that “synthetic thinking”, content-based and evidenced by writing, should be a goal of CBS’s writing-enriched curriculum². The WEC project’s student survey

¹ Faculty response from the WEC survey.

revealed that our students are often at a loss about what is valued in scientific writing, instructions seem haphazard, and they sense that at least some of the writing they do is not authentic. The following quotes from the student survey are representative of these attitudes.

“We are often not provided with clear templates for what each teacher wants, they usually seem to think that we should know what they expect based on previous courses, but this is not a good assumption since every class has such different expectations.”

“Correct terminology is honored, however, grammar and writing at a high level are not required nor really even asked for always.”

“Other than my directed research project this semester, I don't feel I have had any experience doing the kind of writing actual scientists do professionally, just silly assignments where we look up background information on a subject and report it to the instructor, or responses to specific questions asked in a lab manual.”

The WEC surveys revealed “disconnects” between faculty and student perceptions about scientific writing and the goals of CBS writing assignments. For example, 58% of the surveyed faculty indicated that they hoped to use writing assignments to “develop and deepen thinking”, with a third of respondents ranking this as one of their top-three goals, whereas only 10% of the students believed this to be a top goal of writing in CBS. Similarly, faculty described as “weak” the capacity of students to argue a position using a thesis and persuasive evidence. This may not be surprising, as only 18% of student respondents ranked “thesis-driven: focused on evidencing one or more key arguments” as an important goal of scientific writing.

These results highlight the need to unpack our expectations and values surrounding scientific communication, making explicit what is currently implicit. Our CBS students are doing a lot of writing as they navigate the curriculum, but we are missing opportunities to highlight and hone its relevance and to help our students develop more professional, polished scientific communication capabilities.

Section #1: DISCIPLINE-SPECIFIC WRITING CHARACTERISTICS^{3*}: *What characterizes academic and professional communication in this discipline?*

Over the course of several meetings, faculty members (representing each of the seven majors) identified and revised a list of characteristics of academic and professional communication in the sciences. We identified some characteristics that are shared with writing in the liberal arts (for example, the presence of a narrative). This notion of a scientific “storyline” is a surprise to many students. Other characteristics seem more obvious, and reflect the direct, data-driven communication of scientists.

The following reflects the CBS faculty’s evolving list of the characteristics of effective scientific writing.

Obviously, there are multiple genres aimed at a variety of audiences, so not every piece of writing would be expected to evidence each of these characteristics.

- **Concise:** Arguments or descriptions are direct and to the point, generally employing no unnecessary words.
- **Precise:** Wording is unambiguous; scientific terminology is used appropriately; objects, findings and processes are described accurately.
- **Overt:** Ideas are presented in a direct and comprehensible (“reader-friendly”) manner.

² Developing writing activities that promote “synthesis” as a desired writing ability, will be a focus of EEB’s writing enriched curriculum plan in the coming year.

*Adjectives, or adjectival phrases are typically most useful here, for example, “transparent to logic,” (Nursing); “Analytic (versus journalistic) and argumentative” (Political Science).

- **Presence of a logical and cohesive narrative:** Much scientific writing tells a story that emerges from logic, but remains separate from its author.
- **Evidence-based:** Ideas and conclusions are based on data; narrative moves from data to conclusions
- **Structured to reflect scientific reasoning:** Much scientific writing includes a description of a hypothesis based on current knowledge and the methodology used to test the hypothesis, the resulting data, and an interpretation of the data in light of other published work.
- **Cumulative and contributive:** Strong scientific arguments should reflect the cumulative and contributive nature of science (synthesizing and building upon foundational concepts and findings of others).
- **Organized using specific scientific formats:** For example, research reports generally contain an Introduction, Methods, Results and Discussion; text is typically accompanied by supporting data in the form of tables, figures, and/or graphs which each contain appropriate and informative legends (captions).

Section #2: DESIRED WRITING ABILITIES^{4}:** *With which writing abilities should students in this unit's majors graduate?*

In the facilitated WEC meetings, we were coached to use adjectives to describe scientific writing characteristics, and verbs to describe the writing capabilities with which our students should graduate. Perhaps not surprisingly, we had trouble maintaining the distinction. The following reflects the CBS faculty's desired writing abilities, with the addition of those that reflect the characteristics listed above. As presented here, the list is inclusive and not prioritized or ranked in terms of novice and advanced abilities.

