Writing in the Disciplines Sources

1. What is Writing in the Disciplines?
2. https://wac.colostate.edu/resources/wac/intro/wid/

Contents

Writing assignments are often used to support the goals of Writing in the Disciplines (WID), also called writing to communicate. Writing assignments of this sort are designed to introduce or give students practice with the writing conventions of a discipline and to help them game familiarity and fluency with specific genres and formats typical of a given discipline. For example, the engineering lab report includes much different information in a format quite different from the annual business report.

Because WID is used by a large number of WAC programs, this guide presents a great deal of information on WID, including a detailed rationale, examples, and logistical tips.

A Fuller Definition of WID

WID assignments are typically, but not exclusively, formal documents prepared over a few weeks or even months. The final documents adhere to format and style guidelines typical of the professional genres they help students learn about and practice. Teachers comment primarily on the substance of these assignments, but teachers also expect students to meet professional standards of layout and proofreading (format and mechanical correctness).

Without doubt, the single most important reason for assigning writing tasks in disciplinary courses is to introduce students to the thinking and writing of that discipline. Even though students read disciplinary texts and learn course material, until they practice the language of the discipline through writing, they are less likely to learn that language thoroughly. In addition, teachers cite other specific advantages of WID tasks, large and small. Such writing helps students to:

- integrate and analyze course content
- provide a field-wide context to course material
- practice thinking skills relevant to analyses in the discipline
- practice professional communication
- prepare for a range of careers in the field

When to Choose WID, WTE, or WTL

Teachers need to decide which goals are most important for them and for the students they typically teach. For instance, if you ordinarily teach a freshman-level survey course that introduces students to the field, giving students practice in the conventions of writing for that field is generally inappropriate. Rather, you would probably want to give students opportunities to write about the new, foundational concepts they're being introduced to so that you can be sure they are learning the fundamental ideas they will need to take other courses in your discipline.

Teachers thinking about assigning writing in their courses also need to consider just how much time they'll have to review or respond to student writing. Assigning a 20-page term paper in a course with 200 students is unrealistic because teachers seldom have time to read and respond to such lengthy student writing.

Adjusting WID Tasks to Your Teaching Context

As teachers determine goals for writing and their time commitment, they discover an entire spectrum of writing they might assign in their classes. You will base your decisions on complex factors, but the simplified grid below can point you toward additional materials that might be most useful to you as you plan your writing component for each class.

Use this grid to suggest which kinds of writing might be most appropriate in your classes:

	WTL	**WTE**	**WID**
Goals	to help students learn foundational concepts to check students' understanding of material	to practice in critical thinking, reading and writing; to engage students in critical thinking	to practice writing conventions of the discipline; to gain familiarity with genres and design conventions
Students	mostly freshmen and sophomores	all students	mostly senior majors
Typical enrollment	can be used in the largest classes	varies depending on goals	fewer than 35
Possible assignments	• writing-to-learn prompts	• *reading journals* • *lab or field notebooks* • *response papers*	• real writing tasks for audiences students will *write to as professionals* in field • *academic papers* based on journals in the field • library or other *source-based writing*

Alternate Forms/Formats that Mimic Professional Writing

Think of alternate forms/formats. Although the research essay is the most common kind of WID assignment, it's not the only format that students can use to learn about disciplinary writing conventions. If professionals in your field use any of these types of writing, consider using these formats to help students understand the thinking and writing of your discipline:

- Project or lab notebook
- Progress report
- Management plan
- Position paper
- Interpretive essay
- Casebook
- Review of literature
- Journal or professional article
- Project proposals
- Grant proposals
- Lab/field reports

Combining WTL and WTE with WID

In addition to discipline-specific formats, other kinds of writing assignments can help students learn the language and ways of thinking of a discipline, even though they may not mimic its professional writing. Any of these writing activities can provide the basis for a longer, more formal assignment, or can be used only to promote class discussion and/or thinking about course material:

Reading Journal

In a discipline-specific context, teachers using a reading journal ask students to write summaries, responses, and syntheses as appropriate for the field. "Readings" might include not only assigned textbook material, but also lectures and outside reading of professional or popular articles relevant to the course material. Teachers might want to assign specific questions to be answered in entries about each reading, or they might link readings in other ways.

Jargon Journal

When you introduce new terms in your lectures or when students see them in readings, ask students to jot the terms down in a notebook or electronic file. Periodically, students then return to the list of terms and fill in or revise working definitions of each term.

(Some terms will be easy to define immediately after they are introduced in a course; other terms might take more familiarity with the complexity of a concept to define accurately.) Build in some incentive for keeping the jargon journal by pointing out that students can refer to the definitions as they prepare for—and perhaps write—exam responses.

Rhetorical Analysis

In addition to analyzing articles for content, as students might do in the reading journal, teachers can also ask students to look specifically at professional articles for rhetorical issues:

- Scope and focus
- Organization (conventional headings)
- Arrangement
- Level of detail
- Kinds of evidence required
- Uses of citations
- Style

Small-group or full-class discussion of these analyses will help students understand the critical approaches professionals in the field typically adopt as well as the writing conventions accepted by major journals in the field.

Analyze an Expert's Revisions

Bring in drafts of your own work or of someone else's professional work that you have permission to share with students. Show students:

- how professionals shape and revise research questions
- how professionals work from raw data to write sections outlining results and discussion
- how professionals move from draft to draft as they work through the entire writing project

Popular Article

Because the popular article is written to a general audience with little specialized knowledge, teachers often assign this writing task to be sure students understand material well enough to explain it in non-technical terms. If you're concerned about assigning a full-length article, you could assign this task as a group writing project, with different group members responsible for chunks of the final article. Or you might just

assign the introduction and an outline for key ideas that would go into the remainder of the article.

