Last Updated March 27, 2019

Indiana University of Pennsylvania
WAC
Writing Across the Curriculum

IUP DEPARTMENT OF BIOLOGY

Department Writing Plan

Compiled by
Dr. David Janetski, Assistant Professor, Department of Biology
with consultation by Dr. Bryna Siegel Finer, Director of Writing Across the Curriculum

Submitted to:
Dr. Narayanaswamy Bharathan, Department Chair
the Faculty of the Department of Biology
Dr. Deanne Snavely, College of Natural Science and Mathematics
Dr. Timothy Moerland, Provost
Dr. Edel Reilly, Director of Liberal Studies
Dr. Karen Rose Cercone, Provost's Associate

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Summary and Goals

The purpose of this Department Writing Plan is to describe the current use of writing as a teaching tool in the Biology curriculum, raise awareness among faculty about ways to better integrate writing into teaching, and establish a framework for assessing student writing skills. The Biology Department has two overarching goals related to student writing: 1) improve scientific writing proficiency through the use of writing-to-communicate activities, and 2) increase use of writing-to-learn activities across Biology courses to improve student engagement with Biology content knowledge.

Currently across the Biology curriculum, 39% of courses display some level of writing-enrichment. This value is likely an underestimate, however, as only 11 out of 22 faculty responded to a 2016 survey about writing activities used in courses. The Biology Department seeks to build on this level of writing integration by more thoroughly assimilating Writing-to-Communicate (WTC) and Writing-to-Learn (WTL) activities into undergraduate biology courses. Increased discussion of writing and opportunities for instruction are intended to shift the culture in the Biology Department in order to more strongly emphasize to students the importance of scientific writing. To do so, we aim to accomplish the following measurable goals within one year of publication of this report: 1) increase faculty participation in the writing survey to 100%, 2) achieve 50% completion by Biology faculty of the annual liberal studies writing workshop, 3) hold at least one guest workshop by WAC Director Bryna Siegel Finer at a Biology faculty meeting, and 4) once a semester, email an instructional online video about teaching scientific writing to all Biology faculty (or other pertinent information as may be deemed more appropriate).

To assess student writing in the Biology program, we propose a framework that will permit Biology faculty to identify strengths and weaknesses in student writing. In short, students will assemble a "portfolio" of sample writing assignments, of which one assignment will be assessed by the Biology Writing Committee using a standard rubric. Assessment scores will be used to adapt the Writing Plan and Biology course curriculum as appropriate to improve student writing proficiency. Measurable goals for instituting this framework into the Biology curriculum are: 5) introduce writing expectations to freshmen students in BIOL 201, including the portfolio concept and assessment procedures, and 6) in Spring 2018, the Writing Committee will conduct a random initial writing assessment of at least 15 graduating seniors to achieve baseline results.

Action Items

To achieve our goals, the WAC Director recommends the following action items for continuing program facilitation:

- Elect at least one faculty member to continue to be the WAC/BIOL liaison.
- Provide all newly hired faculty a copy of the DWP, and recommend attendance at WAC workshops or the two-day writing workshop for Liberal Studies faculty.
- Add "Department Commitment to Writing" statement to department syllabi as appropriate.
- Share biennial assessment results with the WAC Director as part of the 5-year program review process.
- Add areas for the teaching and assessment of writing as goals on department and faculty five-year review documents.
- Continue to update the Writing Outcomes Curriculum Map as courses are added, removed, and revised in the Biology curriculum (and communicate these changes to the WAC Director).

BIOLOGY Department Writing Plan
Rollout Fall 2019

Scientific Writing in Biology

Writing is an essential skill for professional scientists. In Biology, designing and carrying out experiments are often thought of as the essence of the discipline, but the work of scientists has little meaning if it isn't communicated effectively to peers and other interest groups through writing. The importance of writing skills is well understood by potential employers, but students in Biology often lack an appreciation for the role of writing across scientific disciplines and its significance for obtaining employment. The IUP Biology Department is committed to helping students see why writing is meaningful in the sciences, including emphasizing the critical importance of writing for successful job applications, grant proposals, scientific reports, literature reviews, abstracts, poster presentations, oral presentations, and scientific journal articles. Scientific writing includes not only mastery of basic grammar and syntax, but a clear understanding about how to compose a research paper (including introduction, methods, results, and discussion). Scientists also must be skilled at engaging readers through effective use of narrative, logical flow, language, and style, as well as synthesizing information and evidence from appropriate sources to create a persuasive argument. These higher-level writing skills are critical for obtaining research funding and publishing in high-impact scientific journals. Our department aims to improve student proficiency (see proficiency criteria below) in scientific writing through the use of professional writing assignments and writing-to-learn activities.