- **Communicate information in a manner that is overt and logical:** Graduates should be capable of writing a scientific narrative that is direct, with an overt and transparent logic.
- **Communicate information in a manner that is precise and concise:** Graduates should be capable of communicating scientific ideas and principles in a manner that is concise, unambiguous, and inclusive of correct terminology.
- **Present and interpret data in context:** Graduates should be able to contextualize scientific problems or issues in terms of what is known and what is unknown. They should be able to generate narrative that moves from data to conclusions, reflecting the cumulative and contributive nature of science.
- **Synthesize ideas in new ways:** Graduates should be able to present ideas relevant to content at hand, building on what is known. They should be able to organize information and take a position— synthesizing information from a variety of sources rather than presenting a laundry list of ideas.
- **Analyze and interpret published work, gauging the efficacy of evidence:** Graduates should recognize and use scholarly sources without accepting everything that they read. In other words, they should be able to critique reasoning, data and/or methodology.
- **Identify significant gaps in scientific knowledge and develop research questions to address those gaps:** Graduates should be able to identify critical gaps in scientific knowledge and propose research questions that could yield findings to address those gaps.
- **Read analytically, recognizing choices made by authors:** Graduates should be able to recognize characteristics of scientific discourse in scientific articles.
- **Become comfortable with ambiguity:** Our graduates should communicate in a manner that recognizes that there are usually several ways to interpret data.

^{**}Verbs or verbal phrases are typically most useful here, for example, "Take a principled, not arbitrary position" (Geography); "Visually represent designs and explain salient features of a part or concept" (Mechanical Engineering).

- **Demonstrate data appropriately:** Graduates should be able to properly construct, caption and format figures and tables. They should make intentional choices about how data is presented to audiences (when to use a figure, what kind of figure to use, what is the most logical sequence of evidence). They should be able to use technical programs (like Excel) to create effective figures, but should understand the underlying mathematical and/or statistical principles.
- **Understand and use recognized formats for scientific research papers:** Our graduates should understand the components of a typical scientific research paper and know how scientific information is conveyed in each component.
- **Alternate appropriately between multiple modes of communication:** Graduates should effectively communicate scientific thoughts and principles in the following ways (oral, written, graphic, numeric) and use these modalities in complementary ways.
- **Write compellingly to audiences within and outside of the discipline:** Graduates should be able to communicate both the science and the significance of the science to multiple audiences, using terminology that is appropriate for the intended audience.
- **Work and write collaboratively**
- **Develop strategies to effectively revise and/or self-edit written work**

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, structural plans does this unit have for changing the way that writing and writing instruction are sequenced across its course offerings? With what rationales are changes proposed and what indicators will signify their impact?*

Writing across the CBS curriculum. CBS students move through a sequence of courses, completing prerequisites and core coursework in mathematics, chemistry, physics and general biology before they move into the specific coursework of their undergraduate major. Students encounter substantive writing instruction outside of the college: in Freshman Writing and liberal education coursework, and in a two-semester writing-intensive (WI) physics series (Phys 1201W and 1202W or Phys 1301W-1302W). Our undergraduates write a lot in CBS courses as well. The lab report is a typical means of assessment in laboratory courses. In many of our lecture or seminar courses, students write papers, proposals, or respond to short prompts on exams. Although the WEC faculty survey revealed that students complete 10 or more pages of finished writing in over 20% of courses, CBS does not offer many courses that meet the WI requirement.

Given the vertical nature of the curriculum, and the complexity of the units involved in the CBS undergraduate education, we recognize that an important step in our WEC process is to gather information about the kind of formal and informal writing that is done within the various majors, across course levels (2xxx thru 4xxx) and different course types (lecture, laboratory, seminar).

Towards this goal, we held a series of smaller major-specific meetings in the spring and summer of 2010. We visited with faculty representatives from each major (except Neuroscience and EEB) and talked about how writing is or is not integrated into their unit's curriculum. We found that generally, the faculty did not have a clear idea of what other writing was being assigned in courses within their major, and they did not know how students were being prepared to write about science in the shared 2xxx and 3xxx core courses. We ended each of these meetings by asking undergraduate teaching faculty to complete a short survey (Appendix A)

Department or Program	# of surveys completed
Biology	4
Microbiology	9
Neuroscience	1
Biochemistry, Molecular Biology and Biophysics	12
Genetics, Cell Biology, and Development	4
Plant Biology	1

about how their course(s) might currently (or in the future) help students reach the objectives outlined in our list of desired writing abilities. EEB was not surveyed because they are already in WEC implementation, however they have modified this survey and will be administering it to their faculty in the coming year. Although response rates were variable because of the ways the surveys were administered in some units, we received survey responses from a majority of the undergraduate teaching faculty (Table 1). Data from these surveys will be mined in order to begin to develop a curricular map that describes how our courses help to develop desired writing abilities.

