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WRITING TO LEARN: A COURSE DESIGN AND EDUCATIONAL RESOURCES

by

GEOFF KESTON

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SYNTHESIS*

MASTER OF ARTS

CRITICAL AND CREATIVE THINKING

UNIVERSITY OF MASSACHUSETTS BOSTON

May 2022

Advisor: Robert Ricketts

* The Synthesis can take a variety of forms, from a position paper to curriculum or professional development workshop to an original contribution in the creative arts or writing. The expectation is that students use their Synthesis to show how they have integrated knowledge, tools, experience, and support gained in the program so as to prepare themselves to be constructive, reflective agents of change in work, education, social movements, science, creative arts, or other endeavors.

WRITING TO LEARN



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ABSTRACT

Higher education students write in many courses, but often as only a small part of a class and without guidance about how to use writing to learn. This paper describes the design of a dedicated course, Writing to Learn, in which students practice many genres and study the science of learning. A focused approach to using writing as a way to learn aims to give students extensive and diverse practice, which isn't done in many published case studies. And making ideas from psychology, neuroscience, and the theory of pedagogy a part of the course content shows students why and how particular writing activities aid (or fail to aid) learning. The instructor and students will test concepts and practices from the literature and suggest changes, thus taking on the role of action researchers contributing to the field. This document contains (i) a synthesis paper with a literature review explaining the thinking behind the course and (ii) a course outline with assignments, discussion topics, and in-class activities. While created to be used for an undergraduate general education or graduate interdisciplinary course, these materials can be remixed and repurposed for other classes under the terms of a Creative Commons Attribution-NonCommercial 4.0 International License.

Keywords: writing to learn, writing across the disciplines, writing across the curriculum, pedagogy, action research, course design, course materials, open educational resources

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Introduction: The Need for an Additional Type of Writing to Learn Course

Writing is used extensively throughout higher education as a way to help students learn. The practice of “writing to learn” was popularized at least as early as 1988, when William Zinsser published the mass market book *Writing to Learn: How to Write—and Think—Clearly About Any Subject at All*, and the related concept of “writing across the curriculum” traces its origins to a seminar held in 1969 through 1970 (Palmquist et al., 2020). Yet despite a long and diverse history, this pedagogical technique remains underexplored.

This paper proposes a course, Writing to Learn, that aims to study the field and contribute new best practices to it in a pair of novel ways:

- having students use more types of writing than in published case studies,
- incorporating many concepts from the science of learning into its content and talking explicitly to students about them.

Students will choose their own goals—such as to draw, play music, or use advanced math in their work—and apply writing and learning concepts to achieve it. Writing is not just composing words but also all of the enabling activities, including acquiring new knowledge and skills. In this way, the course is a survey of established ideas from psychology, neuroscience, writing studies, and pedagogy.

But the Writing to Learn course also asks students to test and comment on concepts from the literature and to propose modifications and innovations, that is, to perform “action research.” By performing action research, students will be more engaged, which will improve retention and deepen their understanding of core concepts. And further, students could contribute to the

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literature and the wider practice of writing to learn by sharing their critiques and recommendations.

These elements of critique and constructive recommendations invoke critical and creative thinking, whose tools for scrutinizing established practices and seeking alternatives are integrated into the course design and used by students throughout the semester. If writing to learn is to evolve, new approaches and fresh perspectives are needed.

This project of expanding and rethinking writing to learn's use is in the spirit of a call to action given in a literature review on writing across the curriculum, a concept that, in practice, is nearly synonymous with writing to learn:¹

The active and ongoing examination of what makes [writing across the curriculum] work has been a central part of what has led to its success. It has brought about significant changes in our understanding of its goals, characteristic practices, and relationship to other educational emphases and practices, such as critical thinking, student success, educational assessment, civic engagement, and career preparation (Palmquist et al., 2020, pp. 5–6).

Even more specifically, Palmquist et al. emphasize the importance of real-world uses in courses as a way to improve writing to learn, saying that the practice's development "will be fueled by the lessons we learn from its application in classrooms and other learning spaces at all levels of education, from primary to secondary to tertiary" (p. 38).

Palmquist et al.'s invitation to contribute to writing to learn's evolution is broad, encompassing "classrooms and other learning spaces at all levels of education," so no single project could fill all of the gaps. The course and action research proposed here, targeted to a

¹ For a discussion of this terminology, see the literature review below.

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higher education course not restricted to a particular discipline, aim to add to our understanding of writing to learn by answering these questions:

- Will devoting an entire course to writing to learn enable students to become more skilled in using the concept? If so, what is the progression and nature of their development?
- How does explicitly teaching students about the science of learning affect their ability to use writing as a tool for learning?
- How can writing to learn be used outside of a discipline-specific course?
- What is the pedagogical value of writing assignments that haven't been widely tested in the writing to learn literature?

In addition to responding to gaps in the literature, the Writing to Learn course targets problems I've seen in my own more than 10 years of teaching Technical Communication to undergraduates in Temple University's College of Engineering, and, more recently, teaching the same subject to working professionals through UC Berkeley's online Extension program. Many students think of writing as an additional burden that complicates and takes time away from the burdens of research and analysis. Generalizing beyond my own students, I hypothesize that this view of writing is widespread, so the Writing to Learn course shows people how to use composition as a tool to aid, not hinder, the acquisition of knowledge and skills.

In many ways, the course I teach at Temple is similar to the new one proposed here:

- Students choose their own topics.
- Topics are highly challenging for students to understand.
- I'm not an expert on students' topics.

Students don't intuitively know how to use writing as a tool for learning, so over the years, my teaching has integrated more ideas from psychology and has put greater emphasis on

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metacognition, reflection, and dialogue. But students need more help, and the literature today offers only some answers. A dedicated Writing to Learn course will not only help students to acquire new approaches for self-teaching, but it will also generate new ideas and insights that can be shared with other educators and other learners.

The paper below, although written as a scholarly article for other educators, will also be shared with students—not as a single document but broken into smaller pieces and used in introductions to weekly modules, my explanations of activities, etc. And as described in the Future Directions section, the material in the paper can be reused and repurposed by others under the terms of the Creative Commons Attribution-NonCommercial 4.0 International license.

Literature Review

This literature review weaves together three threads:

- studies and educational materials on writing to learn,
- the science of how people learn (from psychology and neuroscience),
- my own teaching experiences and interactions with other educators, along with published accounts of teaching advice outside of research journals (e.g., trade books, blogs, and open educational resource repositories).

Yet these threads don't quite merge into a tight, cohesive tapestry. I take heed of the "strong cautionary note" offered by Immordino-Yang and Faeth (2016) about applying neuroscience to teaching. They argue that educators often use ideas from neuroscience in ways that are ineffective, or even harmful. I apply this caution to using ideas from psychology and other empirical studies too. This literature review, then, along with the course description that follows it, will find inspiration and empirical support in the literature but will also keep in view the

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complexities of teaching in real contexts, taking into account my own teaching experience and that of other educators.

This paper, then, is a “not quite synthesis.” As one definition of “synthesis,” Webster’s offers “the combining of often diverse conceptions into a coherent whole” (Merriam-Webster, n.d.). But the theory and practice of teaching don’t quite form “a coherent whole.” Gaps persist, presenting an opportunity for critical and creative thinking as practiced by action researchers. This Writing to Learn course, therefore, can contribute to the understanding of how writing can be used to help students learn.

Writing to Learn

In a review of the literature on writing to learn's use in science² education, Prain (2006) identifies two definitions of the practice:

- The first is learning to compose the types of documents commonly produced by experts in a given field. In science, for example, this includes lab reports and scholarly research papers. According to this definition, learning a discipline like biology or chemistry is, in part, the process of becoming able to write in certain accepted ways. Writing is not simply a technique for learning; it is also a subject matter of the learning. In the parlance of education, assignments that mimic the real types of work by professionals in a field are called “authentic.”
- The second definition views writing as a technique for learning, as a means but not an end. This definition includes writing exercises that aid learning but that are not authentic

² Much of the research on writing to learn and related concepts has been done in STEM classes, so the literature discussed in this paper will lean toward these fields. One potential area of inquiry is how writing to learn in STEM classes differs from its use in other disciplines.

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replicas of the finished products created by professionals in a field. Examples include "1-minute papers" and reflective writing (Dukewich and Vossen, 2015).

Similar distinctions, with different terminology, are made by Colorado State University's Writing Across the Curriculum Clearinghouse (WAC Clearinghouse), one of the leading resources in the field. It defines "writing across the curriculum"—that is, writing in many types of courses, not just those offered by the English department—as the top level category. Under writing across the curriculum fall these subcategories:

- Writing in the Disciplines

The term "writing in the disciplines" refers to activities in which students practice the types of writing done in their fields to become skilled with the "specific genres and formats typical of a given discipline" (WAC Clearinghouse, 2022a). It is also called "writing to communicate" because it models creating documents that would ordinarily be shared, such as scholarly research articles.

- Writing to Learn

The WAC Clearinghouse uses the term "writing to learn" to refer to "short, impromptu or otherwise informal and low-stakes writing tasks that help students think through key concepts or ideas presented in a course" (WAC Clearinghouse, 2022b). Their purpose is not typically to communicate but to develop and structure one's own knowledge.

Exercises in this category tend to be short—the WAC Clearinghouse gives as examples pretest warm-ups, reading journals, and Elbow's believing and doubting games. (For more on the believing and doubting games, see Elbow (2009).)

- Writing to Engage

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The practice of “writing to engage” focuses not on communicating but on critical thinking and associated longer, deeper types of writing such as evaluations, critiques, and progress reports (WAC Clearinghouse, 2022c). Importantly, practices like evaluation and critique entail not just learning established knowledge but also creating new knowledge, opening a space for creative thinking too. Exploring the connections between writing across the curriculum and critical thinking has been a focus for the WAC Clearinghouse's founding editor and publisher, Mike Palmquist. Spotting a gap in current practices, he argues that higher education has concentrated on short exercises to help students build basic skills and authentic types of writing that put mature skills into practice, but hasn't made enough use of writing that lies between these poles (Palmquist, 2020). This gap is an especially ripe target for the proposed Writing to Learn course's action research, presenting an opportunity to apply concepts of critical and creative thinking. (Palmquist briefly mentions creating as one underused aspect of writing to learn.)

In this paper and the proposed course, I follow Prain in using the phrase “writing to learn” to refer to all of the types of writing discussed above. Using “writing to learn” to denote all of these activities is simpler and is consistent with the use of the term in much of the literature. This usage also aligns with the common sense idea that any writing activities that aid learning belong in the course—the WAC Clearinghouse's descriptions of writing in the disciplines and writing to engage do, after all, say that these practices involve learning.

But while I don't, in general, use the WAC Clearinghouse's terminology, I sometimes rely on its distinctions among types of writing. These distinctions will be covered in the course too and are crucial for dissecting how writing can be used for learning. Students, in their role as

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action researchers, will critique the WAC Clearinghouse's three-part categorization and consider whether it is the best taxonomy to use.

The course's action research—to be conducted by the instructor and students alike—will also work to clarify what various literature reviews have found to be inconsistent results in writing to learn research (Gere et al., 2019; Arnold et al., 2017; Anderson et al., 2015; Klein, 1999; Keys, 1999). For example, Arnold et al. (2017) see in the literature a “confusing set of findings” in which studies vary on whether writing to learn is effective and in which the differing contexts and sometimes low sample sizes of case studies complicate the interpretation of results. This confusion, they argue, stems partly from a failure in some studies to consider the different types of learning that might be achieved from different types of writing.