Overarching Goals

The Biology Department writing plan has two primary goals:

1. *Improve student proficiency in professional scientific communication (writing-to-communicate)* – Student expression of scientific knowledge and analysis through writing and other means should be evidence-centered, insightful, concise, accurate, objective, and structured using typical scientific formats.
2. *Increase the use of writing-to-learn activities across the biology curriculum* – Encourage faculty to assign writing activities that enhance student engagement and improve critical thinking, introspection, and development of informed opinions in order to reinforce course concepts and provide consistent messaging to students of the value of writing in the discipline.

Integration of Writing into Undergraduate Curriculum

Biology faculty currently use writing as an indispensable teaching tool and work hard to improve student proficiency in scientific writing by giving students a variety of opportunities to develop their writing skills. However, a faculty survey in 2016 indicated that the proportion of Biology courses that are writing-enriched with WTC and/or WTL is only 39% (24 out of 61 courses). Specifically, 28% of courses implement both WTC and WTL, 8% use only WTC, and 3% use only WTL. However, these values likely underestimate actual levels of writing-enrichment, as only 11 of 22 faculty responded to the survey. We seek to build upon this level of writing integration by more thoroughly assimilating WTC and WTL activities into undergraduate biology courses. Specifically, we will increase opportunities for faculty to obtain tools for

more effective use of writing in course curricula. A number of department faculty have participated in writing workshops and meetings with the WAC director and professionals from other institutions, but true integration of WAC will be more effective with a commitment from all department faculty to share in these activities. Additional training opportunities therefore may help improve faculty use of WTC and WTL, such as:

- Liberal studies writing workshops
- Seminars from writing professionals in the sciences
- WAC director visits to department faculty meetings; potential topics include:
    - Strategies for providing efficient and instructive feedback on student writing
    - Emphasizing higher order writing skills and providing effective sentence-level support
- Online instructional videos and other best practices about WTC and WTL (e.g., https://wac.colostate.edu/intro/pop2d.cfm)

Writing-to-communicate assignments are used in biology courses to assess student proficiency at scientific writing and understanding of course content. These activities typically involve direct communication about scientific topics and/or independent research projects, such as writing a scientific report or manuscript, but may also include research posters and oral presentations. Specifically, students use WTC to develop the following discipline-specific skills:

- Express ideas in a clear, concise manner, including logical flow from one point to the next.
- Basic proof-reading and peer review, such as identifying thesis statements and arguments, as well as editing paragraph and sentence construction, flow, word choice, and citation format.
- Correct grammar, appropriate word choice, and cohesive sentence and paragraph structure.
- Understanding of the basic components of a scientific paper, including Introduction, Methods, Results, and Discussion, including appropriately formatted tables and graphs.
- Inform and persuade varied audiences (e.g., peers, academic, public, policy) about scientific topics in an engaging, reader-friendly manner.
- Critical thinking and appropriate application of findings to other systems, acknowledging levels of variability inherent in nature.
- Synthesis of data and evidence contributed by themselves and/or the scientific literature to build arguments and draw conclusions about biological concepts.

Writing-to-learn activities help students think about new ideas and ultimately improve understanding of course concepts. These activities permit students to explore their thoughts and develop opinions and arguments in a low-stakes setting. Examples of WTL activities include reading responses, free-writes, and journaling. Students use informal WTL assignments to:

- Develop thinking skills
- Assess their own understanding and identify misconceptions
- Discover connections between course content and everyday life
- Express complicated concepts
- Develop viewpoints and describe evidence that supports those viewpoints
- Evaluate and interpret data presented in scientific journal articles
- Practice forming conclusions about scientific datasets

Communicating Writing Expectations to Students

The importance of writing skills to biology is communicated both in and out of the classroom. For writing-enriched courses, writing activities and assignments are described in the course syllabi. Instructors often use rubrics tailored for specific assignments, and discuss their expectations about good writing with

students. In addition to WTL activities in class, some instructors devote class time to peer review and to class discussion of writing projects and the writing process. Instructors also provide individual feedback to students on their writing assignments and often require revised drafts of major writing activities. Students are encouraged to utilize the Writing Center for extra assistance with writing assignments.

Overall, students are provided with opportunities to develop writing skills as a central component to their education in Biology. We consider all students to be capable of strong writing and all writing to have room for improvement. Students enter the program with widely varying levels of writing proficiency. However, our goal is to ensure that all students are challenged and encouraged to develop excellent writing skills, to learn and think about biological science through the process of writing, and to articulate their passions and skills through writing that will allow them to excel professionally and academically. This may also include extra-curricular activities where scientific communication is critical, such as independent research projects with faculty mentors.