Initial steps for changing the way CBS integrates writing instruction in its undergraduate curriculum include the following:

Build curricular cohesion

In year 1 of implementing our Writing Plan, we propose going into each CBS unit (during a regular faculty or undergraduate teaching committee meeting) in order to discuss the results of these surveys. Our goal is to give the faculty a more comprehensive picture of current writing and writing instruction in CBS classes, and prompt them to consider (a) how their own upper division coursework might logically build on scientific writing skills introduced in the lower division coursework, (b) how different upper division courses in each major might purposefully focus on one or more of the communication-related skills the faculty identified as “desired writing abilities” for CBS graduates. No one course or assignment needs to or should do it all, and the aim is not to suggest that units necessarily need to develop new WI courses. Rather, the goal is to improve student writing by allowing faculty to frame individual assignments (small or substantial, formal and informal, existing and new) with more overt goals, clearer expectations, and common language⁵, as well as a better understanding of what students have already experienced and what they will be expected to accomplish in writing as they move through the curriculum.

Data from our informal “writing in the major” survey will be aggregated and additional faculty responses from these meetings will be collated in order to generate a curricular map that describes how our core and major-specific courses work together to develop the writing abilities we have identified for our graduates. The map is not expected to be static; it should serve as one of a number of web-based resources that CBS faculty turn to when thinking about course- and curriculum-design. The presence of the CBS faculty-articulated writing characteristics and abilities (listed in the first two sections of this plan) in course materials (syllabi, assignment goals, rubrics) would be a very simple indicator of the success of this effort.

Focus on laboratory courses. Scientific writing is data driven, and much of it revolves around describing protocols, illustrating results and analyzing findings. In the college-context, this kind of writing is usually evidenced in lab reports. The lab report is a principle means of assessment in CBS laboratory courses, but according to the WEC student survey, the goals and expectations of lab reports can seem arbitrary. Some students express concern that they are not necessarily being prepared to write authentic research reports. Instructors who teach upper division laboratory courses are not aware of the expectations and guidelines developed in lower-division courses.

Developing well-articulated writing guidelines and instructional strategies for laboratory courses is, therefore, a goal of CBS WEC implementation. We propose analyzing current laboratory writing guidelines in CBS courses and then sharing that information with the faculty who teach 2xxx, 3xxx and 4xxx laboratory courses. These data should serve to focus a discussion that would culminate in the development of new instructional materials (for example, style guides for laboratory reports, 5-minute writing workshops, grading rubrics, etc) that can be

⁵ We benefit from the first year WEC implementation work of EEB, which highlighted the need to be more explicit about assignment goals and expectations and to match assessment criteria with the explicit expectations.

adapted and used in a sequenced and consistent manner. This effort should help our students to transfer what they have learned about scientific writing between courses and build towards a more authentic, polished product, two faculty-articulated goals. The shared development and adoption of instructional materials will be an early indication of the impact of this effort.

In our recent SurveyMonkey instructional support survey (Appendix B) ⁶, 65% of the faculty respondents commented specifically on this goal, and 73% of those comments were strongly in favor. There were a number of thought-provoking responses, including the following:

“I think TAs require much more training from the faculty before they grade writing assignments.”

“The lab courses would be a natural place for implementing more writing activities. The lab sections tend to be small and more manageable for writing and assessment, as opposed to the large lecture sections. Suggestions for writing activities, and developing grading rubrics that don’t take oodles of time are essential, particularly if the labs are run by TAs with little faculty involvement.”

“I think this is a good long-term plan, but I’m concerned about individuals not wanting to change their rubrics in their courses. My first reaction to reading this was ‘Oh no! I’ve worked so hard to get our rubric to its current state, and I don’t want to change it!’ I think it would really help students, though, to have consistent expectations about lab reports from course to course. We know that students tend to look at assignments as exercises in giving the instructors ‘what they’re looking for’, rather than producing the best possible reports. If we’re all looking for the same types of things, and those expectations are based on how professional scientists write (brought to a level appropriate for an undergraduate), then I think we’ll serve students better in the long run.”