Sequencing Tasks

One reason that students report feeling overwhelmed by WID tasks is that they aren't sure where to start and then how to proceed to produce a good project of the sort required by the assignment. You can help students—and get better final drafts to read—by setting up a sequence of tasks that build toward the final project.

Two approaches work well when designing a sequence:

1. Break the large writing task into chunks so that students can tackle parts of the assignment and get feedback before moving to the next chunk. For an example, view the Ag Econ sample assignment.
2. An alternative is to devise tasks that build on each other, known as scaffolding. For instance, if you hope to assign a professional review of literature as the final project, first have students write abstracts or summaries of articles, then ask for annotations, and finally ask for synthesis. At the same time, have students analyze published articles to determine what a review of literature typically looks like in your field. By giving students scaffolded writing and analytic tasks, they become more confident and more able to meet your criteria for the final writing task.

Responding to Student Writing

You'll find more detailed advice about feedback in the sections under

- Do I have to be an expert in grammar to assign writing?
- What makes a good writing assignment?
- How can I handle responding to drafts?

A few points bear repeating here:

- Responding to students' writing involves far more than simply marking errors in punctuation and mechanics. Most grading time, by far, is devoted to commenting on focus, development and arrangement of ideas, the quality of arguments, and other larger issues.
- Tell students in advance specifically what your expectations are for high-level writing skills. Then focus your commenting on how well students meet those specific criteria. Also consider developing a rubric or some other commenting guide to help you comment quickly but thoroughly on the points you decide are most important for a given assignment. (See the samples in "What makes a good writing assignment?" and "How can I handle responding to drafts?")

Improving the Research Essay

When professors are reluctant to assign research essays, they often claim that students cannot write clearly and logically, synthesizing sources and evaluating data to draw closely argued conclusions. Most often, these weaknesses are not the result simply of poor writing skills, but also of poorly defined criteria that students don't grasp. Fortunately, teachers can improve the research essay by clarifying goals for the assignment and keeping students' resources in mind.

Excellent Goals for Assigning Research Essays

Most university professors agree that research-based writing in college classes can and should meet these goals:

- foster critical thinking about raw data and other people's conclusions
- give students an opportunity to work independently on a large project
- mimic behaviors that students must know if they pursue advanced academic degrees
- mimic behaviors that students will draw on in other aspects of their lives (examples range from buying cars to management decisions)
- familiarize students with major journals, research methodologies, and writing conventions of their major fields

Questions to Ask about how Students will Perceive your Goals

Students often view the research-based paper as an exercise in cutting and pasting rather than in carefully sifting and synthesizing key ideas that support their own thinking. So teachers get the best results from research-based assignments that they have revised after considering these questions:

- Have we, in teaching research rather than critical thinking about researched information, misled ourselves and our students into reducing this vital undertaking into a set of easily replicated steps?
- And then by focusing on the steps, do we give students the wrong message about what is important in doing research?
- When we give students 50 pages on documentation styles, are we telling them that format is more important than the critical synthesis of views and data?
- How, then, might we reorient students' thinking about research-based writing?
- Do students who see most of the grading criteria and weighting of the final grade devoted to the mechanics of finding and citing material believe in the goals we hope to foster with research-based writing?

Three Points to Consider

If you've decided that a traditional research essay best meets your teaching goals, please consider three ideas that might make this assignment more useful for students:

Find out what your students already know about using the library and the Internet for research

Most students in upper-level courses (and even most freshmen) know how to find general sources. But many upper-division students may not yet be familiar with specific sources in your discipline. Make sure they know how to find these, and even consider arranging a session in the library to go over search techniques for databases in your field.

Find out what your students already know about reading research-based articles in your discipline

Students are remarkably reluctant to admit they have a hard time reading research-based texts. But if they don't know how to read professional articles in your field, they certainly won't know how to evaluate the data and conclusions in those articles. You can tackle this problem with some sequenced "mini"-writing tasks (like those described in the Combining WTL and WID section).

Give students a chance (or chances) to work on parts of the final assignment as separate tasks

The Ag Econ assignment is a good example of breaking down a larger writing task so that the teacher can see if students need help with key elements of the larger writing task. If students, for example, don't know how to frame an adequate research question, you can head off this problem if you give students a mini-task that asks for a research question long before students begin their source work.

Similarly, if your experience with this course in the past suggests that students often struggle to analyze or synthesize data, you might want to set up sequenced writing tasks that give them some practice—and feedback—on these key writing skills.

Beyond the Basics

The literature now available on writing in the disciplines or writing to communicate is deep and broad, encompassing far more than a brief bibliographic essay can accurately capture. Let me offer instead two pieces of advice—consult the general resources noted here and look at the journals in your discipline that take up teaching issues. Those journals are most likely to include articles that situate writing to communicate activities

in the courses you might find yourself teaching. The articles themselves will glean from the robust resources to point you toward those titles that will best fill in background you might find helpful.

We collect below titles from across disciplines to offer some potential starting points. We have organized the resources in a table to cluster articles by discipline. Please note, however, that disciplinary titles here point to writing in the disciplines rather than writing to learn (or writing to engage) titles that are included in the WTL section of this resource. All titles refer to the list of Works Cited that follows the tables.