Suggested Syllabus Statement

The Department of Biology is committed to developing student writing throughout the curriculum. In this class, as in almost every class in the department, you will complete writing assignments and activities designed to improve your communication skills in this course, other courses, and in the profession. You are encouraged or may be required to add assignments that best illustrate your writing skills to your online writing portfolio.

Implementation and Assessment of Department Writing Plan

Writing is currently assessed in the Biology department using a variety of methods, nearly all of which occur within individual courses (see Writing Outcomes Curriculum Map below). For instance, WTC is evaluated through lab reports, written research papers, posters, oral presentations, and essay questions on exams. Written research projects often involve a process for revision based on instructor feedback. Also, low-stakes WTL assignments are used by many biology faculty to encourage self-reflection and deepen understanding of course concepts.

The current writing strategy in the department provides a variety of course-specific writing experiences to students, but lacks a broader framework for measuring student proficiency toward the end of program completion. Also lacking is a method for tracking the degree to which biology faculty use WTL activities in their teaching.

We plan two new strategies for assessing WTC and WTL in the Biology department:

1) *Writing-to-Communicate Assessment* – Proficiency in scientific writing will be assessed for senior biology majors by a committee of Biology faculty (a.k.a. the "Writing Committee"). The outline below explains the steps in the assessment process, concerning both students and faculty.

    i. First, expectations for writing and the assessment process will be introduced to Biology students in their opening biology course (BIOL 201 or 202).

    ii. Second, in BIOL 201 and 202, students will be instructed on how to create a Writing Portfolio to contribute to as they complete their major coursework (see Appendix A). The portfolio is to include a sample writing assignment or research paper (required), plus two of the three following options, each of which could be the product of a course assignment or an independent research project: (1) poster presentation, (2) oral presentation, and/or (3) grant proposal.

Students may add items to their portfolio from any Biology major courses they wish; i.e., they are free to choose whatever they feel is their best work. Students may also be asked to add self-reflection writing assignments to their portfolios. Faculty of major courses (e.g., BIOL 201, 202, 203, 250, 362, etc.) will be encouraged to have students add assignments to their portfolios as part of the required work for their courses or for extra credit. In addition to facilitating writing assessment, portfolio development will provide students with a useful collection of work to showcase to potential employers following graduation. Options for building a portfolio include the following websites:

- WordPress (https://wordpress.com/)
- Weebly (https://www.weebly.com/)
- Wix (https://www.wix.com/)
- Digication (https://www.digication.com/)
- Examples of ePortfolios: http://wp.auburn.edu/writing/eportfolio-project/eportfolio-examples/

iii. Third, during their senior year after portfolios are complete, students will submit web addresses of portfolios to the writing committee. This should be done before February 15 in the spring semester of their senior year.

iv. The writing committee will consist of three biology faculty. The committee will randomly select a representative sample of the graduating class from which student writing samples (research papers) will be evaluated using a standard rubric (Appendix A). After student names have been removed, all three committee members will read the research paper included in each student's Writing Portfolio. Averages will be computed for each rubric category and a holistic score.

v. Finally, the writing committee will report results to the biology department and the WAC director for discussion and feedback. Modifications to the Writing Plan and to the Biology course curriculum will be made as appropriate based on feedback and implemented the following year. All results, meeting minutes, and discussion notes will be archived on the O drive. This database will allow for analysis of long-term trends and inform faculty about areas in need of improvement (based on scores for individual rubric categories).

2) *Writing-to-Learn Assessment* – Trends in faculty implementation of WTL activities will be tracked using annual surveys of both students and faculty.

i. Faculty will be asked annually to update their courses on the Writing Outcomes Curriculum Map. Responses will be summarized by the writing committee and archived on the O Drive.

ii. Student perceptions about writing will be surveyed by asking senior biology students for feedback. The survey may include questions about attitudes toward writing, use of writing as a learning tool, perceived importance of writing in scientific professions, how often writing was emphasized in courses, self-perceived proficiency in writing, etc.

For transparency and ethics, this statement will be included on syllabi of courses in which students will be submitting writing to their portfolios:

Suggested syllabus statement for Writing Assessment:

The Biology Program is undergoing programmatic evaluation. Please be advised that your writing assignments may be randomly chosen for program assessment purposes. Program assessment activities

will have no bearing on your course grade and, should your work be selected, your name will not be attached to it. If you have any questions about program assessment or wish to withdraw permission for use of your work, please contact the Biology Writing Coordinator, Dr. David Janetski (janetski@iup.edu).