“This would be useful as long as it still gives instructors the ability to adapt the writing to their own course emphasis—not all laboratory courses are the same and some deliberately focus on different aspects of scientific writing.”

These comments stress the need for TA-training as well as preserving flexibility for instructors.

Restructure the college’s upper-division WI requirement. For a variety of reasons (class size and TA funding mechanisms among them), CBS has had difficulty uniformly meeting the University requirement that students should graduate with one upper division WI course in their major (Table 2). Only the neuroscience major has a 3xxx WI course that is required of all their majors. EEB offers a 4xxx WI course (EEB 4609W); their majors either use that, or one of the 3xxx Biology courses (Biol 3007W or Biol 3408W) to fulfill their requirement. Plant Biology majors fulfill the requirement either by taking Biol 3005W, 3007W or PBio 4516W. Microbiology offers MicB 4141W, but does not have the capacity to accommodate all of the graduating students in the major. Two of the larger majors (Genetics, Cell Biology and Development, and Biochemistry) do not offer a major-specific upper division writing-intensive course. In the college as a whole, more than a quarter of graduates do not meet the upper division WI requirement. In some majors, approximately a third of the graduates do not. Clearly, one of our goals needs to be to bring CBS into compliance with the University’s WI requirement.

Academic plan	Total Graduates (2009-2010)	Percentage of students who fulfill the upper division WI in CBS
Biology	201	73
GCD	92	69
Biochemistry	78	64
Microbiology	46	67
Neuroscience	35	100
EEB	22	91
Plant Biology	3	100
Total	477	73

⁶ This survey previewed the goals that appear in this writing plan. It served in lieu of a face-to-face WEC project “meeting 4”, so that we could receive feedback from as many faculty as possible.

Revise the college's Writing-Intensive directed research course. Almost 20% of our undergraduate students who do meet the upper division WI requirement, do so in the context of WI directed research. These are one-on-one projects mentored by faculty who may regularly teach CBS undergraduates, but faculty mentors may also be in the Medical School or another health professional school, and have little other engagement with undergraduates or the undergraduate curriculum. Faculty members may agree to mentor directed research projects without fully understanding the goals of the WI curriculum, and we have not articulated a clear set of expectations regarding the kinds of writing instruction they would need to provide students. Nor have we identified required dimensions of the formal written product(s). At best, the writing instruction that our undergraduates receive in this context is uneven. These one-to-one experiences are also labor-intensive. Even the most committed of our faculty will generally take only one WI directed research student a semester. Analysis of course registration reveals that although approximately half of our graduates do directed research, only 13% of our graduates earned WI credit through directed research last year.

A goal for year one of implementing our writing plan, therefore, is to develop sets of guidelines and expectations for directed research processes and deliverables, and to develop relevant instructional support materials (online- and course-based) in order to more effectively support this capstone research-based writing experience. In our recent instructional support survey, 80% of the faculty respondents commented on this goal, and 70% of those comments were in strongly in favor. The following capture the flavor of much of the feedback:

"While some faculty mentors may object that there is too much 'meddling' by introducing more hoops for everyone to jump through, this is the one place where one-on-one writing mentoring can really occur, and it is important to get it right here."

"Yes. I don't offer WI directed research because there are insufficient guidelines and I don't have time to develop them."

"Guidelines are important, but more important is finding a mechanism whereby the final written reports are evaluated on a consistent basis. One idea might be to have a designated panel of readers...[] to take it out of the hands of the mentor."

"This is the best place to teach students to write but the time commitment of advisors varies greatly. The most effective approach would be to develop standards for reports associated with these experiences, along with some advisor-independent review. Attempts to standardize advisor behavior via any other means are not likely to succeed."

We expect that clearer guidelines and effective supporting materials for WI directed research will increase the likelihood that faculty will agree to mentor these experiences and will improve the quality of the student experience and written product. The former would be evidenced by more registrations for WI directed research. The latter would be evidenced by the regular assessment of student writing samples conducted by the WEC program team.

Faculty feedback also suggests that we should consider developing a college-wide system to review the capstone writing projects.

Consider developing additional Writing-Intensive courses. The recent revision of WI course guidelines may help some CBS units develop new courses that meet the standards, particularly because the requirement for revision now can be met by providing feedback on recursive assignments in a genre. Given that most laboratory courses require that students submit multiple laboratory reports, existing small laboratory courses could be adapted to meet the new WI requirement. The CBS WEC liaison would work with interested faculty to facilitate this process, which would likely involve consultation with the Center for Writing's Teaching with Writing consultants and development of TA training mechanisms.