Most reviews of the writing to learn literature treat varied definitions and differing contexts as a problem: How can we definitively determine whether writing to learn is an effective strategy if it is practiced in different ways in different courses? But this paper and the proposed course suggest an alternative response to such confusion. Rather than narrowing down the concept to conduct a controlled study, I present a course design that includes concepts and exercises across the range of writing to learn. This is not an argument against narrow definitions and controlled studies, but it is an argument in favor of the role of diverse, in-context research as one essential component of improving and expanding the practice of writing to learn in higher education.

Yet all writing to learn practices would not fit within a single course, so some curation of the literature is needed. And despite some inconsistencies and uncertainties in the research, there is solid support for the pedagogical benefits of many writing activities. Therefore, the course's choice of readings and activities will build a foundation based on the long history of writing to

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learn, even as students perform as action researchers, questioning common beliefs and improving existing practices.

A good starting place for this foundation is Anderson et al.'s study (2015), which added questions about writing to the Indiana University Bloomington's annual National Survey of Student Engagement, in which undergraduates from many institutions provide answers about their educational experiences and perceptions. Based on responses from 41,802 seniors and 29,634 freshman, Anderson et al. analyzed which writing practices students were using and compared them to students' perceived learning, as judged by answers to the survey's standard questions. The study found that the following three characteristics of writing tasks were most associated with learning (pp. 205–207):

- "interaction" about drafts, such as instructor feedback and classmate peer review;
- "meaning-making," such as applying "integrative, critical, or original thinking";
- "clear writing expectations," such as providing rubrics.

A meta-analysis by Gere et al. (2019) added to these three characteristics metacognition, which is widely used in writing to learn studies and has often been associated with successful learning.

These four characteristics serve as some of the guideposts for the course's overall design and its choice of assignments and in-class activities. Interaction about drafts and clear writing expectations relate to the instructor's communication and class management, and they are addressed by having students submit multiple drafts and engage in peer reviews, among other aspects of the course design. But it is meaning-making and metacognition that relate directly to the course's content and its goal of having students use critical and creative thinking as action researchers. In particular, the course design is based on Gere et al.'s view that the literature

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supports the idea that writing to learn could enable students to “shift from algorithmic to conceptual learning” (p. 103).

Another guidepost is Arnold et al.’s research (2017) on how different types of writing yield different learning results. In particular, “more essay-like” writing was found to be effective for learning, suggesting the benefits of “reorganization and elaboration,” which are taught and practiced within the course. A final guidepost is Bean’s (2011) idea that writing about a topic in multiple genres improves critical thinking. With this in mind, students are assigned to write in several genres throughout the course.

The Science of Learning

The psychology and neuroscience literature on how people learn is vast, but it hasn’t been extensively incorporated into the study and practice of writing to learn. Many classroom applications have focused on metacognition and reflection. While these activities are indeed pedagogically very useful, they are only two of the concepts from the science of learning that could help students to more effectively use writing to learn. In particular, whereas metacognitive exercises in writing classes are often *descriptive*—students are asked to describe their processes and thoughts—the literature on learning offers concepts that are *prescriptive*, identifying which pedagogical and study practices work best.

The design of the Writing to Learn course aims to address Arnold et al.’s (2017) observation that there are underexplored potential benefits in connecting the writing to learn and cognitive psychology literatures, which they see as having “developed largely independently resulting in different, yet at times parallel, views on learning” (p. 116).

Below is a review of the key science of learning concepts used and discussed in the Writing to Learn course.

LEARNING: A DEFINITION AND THEORIES

A useful definition of learning is provided in the *American Psychological Association Dictionary*:

[T]he acquisition of novel information, behaviors, or abilities after practice, observation, or other experiences, as evidenced by change in behavior, knowledge, or brain function. Learning involves consciously or nonconsciously attending to relevant aspects of incoming information, mentally organizing the information into a coherent cognitive representation, and integrating it with relevant existing knowledge activated from long-term memory (APA, n.d.).

The course integrates many concepts from this definition. It covers memorizing facts (“information”) and putting learning into practice (“behavior”), for example. The course also introduces students to learning *theories*, which go beyond the APA’s basic definition to explain the contexts and conditions in which learning occurs most effectively. Specifically, learning theories propose answers to the following questions, according to Ertmer and Newby (2013), who build on the ideas of Schunk (1991), represented by the first five questions, and who add two questions from the perspective of instructional design, represented by the final pair in the list:

“How does learning occur?”

“Which factors influence learning?”

“What is the role of memory?”

“How does transfer occur?”

“What types of learning are best explained by the theory?”

“What basic assumptions/principles of this theory are relevant to instructional design?”

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“How should instruction be structured to facilitate learning?”

These questions will guide students’ studying of learning theories and give them a basis on which to analyze each as action researchers.

There are four prevalent learning theories (Ertmer and Newby, 2013):

- behaviorism, which views learning mainly in terms of the influence of external stimuli;
- cognitivism, which focuses on the mental processes involved in learning;
- constructivism, which sees learning as a process by which people “make meaning” of new information and skills, largely by connecting them to previous knowledge;
- connectivism, which does not supplant the ideas of cognitivism or constructivism but adds the idea that being able to access information or complete tasks through technology (such as the Internet or software) qualifies as learning. As described by Siemens (2005) in the seminal article that introduced this theory, "Know-how and know-what is being supplemented with know-where (the understanding of where to find knowledge needed)" (p. 2).

All of these theories will be covered in the class, because they are foundational knowledge in the science of learning. But they’ll be given different weight and will play different roles.

Behaviorism is largely out of favor in psychology, and it treats learning as something done *to* people rather than *by* them, so it will be discussed only for historical purposes. Cognitivism will be considered mainly for the portion of the course devoted to the retention of facts and mastering of skills (especially Weeks 3–4).

The overall course design, and the focus of students’ study of learning, is rooted in constructivism and connectivism. These theories emphasize a person’s intentional involvement in their own learning, and they provide more opportunities to make changes to the course as

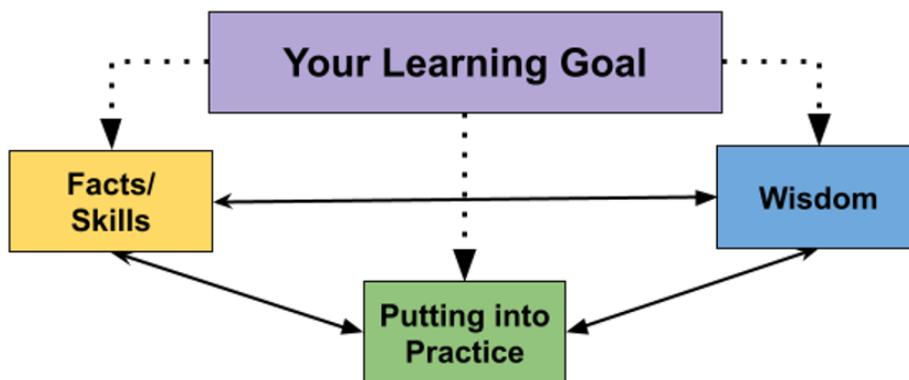
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action researchers. Connectivism, in particular, presents a target for the course's action research because it is relatively new and thus still being tested and shaped. Further, its focus on technology will be novel to many adult students, whose past education was in a previous era, without today's software and availability of networked information. And in my experience since 2011 teaching undergraduates, who were educated in the new connectivist era Siemens describes, most traditional college age students need to be shown how to use technology for scholarly research and writing: the everyday technical fluency of students doesn't automatically help them to use technology for writing. (The fact that knowledge and skills in one domain don't easily transfer to another is covered elsewhere in this paper and discussed with students in the course itself.)

THE FACTS/SKILLS, WISDOM, AND PUTTING INTO PRACTICE FRAMEWORK

This course asks students to choose their own learning goals and then to use various writing and learning approaches to achieve them. To ensure that these self-selected goals enable students to practice all of the approaches covered in the course, they must entail

- learning facts and developing skills,
- obtaining wisdom,
- putting facts, skills, and wisdom into practice.



(Source: Author)

This multidimensional framework enables students to fully engage in the course. For example, the goal of simply memorizing dates and names pertaining to World War II would not be sufficient; a student could revise this goal to teaching an adult learning course about World War II. This revised goal would include learning facts but would also require attaining some wisdom, because teaching requires sense-making about a topic, such as to lead an open discussion in a class. And the processes of designing and delivering the course would lead to further learning, not just about World War II but also about teaching, for example.

This facts/skills, wisdom, and putting into practice framework is based in part on psychologist Robert Sternberg's wisdom-intelligence-creativity synthesized (WICS) model (2003). Having a connection to the literature is important for the theoretical and empirical grounding in my course design decisions but also to share with students, so that, as action researchers, they can critique work done in class.

Sternberg's WICS model is useful for the course because:

- It contains a good literature review of scholarly work on wisdom, which will be useful for students in Writing to Learn as they consider how to develop wisdom about their learning topics. It also includes Sternberg's own definition:

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[A]n individual is wise to the extent he or she uses successful intelligence, creativity, and experience as moderated by values to (a) seek to reach a common good, (b) by balancing intrapersonal (one's own), interpersonal (others'), and extrapersonal (organizational/institutional/ spiritual) interests, (c) over the short and long terms, to (d) adapt to, shape, and select environments (p. 395).

This definition shows how both action research ("adapt" and "shape" situations) and creative thinking connect to wisdom.

- Sternberg sees WIC as, at least in part, "developing expertise," so it is learnable, not simply innate.
- Sternberg's distinction between "academic intelligence" and "practical intelligence" will be useful for students as they evaluate different aspects of learning:
 - Academic intelligence includes both memory and analytical skills. Memory is the ability to "recall and recognize" and relates directly to the "facts" requirement of students' goals. The other component of intelligence comprises the abilities to "analyze, evaluate, and judge information," and this relates to the skills, wisdom, and putting into practice components of student goals.
 - Practical intelligence involves solving "everyday problems" with the help of "knowledge gained from experience" (p. 388). Sternberg's description resembles aspects of action research (one can change an environment) and metacognition (one can change themselves to better function in an environment). Sternberg also mentions choosing an environment in which to work.
- Sternberg applies his WICS model to a variety of topics, so it is flexible. The article on leadership (2003) is a good introduction and the definition of leadership (contrasted to

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management, which is more tactical and administrative) bears some similarities to action research.

- The synthesis element of the WICS model is important because Writing to Learn aims to interconnect various types of learning.

Sternberg's article is meant as a starting point for discussing wisdom, a subject that extends well beyond scholarly literature. The Writing to Learn course will consider thoughts on wisdom from philosophy, cultures, artists and other sources. For example, the literary essay assignment and the readings of published essays demonstrate how this genre displays an author's wisdom (see Weeks 5–7 in the course plan).

The course's facts/skills-practice-wisdom framework was developed to categorize these practices broadly and simply. A complex framework, on the other hand, might capture more granular distinctions, which could be useful for some research purposes, but would be less useful for class activities among a varied group of students with differing learning goals.

The terms “facts” and “practice” also roughly correspond to technical terms in the psychology literature:

- *Explicit knowledge*—Can be shared directly in writing or speech. Often called “knowing that,” as in “a person knows that $2+2=4$ ” and can state this explicitly.
- *Implicit (aka tacit) knowledge*—Is difficult to express in writing or speech; a common example is riding a bike. This is often called “knowing how.” Sometimes the term “procedural knowledge” is used to describe “knowing how” to perform a more prescribed step-by-step activity.

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Most of the facts students learn and skills they acquire will be well-established core knowledge in their chosen topic area, but the course also invites students to develop new ideas and practices that contribute to a field.