Writing Outcomes Curriculum Map

The Writing Outcomes Curriculum Map demonstrates:

- Conscious effort on the part of department faculty at placing core disciplinary genres at appropriate levels of the curriculum, scaffolding and reinforcing the writing skills necessary for students to succeed in writing those genres (For example, in BIOL 201 students the basic elements of a scientific paper, i.e., Introduction, Methods, Results, and Discussion. In BIOL 362 students carry out a simple experiment and write a research paper describing their findings, with focus on higher-level writing skills).
- Integration of writing-to-learn activities in a number of courses in the curriculum; includes use of writing as a tool to reinforce concepts, organize thoughts, and assess one's own understanding.
- Professional scientific writing skills are also taught and evaluated in a sequential manner (For example, the basic conventions of scientific writing are taught in BIOL 201 and 203 and synthesize their own research, both individually and with groups, in BIOL 362 and BIOL 490).
- Information below was acquired from a Biology faculty survey in spring 2016.
- **24 out of 61 courses use WTL and/or WTC = 39% of courses are writing-enriched**

Course	Title	Expected Writing Skills	Writing Activities (Write to Learn [WTL] and Writing to Communicate [WTC])	Introduced, Reinforced, or Emphasized	Genres Modeled Through Reading
101	Basic Biology	The ability to synthesize and represent thoughts/responses to scientific thinking; building of critical thinking skills	Discussion board responses on D2L in response to a scientific editorial piece or journal article (WTL)	Introduced	
			Essay questions on exams (WTC)	Reinforced	
103	Life on Earth		"Science in the News" each week students are required to write a 1page summary of a science story that has taken place in the last 7 days (WTL)		
104	Human Biology	Student will learn to communicate knowledge and exchange ideas in written and graphical/tabular form, based on answers to laboratory questions and the	Upon completing laboratory exercises, students answer questions related to concepts behind the human biology experiments completed that day and interpretation of the	In the context of a liberal studies course, students are encouraged to think critically	

		liberal studies assignment. Students will be able to state a thesis topic at the beginning of an expository paper and develop their arguments citing evidence from their primary sources (liberal studies book) and other sources found in researching their topic.	data. As an instructor, I check on the students while they are answering the questions and give feedback and guidance about their answers. We also frequently have group discussions about the answers to the questions. These questions are graded. (WTL)	about presentation of scientific data in popular press through examples of proper use of scientific method and examples of improper use of scientific methods.	
			Lab - Read a non-fiction, book and other related sources, that addresses scientific questions relevant to the course (human biology) such as influence of diet, exercise, physiology and genetics on obesity and health. Students will identify two major controversies (ethical issues) of interest and write a critique of key chapters of the book. Students will define and analyze problems related to their topic, and then communicate their analyses and conclusions in a short (>1000 word) paper and 5-minute presentation/discussion with the class. (WTC)		
		Ability to analyze and respond to questions posed about the topics discussed in the course. Introduce the idea of scientific thinking.	Discussion board responses on D2L in response to a scientific editorial piece or journal article (WTL)	Introduced	
			Essay questions on exams (WTC)		
			8-10 short-answer quizzes, 2-4 sentences per question, 2-3 questions per quiz (WTL)		
105	Cell Biology				

106	Human Genetics and Health	Critically assess and respond to scientific editorial pieces in relation to genetics.	Selection of relevant articles (from things like Time or Newsweek) and writing a response to the article and relating relevant concepts to the genetics discusses in lab (WTL)	Introduced	
107	Introduction to Forensic Biology				
115	Biotic Diversity of North America				
117	Understanding HIV Biology and AIDS				
118	The History of Pain				
119	Emerging Diseases				
123	Perspectives in Cell and Molecular Biology				
150	Human Anatomy	This lab is designed to have students learn anatomical structure and no writing is done in the laboratory sections.			
155	Human Physiology and Anatomy				
200	Medical Terminology				
201	Principles of Ecology and Evolution	Students communicate in writing (prose, graphs and tables) their experimental methods, results, and conclusions using appropriate format for scientific papers.	Written responses to lab manual questions, occasional written responses to questions/topics presented in lecture (usually graded by peers); intended to encourage introspection and critical thinking (WTL).	Reinforced	
			Three full lab reports emphasizing components of a scientific paper (Introduction, methods, results, tables, figures, discussion, and literature cited). (WTC)	Introduced, emphasized	