3. GA Doe Webinar

https://www.georgiastandards.org/Georgia-Standards/Pages/ELA-Webinar-6-12-Writing-Across-the-Curriculum.aspx

4. GA DOE Powerpoint

https://www.georgiastandards.org/Georgia-Standards/Documents/ELA-Webinars/ELA-6-12-Writing-Across-the-Curriculum-Session-4-PowerPoint.pdf

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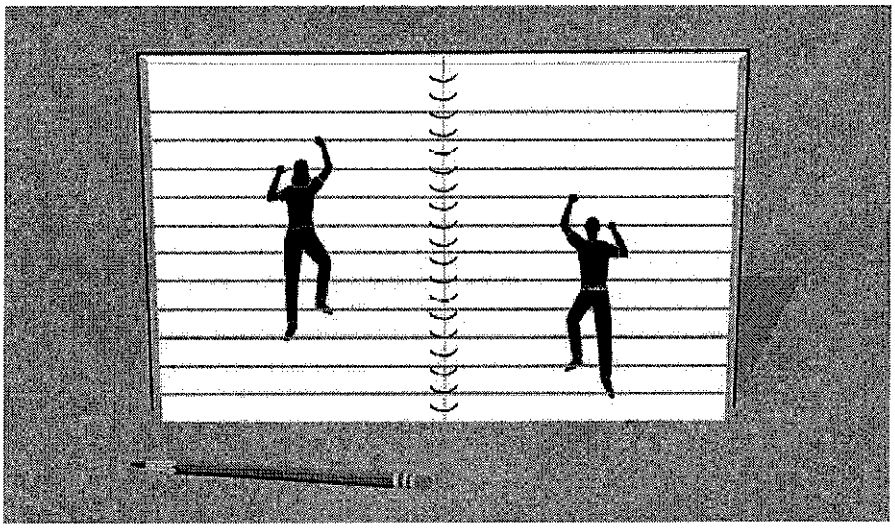
Is Professional Writing the Missing Link in High School English Classes?



—Illustration by James Steinberg

Some experts say students also need lessons on the kinds of writing they will one day use on the job

By Sarah D. Sparks

September 25, 2018 | Corrected: October 4, 2018

If you want a hint of the gap between students' writing skills and workplace demands, look at Amanda Baker's new English class in Wayne, Mich.

Forget composing technical manuals; when the Wayne Memorial High School teacher developed a new course in professional writing, she found her students weren't familiar with writing formats of people even a few years older.

"The vast majority of my class have never attempted to write email; they only text," Baker said.

While employers and educators have been working to infuse more career and technical content into K-12 curricula, studies show some of the most common writing tasks in the work world never find their way into high school English courses, and modern students may be less likely than those in previous generations to learn professional writing on their own.

"The assumption is typically that writing is a single skill, and that's not really a correct assumption. I might be good at writing scientific articles, but God

Special Report: Literacy for the Workplace
What Literacy Skills Do Students Really Need for Work?

Correction:
An earlier version of this story misstated Steve Graham's affiliation. He is a professor at Arizona State University.

help me if I had to write a novel or poetry," said Steve Graham, a writing education expert and a professor at Mary Lou Fulton Teachers College at Arizona State University. "It's pretty clear there is not a strong match between what businesses are looking for and what schools are doing. [Writing in school] really has more of an emphasis on what might happen in college than in the workplace."

Speaking Skills Top Employer Wish Lists. But Schools Don't Teach Them

Jobs at All Levels Now Require Digital Literacy. Here's Proof.

Is Professional Writing the Missing Link in High School English Classes?

How to Make Reading Relevant: Bring Job-Specific Texts Into Class

Do Students Need an Exam to Measure Workplace Skills? Four States Think So.

From business leaders to engineers, industry professionals consistently rate written communication skills as among the most important for new workers. Yet even in the wake of new academic standards in most states that encourage more writing, educators and researchers find writing instruction inconsistent and more focused on academic than practical writing. That's why some educators and business leaders are experimenting with ways to infuse career writing into students' high school years, in or out of English class.

Baker's English class at Wayne Memorial High, and Tony Nassivera's business class at Hudson Falls High School in Hudson Falls, N.Y., are two cases in point.

While in two different departments, both teachers developed their courses to bring in working professionals and human-resource staff from multiple fields to help students understand what writing they will need on the job. Baker's students use simulations of common work scenarios, from company meetings to product proposals, to learn to write alone and in groups.

"In my general English class, I have to keep reminding students, 'Even if you don't become an English teacher, this will still be useful,' " Baker said. "In business writing, they see that here immediately."

What Is Workplace Writing?

Though employer surveys tend to be vague about the specific skills in "written communication," studies and interviews do show some consistent requests, including the ability to analyze and explain concepts and situations succinctly, engage in clear and courteous conversations, present evidence-backed arguments and requests, and switch tone and format to respond to different audiences.

"It's small things," said Kyleen Gray, a literacy department head at Rainbow District School Board in Ontario, who also coaches U.S. teachers in how to incorporate business writing in English. "Academic writing is almost universally third person; business communication can be as formal, but more personal and more purposeful—getting someone to buy something or hire you, for instance. A report is not the same as a [book] review."

Data Snapshot

76 percent of business executives and 78 percent of hiring managers identify being able to communicate effectively in writing as a very important skill for recent college graduates.

Source: Association of American Colleges and Universities, 2018

A **2018 survey by the American Society for Engineering Education** found that leaders in the science, technology, engineering, and math fields listed professional communication skills as the most important in their fields, above even problem-solving, analytical skills, and technical-writing skills.

"As you look at Gen Z, the kids in middle and high school and those entering the workforce right now, they've grown up in a world of 120 characters and Instagram; that's how they've learned to communicate," said H. John Oechsle, the president and chief executive officer of Swiftpage, a Denver-based digital marketing firm. Oeschsle is also a member of Gov. John Hickenlooper's Business Experiential Learning Commission, which is working with businesses to help students develop workplace skills. "What we're finding is, as younger folks are entering the marketplace, they have a real issue with putting together short, concise, and clear written communication about something, whether it's a

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project or a problem that they're trying to solve. This is a real problem, and it's getting worse, not better."