Integrating the concept of wisdom into the course invites a wider range of student-contributed discussion concepts and expands the course bibliography beyond the scholarly and educator-practitioner literature, thus providing a better survey of thinking about learning.

Putting knowledge, skills, and wisdom into practice gives students feedback about their learning. For example, a student could teach a workshop to get personal feedback from their target audience or create a video to test their technical and aesthetic skills. These tests aim to be at least partly uncontrolled, so that students can get unexpected information: people in a workshop may express surprising opinions and filmmaking hardware and software might not work as anticipated. The course includes two formal putting into practice assignments, in which students use a full range of their learning, but students will also often use smaller activities to get frequent feedback.

TRANSFER OF KNOWLEDGE AND SKILLS (CORRESPONDS TO WEEKS 1, 2, AND 13)

Years ago, in my Technical Communication class at Temple, I assigned an annotated bibliography that students would complete before submitting a research paper's first draft. Their work on the bibliography was detailed and thoughtful, so I was surprised when their papers were underdeveloped. Many sources used in the bibliography weren't used in the paper. Sharp analysis from the bibliography turned into loose generalizations in the paper.

Students hadn't transferred their learning from one assignment to another, even though it was clear—to me, at least—that the bibliography was a scaffolding exercise for the paper. The two

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assignments even required the same four subheadings, which I assumed would clearly show the connection between the bibliography and the paper.

I've told this story to other educators, who've nodded and shared similar experiences. As instructors, this is confounding: how can students miss something that's so evident? But psychology research shows that transferring knowledge and skills from one situation to another is difficult.

At the beginning of her essay debunking the idea that "writing knowledge transfers easily," Carillo (2017) says that "It may not be an exaggeration to say that the very notion of writing instruction is based on a myth" (p. 34). The "myth" that Carillo targets is that students will apply their learning from early writing courses like freshman composition to later, discipline-specific writing classes.

To generalize Carillo's point about learning transfer not occurring automatically between writing courses, we can more broadly say that many educators mistakenly believe that if a student has demonstrated knowledge or skill in one context, they have "learned" it. And generalizing further, we can hypothesize that many educators fail to understand the psychology of learning, which shows not only that transfer is an obstacle, but that in many other ways, learning doesn't "just happen." The need to challenge these assumptions about transfer and to develop better pedagogical techniques for fostering it creates an opportunity to use critical and creative thinking.

Transfer is also a conspicuous—if not quite quantifiable—metric for learning. Students will be able to see for themselves what past learning hasn't transferred to new situations, and they can set transferring learning out of the Writing to Learn course as a goal.

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The Writing to Learn course includes activities to *transfer in* previous learning and *transfer out* learning to future work. The design of the transfer in and transfer out exercises specifically, along with various aspects of the course in general, are influenced by the concept that Yancey et al. call the "writing-transfer-mindset" (2018). As factors that promote transfer, Yancey et al. identify reflection, student awareness of transfer (and the setting of it as a goal), and the development of a vocabulary for writing that includes these terms: "rhetorical situation, purpose, context, audience, genre, reflection, knowledge, and discourse community" (p. 43). These concepts will be discussed and used in activities throughout the course.

One major transfer-related assignment, submitted in the middle and near the end of the semester, analogizes learning transfer in the course to NASA's development of technology for the Apollo program that sent people to the Moon. To complete its mission, NASA needed to innovate new technology. Later, it offered technology created through its Moon mission to private businesses (NASA, 2004). Just as technology developed for NASA's Moon mission has been transferred to other uses in other domains, the skills and tools students develop to achieve their Writing to Learn goal can be transferred to future contexts. The Moon Mission Toolkit assignment asks students to record learning throughout the course, organized for quick scanning and including active Web links for easy reference.

Making transfer a named topic within the course and having students routinely think about it follows guidance from Elon University's "Statement on Writing Transfer." The statement, based on a two-year research seminar with 45 participants, identifies as course design traits that aid transfer "explicitly modeling transfer-focused thinking" and "the application of metacognitive awareness as a conscious and explicit part of a process of learning" (2014). (The full statement

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will be assigned reading for students, because of both its good overview of issues in writing transfer and its direct invitation to use its ideas for continued research on the topic.)

FOUNDATIONAL KNOWLEDGE AND SKILLS (CORRESPONDS TO WEEKS 3–4)

To help students use writing as a learning technique, the course talks about how learning works. Otherwise, the writing to learn process would remain opaque, and students would lack the understanding needed to build their own writing to learn practices.

Two types of foundational learning that the course covers are memorizing facts and mastering discrete skills. (A “discrete skill” has a clearly defined beginning and end, such as completing a long-division problem or playing a musical scale up and down an octave (Oxford Reference, n.d.).) The memorization of facts and acquisition of discrete skills are often goals in themselves, but they are also the foundation for multidimensional learning, such as defined in Writing to Learn students’ goals, which involve acquiring wisdom and putting knowledge into practice.

In the science of pedagogy, the effectiveness of quizzes for improving memorization is well established (McDaniel et al., 2011; Roediger and Karpicke, 2006a; Roediger and Karpicke, 2006b). Learning to self-quiz is a valuable skill in itself, for critical and creative thinkers in general and for writers in particular, because it helps in mastering foundational knowledge. Students could use this technique to enhance learning in a variety of settings in the future. Further, retrieval practice can improve the transfer of learning to novel contexts (Roediger and Butler, 2011).

One form of writing that has been shown to improve retention is “elaboration,” which involves writing about the topic being studied while adding meaning to the content, such as by relating it to previous learning (Arnold et al., 2017; Weinstein et al., 2017). Just as not all types

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of writing yield the same types of learning, not all types of elaboration help memory in the same way. To make elaboration effective, the course will use the "elaboration principles" that Levin (1988) recommends based on a literature review: elaboration should be "meaningful," "integrate" new and old knowledge, and make "logical connections" (pp. 192–193). Levin also finds that metacognition makes elaboration more effective.

And because the course positions students as action researchers, quizzing and other retrieval activities will be among the practices they'll discuss and critique. Testing has such a large role in education that not covering it in a survey course on learning would be a significant omission. Further, one theme of the course is that writing is not just composing words but is all of the activities involved in creating written works, including acquiring basic knowledge and skills. This conception follows Bereiter and Scardamalia (1987), who write that "[t]he mental activities of writing considered in our research are the same kinds of higher mental processes that figure in cognitive research on all aspects of human intelligence. They include goal setting, planning, memory search, problem solving, evaluation, and diagnosis" (p. xiii).

EMOTIONS AND LEARNING (CORRESPONDS TO WEEK 6)

The course covers emotions because there's compelling evidence for their role in learning and, from my own experience as a teacher, signaling to students that emotions can be discussed opens up discussions.

The following sources will be used because of their practical applications:

- Immordino-Yang and Faeth (2016) explain that emotion is important to learning. The idea that students should suppress or shut off feelings in favor of cold rationality misunderstands the important role that affect plays in education. But the authors also say that not all emotions are helpful. For example, a student who becomes overwhelmed with

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negative judgments when reviewing a rough draft would be inhibited. Conversely, if a student's negative and positive emotions while rereading their draft correspond to the actual quality of their writing, they would be using feelings in a productive, *task relevant*, way.

- The control-value theory identifies the overarching characteristics of a course or assignment that promote student motivation: the ability for students to *control* their learning (such as by selecting topics and having the capacity to succeed) and *valuing* what they are learning (Pekrun et al., 2007). Writing to Learn incorporates control-value theory, letting students design some assignments and class activities and having them choose topics that are personally important. And by sharing the concept of control-value theory, the course encourages students to use these concepts to guide their self-learning.

Pedagogy: Theory and Practice

The literatures on writing to learn and the science of learning heavily shape the design of this course and will be shared directly with students. But as is often the case in designing courses, a gap will remain between what can be strongly justified by empirical research and the reasoning behind many pedagogical decisions. Controlled research of learning lends credibility to many of the choices I've made in crafting assignments and activities, yet such studies, because of their tight controls, cannot provide a detailed blueprint describing every aspect of a course. And even case studies of using writing to learn, while capturing some of the complexities and unpredictability of real classes, employ context-specific assignments and activities, which would need to be adapted for a different course.

This gap between research and practice motivated the following choices I made in designing the course:

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- Students (and the instructor) will be action researchers, evaluating how concepts from the literature work in practice.
- As an instructor, I'll explicitly share my pedagogical decisions with students and ask them to give me feedback on them, a practice I call "pulling back the curtain."

The course will keep alive the tension between theories and their applications.

Students will also study the literature on writing, both from scholarly researchers and working writers. To help students use writing more effectively to learn, the course works to improve their composition skills and teaches them about publishing.

ACTION RESEARCH AND PULLING BACK THE CURTAIN

The literature offers many controlled studies on writing to learn, yet narrowly focused research can't provide detailed guidance about every aspect of course design and execution, especially considering the complex dynamics of real classes. The literature also includes many writing to learn case studies, but they are limited to specific contexts and evaluate only a limited range of writing and learning activities. To help fill these gaps, this course puts students into the role of action researchers.

By conducting action research, the instructor and students can generate empirical evidence that enriches the field's understanding of concepts in the literature and identifies new questions to pursue. Performing action research will also help students by making them active rather than passive learners, and it will push students to think about how to transfer ideas from the literature into their own practices. (For one of many studies on the benefits of active learning, see Freeman et al. (2014).)

Unlike many other forms of scholarly work, action research doesn't require training in specialized methodologies. "[E]veryone can do it," say McNiff and Whitehead, who add that

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students not only can but also "should do action research" (2011, p. 7). Action research is particularly suited to the Writing to Learn course because it works well when performed by groups. And unlike more rigidly defined methodologies, its parameters and goals are decided "in negotiation" within a community, such as a class (p. 8).

To help students take on the role of action researchers, this course uses both McNiff and Whitehead's work and two chapters of a book by Tomal (2010), which is also valuable for its clear, plain-language descriptions of key research concepts such as dependent and independent variables, the operationalizing of terms, and the null hypothesis. These concepts will be discussed in the course for two reasons: understanding them is important for interpreting scholarly research papers (which is needed for many types of learning) and knowing about "traditional research methods," as Tomal calls them, will help to put action research into place among other research approaches. Understanding how action research differs from other methods will help students to more critically compare their results, as action researchers, to the results about writing to learn in the literature.

But McNiff and Whitehead's reassurance that everyone can conduct action research shouldn't be interpreted as dismissing practice or training. By analogy, we might say that "everyone can be a public speaker" as a way of expressing that all voices have something to offer to a conversation and that (almost) anyone can stand up and share their thoughts. As with public speaking, however, there is much to learn about action research. The need to help students perform well as action researchers creates an opening for critical and creative thinking.

Taylor (2002) describes two conceptions of critical thinking: the traditional view, which involves judging and fault-finding, and the view he discovered through teaching, which compares critical thinking to taking a journey. His journeying metaphor emerged from watching

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students struggle to take a self-regulated role similar to the action research that the Writing to Learn course plans. Taylor's students didn't see the value of talking to classmates, for example, and they wanted more "direct interaction" with him. Some didn't see themselves as critical thinkers, found the process of dialogue uncomfortable, and wanted prescriptive guidance about critical thinking. Anticipating that students in Writing to Learn will share these concerns, and that they will think the same about being asked to be creative, the course will discuss and practice critical and creative thinking to help all class members fully participate as action researchers.

First, as part of Week 1's "transfer in" activity, students will be asked to identify the knowledge and skills they have used before. Many students might not recognize the similarity between science experiments, for example, and critical and creative thinking, so instructor prompts will help them to recognize the opportunity to transfer in previous learning.