202	Principles of Cell and Molecular Biology		Poster presentations of class projects (WTC)		
203	Principles of Genetics and Development	Students are expected to effectively communicate their lab data, demonstrating that they understand the lab activity and interpretation of the data	At the end of each lecture, students write a Minute Paper in which they describe the most important thing they learned, and also what is still unclear to them (WTL)		
			Three complete lab reports, each containing a Title, Authors, Abstract, Introduction, Methods, Results, Discussion, and References. Also two review papers on a research article. Lecture exams are also mainly short answers and discussions (WTC)	Reinforced, emphasized	
210	Principles of Plant Biology	Students will learn how to communicate their findings in the format of a scientific paper.	Essay exams (WTC)	Reinforced	
			Three complete lab reports in manuscript format. Students must analyze data using appropriate statistical tests and be able to summarize their findings. (WTC)	Reinforced, emphasized	
211	Investigative Biological Forensics				
220	General Zoology	Synthesis of information into coherent statements of concepts	Homework assignments (WTL)		
			term project written in scientific format; 4 exams each of which are at least 50% essay (WTC)	Reinforced	
221	Environmental Health and Protection				
240	Human Physiology		8-10 short-answer quizzes, 2-4 sentences per question, 2-3 questions per quiz; 10-12 short-essay lab write-ups, 8-12 questions each, 3-6 sentences per question		

			(done as group work) (WTL, WTC)		
			Short essay problem set (quantitative, with written interpretation; 4-8 sentences per question), 3-4 sets per term, 6-8 problems per set (done as group work) (WTC)		
241	Introductory Medical Microbiology		Writing activity in my lab sections involve a one-page report for each of the two assignments. All lab quizzes have a short essay/answer format (WTL)	Introduced	
			BIOL241 is a non-majors course. Writing skills in my lab sections are focused on data analyses, data communication and interpersonal skills in form of reports, quizzes and an essay portion of lab and lecture final exam. (WTC)		
242	Comparative Vertebrate Anatomy	Express knowledge coherently	Ungraded writing assignments, to help organize thoughts (WTL)	Reinforced	
			Short essay questions (WTC)		
250	Principle of Microbiology				
261	Ornithology				
272	Conservation of Plant and Animal Resources	Students are asked to prepare and deliver scientifically accurate methods and results in accordance with professional examples provided in the course	Written responses to lab materials designed to prepare students for a career in wildlife management conservation by the end of the semester (WTL, WTC)	Reinforced, Emphasized	
			Prepare a professionally accurate species management plan (WTC)		
300	Genetics and Medicine and Nutrition				

310	Applied Entomology and Zoonoses				
313	Forensic Analysis of DNA				
323	Introduction to Toxicology and Risk Assessment	Students will develop skills needed for developing and writing a review article (e.g., outlining, writing abstract, developing a list of relevant references). Students will be able to critically assess strength and weaknesses of basic toxicology studies.	Bonus opportunity on lethal injection: answering questions from primary sources about the pharmacology and toxicology of the components, differences in practices of human execution from animal euthanasia, problems with the practice of lethal injection and how tox principles can explain these. Short answer study guide to help prepare for exam (WTL)	Introduced, reinforced	
			Toxicology project paper: Students will write an outline, then and abstract and finally literature review on a toxicology topic of interest. Short answer exam questions: Students will be able to read toxicology literature and provide concise, well-thought, answers to objective questions and those requiring interpretation of data/information (WTC)		
			Students work in teams of 3 on toxicology project (paper and presentation). The presentations were given as a "mini-symposium". Toxicology review papers had to cite primary references (WTC)		
331	Animal Developmental Biology				

352	Comparative Animal Physiology				
362	Ecology	Write and properly format an engaging, full-length scientific paper about a completed research project and/or literature review; critically evaluate and respond to peers' writing; summarize and interpret scientific research orally and in writing	Daily quizzes with short answer "thought and interpretation" questions; 2-3 one-page responses to scientific articles; 4-5 exams with both short (1-2 paragraphs) and long (1+ page) essay questions (WTL, WTC)	Reinforced - structure and organization of scientific paper; Introduced, emphasized - advanced skills of scientific communication through writing, such as targeting a specific audience, making a compelling argument, engaging the reader, clear and concise language, etc.	
			Research paper consisting of Intro, Methods, Results, Discussion, and Lit Cited, 6-8 pages in length, includes multiple peer-reviews and one instructor review before final draft is submitted; writing activities are accompanied by student reading of "Writing Science" by Joshua Schimel (WTC)		
364	Immunology		Writing activity in lecture and lab involve essay exams and quizzes (WTL)	Reinforced?	
			In labs, in addition to essay quizzes, writing activity involves two two-page lab reports (WTC)		
			BIOL364 is a majors course which by some would be described as writing intensive. Lecture and lab exams, quizzes are in essay format.		
401	Laboratory Methods in Biology and Biotechnology				
402	Advanced Human Anatomy				
405	Biology of the Cell				
410	Molecular Biology Topics				