Summary of initial curricular revisions:

- **Build curricular cohesion:** Hold meetings in each of the units (Spring and Fall, 2011) to review the lists of discipline-relevant writing characteristics and desired writing abilities included in the first two sections of this plan, and ask faculty to consider how they might utilize these lists in the **major-specific upper division** courses they teach.
- **Focus on laboratory courses:** Collect instructional materials that support writing (syllabi, assignments, instructions, rubrics, etc.) in CBS **laboratory courses** to understand what is being communicated to

students and how. We propose to initiate this effort in the Spring of 2011, following the model established by EEB. We propose to bring lab course instructors together (no later than the Fall of 2011) to (a) review the data, (b) articulate goals for lab course-related writing, and (c) consider how to align and calibrate laboratory-based writing instruction with the list of characteristics and abilities that the faculty has generated.

- **Revise the college's Writing-Intensive directed research course:** Develop instructional support materials (web- and course-based) for **WI directed research**, the capstone writing experience for many of our majors. This activity would be initiated in the Spring of 2011.

Section #4: ASSESSMENT of STUDENT WRITING: *How does this unit currently communicate writing expectations (see sections #1 and #2) to undergraduate students? How satisfied is the unit faculty that students are adequately familiar with these expectations? How satisfied is the unit faculty that student writers are successfully meeting identified expectations by the time they graduate? Why? If less than satisfied, what plans does the unit propose for closing the gap?*

Although College of Biological Sciences entering freshmen have the highest mean scores on SAT and ACT writing tests⁷, these high scores don't translate into strong scientific writing skills. A significant percentage of instructors rated student writing as "weak" in the ability to "argue a position using a hypothesis and evidence", "report complex data and findings" and "use writing to deepen and develop thinking". Year one implementation work by EEB suggests that this is likely because we are not explicit about the goals of our assignments or our expectations.

The implementation activities described above are all aimed at improving how writing expectations are communicated to students. Briefly:

- We plan to review communications around writing expectations in laboratory courses and use the information to develop instructional resources that can be adapted by individual instructors.
- We plan to discuss the lists of scientific writing characteristics and desired writing abilities in meetings within each major to help undergraduate teaching faculty determine how they might use these to more effectively communicate writing expectations in their courses.
- We plan to hold one or more CBS-specific workshops to provide support for instructors who rely on teaching assistants to assess student writing.
- We plan to develop clear guidelines for the capstone writing-intensive directed research project and discuss the feasibility of outside readers.
- We will participate in the structured rating of student writing that is being performed by the WEC project team using raters within and outside of the discipline. The first samples (representing the baseline) would be evaluated in Summer 2011.

Section #5: REQUESTED SUPPORT: *What forms of instructional support does this unit request to help implement proposed changes? What are the expected outcomes of named support? What kinds of assessment support does this unit request to help assess the efficacy of this Writing Plan? What are the expected outcomes of this support?*

Instructional support :

⁷ OIR statistics (New Freshman Characteristics, Fall 2005-2009)

- Group consultation/facilitation of meetings (“Now what”: Taking the next steps with WEC) in each of the CBS majors (except EEB). (Spring, Fall 2011)
 - These meetings will be co-facilitated by Leslie Schiff (WEC liaison) and Pamela Flash
- Instructional consultation /facilitation of meeting(s) with instructors involved in laboratory coursework (after data have been collected). (Late Spring 2011 if possible; Fall 2011 at the latest)
 - We propose to hold a longer meeting (half day retreat) that will be co-facilitated by Leslie Schiff (WEC liaison) and Pamela Flash
- Instructional consultation with faculty involved in generating clearer guidelines for WI directed research/honors theses. (Spring-Summer 2011)
 - Leslie Schiff (WEC liaison) will consult with members of the CBS Educational policy committee, the honors advisor (Sarah Corrigan), and other interested faculty.
- Posting instructional materials to the CBS website
 - Staff in CBS student services and technology/instructional design will assist as needed.⁸

In our implementation survey, we asked faculty how likely they would be to participate in a variety of instructional support opportunities. Almost 60% of respondents indicated that they were strongly interested in CBS-specific workshops on writing instruction and 25% expressed interest in grade-norming sessions for TAs in multi-section courses. Therefore, in addition to the curricular goals described above, we propose the following:

- Hold one or more customized CBS-specific workshops on grading-norming (for TAs: Fall 2011, Spring 2012), and writing instruction/assignment development (for faculty: Fall 2011, Spring 2012).
 - Staff from the Center for Writing and/or the WEC project will facilitate workshops.