Second, because many skills that students already have are discipline specific, the course also teaches more general skills, applicable to many situations. Definitions of critical and creative thinking abound, but most identify (among other things) conducive practices and dispositions.

To help students make conducive practices into habits, the course gives students generic critical thinking questions from the literature to use in peer review and other exercises, for example, "Could you elaborate further?" and "How does that relate to the problem?" from Paul and Elder (2006).

These stock questions help students develop a rote approach to developing the habits of critical thinking. Creativity can also be fostered through step-by-step processes. The SCAMPER substitution method, for example, considers the following changes to an idea, practice, or technology:

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- substitute,
- combine,
- adapt,
- modify (or modify, maximize, minimize),
- put to another use,
- eliminate,
- reverse or rearrange.

Students could use this and other step-by-step processes to make creative changes to the course, participating as action researchers. (See, for example, the Osborne–Parnes creative problem solving method (Parnes, 1992).)

Unlike the practices listed above, dispositions cannot be put into action on demand by simply following a rote procedure. Instead, students will work to foster these habits throughout the semester. Given that the course spans many topics, a short list of generic dispositions will be most effective. For critical thinking, Tishman’s (2001) summary of core thinking habits, quoted below, will be used:

1. “The disposition to pose and explore problems.
2. “The disposition to critique and test theories and explanations.
3. “The disposition to seek multiple perspectives and possibilities.
4. “The disposition to be judicious and reflective.” (p. 73)

For dispositions that promote creativity, the course uses a similarly short and generic list: “openness to experience” and a willingness to take risks (Ivcevic and Hoffmann, 2019).

To enable students to fully analyze and critique all components of the course, I’ll routinely explain the pedagogical reasoning that led me to choose the topics to include, how assignments

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were crafted, and how the course is managed. Students will be encouraged to comment on these decisions and to suggest improvements. I've previously called such open discussion about a course's pedagogical strategy "pulling back the curtain" because it resembles a magician showing the audience how a trick works (Keston, 2021). Teaching pedagogical concepts will give students techniques they can later apply to their own learning and to their own teaching, if applicable.

The practices of pulling back the curtain and action research go hand-in-hand. By sharing the pedagogical reasoning behind the course's design, the instructor begins a dialogue about learning and invites student feedback. And by performing as action researchers, students pull back the curtain on their own experiences, talking about their learning challenges and corrective actions they will make.

The idea that teaching about a topic helps one to learn is supported by my own experience and by formal research:

- Teaching about a topic has often helped me to retain information and to think more deeply than merely studying it. When I teach, I'm focused and emotionally engaged (including both enthusiasm and anxiety), which are states that promote memory and thinking. Giving presentations affects me in similar ways, and the course design asks students to give formal presentations in Week 12.
- Fiorella and Mayer (2013) conducted a study in which students were divided into three groups: those who only studied a topic (control group); those who prepared to teach a lesson on the topic (preparation group); and those who both prepared a lesson and taught it (teaching group). The preparation and teaching groups did better than the control group

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on a test shortly after the activity, and the teaching group (but not the preparation group) did better on a test given a week later.

Teaching's ability to aid learning has also become popular among the public recently because of an often-shared quote attributed to the Roman philosopher Seneca: "While we teach, we learn" (see, for example, Murphy (2011) for a use in the popular press).

USING WRITING AS A TOOL FOR LEARNING

To show students how to use writing as a tool for learning, this course must teach them about the tool itself—just as a surgeon must learn to hold a scalpel or a violist a bow. Providing guidance on composition will also establish common concepts and terminology within the course.

But teaching students to become better, more versatile writers presents two major challenges: First, determining which aspects of writing to cover is difficult. Writing entails more than can be covered in a single semester, especially when a course involves other topics, such as the science of learning. I've made decisions on what to cover based on:

- my own teaching experience,
- my own practice as a reader and writer,
- trade books on writing,
- ideas from the scholarly literature on the theory of composition,
- my work on the in-progress textbook *STEM Writing: Mindsets, Tools, and Techniques*.

One target of the course's action research is which aspects of writing are most useful to include in the course. Over time, the course and its materials will be redesigned based on this feedback.

Second, students vary in their skills and their experience levels as writers. A concern, then, is that inequities in writing will lead to inequities in outcomes in the course. An answer to this

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concern comes from Bereiter and Scardamalia (1987), who argue that most students, even those often considered to not be good writers based on literary standards, can still perform functions that I'm here calling "writing to learn":

[Students] are used to considering whether the text they have written says what they want it to say and whether they themselves believe what the text says. In the process, they are likely to consider not only changes in the text but also changes in what they want to say. Thus it is that writing can play a role in the development of their knowledge (p. 11).

Bereiter and Scardamalia make a use distinction between a type of communication they call "knowledge telling" and another they call "knowledge transforming." Knowledge telling, which is a more basic level of writing, involves listing what one knows without reorganizing or rethinking. The higher level, knowledge transformation, makes writing and thinking an integrated activity; over the span of multiple drafts, writers develop ideas through the process of composing texts.

With the goal of knowledge transformation in mind, a key theme throughout the course is that writing clearly and precisely helps to develop and test ideas. In his book *Writing to Learn*, Zinsler explains that "[w]riting organizes and clarifies our thoughts" (1988, p. 16). He also describes writing as a way to understand our own thinking: "we write to find out what we know and what we want to say" (p. viii). And he links writing and learning: "[w]riting and thinking and learning [are] the same process" (p. ix).

A similar point is made by Heard (2016) in his book *The Scientist's Guide to Writing: How to Write More Easily and Effectively Throughout Your Scientific Career*: "What if you never 'started' writing up a project because you were writing all the way through its planning and execution?" (p. 38). This approach, he says, "makes doing science and writing about it threads of

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a single interwoven activity” (p. 38). Heard uses the phrase “early writing” to describe writing while still learning.

The general learning benefits of writing to communicate (which the WAC Clearinghouse also calls writing across the disciplines) are often neglected in the literature. Typically, the value of writing to communicate is seen only as learning how to work in a particular genre, with defined conventions. So when students are asked to write a scholarly research paper, for example, the goal is seen only as teaching them to conform to work within the introduction-methods-results-discussion framework and to adopt the voice of a scientist. But as Zinsser and Heard point out, completing an authentic writing assignment such as this also aids thinking and learning about the topic.

Writing to Learn assigns students to compose a piece in the style of an authentic type of writing in their chosen field. This assignment aims to achieve both learning benefits discussed above: to give students practice with the conventions of a particular genre and to foster learning about their topics.

Another assignment asks students to write in a different genre, a literary essay, which could also be called “creative nonfiction.” Students will analyze writing such as Brian Phillips’ essay “Sea of Crises” (2015) as an example of one type of writing to learn. Phillips shows how a piece of writing can nominally be about one thing (in this case, sumo wrestling) while also being about many other topics (cultural traditions, mental health, and the narrative techniques of novels, to name a few). Similarly, a Writing to Learn student will explore one self-chosen topic as their learning goal and in the process discover much more. Other types of nonfiction will be studied to give students examples of various writing structures to use as models (see Week 2).

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A subtopic in the course related to learning to write is the Open Education Resource (OER) movement. The decision to cover OERs is based on the following:

- OERs are a source of educational materials that students can study to learn about their topics; in particular, students whose previous formal education was completed before OERs became popular might not know about these resources.
- For the portion of the course about teaching to learn and creating pedagogical materials (Week 8), OERs provide examples of lesson plans and other instructional content.
- There is an OER community, with online meeting places, communication channels, and events. Participating in a community relates to the concepts of discourse communities and social constructivist learning, which are themes in the course.
- OER repositories are places where students can publish their work, which the course encourages.
- OERs and related concepts like open peer review and open science are important trends in publishing, and as a writing class, trends in publishing are a subtopic.

Objections and Replies

IS AN ENTIRE COURSE NECESSARY?

In higher education, many of writing to learn's uses are in disciplinary courses, especially in STEM. But instructors often express concern that it takes time away from other activities (Palmquist et al., 2020; Finkenstaedt-Quinn et al., 2021). Thus writing to learn is frequently limited to short, "low stakes" in-class exercises. This way of using writing to learn diminishes its effectiveness, I hypothesize, so the proposed course focuses an entire semester on the topic.

Writing to Learn is, to an extent, a survey course that aims to cover a wide range of writing and learning concepts. While in many cases I've chosen ideas and activities that will be most

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helpful based on my own teaching experience and empirical research in the literature, another course design goal, sometimes pulling in a different direction, is to give students a broad understanding of the science of learning and of writing studies. This goal motivates the inclusion of many practices, especially the intensive study of concepts in Weeks 3–4.

CAN AN INSTRUCTOR EFFECTIVELY TEACH A COURSE THIS BROAD?

A common reservation about using writing to learn is a lack of confidence that many instructors feel regarding teaching composition, which is outside their expertise (Palmquist et al., 2020). This proposed course adds teaching the science of learning on top of this challenge, and students will choose their own topics, spanning a range of disciplines.

One way that instructors can address this challenge is to remix the course’s content so that they’re comfortable teaching it, which is allowed under the Creative Commons Attribution-NonCommercial 4.0 International license used for this material. The course outline below doesn’t specify every pedagogical decision—grading rubrics are omitted, for example—so some aspects of the design are meant to be determined by each instructor.

But another argument made by this paper is that concepts from writing to learn and the science of learning are useful for instructors in many fields and contexts. Therefore, the course pushes educators to expand their teaching toolkits, which will sometimes be difficult.

I’ve wrestled with this difficulty in my own teaching at Temple University: I’m a technical writer and my students are engineers. To guide students on writing about topics that I know little about, I focus on treating writing as a problem-solving process and have students engage in frequent metacognition. Talking with students often about their progress and obstacles helps me to assess their needs, so that I can offer individual advice and make some changes to the overall course plan throughout the semester. As opposed to rigid designs, this flexibility enables

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teaching to be responsive to evidence about each cohort and allows students to become more active in their own learning.

CAN WRITING TO LEARN BE TAUGHT OUTSIDE OF A DISCIPLINE?

Teaching writing outside of a particular discipline, as my course design proposes, raises the potential objection that writing necessarily occurs in a context or “discourse community.”

Writing to Learn’s design answers this objection by:

- making the concept of discourse communities a part of the course discussion with students,
- giving students assignments in which they put learning into practice; some of the writing in the course will be “authentic,” with a context determined by students.

CAN STUDENTS PERFORM WELL AS ACTION RESEARCHERS?

Instructors may doubt that their students would take on the role of action researchers, which might be unfamiliar and uncomfortable. The course’s design recognizes this obstacle and aims to help students overcome their reluctance. Depending on the characteristics of any particular cohort, the amount and level of action research expected can be de-emphasized. For example, early in their academic careers, students may be less practiced with self-regulated activities like analyzing pedagogical concepts and might have less of a perspective from which to offer constructive critiques. But even first-year undergraduates can reflect on their experiences and offer their opinions, especially with the help of the scaffolding provided by the course’s activities and reading list.

Future Directions: An Invitation to Remix

This course's Creative Commons license type, CC BY-NC 4.0, allows for others to do the following with the materials in this document:

“Share—copy and redistribute the material in any medium or format

“Adapt—remix, transform, and build upon the material” (Creative Commons, n.d.).

Students and other educators can use this material, in whole or in part, in its original form or creatively modified and expanded upon as they wish. I hope that others will share their remixes and talk about their experiences using the materials, thus contributing to the course's action research.