National surveys of middle and high school teachers have found that even after the advent of the Common Core State Standards, which stress writing across all subjects, teachers use relatively few writing tasks frequently. Of the tasks they did use at least once a month, virtually none involved the kinds of writing that would be needed in the workplace, such as analysis or formal persuasive writing. In both **middle** and **high schools**, the most common written tasks were short-answer questions, worksheets, and note-taking while reading or listening. Explanations and analysis were used in high school but not as commonly as the other tasks.

"The most common activities involve writing without composing. How often do kids write stuff that requires more than a single page? Not very often," said Graham of Arizona State University. "There's not enough writing going on for students to meet the needs employers are looking for to be successful in the workplace."

Writing in and Out of School

Most common writing tasks in secondary school:

- Note-taking while listening
- Short-answer responses
- Worksheets
- Reading analysis/interpretation
- Explanations

Common professional writing tasks:

- Clear and courteous emails
- Succinct explanation of concepts or situations
- Evidence-backed persuasive writing
- Conveying the same information for different audiences
- Conducting or responding to a written interview

Source: "High School Teachers' Use of Writing to Support Students' Learning: A National Survey," Reading and Writing, 2014; *Education Week*

In 2011, the **National Assessment of Educational Progress changed its writing exam** to focus on more real-world writing tasks, such as persuading, explaining, and conveying experiences. Little more than 1 in 4 students at either 8th or 12th grade performed proficiently on the 2011 writing exam. For example, only 23 percent of students wrote a competent or effective letter giving evidence for or against a proposed business in a town. And nearly 40 percent of students exhibited developing, marginal, or no skill at explaining a type of technology they used frequently. Moreover, 8th grade gender and racial achievement gaps were significantly wider on the writing test than in the same year's reading NAEP.

The writing test allowed students to use more digital tools for writing, such as computer-based spell-check, thesaurus, and editing functions. Students who frequently used editing and thesaurus tools performed better on the test, but most students did not use those tools.

Leveraging Tech or Pushing Back?

Like Baker, Nassivera said the transition from emotional, casual, highly abbreviated texting to business correspondence tends to be the hardest skill for students to master in his business course.

"When you are going into the professional world—I can't find a less blunt way to say it—you have to sound smart. In the way you write and the words you choose, you have to sound credible," Nassivera said. "If you are working with someone in their 50s and you are in your 20s, a smiley emoji is just not going to be considered professional."

Knowing the basic format for an email isn't enough, according to a **forthcoming study in the October issue of the journal English for Specific Purposes.** Researchers in England and Hong Kong gave students a series of assignments in which they were asked to write a series of emails with a client and a manager in an ongoing business scenario, using information from both prior emails and a voicemail.

Stephen Bremner, an associate English professor at City University of Hong Kong who focuses on workplace communication, found the student writers faced "considerable challenges" in deciding what information to include from different texts, how to present

problems, and how to consider their readers. "Students need to be encouraged to think about the relationship as well as the message and to consider the question of how to acknowledge the ongoing dialogue and relationship effectively," Bremer and his co-author noted.

In a series of assignments, Nassivera helps his students build up from their texting. Students take a recent substantive text and try to rewrite it using no abbreviations but keeping the meaning. From there, students study **how businesspeople like Apple founder Steve Jobs wrote emails** and memos and work their way up to writing formal e-mails to district staff.

'Immediate Payoff'

Baker said she tries to adapt her English course each year to practical skills in areas that interest students, such as writing business plans to pitch a new company or practicing the résumés, cover letters, and formal correspondence associated with job searches. That project proved particularly useful for one of Baker's 12th grade students, Jessica Leigh, who graduated this spring. "The job I found was a coaching job, and I needed the money, so I did the project but at the same time, I actually applied for the job," she said.

A few classes later, Leigh asked Baker's permission to keep her mobile phone turned on in class; she was expecting a call back from Sky Hawk Sports, the youth-coaching company she had researched.

"I put it on speaker, and everybody in class was quiet while the guy was talking with me"—to offer her the job—"but after we hung up, everybody was cheering and stuff," she said. "It was really cool."

Baker agreed. "It was so nice to see that immediate payoff for her. That is where the growth became really tangible."

Leigh noted that neither her other English nor business classes in high school taught her how to communicate in a professional environment. "I even had a marketing class where I worked in the school store and learned money handling, but it never taught me anything about writing or résumés or job interviewing. Until I had [Baker's] class, I didn't know anything about it," Leigh said.

She has continued to coach children for the sports group over the summer to save up for college to pursue a business degree later this fall.

"I'm really glad I took that class," she said, "because otherwise, I wouldn't have this job."

Vol. 38, Issue 06, Pages s15, s16, s17

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14

Projects, Portfolios, and Performance Assessments

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Can 'Capstone Projects' Deepen Learning for High School Seniors?

Fremont High School teacher, Maya Brodkey, left, talks with senior Cristy Gonzalez-Hernandez about her senior capstone project during class at the Oakland, Calif., school. The district has had a policy since 2005 requiring students to complete a "serious research project or exhibition" in order to graduate.
—Ashley Crichton for Education Week

By Stephen Sawchuk

February 5, 2019

Oakland, Calif.

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Fremont High School teacher Maya Brodkey is laying out the next building block in her students' high school graduation project—a yearlong assessment oriented around a research question students have developed on a social issue like homelessness, war, or vaping. They've already conducted hours of online research and written essay drafts outlining their problems; the next step is to deepen their understanding and gain additional perspectives through field research, including an interview.