Assessment support.

- Collection and analysis of artifacts (syllabi, rubrics, lab manuals) from all CBS laboratory courses (Spring 2011)
 - This activity will be coordinated by Leslie Schiff, the WEC liaison, in consultation with a member of the WEC team.
- Rating of student writing (Summer 2011)
 - This will be performed as part of the WEC Team’s Assessment of Student Writing project.

As CBS moves forward in developing and assessing its writing-enriched curriculum, we will take advantage of the expertise of Richard Brown. Richard is an assessment specialist who was hired by the college to help plan and implement assessment strategies for an HHMI-funded program to improve biology education by engaging all undergraduates who take biology courses in hands on research.

Section #6: PROCESS USED TO CREATE THIS WRITING PLAN: How, and to what degree, were stakeholders in this unit (faculty members, instructors, affiliates, teaching assistants, undergraduates, others) engaged in providing, revising, and approving the content of this Writing Plan?

The complexity and scope of the CBS project led us to evolve the WEC meeting process as we tried to engage as many faculty members and instructors as possible. At the start of the process we surveyed 182 faculty members and instructors, 1576 students, and 929 affiliates. Response rates in those groups were 38, 17 and 7%. We held a series of CBS-wide face-to-face meetings in which we developed and refined the characteristics and abilities lists and talked about project goals. Representative faculty members from each of the majors and key instructors

⁸ This should be coordinated with EEB’s efforts to post instructional materials.

were targeted for these meetings. We then held additional major-specific meetings to talk specifically about the upper division curricula, or in the case of Biology, the “Foundations of Biology” core coursework. As the writing plan developed, we wanted formative feedback from as many faculty as possible. In lieu of the typical M4 meeting, we developed a survey to describe and get input on the priorities of the writing plan (Appendix B). This was administered via SurveyMonkey to 145 faculty members. 83 started the survey and 73 finished it (response rate 50%). Priorities were also discussed at CBS Educational Policy Committee (EPC) meetings in Spring and Fall of 2010. The WEC liaison (Schiff) drafted the plan, which was then emailed to all CBS faculty, instructors and students with a request for feedback. The EPC voted to approve the plan on October 19, 2010.

Section #7: Briefly, please describe the ways that the ideas contained in this Undergraduate Writing Plan address the University's Student Learning Outcomes (<http://www.slo.umn>).

The following list takes advantage of our “desired writing capabilities” to document some of the ways our evolving writing-enriched CBS curriculum will help graduates achieve the University’s broad Student Learning

SLO	Writing capability
<i>Can identify, define, and solve problems</i>	Analyze and interpret published work, gauging the efficacy of evidence
<i>Can locate and critically evaluate information & Have mastered a body of knowledge and a mode of inquiry</i>	Analyze and interpret published work, gauging the efficacy of evidence Present and interpret data in context
<i>Can communicate effectively</i>	Synthesize ideas in new ways and organize them logically Write compellingly to audiences within and outside of the discipline Communicate in an overt and reader-friendly manner Communicate information in a manner that is precise and concise Develop strategies to effectively revise and/or self-edit written work
<i>Understand the role of creativity, innovation, discovery, and expression across disciplines</i>	Synthesize ideas in new ways and organize them logically
<i>Have acquired skills for effective citizenship and life-long learning</i>	Work and write collaboratively Become comfortable with ambiguity