Some specific suggestions for remixes are:

- The Writing to Learn course was designed to be interdisciplinary, so it can be offered as an undergraduate general education course or as a graduate course open to students with varying backgrounds. But the course or parts of it could be adapted for discipline-specific classes, which is one of the most common settings in which writing to learn is practiced.
- The course's use of action research as its primary methodology limits the generalizability of its results. As Tomal (2010) notes, “[W]hile traditional research methods are much more concerned with relating the findings to other settings or populations, action research is more concerned with improvements within the context of the study.” A remix of the course could replace or supplement action research with more generalizable research methods.
- One reason this course encompasses a broad range of topics is to find areas that need further inquiry, both in the field of writing to learn and for students individually. The ideas generated by the course's action research could later be tested in controlled studies.

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For example, the course's discussions ask students open-ended questions about their perceptions of, and experiences with, various writing and learning activities. But students might instead be asked to answer according to a Likert scale or other quantitative instrument.

- The time constraints of a single semester limit the range of writing activities included in this course. But many more types could be explored, from small in-class exercises to major papers. Two good reference sources for writing to learn assignments are:
 - The WAC Clearinghouse's Web page on writing to learn (2022b) describes short exercises, and its page on writing to engage (2022c) describes deeper assignments (like critiques and comparisons) that foster critical thinking.
 - Anne Michaels Edwards' book *Writing to Learn: An Introduction to Writing Philosophical Essays* (1999) breaks down philosophy into cognitive steps, devoting a chapter each to "Writing for Understanding," "Writing for Application," "Writing for Analysis," "Writing for Evaluation," and "Writing for Synthesis." These writing assignments represent the building blocks of thinking and, like the WAC Clearinghouse's "writing to engage" assignments, could be used as scaffolding between smaller writing exercises and comprehensive term papers.
- Some of the course's concepts and practices were inspired by the literature on critical and creative thinking. But these two fields might also find inspiration in ideas from this course. There is more room to explore how writing influences the processes of critical and creative thinking. For example, one metric of the gap in the creative thinking literature is that in the *Cambridge Handbook of Creativity* (Kaufman & Sternberg, 2019),

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not a single chapter title includes the word “writing” or a near synonym; the only reference to writing in its index is a single entry for “writing as therapy.”

Educators, writers, and anyone with an interest in these ideas are encouraged to go beyond these suggestions to reuse and repurpose this course material.

Course Outline

Introduction

We typically think of writing as a way to communicate fully formed ideas with others. But writing is just as useful for gaining knowledge and for developing and testing new concepts. In this "Writing to Learn" course, we'll expand our writing abilities, acquire new learning skills, and find connections between writing and learning.

You'll choose something you wish to learn, and then we'll use various writing and learning activities—from the research literature and from real-world practitioners—to help you achieve this goal. You have much freedom in choosing a focus, but the general requirement is that the goal involves learning facts, developing skills, nurturing wisdom, and putting facts, skills, and wisdom into practice. Think about a few potential goals to discuss during the Week 1 meeting.

As a student in this class, you'll be asked to evaluate the concepts we cover and activities we practice. For example, you'll identify which learning tactics are suited for which situations—such as those that are best for basic concepts compared with those that are better for deeper thinking. You'll also recommend improvements to writing and learning practices and even suggest new ones. This type of evaluation and improvement is called “action research.” It is a methodology—strongly rooted in education but performed in other disciplines too—in which participants in real situations, like a classroom, analyze practices and recommend changes. We'll work together as action researchers to explore and develop ways to use writing as a method of learning.

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Through instructor feedback, peer reviews, and self-assessments, you'll also improve your skills in research and in nonfiction writing.

Week 1: Core Concepts and Goal Setting

Learning Goals

At the end of this part of the course, students will be able to:

- Define writing to learn and provide examples of its use in education.
- Define constructivism and connectivism.

Due Before Class

N/A (first meeting)

Discussions

WHAT IS WRITING TO LEARN?

Writing can be used to aid learning in (at least) the following three ways:

- Carefully composing text to clearly communicate to others compels us to think about the accuracy and precision of what we're saying, to consider our word choices, to rework sentences to be concise and direct, and to put our ideas into a logical order that readers can easily follow. In many cases, learning to write according to certain genre conventions is the goal itself; for example, learning to become a research biologist involves learning to write scholarly research papers.
- Short writing exercises, not directly for others, act as learning aids.
- Longer writing exercises, not directly for others, help us to test hypotheses (do we still believe this now that we've said it at length?) and to work out ideas.

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(This list is roughly based on distinctions made by the Writing Across the Curriculum

Clearinghouse: [https://wac.colostate.edu/resources/wac/intro/.](https://wac.colostate.edu/resources/wac/intro/))

What are the habits and practices of writing to learn?

- There's typically a question.
- Leaving blanks is a common practice (write what you know, until you reach what you don't know).
- Recordkeeping mechanisms are used (e.g., of personal revision plans and feedback from others).
- The practice leaves room for research, reflection, and sharing.
- Reorganizing and thinking about structure are frequently performed.
- It's partially reader-oriented, at least hypothetically (it's not a diary).
- Clarity and precision are used as forms of empirical testing.
- Metacognition and other concepts from psychology and neuroscience are deliberately employed.

The other activities of learning need to play key roles. So what is writing's role? Hypotheses to explore in this course are that writing to learn helps to:

- test ideas,
- enable knowledge to sink in,
- push writers to thinking more precisely and clearly,
- enable writers to organize ideas in their own heads,
- expose a writer's ideas to others,
- push writers to move forward and produce,

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- give writers something external with which to interact (i.e., function as an external hard drive).

In a review of the literature on writing to learn's use in science education, Prain (2006) identifies two schools of thought:

- According to the first, writing to learn in science means learning to write scholarly articles, lab reports, and other types of documents that scientists write. Writing to learn focuses on mastering the linguistic conventions of the genre.
- According to the second, writing to learn incorporates a wider range of types of writing, including pieces of writing that, in themselves, wouldn't fall within the genre of science writing.

We can ask whether these are necessarily competing schools of thought.

Writing is not just typing but is instead all of the activities that enable, support, and reflect back on written text. In this course, you'll be an action researcher who will test writing and learning concepts and then use the tools of critical and creative thinking to critique, adapt, and improve them.

CONSTRUCTIVISM AND CONNECTIVISM (CORE LEARNING FRAMEWORKS FOR THE COURSE)

Compare the key traits of major learning theories:

https://web.archive.org/web/20120303011850/https://docs.google.com/Doc?id=anw8wkk6fjc_14gpbqc2dt

In particular, consider how the newest theory, connectivism, will be useful for learning in this course: http://www.itdl.org/Journal/Jan_05/article01.htm

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SETTING YOUR GOAL

You have broad latitude in choosing a learning goal to pursue this semester, but the general requirement will be that the learning goal comprises facts, wisdom, and practice. A learning goal incorporating facts, wisdom, and practice will enable you to test a full range of learning concepts, whereas just memorizing facts or just changing practices, for example, would limit the territory you could explore.

Another requirement is that the goal defines a type of writing that is common in the discipline you've chosen. You'll then write multiple drafts of this type of document throughout the semester. In pedagogy, an assignment modeled on real-world writing in the field is called "authentic."

Your learning goal should also be:

- Large enough to occupy a significant portion of the semester.
- Challenging enough to require many new tools and techniques to accomplish it. (For example, if you're already a skilled musician, learning to play a new instrument wouldn't require many *new* tools and techniques.)
- Deeply worthwhile, to help you persist.

If you have a goal defined in terms of an activity, like getting into better physical shape, redefine it into a multidimensional learning goal, such as gaining the knowledge and skills of a physical trainer.

BEGIN YOUR MOON MISSION DOCUMENT

To complete its mission to the Moon, NASA needed to create various technologies, like the fabric of spacesuits. These technologies were later transferred to other contexts, including

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outside of NASA through its Office of Technology Transfer and Commercialization (NASA, 2004).

Likewise, to achieve your goal this semester, you'll need to develop new writing and learning tools, which you'll later be able to transfer to other situations. To keep track of these new tools and be able to refer to them easily in the future, create a "Moon Mission Toolkit" and use it throughout the semester.

The tools you discover and develop for your Moon Mission Toolkit *are* the course. They aren't separate goals. Take the time to pursue new skills and concepts that emerge.

For more on NASA-developed technology, see

https://www.nasa.gov/directorates/spacetech/feature/Going_to_the_Moon_Was_Hard_But_the_Benefits_Were_Huge

In-Class Activities

TRANSFER IN PREVIOUS KNOWLEDGE AND SKILLS

Find and organize materials from previous courses and other relevant learning; share the materials with classmates. The goal of this "transfer in" exercise is to build a foundation of preexisting knowledge and tools that students can apply to this course.

For Next Week

Readings:

- Tomal, D. R. (2010). *Action research for educators*. Rowman & Littlefield Publishers.
- McNiff, J., & Whitehead, J. (2011). *All you need to know about action research*. SAGE Publications.

WRITING TO LEARN

- "Writing Knowledge Transfers Easily" by Ellen C. Carillo:
<https://open.umn.edu/opentextbooks/textbooks/794> (Hint: The book containing this article is *Bad Ideas About Writing*, so the point of this article is that, in fact, transfer is difficult.)
- Elon Statement on Writing Transfer: <https://www.centerforengagedlearning.org/elon-statement-on-writing-transfer/>

Assignments:

- Learning Goal Proposal
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use a conversational style to write approximately 300 words answering the core questions.

Week 2: Frameworks and Transfer of Learning

Learning Goals

At the end of this part of the course, students will be able to:

- Define the term "transfer" and explain the types of transfer.
- Explain the concept of a "framework" for learning and writing; explain how frameworks relate to learning concepts discussed in the course.
- Create graphic organizers relevant to their topics.
- Explain the science of learning behind "retrieval practice."
- Define "action research" and explain how it incorporates critical and creative thinking.

Due Before Class

Readings:

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- Tomal, D. R. (2010). *Action research for educators*. Rowman & Littlefield Publishers.
- McNiff, J., & Whitehead, J. (2011). *All you need to know about action research*. SAGE Publications.
- "Writing Knowledge Transfers Easily" by Ellen C. Carillo:
<https://open.umn.edu/opentextbooks/textbooks/794> (Hint: The book containing this article is *Bad Ideas About Writing*, so the point of this article is that, in fact, transfer is difficult.)
- Elon Statement on Writing Transfer: <https://www.centerforengagedlearning.org/elon-statement-on-writing-transfer/>

Assignments:

- Learning Goal Proposal
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use a conversational style to write approximately 300 words answering the core questions.

Discussions

How do quizzes (and other retrieval practice exercises) help us to retain knowledge in long-term memory? Why does this course use low-stakes quizzes to establish foundational knowledge?

What is action research, and how will we use it in this class? What critical and creative thinking practices will help you to perform action research?

What is transfer of learning, and why is it difficult? What is metacognition's role in promoting transfer?

In-Class Activities

Identify Foundational Knowledge for Your Topics

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Download software for self-quizzing (e.g., Kahoot!); do the following activities while it's downloading:

- Individually, brainstorm and research foundational knowledge for your topic.
- In a small group, work with partners to help each other identify more foundational knowledge about your topics.
- Using the quiz software, create a self-quiz for your topic.

Create a Quiz on Transfer

In a small group, use this week's readings to write one short answer and two multiple choice quiz questions about transfer. The instructor will then assemble the questions into a single quiz, which will be given to the class during Week 3's session.

Analyze Publishing Models

The different ways authors organize and present their ideas suggest different ways of thinking about topics. Look at these examples of published works and discuss what the "angle" and style of each suggests about the writing to learn process. (In some cases summaries are linked, so it's only necessary to study its angle, not the full work.)