Students can choose to use focus groups, which Brodkey points out can elicit great information about why people hold the beliefs they do, but can be hard to schedule. They can conduct a one-on-one interview with an expert, with the knowledge that any single anecdote or position is necessarily limited. Or they can draft a survey to get superficial feedback from a wide range of people, which sounds like a lot of fun to these seniors—until Brodkey explains that it also means collecting and analyzing the resulting data, and all those data are limited by how the students frame their questions.

She references student Joanna Gonzalez's topic, which is on immigration policy and racism, clearly a front-burner issue in this diverse school system of 50,000.

"You can't just do a survey for immigrants. What does that mean? Are you asking people if they immigrated in a particular category? Are they a particular age? Did they immigrate and now have citizenship? Are they the children of immigrants?" she points out.

The students gather in groups to start thinking about what kind of field research they will choose. Only a handful have ever conducted a formal interview before, and most are a little nervous.

Special Report: Projects, Portfolios, and Performance Assessments

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Read the Full Report

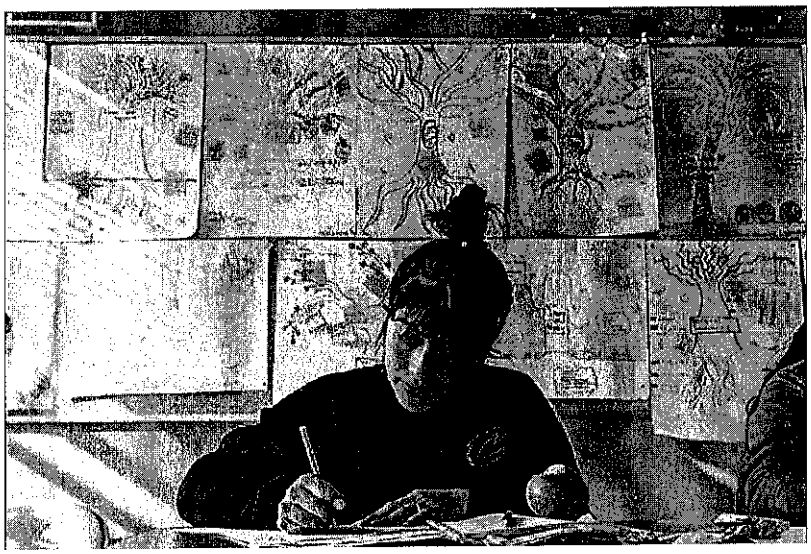
It's no wonder: For most students, researching and writing about their topics represents the most sustained piece of writing they've had to do in high school, and field research isn't even the last step. To graduate, they'll have to craft a presentation about their topic for their entire school and respond to questions posed by a panel of teachers, almost as if they're defending a thesis.

In High Demand

Oakland's Graduate Capstone Project, as it's called, provides a comprehensive look at how policymakers might think of structuring a yearlong performance test. Around 16 states have policies encouraging similar projects for high school graduation, but most of them don't require it, and implementation of the projects tends to be uneven.

There's nothing unique about the Oakland assessment's individual pieces. What's unusual is how they're knit together comprehensively, with an eye toward making sure students' mastery of research, writing, and oral skills **matches the needs of what comes next for them.**

"We really tried to learn from the mistakes of the past and think of this as not just a compliance policy," said Young Whan Choi, the district's manager of performance assessments. "It gives us an opportunity to improve the quality of the learning experience for students and develop some shared understanding of what we mean by a high-quality research paper, and a high-quality presentation, and what it means to be an Oakland graduate."



Cristy Gonzalez-Hernandez, another Fremont 12th grader, works on her senior capstone. At Fremont, drafts of student papers are shared among faculty, and final versions are blind-scored by at least two educators.
—Ashley Crichton for Education Week

5. States to Schools: Teach Reading the Right Way

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All those **skills are in high demand** not only by colleges but also by employers, who say that few young people have the **requisite oral-presentation or writing skills they expect** of new hires.

"I have had students who have come back years later and said, 'Having all these deadlines for different parts of the project helped me meet them for college,' " said James Barbuto, who teaches in nearby Skyline High School and oversees the capstone projects there. "I've never had a student who's not been successful in some way, or gotten something out of it."

Oakland teachers like Brodkey have encouraged students to select topics they've personally been touched by or feel passionate about. Partly, that's because students need something complex enough to sustain a whole year. More importantly, it's simply more authentic to a post-high-school world than topics like dress codes or cafeteria food.

"It sets them up to have a strong argument," she said. "And with regard to civic education and engagement, when you pick a real issue, it's easier to have a sense of agency."

Joanna's classmate Vtee is examining problems faced by the Cambodian community here, many of whom are still suffering the aftereffects of the 1979 Khmer Rouge genocide. Another student, who fled from violence in Yemen a few years ago, has chosen to research the effect of the civil war there on youths.

Tuuta Fili is among those students who've picked homelessness. "I had a best friend in elementary school who lived in his car for half a year and a motel for a year. And he still made it to school and stuff," Fili said.

Laptop computer in hand, he mulls over the fieldwork assignment, thinking about whom to interview. An idea occurs to him: Near one of the downtown Oakland subway stops, there's a new housing development for people experiencing homelessness. Maybe one of the developers would agree to be interviewed about the challenges and costs of creating affordable housing for his project, he thinks.

A Renaissance

Oakland's efforts constitute a renaissance of sorts for the program. District policy has required seniors to engage in a "serious research project or exhibition" since 2005. But until recently there was little consistency in student projects, according to Choi. Teachers treated oversight of the graduation project like a hot potato, a duty they passed off to one another in an "it's your turn" rite of passage.

In effect, Choi said, the requirement contributed to stratification in the district: Some students got an opportunity to write in-depth research papers, but others didn't—sometimes within the same high school.

In 2012, the district latched onto the requirement as a lever to focus the senior year and improve student civic engagement. During the first few years Oakland first worked with students in career and technical education, but over the last few years grant support has expanded the capstone projects to the general curriculum.