Appendix A

How are we introducing and/or developing these abilities in OUR curriculum?			
With what writing abilities should majors graduate? (verbs) [This list was drafted by faculty representing all CBS units]	Yes, I focus on this ability in my course. (Please jot down the approach/assignment/activity etc. that you use.)	This is the general level at which I engage students in working with this ability (Circle Novice (N) , Intermediate (I) or Advanced (A))	I might think about incorporating or refining in the future to address these abilities
1. Read analytically , recognizing choices made by authors and characteristics of scientific discourse in scientific articles		N I A	Y N
2. Present and interpret data , putting into context and answering the question “Why do we care about this?”		N I A	Y N
3. Identify gaps in data and form quality research questions		N I A	Y N
4. Synthesize ideas in new ways and organize them logically (present ideas relevant to content at hand, organize logically, and take a position—taking ideas from a variety of sources—not just presenting a laundry list of ideas)		N I A	Y N
5. Analyze and interpret studies, gauging the efficacy of evidence <ul style="list-style-type: none"> Recognize scholarly (versus opinion-based) sources Critique reasoning, data, logic, method 		N I A	Y N
6. Become comfortable with ambiguity (multiple interpretations of data)		N I A	Y N
7. Write compellingly to audiences both within and outside the discipline (able to communicate both the science and significance of the science to multiple audiences, convincing readers people to care about events/facts by showing their relevance to readers’ experience)	[please delineate between “inside” and “outside” audiences in your response]	N I A	Y N
8. Demonstrate data appropriately (make intentional choices about how data should be presented to audiences (which genres to use, when to use a figure, what kind of figure to use, sequence of evidence, etc.)		N I A	Y N
9. Alternate appropriately between multiple modes of communication (oral, written, graphic, numeric) communication (use them in complementary ways)		N I A	Y N
10. Create and caption figures without computer aid on semi-log graph paper; use technical programs, like Excel to create figures		N I A	Y N
11. Work (and write) collaboratively		N I A	Y N

Appendix B.

1. Welcome page

What follows is a brief survey (it should take between 5 and 10 minutes to complete) related to the college's Undergraduate Writing Plan which we, as a faculty, are creating (and I, as Liaison, am assembling). If you have been participating in this process and know about WEC, feel free to move right into the survey, which asks you to react to the college's writing-related priorities. If you don't know much about the project and our process, you may want to read through the RELEVANT BACKGROUND section below to provide you with necessary context before responding.

Either way, your input at this stage--whether rudimentary or detailed--is critical and appreciated.

Please complete as soon as possible (I'm drafting the plan right now and your ideas are instrumental to what I come up with), and not later than Friday, September 10th.

Thanks, Leslie Schiff
Faculty Liaison for CBS WEC
Department of Microbiology

RELEVANT BACKGROUND:

In the spring of 2009, the College of Biological Sciences engaged as one of 18 academic units to pilot University's Bush grant-funded Writing-Enriched Curriculum project (<http://wec.umn.edu>). Because we recognize the importance of graduating students who are able to produce high quality scientific communications and recognize that individual instructors may be understandably reluctant to integrate lots of time-consuming writing instruction into their courses, we were happy to volunteer to serve as one of the pilot units in a process that will enable us to address these issues.

So far, our participation in WEC has been structured in a series of meetings in which we have identified--rather than having someone else identify them for us--the scientific writing abilities with which we would like our students to graduate. The next step in this process is to develop a one-year action plan (called the CBS Undergraduate Writing Plan) to improve student writing outcomes. As the faculty liaison for the process, I am charged with representing your ideas in this plan. At the end of next year, we will revise this initial plan and move into a three-year implementation/assessment rotation.

Based on the rich conversations we have had over the last year, the following brief survey is designed to gather faculty input regarding the specifics of that plan. I will use your responses to develop the first edition of our Writing Plan, which will go to the Campus Writing Board for approval and then to Vice Provost McMaster's office for consideration of fiscal requests.

2. Page 1

1. What is your rank?

- Full professor
- Associate professor
- Assistant professor
- Instructor (P/A)
- Other (please specify)

2. What kinds of undergraduate courses do you currently teach?

- Lecture
- Lab
- Directed Research
- Other (please specify)

3. Page 2

YEAR ONE GOALS

In our CBS-wide meetings and undergraduate major-specific meetings, a number of common themes and concerns were raised. These suggest some early goals for our writing-enriched curricular reform.

The following items are, in essence, a list of goals for the first year of implementation of CBS's Writing Plan. We invite your reactions to each.

1. NOW WHAT? (Fall 2010): Colleagues have requested that we hold brief discussions (called "Now What?" meetings) in each department and program (possibly using a portion of regular faculty meetings) in order to:

- apprise a broad population of the college's approved Writing Plan**
- discuss implementation activities**
- discuss questions and concerns related to writing in the college and WEC**

Comment:

2. DIRECTED RESEARCH COURSES (Fall 2010-Spring 2011): Many of our students earn their upper-division WI credit in these often under-structured course formats, and yet they are not always yielding satisfactory and scholarly reports. We therefore recognize the need to develop clearer guidelines and support materials for students and their faculty advisers.