For each model, answer these questions:

- Where does the author position themselves within the narrative?
- What writing style do they use?
- What visual style do they use?
- How is the content structured, and why?
- What types of reader engagement and/or interaction are expected?
- What types of writing to learn would have been involved?

Models:

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- A.J. Jacobs (multiple books): <https://ajjacobs.com/books/>
- *The Botany of Desire* by Michael Pollan:
<https://michaelpollan.com/books/the-botany-of-desire/>
- *Cod: A Biography of the Fish That Changed the World* by Mark Kurlansky:
<https://www.penguinrandomhouse.com/books/330809/cod-by-mark-kurlansky/>
- *Salt Fat Acid Heat* by Samin Nosrat:
[https://en.wikipedia.org/wiki/Salt_Fat_Acid_Heat_\(book\)](https://en.wikipedia.org/wiki/Salt_Fat_Acid_Heat_(book))
- *The Pencil* by Henry Petroski: <https://www.penguinrandomhouse.com/books/130245/the-pencil-by-henry-petroski/>
- *How Pictures Work* by Molly Bang: <https://www.youtube.com/watch?v=Mwmw3bbhqJc>
- A scholarly research paper (IMRD structure)—“A Citation Analysis About Scholarship on Zines” by Anne Hays:
<https://iastatedigitalpress.com/jlsc/article/12869/galley/12546/view/>

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Creating a Framework for Your Learning and Writing

A framework organizes facts and concepts so that they can be more easily analyzed. For example, events can be organized into a timeline and concepts can be categorized hierarchically by type. Think about the following topics and possible frameworks. Describe how they help both the writer and the reader to think about a topic:

- Music: composing vs. improvising
- Psychology: *Thinking, Fast and Slow* by Daniel Kahneman
- Technology: hardware vs. software
- Publishing: scholarly vs. popular
- Morality: descriptive vs. normative

Create some frameworks for your topic. How can they be depicted as graphic organizers?

For Next Week

Readings:

- Elaboration: <https://cognitiveresearchjournal.springeropen.com/articles/10.1186/s41235-017-0087-y#Sec5>
- Interleaving: <https://www.scientificamerican.com/article/the-interleaving-effect-mixing-it-up-boosts-learning/>
- Elaboration is better than highlighting:
<https://doi.apa.org/doiLanding?doi=10.1037%2Fxap0000119>
- Carey, B. (2010, September 6). Forget what you know about good study habits. *The New York Times*. <https://www.nytimes.com/2010/09/07/health/views/07mind.html>

Assignments:

WRITING TO LEARN

- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use a formal scholarly style to write approximately 300 words answering the core questions.

Week 3: The Science of Learning—Building a Foundation with Memorization and Discrete Skills (Part 1 of 2)

Learning Goals

At the end of this part of the course (Weeks 3 and 4 are a single unit), students will be able to:

- Demonstrate the ability to use the learning techniques covered in class.
- Based on concepts from the science of learning, explain why elaboration and explanation are effective for learning but highlighting text offers little if any benefit.
- Explain the advantages and limitations of rote learning.

Due Before Class

Readings:

- Elaboration: <https://cognitiveresearchjournal.springeropen.com/articles/10.1186/s41235-017-0087-y#Sec5>
- Interleaving: <https://www.scientificamerican.com/article/the-interleaving-effect-mixing-it-up-boosts-learning/>
- Elaboration is better than highlighting:
<https://doi.apa.org/doiLanding?doi=10.1037%2F0000119>
- Carey, B. (2010, September 6). Forget what you know about good study habits. *The New York Times*. <https://www.nytimes.com/2010/09/07/health/views/07mind.html>

Assignments:

WRITING TO LEARN

- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use a formal scholarly style to write approximately 300 words answering the core questions.

Discussions

Why do so many students highlight text (and why isn't it an effective tactic)?

Why is rote memorization a good foundation for deeper activities like reflection and action research?

Key learning/pedagogical concepts, terms, and techniques

What are the following concepts, and what is the science of learning behind them?

threshold concepts; exam wrappers; how flash cards work; the SQRRR technique; interleaving; authentic and renewable assignments; community of inquiry; formative vs. summative assessment; cognitive load

Key writing/research concepts, terms, and techniques

What are the following concepts, and how do they relate to writing to learn?

IMRD structure of research articles; elaboration; discourse community

In-Class Activities

For your learning goal, determine what to memorize and what discrete skills to acquire:

- Demonstrate IMRD structure of scholarly papers; find key terms and concepts in scholarly papers on student topics.
- Find and analyze case studies of student topics in practice.
- Break down topics into subcomponents:
 - Dick and Carey instructional analysis:

<https://www.itma.vt.edu/courses/appliedid/lesson3review.php>

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- Project Management Institute task breakdown:

<https://www.pmi.org/learning/library/applying-work-breakdown-structure-project-lifecycle-6979>

Writing Exercise: Elaboration

Write about how your topic in this course connects to your life, work, and other academic studies.

Quiz on Transfer of Learning

This quiz is based on the questions you created in Week 2.

For Next Week

Readings:

- Continue studying readings assigned for Week 3.

Assignments:

- Literature review for your self-chosen topic

Week 4: The Science of Learning—Building a Foundation with Memorization and Discrete Skills (Part 2 of 2)

Learning Goals

At the end of this part of the course (Weeks 3 and 4 are a single unit), students will be able to:

- Demonstrate the ability to use the learning techniques covered in class.
- Based on concepts from the science of learning, explain why elaboration and explanation are effective for learning but highlighting text offers little if any benefit.
- Explain the advantages and limitations of rote learning.

Due Before Class

- Literature review for your self-chosen topic

Discussions

Key learning/pedagogical concepts, terms, and techniques

What are the following concepts, and what is the science of learning behind them?

variables (independent, dependent, confounding); research method types;
operationalizing terms; the null hypothesis; backward design; Eric Mazur's peer
instruction; metacognition

Key writing/research concepts, terms, and techniques

What are the following concepts, and how do they relate to writing to learn?

expert blind spot ; explanation; select grammar, punctuation, and style guidelines

In-Class Activities

Writing Exercise: Explanation

Choose an idea from the literature on your topic and practice the explanation writing technique.

Imagine yourself explaining the idea to another person.

Critical Analysis

This week’s critical analysis will be performed in class. Participate in a “think-pair-share” exercise with a partner in class and answer the following: What has/hasn’t helped your learning so far, and why? What adjustments will you make?

For Next Week

Readings:

- The Miniature Guide to Critical Thinking:
https://www.criticalthinking.org/files/Concepts_Tools.pdf
- Straub, R. (2014). Responding—really responding—to other students’ writing. In *Writing about writing: A college reader* (pp. 16–25). Bedford/St. Martin’s.
- Types of Peer Review: <https://authorservices.wiley.com/Reviewers/journal-reviewers/what-is-peer-review/types-of-peer-review.html>
- How the pandemic changed editorial peer review—and why we should wonder whether that’s desirable: <https://blogs.lse.ac.uk/impactofsocialsciences/2021/02/10/how-the-pandemic-changed-editorial-peer-review-and-why-we-should-wonder-whether-thats-desirable/>
- Open Peer Review in the Humanities:
<https://scholarlykitchen.sspnet.org/2020/03/04/guest-post-open-peer-review-in-the-humanities/>

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- What is open peer review? A systematic review: <https://fl000research.com/articles/6-588>
- Open Peer Review: <https://plos.org/resource/open-peer-review/>
- List of Open Peer Review Journals:
https://www.ala.org/acrl/publications/keeping_up_with/opr
- Open Peer Review Examples:
 - "A Systematic Metadata Harvesting Workflow for Analysing Scientific Networks": <https://peerj.com/articles/cs-421/>
 - "Achieving Human and Machine Accessibility of Cited Data in Scholarly":
publications <https://peerj.com/articles/cs-1/>

Assignments:

- In-progress draft of your authentic writing assignment.
- Find two examples of creative nonfiction (preferably, find examples in a form that can be shared with classmates).
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Record video or audio of yourself answering the core questions.

Week 5: Peer Review

Learning Goals

At the end of this part of the course, students will be able to:

- Describe the traditional scholarly peer review process, based on examples provided.
- Analyze the arguments for reforming traditional peer review.
- Provide classmates with constructive reviews of their works-in-progress.

Due Before Class

Readings:

- The Miniature Guide to Critical Thinking:
https://www.criticalthinking.org/files/Concepts_Tools.pdf
- Straub, R. (2014). Responding—really responding—to other students’ writing. In *Writing about writing: A college reader* (pp. 16–25). Bedford/St. Martin’s.
- Types of Peer Review: <https://authorservices.wiley.com/Reviewers/journal-reviewers/what-is-peer-review/types-of-peer-review.html>
- How the pandemic changed editorial peer review—and why we should wonder whether that’s desirable: <https://blogs.lse.ac.uk/impactofsocialsciences/2021/02/10/how-the-pandemic-changed-editorial-peer-review-and-why-we-should-wonder-whether-thats-desirable/>
- Open Peer Review in the Humanities:
<https://scholarlykitchen.sspnet.org/2020/03/04/guest-post-open-peer-review-in-the-humanities/>
- What is open peer review? A systematic review: <https://fl000research.com/articles/6-588>
- Open Peer Review: <https://plos.org/resource/open-peer-review/>
- List of Open Peer Review Journals:
https://www.ala.org/acrl/publications/keeping_up_with/opr
- Open Peer Review Examples:
 - "A Systematic Metadata Harvesting Workflow for Analysing Scientific Networks": <https://peerj.com/articles/cs-421/>

WRITING TO LEARN

- “Achieving Human and Machine Accessibility of Cited Data in Scholarly”:
publications <https://peerj.com/articles/cs-1/>

Assignments:

- In-progress draft of your authentic writing assignment.
- Find two examples of creative nonfiction (preferably, find examples in a form that can be shared with classmates).
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Record video or audio of yourself answering the core questions.

Discussions

In respect to learning, what are the advantages and disadvantages of closed vs. open peer review?

Based on today's activities, what were the benefits and limitations of each type of peer review?

Read the essay “Sea of Crises” by Brian Phillips and discuss the following

<https://grantland.com/features/sumo-wrestling-tokyo-japan-hakuho-yukio-mishima-novelist-seppuku/>:

- How does the main topic (sumo wrestling) lead to many other types of learning and exploration?
- How does this type of learning—focusing on one topic while learning about others—serve as a metaphor for the learning we're doing in this course?
- Why is creative nonfiction, specifically a literary essay, a good genre for this style of learning?

In-Class Activities

Rounds of Different Types of Peer Review

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I Heard, I Noticed, I Wondered: www.tnellen.com/cybereng/method.html

Purdue Online Writing Guide's Instructor's Guide for Giving Feedback:

https://owl.purdue.edu/owl/general_writing/the_writing_process/feedback/instructor_guide_giving%20feedback.html

Use concepts from Paul and Elder to guide your analysis:

https://www.criticalthinking.org/files/Concepts_Tools.pdf

Essays: Content

Starting this week and continuing in Weeks 6 and 7, you'll work on an article about your topic in the style of a nonfiction, explanatory personal essay. This genre is more expressive, open-ended, and stylistic than most other nonfiction writing, incorporating techniques from literary writing, so we'll call them "literary essays" for short. This is a broad category, which falls into the larger category of creative nonfiction, but the model for this assignment is an essay in which the author:

- Sets out to learn about an external topic. ("External" here means not purely reflective or opinion-based.)
- Writes to help readers learn.
- Describes their personal experiences while learning and writing.
- Carefully composes the essay (rather than merely cataloging facts or taking notes).