These evolutions have been implemented from the bottom up, rather than as a mandate. The Oakland district still gives high schools flexibility to decide whether to make the capstone a separate course or to work it into an existing one. And the district didn't initially use common scoring guidelines to judge students' writing, field research, or oral-presentation skills.

But as groups of teachers started adopting them on their own, they saw how it gave them a shared language for discussing student work, and improved equity by making sure each project was being judged by the same set of standards. Now, the district disseminates three sets of guidelines to all—one for the written paper, one on conducting field research, and one on the presentation—and offers teachers training on them.

For now, actual scoring procedures differ from school to school. At Fremont High, drafts of student papers are shared among faculty, and final versions are blind-scored by at least two educators. Students know that their work will have to satisfy even their most finicky teachers.

Not all schools have adopted the full Graduate Capstone Project—some still do a less-formal project or use a simpler scoring system. But the culture around the capstones is growing. For the class of 2018, two-thirds of graduating seniors participated in the full project.

Shaping Instruction

For teachers like Brodkey and Barbuto, the capstone truly comes down to instruction, not testing. It's required them to rethink their own teaching approaches.

Both teachers say **one of the most challenging lessons they teach has to do with sourcing**, especially in identifying skewed news articles and making sure students weigh multiple, conflicting perspectives on their topics.

Barbuto has students read each source they turn up at least three times: once to weigh its credibility, including by looking at the publisher's credentials and purpose; next, reading for background and context; and finally, synthesizing and seeing how it complements or alters their overall conclusions about their topic.

Senior Erickson Obasuyi confers with his teacher, Maya Brodkey, about his senior capstone project at Fremont High School in Oakland, Calif. Brodkey said she encourages students to choose topics that have touched them or that they feel passionate about to sustain their interest during the year.
—Ashley Crichton for Education Week

There's also the big task of simply keeping tabs on students' progress and providing the right supports, like helping them identify and link up to experts for their interviews.

Students feel the pressure, too. Senior Janeli Romero-Garcia describes the project as difficult, but doable.

"We're not doing it all in a rush," she said. "There are pieces here and pieces there, and they're all coming together."

Teachers are also thinking about how they want to see the capstone project evolve next.

Barbuto would like to see colleagues in earlier grades beginning to familiarize themselves with the scoring frameworks, so that it's easier to help students build the foundational skills over time.

"When we first started doing this years ago, the immediate feedback from the students was that it was too much to expect them to master these skills in senior year. They needed to be practicing it every year," he said.

Brodkey wants to double down on the social justice, community focus of her capstone teaching, inching the projects closer to action civics, in which students not only identify and research a problem but also try to use civic channels to help solve it.

"We continue to ask questions about: Should we keep capstone as a separate class? Should we fold it into English?" she said. "But there is not a question about whether we should do the project."

Vol. 38, Issue 20, Pages 10-13

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FIRST PERSON

Students in My Math Classes Next Year Will Do a Lot of Writing. Here's Why

By Amy Shapiro

June 20, 2016

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I started my teaching career at a large comprehensive high school, teaching math exactly as I had been taught. Each day, I introduced my students to a new type of problem, solved a problem for them, and wrote the procedure in listed steps alongside my solution. Then I assigned them additional problems to solve on their own using the procedure that I provided. My students' progress was slow with this approach, and I felt like I was struggling to reach them.

After four years of teaching, I switched gears and spent my fifth year teaching physics to 9th graders at a new engineering-themed small school in the Bronx borough of New York City. That year was completely different from my past teaching experience, both in terms of the content I was teaching and the type of instruction I was trying to provide my students. I used an inquiry-based curriculum with project-based assessments in this physics course with mixed success.

I finished the year feeling like the course had gone better than the teacher-centered math courses I had taught during the previous four years, but I wasn't able to instantaneously change the learning in my classroom as much as I had hoped. Again, I found myself struggling to accurately assess what had gone wrong and how to improve.

See Also: **Guided Reading: How to Make Kids Hate (or Love) to Read**

Vocabulary Lessons

My principal contacted me over the summer because she was looking for someone to attend a training on teaching English-language learners. Our district's department of education required someone from each school to attend a weeklong summer professional-development course, and no one else from my school was available or wanted to go. Initially, I felt like the training wouldn't be applicable to my practice, but I decided to attend mostly to "take one for the team." But, in fact, it was this PD experience that opened my eyes as to what had gone wrong the previous year

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and started to provide me with concrete strategies to improve the teaching and learning in my classroom. I learned, specifically, about the central role of language development in learning, even in math classes.

Remodeling the Workshop: Lucy Calkins on Writing Instruction Today

Students in My Math Classes Next Year Will Do a Lot of Writing. Here's Why. (Opinion)

Why Creative Writing Still Has a Place in My Classroom (Opinion)

How the Common Core Re-Mapped the Way I Teach Writing (Opinion)

Through this activity and others like it, I started to think about how much vocabulary my students actually needed to learn in my classroom, especially if I was going to talk to them with appropriate mathematical and scientific words as they learned the new content. Regardless of whether my students were ELLs or former ELLs or neither, all the new content they were learning required them to learn new academic language as well, and I needed to teach this language to them. At this point in my career, I made a commitment that going forward, I would make a conscious effort to help my students develop both spoken and written academic language.

I continued to teach a variety of math and science classes for four years after this eye-opening summer training. I experimented with different ways to get my students talking and writing about math and science. I tried grouping my students purposefully, providing different participation structures like **"round robins"** and **"novel ideas only,"** and asking my students to write lab reports in science class and essays to identify and explain their mistakes in solving problems in math class. I even had my calculus students read a nonfiction book in literature circles about Newton and Leibniz's independent discoveries of calculus and required them to keep a journal about their reading and the connections they were making to their own learning in calculus.