411	Forensic Biology Laboratory Operations				
425	Herpetology				
450	Field Biology at Pymatuning Laboratory of Ecology				
451	Evolutionary Biology				
455	Animal Behavior				
456	Ecological Toxicology				
460	Fundamentals of Environmental Epidemiology				
462	Vertebrate Endocrinology				
463	Limnology	Synthesis of information into coherent statements of concepts	Term projects in scientific paper format; two exams, 100% essay (WTC)	Reinforced	
466	Principles of Virology				
469	Circadian Rhythms and Sleep				
471	Dendrology of the Eastern US				
473	Seedless Vascular Plants: Ferns and Allied Flora				
475	Mammalogy	Clearly convey methods and results in writing. Learning appropriate content for each section for scientific writing. Organize an informative paper on topic chosen, find and synthesize information for peer-reviewed literature using proper citations.	4 lab write-ups methods, results, and conclusions. 1 literature review on topic students choose. (WTC)	Lab write ups should reinforce writing skills from previous courses, while learning new research techniques in course. Literature review is an introduced writing component emphasizing the synthesis	

				of information.	
477	Neurobiology		8-10 short-answer quizzes, 2-4 sentences per question, 2-3 questions per quiz (WTL)		
			Full-length topic paper, 7 pages in length for undergrads, 15 pages for grads; written short-essay exams, 4 exams, 15-25 questions per exam, 4-8 sentences per question (WTC)		
479	Neurobiology of Addiction				
480	Biology Seminar				
481	Endocrinology		Weekly short essay response or free-writing exercises related to lecture topics (WTL)	Reinforced, introduced	
			Literature review of scientific papers (WTC)		
481	Ichthyology	Synthesize research findings through writing, including proper interpretation of data analyses	Short answer quizzes about once per week designed to introduce lecture topics and encourage critical thinking; 3-4 lab reports with Intro, Methods, Results, Discussion (WTL, WTC)	Reinforced, emphasized	
			6-8 page "life history report" about a fish taxon of the student's choosing (individual), oral presentations about chosen fish taxon (group) (WTC)		
481	Applied Principles of Pharmacology	Students will learn to pharmacological principles and then apply those to readings from primary literature for writing short review articles. Students will also get experience and	BIOL 481 - Pharmacology Principles & Applications - Virtual labs: students were given pharmacology data sets asked to short answer/essay answer questions about the data, their		

		coaching in providing concise, thoughtful answers to short-answer questions.	interpretations and conclusions about the data. They were also asked for one assignment to describe what additional data they would like to generate a contract research lab and the justification for this. Short answer/essay questions on exams: students read scientific articles and then answered objective questions about the introduction, methods and results as well as questions about interpretation of the data (WTL)		
			BIOL 481 - Pharmacology Principles & Applications: Assuming the role of a new research or clinical scientist on a team, students were required to write 2 short literature review papers, one on the chemistry and pharmacology of a recently approved drug, the other on a molecular target or mechanism of action. Students selected a drug or mechanism of interest, read one or more scientific articles and then wrote an informative review that could be shared with their new lab group (WTC)		
481	(Ruby course – look up)	Students will be able to communicate scientific discoveries, describe advanced methods, and pose research questions in writing and orally.	"Next best question" assignments - students write a scientific question based upon an original research article. Intended to develop critical thinking, experimental	Emphasized	

			design, and scientific writing skills (WTL)		
			Article presentation - students write and present slides summarizing/analyzing a research article. Feedback includes assessment of ability to clearly communicate scientific concepts and methodology (WTC)		
490	Field Studies in Biology		Students work in groups to compose a 10-15 page management plan centered around a topic of their choosing; groups create a plan, collect data, analyze and interpret the data, then synthesize the information into a comprehensive management plan for a landowner (WTC)	Reinforced, introduced	

Appendix A – Assessment Protocol and Rubric

Assessment is planned for writing samples (i.e., research papers) presented in student portfolios as part of their regular coursework as described above (see "Implementation and Assessment of Department Writing Plan"). All students enrolled in BIOL 201 or 202 are given instructions similar to these:

> Welcome to the IUP Biology Program! Your success in science depends in large part on your ability to communicate effectively through writing. Therefore, you will find that the development of writing skills is a top priority of your biology instructors. This handout will instruct you how to set up a **Writing Portfolio**, which is a personal, online website for archiving and displaying your writing achievements as you progress through the Biology Program. The goals of your portfolio are to 1) showcase your accomplishments to potential employers, and 2) aid the Biology Department in writing assessment.
>
> We recommend you use **Weebly.com** to set up your writing portfolio. The website is free and relatively user-friendly. If you prefer to use a different website, please ask your instructor for approval. Follow these instructions to set up your portfolio:
>
> 1. Go to Weebly.com
> 2. Create an account by clicking the "Sign Up" option on the Weebly home page
> 3. Fill in the required information and click "Create Your Site"
> 4. Answer the questions and select a theme for your website
> 5. Select your domain name (we suggest using a combination of your name and a few numbers of your choosing; for example, johnsmith3633.weebly.com)
> 6. You should now be at the Weebly website building interface. Spend a few moments to familiarize yourself with the options. Here are a few prompts to get you started:
>
>   - From the options on the left-hand side, you can click and drag elements, such as Title, Text, or Image, to the desired location on your webpage
>   - You can delete the default text and images by hovering over the item and clicking the "X" at the top right-hand corner of the box
>   - To modify the various pages/links embedded in your website, select "Pages" at the top, then edit by selecting from the options on the left-hand side of the screen
>
> You might organize pages by topic (Ecology, Cell Biology, Molecular Biology, etc.) or by communication style (research papers, posters, oral presentations, etc.). You may also wish to add photos of yourself in class or in other professional settings, such as attending conferences or conducting research. Do not include items that distract from the goal of your portfolio (impressing potential employers), such as photos of sports or other recreational activities. In short, make it your own, but be professional!
>
> While you may create pages and organize your portfolio as you wish, **you MUST include a page titled "Writing Sample"**. Here you will upload what you consider to be your "best" piece of writing from your college career. It must come from a biology course and be a research or term

paper at least five pages in length. Your writing sample will be used for assessment purposes during your senior year.

After you set up your portfolio, you should regularly add new material as you progress through the Biology Program. As a Biology major, you are **required** to include the following documents (in pdf format) in your portfolio: A) one substantial (>5-page) writing assignment or research paper (again, under the "Writing Sample" page on your website), and B) two of the following three items: (1) poster presentation, (2) oral presentation, and/or (3) grant proposal. Each item should come from either a Biology course assignment or an independent research project. You are encouraged to include additional items in your portfolio from any Biology major course or from your independent research; feel free to choose whatever you consider to be your best and most relevant work for the job you seek.

Samples will be rated on a four-level scale for six individual criteria. Rubric criteria were tested twice by the Biology Department Writing Committee, each time using three student writing samples. These trials were important for fine tuning the rubric to better fit the types of assignments commonly assigned in Biology classes.

Criterion	Below Expectations = 1	Emerging = 2	Meets Expectations = 3	Exceeds Expectations = 4
Grammar and mechanics	Serious grammatical errors are common; proofreading is not evident	Some serious grammatical errors are present; some level of proof-reading is evident	Paper is mostly free of serious grammatical errors and has clearly been proof-read	Paper is free of serious grammatical errors
Language, clarity, and flow	Paper lacks logical flow; appears to be mainly stream-of-consciousness writing; language is unclear	Some paragraphs have clear topics, others do not; some tangential information is included; language is unclear	Most paragraphs have clear topic sentences and generally flow from one to the next; language is mostly clear	Paragraphs have clear topic sentences and are organized to flow from one to the next; language is clear and concise
Introduction (e.g., purpose, objectives, and/or hypotheses, as appropriate for assignment)	Objectives and/or hypotheses are not mentioned; Introduction does not attempt to set up or preview the rest of the paper	Objectives and/or hypotheses are mentioned but unclear; Introduction attempts to set up or preview the rest of the paper, but does so ineffectively	Objectives and/or hypotheses are clear, but are not appropriately matched to the main body of the paper; Introduction sets up the rest of the paper reasonably well	Study objectives and/or hypotheses are present and appropriately match the rest of the paper; Introduction effectively sets up/previews the rest of the paper
Appropriate format and structure for assignment (IMRD, literature review, etc.)	Not all format components are present; paper lacks an overall structure	All components are present, but much of the information is in the incorrect section(s); paper has an overall structure, but is done in an illogical manner	All components are present and mostly contain the appropriate information; paper is mostly structured clearly and logically	All components are present and contain the appropriate information; paper follows a clear, logical structure
Literature cited	Literature cited section is either absent or, if present, has serious formatting errors or references are not cited in the narrative	Literature cited section is present, but with serious formatting errors and incorrect or incomplete reference in the narrative	Literature cited section is present, mostly formatted correctly, and references are mostly correctly cited in the narrative	Literature cited section is formatted correctly and references are correctly cited in the narrative
Accomplishes purpose (persuasive, engaging, and/or informative)	Narrative is not particularly engaging, persuasive, or informative	Narrative is somewhat engaging, persuasive, and/or informative	Narrative is mostly engaging, persuasive, and/or informative	Informs and persuades audience in an engaging, reader-friendly manner
Critical thinking and conclusion (discussion)	Narrative lacks critical thinking and is limited to the topic at hand; does not discuss possible explanations; conclusions are absent or not supported by evidence	Narrative attempts to move beyond the results at hand, but does so in an illogical manner; attempts to offer possible explanations for findings; conclusions are	Findings are appropriately interpreted; writer attempts to apply results to other systems; appropriate possible explanations are discussed; conclusions	Demonstrates critical thinking and appropriately applies findings to other systems; possible explanations are thoroughly explored;