Find examples of literary essays that demonstrate writing to learn. Ask and observe the following about the essays you read:

- How did writing the essay help the author to learn? (For example, consider metacognition and other course concepts.)
- What structure was used, and why (Week 6's focus)?
- What writing style was used for sentences, and why (Week 7's focus)?

WRITING TO LEARN

For Next Week

Readings:

- Sommers, N. (1980). Revision strategies of student writers and experienced adult writers. *College composition and communication*, 31(4), 378–388.
- Immordino-Yang, M. H., & Faeth, M. (2016). The role of emotion and skilled intuition in learning. In *Emotions, learning, and the brain: Exploring the educational implications of affective neuroscience* (pp. 93–105). W.W. Norton & Company.

Assignments:

- First Putting Learning into Practice Assignment and Reflection
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Create a proposal to change some aspects of the course design for future weeks, providing your pedagogical reasoning.

Week 6: Emotions and Learning

Learning Goals

At the end of this part of the course, students will be able to:

- Describe specific ways to apply Immordino-Yang and Faeth's ideas about emotion's role in learning.
- Demonstrate the ability to analyze an example of writing and to justify their opinion of why its writing style is effective (given its audience, purpose, and context).

Due Before Class

Readings:

WRITING TO LEARN

- Sommers, N. (1980). Revision strategies of student writers and experienced adult writers. *College composition and communication*, 31(4), 378–388.
- Immordino-Yang, M. H., & Faeth, M. (2016). The role of emotion and skilled intuition in learning. In *Emotions, learning, and the brain: Exploring the educational implications of affective neuroscience* (pp. 93–105). W.W. Norton & Company.

Assignments:

- First Putting Learning into Practice Assignment and Reflection
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Create a proposal to change some aspects of the course design for future weeks, providing your pedagogical reasoning.

Discussions

Revising

Explain why Sommers' description of the practices and mindset of "experienced writers" is a better model for writing to learn than are the practices and mindset of student writers.

Emotions and Learning

Guided discussion of Immordino-Yang and Faeth's writings on emotions and learning.

Midsemester Instructional Diagnosis

Based on the concept of an instructional diagnosis, as practiced in university teaching and learning centers, students will meet *without* the instructor to discuss the course so far and develop recommendations for changes. (This would typically be done with an outside facilitator; depending on the cohort of students, this activity could be self-led.)

See the following for reference:

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- Small Group Instructional Diagnosis: <https://cetl.uni.edu/small-group-instructional-diagnosis>
- Midsemester Instructional Diagnosis: <https://teaching.temple.edu/classroom-observation-and-mid-semester-instructional-diagnosis>

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In-Class Activities

Introduction to the Institute for Education Sciences Database

Search for key concepts from the class and for your topic: <https://eric.ed.gov/>.

What sources did you find that will aid your learning?

Practice Learning Tools and Techniques

This week, we'll apply what we've learned so far about learning to study the interconnection between emotions and learning. For example:

- Identify core knowledge (e.g., definitions, diagrams of the brain) with which to use quiz and flashcard software.
- Create graphic organizers, such as a timeline of relevant publications.
- Use elaboration and other types of writing to connect the ideas you've read about emotions and learning to your own work and to other knowledge.

Use the Moon Mission Toolkit to perform the activities above; add to the Toolkit based on know insights about learning from the activity.

Essays: Structure

Last week, we talked about writing style. This week, we'll talk about structure.

Review Brian Phillips' essay "Sea of Crises" and essays that you found, then answer the following:

- How does structuring a piece of writing relate to creating a learning framework for a topic?
- What specific techniques do essay writers modulate from one topic to another and one tone to another?

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- How does the IMRD structure of scholarly research articles differ from the structure of essays, and what are the advantages and disadvantages of each structure in terms of writing to learn?

For Next Week

Readings:

- Sternberg, R. J. (2003). WICS: A model of leadership in organizations. *Academy of Management Learning & Education*, 2(4), 386–401.
- Wisdom, in the Stanford Encyclopedia of Philosophy:
<https://plato.stanford.edu/entries/wisdom/>

Assignments Due:

- First Version of Moon Mission Toolkit
- Learning Goal Proposal Rethinking
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Give a short prepared presentation to the class next week.

Week 7: Wisdom

Learning Goals

At the end of this part of the course, students will be able to:

- Explain Sternberg's balance theory of Wisdom.
- Evaluate the balance within their work so far toward their learning goal, and make revisions to their learning tactics and strategies accordingly.
- Find other conceptions of learning (including similar concepts not labeled "wisdom") and evaluate them for application toward their learning goal.

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Due Before Class

Readings:

- Sternberg, R. J. (2003). WICS: A model of leadership in organizations. *Academy of Management Learning & Education*, 2(4), 386–401.
- Wisdom, in the Stanford Encyclopedia of Philosophy:
<https://plato.stanford.edu/entries/wisdom/>

Assignments:

- Learning Goal Proposal Rethinking
- First Version of Moon Mission Toolkit

Discussions

What are other definitions and conceptions of wisdom?

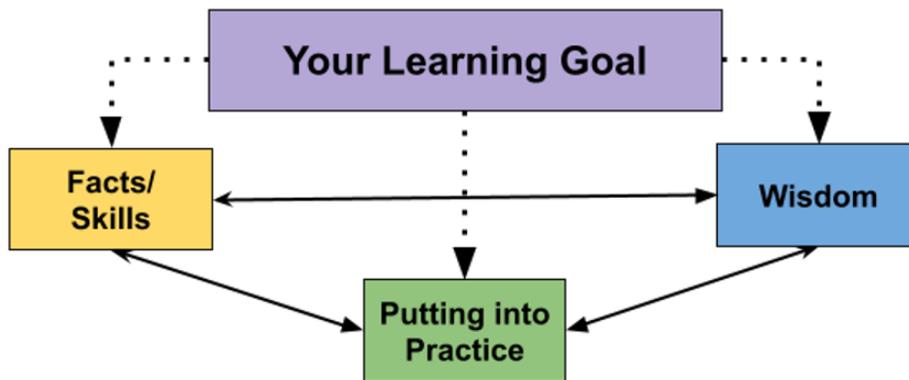
What additional framework foundational information should we cover in Week 9? (Review Weeks 3–4 and identify gaps and areas for further study.)

In-Class Activities

Self-Analysis

Evaluate your own learning and writing so far against the following diagram:

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(Source: Author)

<https://docs.google.com/drawings/d/1Ib4VJm->

[ISMev4WBFQcz1Jd0zUx0jUOSBYUVPwVlhvm8/edit?usp=sharing](https://docs.google.com/drawings/d/1Ib4VJm-ISMev4WBFQcz1Jd0zUx0jUOSBYUVPwVlhvm8/edit?usp=sharing)

Are there imbalances in your work so far (e.g., one element focused on much more than others)?

In a small group, evaluate classmates' work so far and identify imbalances. Suggest paths for future research and writing to correct imbalances. Use previously discussed peer review concepts.

Individual short presentation: Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make?

Plan for Class-Chosen Activity in Week 10

What writing skills and concepts, not covered sufficiently so far, would help you to advance toward your learning goal?

What learning skills and concepts, not covered sufficiently so far, would help you to advance toward your learning goal?

As a class, agree on the topics and goals for Week 10. Refer to ERIC and other sources:

<https://eric.ed.gov/>.

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Essays: Writing Sentences

In the past two weeks, we thought about how the content and structure of literary essays relate to learning. Today, we'll talk about sentences.

Review Brian Phillips' essay "Sea of Crises" and essays that you found, then answer the following:

- How does the writing style relate to its themes?
- How does this writing style impact writing to learn? How would other styles differently impact learning?

For Next Week

Readings:

- Fiorella, L., & Mayer, R. E. (2013). The relative benefits of learning by teaching and teaching expectancy. *Contemporary Educational Psychology*, 38(4), 281–288.
- The ADDIE Model for instructional design: <https://www.uwb.edu/it/service-catalog/teaching-learning/hybrid-and-online-learning/instructional-design/addie>
- Creative Commons for Educators and Librarians:
<https://certificates.creativecommons.org/about/certificate-resources-cc-by/>
- Foundations of Learning and Instructional Design Technology:
<https://lidtfoundations.pressbooks.com>:
 - Instructional Design-as-Process: bottom of p. 39 to top of p. 41
 - Problem Based Learning: bottom of p. 346 (Characteristics of PBL (problem-based learning) to bottom of p. 351 (don't continue to Problem-based Learning vs. Case-based and Project-based Learning)

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- As a supplement, see Problem Based Learning Clearinghouse (University of Delaware): <https://www.itue.udel.edu/pbl/problems>
- User Experience Design: top of p. 557 to bottom of p. 571 (don't continue to Evaluation Methodologies for User-centered Design)
- Open Educational Resources (OER): Overview and Definition: <https://www.edweek.org/teaching-learning/open-educational-resources-oer-overview-and-definition/2017/04>

Assignments:

- Literary Essay About Your Topic
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use objective metrics to measure your learning. (Choose the metrics to use based on readings, discussions, and activities so far.)

Week 8: Designing Pedagogical Materials

Learning Goals

At the end of this part of the course, students will be able to:

- Define and put into use the “backward design” approach to creating learning materials.
- Identify at least three ways that their work from the course could be shared with potential readers or collaborators.
- Analyze the effectiveness of pedagogical materials.
- Define and briefly describe the goals of the following pedagogical concepts:
 - Creative Commons licensing
 - Universal Design for Learning

WRITING TO LEARN

- Learning analytics

Due Before Class

Readings:

- Fiorella, L., & Mayer, R. E. (2013). The relative benefits of learning by teaching and teaching expectancy. *Contemporary Educational Psychology*, 38(4), 281–288.
- The ADDIE model for instructional design: <https://www.uwb.edu/it/service-catalog/teaching-learning/hybrid-and-online-learning/instructional-design/addie>
- Creative Commons for Educators and Librarians:
<https://certificates.creativecommons.org/about/certificate-resources-cc-by/>
- Foundations of Learning and Instructional Design Technology:
<https://lidtfoundations.pressbooks.com>:
 - Instructional Design-as-Process: bottom of p. 39 to top of p. 41
 - Problem Based Learning: bottom of p. 346 (Characteristics of PBL (problem-based learning) to bottom of p. 351 (don't continue to Problem-based Learning vs. Case-based and Project-based Learning)
 - As a supplement, see Problem Based Learning Clearinghouse (University of Delaware): <https://www.itue.udel.edu/pbl/problems>
 - User Experience Design: top of p. 557 to bottom of p. 571 (don't continue to Evaluation Methodologies for User-centered Design)
- Open Educational Resources (OER): Overview and Definition:
<https://www.edweek.org/teaching-learning/open-educational-resources-oer-overview-and-definition/2017/04>

Assignments:

WRITING TO LEARN

- Literary Essay About Your Topic
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Use objective metrics to measure your learning. (Choose the metrics to use based on readings, discussions, and activities so far.)

In-Class Activities

Analyzing Pedagogical Materials

- Find open education resources related to your topic: <https://www.merlot.org/merlot/>
- Identify the pedagogical strategies in the materials.
- Study the materials and apply them to your learning.
- Critique the materials.
- Identify resources whose license permits remixing and created a remixed version that improves them and/or adapts them for a different audience, purpose, or context.
- Reflection: How well did the remixing process work as a writing to learn activity?

Analyze new media learning examples and discuss their strengths and limitations:

- Khan Academy
- MOOCs
- YouTube

Create Pedagogical Materials for Week 10

Refer to your work on Week 7's "Plan for Class-Chosen Activity in Week 10."

Create pedagogical materials to support these learning goals. Incorporate learning and writing concepts covered throughout the semester.