Comment:

3. LAB COURSES (Fall 2010-Spring 2011): Colleagues have requested that focused support be offered specifically to faculty members and instructors who teach with writing in undergraduate lab courses.

We propose bringing together faculty who teach 2xxx, 3xxx and 4xxx laboratory courses in order to to discuss and develop instructional materials (style guides for lab reports, 5-minute writing workshops, grading rubrics, etc.) that can be adapted and used in a developmentally sequenced and consistent manner. Doing so should help our students to transfer what they've learned about scientific writing between courses.

Comment:

4. INSTRUCTIONAL CONSULTATIONS (Fall 2010-Spring 2011): We would like to make available to CBS faculty members, instructors, and TAs consultations with writing pedagogy experts on concerns related to formal and informal writing assignment design, commenting on and grading student writing.

Comment:

5. WRITING DEVELOPMENT WITHIN MAJORS. We will use information we've collected from individual instructors (regarding writing assignments and their relationship to named outcomes) to create a comprehensive curricular map, showing the development of targeted writing abilities from 1XXX-4XXX courses. This map will allow individual instructors to anticipate student levels with more accuracy, and should provide a sense of inter-course and inter-instructor cooperation.

Comment:

6. How likely would you be to participate in the following instructional support opportunities?

	Definitely	Very Likely	Unsure	Not Likely
University-wide Teaching with Writing seminars, workshops, panel discussions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Customized, CBS-specific workshops on writing instruction (including assignments and grading)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Face-to-face consultations (to address concerns related to assignments, instruction, grading, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Online consultation (individual)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Grade-norming sessions for TAs in multi-section courses	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other (please specify)

7. What other comments, concerns, or ideas would you like to make sure we include in the college's 2010-2011 Writing Plan?

Comment:

4. THANK YOU!

I plan to develop an initial draft of the Writing Plan in the coming weeks. I will circulate that draft for your comments and, ultimately, your approval.

I appreciate your taking the time to respond to this short survey...your insights help a lot!

Leslie Schiff

5. WEC Writing Plan Requests

Unit Name: **College of Biological Sciences**

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

Semester 1: Spring 2011		Semester 2: Fall 2011		Semester 3: Spring 2012	
Item	Cost	Item	Cost	Item	Cost
25% RA (spring)	\$8,369.50	25% RA	\$8,369.50	25% RA	\$8,369.50
SurveyMonkey subscription	\$200.00			SurveyMonkey subscription	\$200.00
25% RA (summer)	\$3,802.38				
Semester 1 Total:	\$12,371.88	Semester 2 Total:	\$8,369.50	Semester 3 Total:	\$8,569.50

Rationale for costs and their schedule of distribution

Following the very successful model set forth by EEB, we request a 25% RA (supervised by WEC Liaison and CBS assessment specialist). This individual will be responsible for surveying faculty who teach laboratory courses, collecting and analyzing course materials related to lab reports. We anticipate that the survey and analysis work on the laboratory courses will take at least two semesters. This RA will be involved in presenting the findings to all CBS faculty who are involved in lab courses at the half day retreat. He/she will also help to develop and refine the curricular map of writing abilities in lecture-based courses. Summer 2011 support is included within the Spring 2011 cell above. \$8369.50 (fall)+\$3,802.38 (summer-no tuition). We also request support for a professional subscription to SurveyMonkey. SurveyMonkey was effectively used by the liaison to gather feedback from a large number of CBS faculty. The professional subscription allows results to be downloaded and surveys

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

Semester 1: Spring 2011		Semester 2: Fall 2011		Semester 3: Spring 2012	
Service	Qty	Service	Qty	Service	Qty
Consultation	6	Consultation	4	Consultation	2
Workshop		Workshop	2	Workshop	2

Description and rationale for services

- Group consultation/facilitation of meetings (“Now what”: Taking the next steps with WEC) in each of the CBS majors (except EEB). (Spring, Fall 2011)
 - o These meetings will be co-facilitated by Leslie Schiff (WEC liaison) and Pamela Flash

- Instructional consultation /facilitation of meeting(s) with instructors involved in laboratory coursework (after data have been collected). (Late Spring 2011 if possible; Fall 2011 at the latest)
 - o After we collect and analyze data related to articulation of writing goals in laboratory courses, we propose to hold a longer meeting (half day retreat) to present and discuss the data with all faculty who teach laboratory courses. This meeting will be co-facilitated by Leslie Schiff (WEC liaison) and Pamela Flash