It was an exciting time for me as I tried to help improve the teaching and learning in my classroom, and I definitely felt more successful as a teacher. My students' written work gave me insight into what they understood and what they didn't in a way I had never experienced when the majority of the assessment in my classroom was summative and focused on correct answers rather than explanations and processes.

Academic-Language Development

After nine years of teaching, I left the classroom to take a position at an amazing nonprofit organization where I planned and facilitated PD for preservice and new math teachers. The Common Core State Standards had just started to be implemented, and they were creating a different culture from the one in which I had learned to teach. Students were now being asked to explain their thinking and the processes they used to solve problems and not just to provide the correct answer.

Additionally, the preservice teachers I was working with were required to complete the edTPA, a performance-based assessment, as a part of their certification process, and I had to learn this assessment in order to support them through the process. Part of the edTPA stresses the development of academic language of students, even in a math classroom. Specifically, it requires preservice teachers to identify one language function essential for students to learn in connection with the math lesson they're teaching. It suggests "compare/contrast," "conjecture," "describe," "explain," and "prove" as language functions to be frequently used in a math classroom. As I tried to support the preservice teachers through this process, I began to look around to find examples of how other math teachers in our community were supporting language development in their classrooms.

When I was specifically looking for ways the teachers in our community were supporting their students' academic-language development, I noticed that it was something that many teachers took seriously and incorporated almost daily. One common method that some teachers utilized came out of work traditionally associated with debate teams. They would ask students to justify their work using a "claim warrant" explanation. For example, while referencing a picture of triangle ABC, a student could say or write, "My claim is that angle A is the biggest angle. My warrant is that it is across from the longest side: BC."

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I also saw teachers adopt the idea of a problem without a question. They'd present students with a diagram or a situation and then ask questions like, "What is this situation about? What quantities do you have? What questions could be asked?" This process takes students away from traditional procedural methods of solving problems and gets them to think about different situations mathematically and to describe mathematical scenarios verbally and in writing.

A group of beginning math teachers that I worked with on an inquiry project gave their students examples of problems that were solved incorrectly and asked them to write about the misconception presented in the solution, using sentence starters like "I believe that ...," "I can see that ...," "My evidence for this idea is ...," or "I think this means ..."

A Window on Understanding

All these methods and others were shared among the teachers in our community and were experimented with in different ways, all in hopes of helping develop students' mathematical understanding, generally, through the use of writing. These methods provided for a symbiotic relationship between teaching and learning that previously didn't exist between the two. Through verbal and written strategies, the students gained a deeper understanding of the content.

Meanwhile, students' writing gave teachers a window into students' understanding so that they could really address the content learning of their students. It enabled teachers to assess exactly what their students did and did not understand and adjust their teaching accordingly.

This fall, I return to the classroom, where I will be teaching 7th grade math and science. I re-enter the classroom with a wealth of knowledge from my work as a PD coordinator, knowledge I did not have when I started my teaching career. I hope to be able to synthesize all that I learned, both as a teacher myself and as an educator of educators, to develop my students' mathematical and scientific abilities through writing.

If there's one thing I learned as a math educator, it's that while it's important to have students learn to solve problems and to talk about solutions, it is equally, if not more important, to teach them to write about their strategies and thought processes, or they will always struggle to exhibit their mathematical understandings. And I need to be able to accurately assess exactly where my students are in their content development, so that I can reach them where they are and adjust my teaching accordingly.

I now believe that the key to creating a classroom environment with a true symbiotic relationship between teaching and learning is writing, so next year, my students will be doing a lot of it.

Coverage of the implementation of college- and career-ready standards and the use of personalized learning is supported in part by a grant from the Bill & Melinda Gates Foundation, at ***www.gatesfoundation.org.*** *Education Week retains sole editorial control over the content of this coverage.*

Amy Shapiro has 16 years of experience in education, 10 as a classroom teacher of math and physics and six as a program officer at an education non-profit. She is currently a STEM specialist at a small independent school in upstate NY. This fall, after six years out of the classroom, she will return and teach 7th grade math and science and 11th grade physics.

WEB ONLY

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The Washington Post
Democracy Dies in Darkness

Let the moon rush begin

By **Homer Hickam**

Feb. 21, 2020 at 4:24 p.m. EST

Homer Hickam is the author of "Rocket Boys" (also published as "October Sky"), "Back to the Moon" and the "Crater" trilogy.

For those of us who have been involved with the movement of humankind into space across many years, these are exciting times. Since Vice President Pence's speech last March directing NASA to return astronauts to the moon by 2024, the U.S. space agency, commercial companies and other countries have quickened their efforts to learn more about Luna and prepare to land people there. It's as if the world was waiting for an opening bell and the vice president rang it.

As these efforts get going, however, it's important to avoid the thinking of a half-century ago and look at the moon in a different way. This is, after all, not your grandfather's moon. After the Apollo moon-landing program of the 1960s and '70s, a series of robotic missions discovered that Luna was a lot more interesting than many had previously thought. It has abundant water and oxygen, as well as helium, platinum, thorium, rare earth metals and other minerals that may well be worth digging up and transporting back for use in thousands of products. Last year, a gigantic blob of metal, as yet unidentified but significantly larger than the Big Island of Hawaii, was discovered beneath the lunar south pole. Whatever it is, it has value. The quiet far side of the moon could also provide a location for interstellar observatories, and tourists who would pay a lot to have a lunar vacation are inevitable. In other words, a real business case can be made for the moon, a case that could not only put dollars back into the pockets of taxpayers but also open up jobs for skilled workers on the lunar surface.