		somewhat supported by evidence	are mostly supported by evidence	conclusions are well supported by evidence

Holistic Score: _____

Appendix B – Baseline Assessment Results and Discussion

The results below summarize average scores (of the three Writing Committee members) assigned to 12 senior student writing samples. Writing samples were volunteered by seniors in Spring 2018 and scored in Spring 2019. This first formal assessment is considered a "baseline" for comparison with future writing assessments.

1. **High Achievement Criteria: *80-100%* of samples met or exceeded expectations:**

Criterion 1: Grammar and mechanics		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**91.7% (11 of 12)**	**8.3% (1 of 12)**

2. **Moderate Achievement Criteria: *60-80%* of samples met or exceeded expectations:**

Criterion 2: Language, clarity, and flow		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**66.7% (8 of 12)**	**33.3% (4 of 12)**

Criterion 5: Literature Cited		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**75% (9 of 12)**	**25% (3 of 12)**

Criterion 6: Accomplishes purpose (persuasive, engaging, and/or informative)		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**66.7% (8 of 12)**	**33.3% (4 of 12)**

Criterion 7: Critical thinking and conclusion (discussion)		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**66.7% (8 of 12)**	**33.3% (4 of 12)**

3. **Low Achievement Criteria: *Less than 60%* of samples met or exceeded expectations:**

Criterion 3: Introduction (e.g., purpose, objectives, and/or hypotheses, as appropriate for assignment)		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**50% (6 of 12)**	**50% (6 of 12)**

Criterion 4: Appropriate format and structure for assignment (IMRD, literature review, etc.)		
Year (sample size)	Exceeds/meets expectations	Emerging/below expectations
2017-18 (n=12)	**58.3% (7 of 12)**	**41.7% (5 of 12)**

4. **Averages score and standard deviation (SD) for each of the seven rubric criteria (n=12):**

Criterion	*Average Score (SD)*
1	3.25 (0.43)
2	3.11 (0.46)
3	3.11 (0.66)
4	2.81 (0.67)
5	3.08 (0.95)
6	3.03 (0.70)
7	3.06 (0.60)

Discussion and Recommendations by the WAC Director

The majority of students in this baseline sample are meeting or exceeding expectations in all but two criteria in the Biology DWP rubric: Introduction and Format. These two criteria are important to note because they are not necessarily rhetorical – that is, they do not necessarily speak to students' choices or abilities in critical thinking, content knowledge, or using evidence to make arguments. Instead, they speak more to process awareness – what should a properly formatted document look like, in what way should certain information be organized, what goes into an introduction. This bodes well for the Biology department, as typically, this kind of awareness is easier to teach and learn than rhetorical skill.

To "close the loop" – make these results actionable – I recommend the following:

- Complete more of the outcomes chart, particularly in the Writing-to-Learn column. Knowing more about these kinds of activities – what they are and how they are used – could provide some clues about where students are/not getting practice that might scaffold those process skills
- Consider professional development within the department specifically regarding IMRD format. Make sure all faculty members know this is a weak area for students and are thinking of ways to infuse their own courses (all the way up and down the curriculum) with more instruction and attention to these areas.
- Consider professional development with the WAC director on teaching introductions, or invite Writing Center tutors to visit courses where this skill will be introduced and reinforced; peer tutors can give workshops and make an important impression on students in a classroom setting. Make sure all faculty members know this is a weak area for students and are thinking of ways to infuse their own courses (all the way up and down the curriculum) with more instruction and attention to these areas.