Sharing Your Work

In a small group, look for ways to share your work from this course:

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- Publications
- Conferences
- OER repositories
- Community or adult learning programs
- What else can you find?

Potential sources include:

- Journal of Librarianship and Scholarly Communication:
<https://iastatedigitalpress.com/jlsc/>
- Journal of Teaching and Learning with Technology:
<https://scholarworks.iu.edu/journals/index.php/jotlt>
- Merlot: <https://www.merlot.org/merlot/>
- Institute of Education Sciences: <https://eric.ed.gov/>

Discussions

What are your best learning experiences from the past? What generalizable lessons about learning can you draw from these experiences?

What are the benefits and drawbacks of ADDIE and other backward design models?

Overview of other key concepts:

- Universal Design for Learning: <https://www.cast.org/impact/universal-design-for-learning-udl>
- Learning analytics

For Next Week

Study for the quiz on concepts from Weeks 3 and 4

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Readings:

[To be determined based on student action research regarding what additional material to cover.]

Assignments:

[To be determined based on student action research regarding what additional material to cover.]

Week 9: Foundations and Frameworks Revisited

Learning Goals

At the end of this part of the course, students will be able to:

- [To be determined based on student action research regarding what additional material to cover.]
- Explain concepts and practices from Weeks 3–4

Due Before Class

[To be determined based on student action research regarding what additional material to cover.]

Discussions

View an example presentation and analyze its strengths and limitations. Presentations will be given in Week 12.

As action researchers:

- What conclusions are you drawing about writing to learn?
- How can you document your observations and share them more widely?

In-Class Activities

Quiz on concepts from Weeks 3 and 4.

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Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Participate in an in-class exercise in which a classmate evaluates your learning strategies so far and recommends changes and/or enhancements.

Define content and goals for Week 10: Student chosen subject(s): What is missing from your understanding of writing and learning?

Learning How to Present

Based on learning concepts and tactics from this course, develop a plan to learn about giving effective presentations:

- Transfer
- Constructivism and Connectivism
- Facts, Wisdom, and Putting into Practice
- Emotions
- Peer Review

For Next Week

Assignments:

- Second Putting Learning into Practice Assignment and Reflection
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Review past weekly self-analyses and consolidate your thinking. Capture the results in your Moon Mission Toolkit.

Week 10: Student Chosen Topics

Learning Goals

At the end of this part of the course, students will be able to:

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[To be determined by students based on in-class activities in previous weeks.]

Due Before Class

- Second Putting Learning into Practice Assignment and Reflection
- Critical Analysis: What has/hasn't helped your learning so far, and why? What adjustments will you make? Review past weekly self-analyses and consolidate your thinking. Capture the results in your Moon Mission Toolkit.

Discussions

[To be determined by students based on in-class activities in previous weeks.]

In-Class Activities

[To be determined by students based on in-class activities in previous weeks.]

For Next Week

Assignments:

- Action Research Report

Week 11: Action Research Reporting

Learning Goals

At the end of this part of the course, students will be able to:

- Share their evaluations and recommendations for improvement as action researchers.

Due Before Class

Assignments:

- Action Research Report

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Discussions

What are your observations and recommendations for improvement as action researchers?

In-Class Activities

Action Research Report Sharing/Creating a Consolidated Report

- In a small group, share your individual action research reports.
- As a class, consolidate our findings and recommendations for both changes to the course and contributions to the literature. Reach consensus where possible; document differences of opinion otherwise.

For Next Week

Readings:

- Reread Fiorella, L., & Mayer, R. E. (2013). The relative benefits of learning by teaching and teaching expectancy. *Contemporary Educational Psychology*, 38(4), 281–288.

Assignments:

- Presentation script
- Prepare to deliver the presentation

Week 12: Final Presentations and Proofreading

Learning Goals

At the end of this part of the course, students will be able to:

- Evaluate how presenting (and by extension, teaching) helps one to learn.
- Analyze common writing advice about grammar and mechanics in terms of writing to learn.

Due Before Class

Readings:

- Reread Fiorella, L., & Mayer, R. E. (2013). The relative benefits of learning by teaching and teaching expectancy. *Contemporary Educational Psychology*, 38(4), 281–288.

Assignments:

- Presentation script

Discussions

How did creating and giving a presentation help you to learn? What changes could be made to the assignment or presentation format to improve learning?

In-Class Activities

Deliver Your Presentation

Write and submit your Reflection After Presenting.

Proofreading

Individually, find advice about grammar and punctuation (e.g., from the Purdue Online Writing Lab) and evaluate its impact on writing to learn.

With a partner, share your evaluation of the advice you found.

For Next Week

Readings:

- Reread the Elon Statement on Writing Transfer:

<https://www.centerforengagedlearning.org/elon-statement-on-writing-transfer/>

Week 13: Transferring Out

Learning Goals

At the end of this part of the course, students will be able to:

- Access articles and other materials from this course easily in the future.
- Identify specific ways to transfer their learning to new contexts.

Due Before Class

Readings:

- Reread the Elon Statement on Writing Transfer:

<https://www.centerforengagedlearning.org/elon-statement-on-writing-transfer/>

Discussions

Based on your reading and experiences this semester, how can transfer be improved?

What technologies are useful for transfer?

In-Class Activities

Transfer Learning from the Course to Future Work

Save materials from the course in a permanently accessible cloud source

In-class writing: describe your plans for further learning over the next 18 months

Create 7 calendar reminders over the next 18 months

Future Learning, Publishing, and Presenting

In a small group, look for the following opportunities for continuing and sharing your learning:

- Grants
- Conferences

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- Publishing
- Communities of learning
- Teaching (e.g., adult education courses)

Due at the End of the Semester

- Final version of authentic writing assignment
- Second version of Moon Mission toolkit

Assignment Descriptions

Learning Goal Proposal

Define your learning goal for the course:

- Explain how the goal conforms to the facts/skills, wisdom, putting into practice framework.
- Explain specifically how you'll put learning into practice.
- Define an authentic writing assignment in which you'll write in a form/genre common in your chosen field to explain your topic (or a part of it) to others. For example, you could write a grant proposal, scholarly article, content for a Web site, etc.

As your learning progresses, your understanding of putting into practice and authentic writing in your field will evolve; the proposal will evolve accordingly.

Literature Review

For your main learning goal, analyze at least 10 sources:

- Create two graphical frameworks of the sources:
 - A timeline of citations to provide a chronological framework.

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- An “organizational chart” (like a corporate organizational chart) to provide a conceptual framework (e.g., organized by theoretical approaches within a field, by genres, by research methodologies).
- A list of core knowledge (e.g., definitions, formulas) to memorize using the retrieval practices exercises from Weeks 3–4.
- A 750-word essay in which you’ll use the “elaboration” technique to enhance retention and learning: <https://cognitiveresearchjournal.springeropen.com/articles/10.1186/s41235-017-0087-y#Sec5>.

First Putting Learning into Practice Assignment and Reflection

Your plan for putting your learning so far into practice will be defined in your learning proposal.

What “putting into practice” means depends on your goal. But the key criteria are:

- The action is not tightly controlled, and its results aren’t entirely predictable.
- The activity will provide feedback about how your learning is progressing and what you might need to change about your learning tactics and strategies. (Feedback could be, for example, verbal comments from others or objective results, such as a test score.)

For example, you could lead a workshop, whose students might not learn as well as you expected and who might ask questions that surprise you.

Learning Proposal Rethinking

Approximately halfway through the semester, you’ll reflect on and analyze your work so far and then rethink your learning and revise your proposal:

- Are there aspects of your goal that you’ll modify, minimize, or maximize?
- Is your goal fully engaging you as a critical thinker?

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- Is your goal fully engaging you as a creative thinker?
- How will you put into practice your revised goal?

As you consider these questions, keep in mind that the purpose of your learning goal is to let you practice the learning and writing concepts covered in the course and to help you grow overall as a reflective writer and learner. Will your revised goal help you to continue developing in these ways?

Second Putting Learning into Practice Assignment and Reflection

Your plan for putting your learning in the semester's second half into practice will be defined in your revised learning proposal. See the first putting into practice assignment description for more details.

Action Research Report

Document your observations and recommendations as an action researcher of Writing to Learn. Some specifications of the report will be determined by the class, but the basic requirements are that it will:

- be written for people outside the class, and thus will be formal and include background information about the subject and course;
- cover the course comprehensively, although some parts might be discussed in less detail than others;
- include specific, actionable recommendations for researchers and educators.

The class will be encouraged to share its results publicly, such as at a conference or in a repository of open educational resources, but students will ultimately decide whether and how to share their work.

Authentic Writing Assignment

Write about your topic in a genre modeled on a type of “writing to communicate” commonly used in your learning goal topic area. The choice of the type of writing will be defined in your learning goal proposal.

Literary Essay About Your Topic

In the approximate style of Brian Phillips’ essay “Sea of Crises” and other creative nonfiction we analyzed in class, write a literary essay about the topic for your learning goal. Aim to explore tangential subtopics.

Moon Mission Toolkit

Throughout the semester, you’ll use the Moon Mission Toolkit to record *transferrable* knowledge, skills, and wisdom acquired about writing and learning. Concise, quickly scannable lists and links will be easiest to use in the future.

The Toolkit has three headings:

- Needs Identified—You know a general need to accomplish your goal (e.g., to memorize certain facts) but haven’t identified tools and techniques to meet that need.
- Prototypes—You have a tool that might help you meet a learning need, but you haven’t tested it or connected it to other learning concepts.
- Ready to Adapt/Transfer—A tool is successfully tested, and you’ve analyze why it works and identified its limitations. It’s ready to be adapted to new contexts.

The first version of the Moon Mission Toolkit will be submitted in the middle of the semester, and the final version at the end of the semester.

Weekly Critical Analysis

Each week, from Weeks 2 to 10, you'll analyze the learning concepts and activities you've been using. This will help you to keep expanding and fine-tuning your own learning strategies, and your evaluations will contribute to the action research the class is performing by helping to advance the field's understanding of writing to learn and by developing and improving approaches that other people can use.

Each weekly self-analysis will focus on these core questions:

What has or hasn't help your learning so far, and why? What adjustments will you make?

But to avoid "instrument fatigue"—a phenomenon in which respondents to a testing instrument, like a survey, answer less carefully and thoughtfully over time—we'll vary the ways that these self-analyses are performed:

Use a conversational style to write approximately 300 words answering the core questions (Week 2).

Use a formal scholarly style to write approximately 300 words answering the core questions (Week 3).

Participate in a "think-pair-share" exercise with a partner in class (Week 4).

Record video or audio of yourself answering the core questions (Week 5).

Create a proposal to change some aspects of the course design for future weeks, providing your pedagogical reasoning (Week 6).

Give a short prepared presentation to the class (Week 7).

Use objective metrics to measure your learning (Week 8).

Participate in an in-class exercise in which a classmate evaluates your learning strategies so far and recommends changes and/or enhancements (Week 9).

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Review past weekly self-analyses and consolidate your thinking. Capture the results in your Moon Mission Toolkit (Week 10).

Final Presentation

Creating and delivering a presentation can help you to learn, just as writing can.

Choose a format and style (with presumed audience and context) for your presentation:

- Poster session
- TED Talks
- Formal academic talk
- Round table talk
- Interactive activity

Write a script for your presentation and submit it before class.

Reflection After Presenting

Recall the control-value theory:

- How did choosing the style of your presentation affect your learning?
- What do you think of your choice in retrospect?
- What about classmates' presentations might have aided their learning?

In what ways did creating a presentation help you to learn?

In what ways did delivering a presentation help you to learn?

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