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I'm a member of the Users' Advisory Group of the National Space Council, and one of my duties is to understand NASA's plans for the Artemis moon-landing program and contribute recommendations. Although technical details of Artemis might be modified, there is one thing I've noticed that isn't up for debate: Professional astronauts are going first. While I agree that professionals are required for the initial landings, I don't think that exclusivity should continue for long.

The Apollo program, though successful, was canceled within three years of the first landing, partly because few Americans had a stake in maintaining the enterprise. For many people, the moon was a dry, dead place suitable only for astronauts and scientists and seemed to have nothing of value for those paying the bills. But if we start looking at the moon not as an astronomical object but as an eighth continent and potentially a new source of wealth for the people of Earth, it would be a revolutionary way of thinking about the space frontier. Once electricians, plumbers, miners and construction workers start going to the moon, and the middle class starts using products made with minerals from Luna, the United States will become a true spacefaring nation.

The U.S. government legalized space mining in 2015, and other nations have taken their own approaches to lunar mining for profit. Although the United States signed a 1967 U.N. treaty that suggests no nation can claim sovereignty over the moon, the treaty was developed as an attempt at arms control during a time when the United States and the Soviet Union were landing probes. This Cold War relic is unlikely to prevent Washington or other governments from proceeding toward lunar activities.

My opinion is undoubtedly colored by where I grew up, the little mining town of Coalwood, W.Va. When I was growing up, Coalwood was difficult to get to and its living conditions were harsh. But the town had important economic resources, so people came there, not because they liked living in those remote hills or enjoyed working in the mines but because they could have jobs and make enough money to raise their families. Eventually, they fell in love with the rugged mountains and valleys and the Appalachians became their permanent home. I was nurtured by that harsh but beautiful land. In much the same way, I believe life on the moon could evolve, but first the path must be prepared. We must do what the United States didn't do for Apollo — that is, look past the initial stages of Artemis and plan what comes next.

I propose that NASA make the initial landings and prove that the hardware works. And that is where its duties would end. If the space agency can persuade Congress to give it the money to go on to Mars, let it, but there is too much real, practical work to be done on the moon for the rest of us to get distracted. After Artemis, a consortium led by the U.S. Department of Commerce, with commercial and international partners, should set as its first task building an outpost on the moon near water and oxygen supplies. This could act as a staging area much like St. Louis was for the pioneers on the American frontier. For a fee paid to the consortium, commercial companies, governmental entities and scientific organizations could use this outpost to prepare their personnel and equipment to set forth across the lunar plains, valleys and hills. They could prospect for minerals and other resources in the great lunar outback and eventually plan the construction of observatories and hotels. As more is learned about lunar resources and sufficient business cases are made, towns like Coalwood could spring up all over the moon.

For the first time, humans would be going into space not only for science but also for self-sustaining economic reasons. That's a solid argument for letting the moon rush begin.

Read more:

Robert Zubrin and Homer Hickam: We have the technology to build a colony on the moon. Let's do it.

Mary Robinette Kowal: If space is the future, that future needs to include everyone

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Marillyn Hewson: No, human space exploration is not a dead end

The Post's View: NASA keeps falling victim to presidential whims

ENGLISH LANGUAGE AND COMPOSITION

SECTION II

Total time—2 hours

Question 1

(Suggested time—40 minutes. This question counts for one-third of the total essay section score.)

Directions: The following prompt is based on the accompanying eight sources.

This question requires you to synthesize a variety of sources into a coherent, well-written essay. When you synthesize sources, you refer to them to develop your position and cite them accurately. *Your argument should be central; the sources should support the argument. Avoid merely summarizing sources.*

Remember to attribute both direct and indirect references.

Introduction

Explorers and tales of explorations tend to capture the human imagination. However, such explorations have financial and ethical consequences. Space exploration is no exception.

Assignment

Read the following sources (including the introductory information) carefully. **Then, in an essay that synthesizes at least three of the sources, develop a position about what issues should be considered most important in making decisions about space exploration.**

You may refer to the sources by their titles (Source A, Source B, etc.) or by the descriptions in parentheses.

Source A (Livingston)
Source B (Photo)
Source C (Chamberlain)
Source D (NIH)
Source E (McLean)
Source F (Greenberg)
Source G (Collins)
Source H (Roberts)

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GO ON TO THE NEXT PAGE.

Source A

Livingston, David. "Is Space Exploration Worth the Cost?" 21 Jan. 2008. The Space Review: Essays and Commentary About the Final Frontier. 4 March 2008 <http://www.thespacereview.com/article/1040/1>.

The following is from the Web page of a person dedicated to space travel.

In my opinion, the manned space exploration program is absolutely worth the cost. The money spent on manned space exploration is spent right here on Earth and most of it is spent in the US. We do not yet have a Bank of the Milky Way, the First International Bank of Mars, or a Lunar Mutual Savings and Loan. The money that is spent goes to manufacturing, research and development, salaries, benefits, insurance companies, doctors, teachers, scientists, students, blue- and white-collar workers, and corporations and businesses both large and small. The money disperses throughout the economy in the same way as money spent on medical research, building houses, or any other activity we engage in with government or even private spending.

We have our work cut out for us as we move forward in this new century. We don't seem to get along well with each other here on Earth, but we do quite well in space. Space is our model for all nations. Notice how many more nations are talking about and wanting to get into the manned space act. India, Russia, China, Japan, and the European Space Agency, for starters, all want a manned mission to the Moon and it won't stop there. These countries and agencies know that manned space exploration builds wealth for their nation, solves problems and enhances life for their people right here on Earth, and shows us the way for how we can all live together in peace.

Manned space exploration is absolutely worth the investment. It's not just about what we learn out there in space, or about ourselves, or how to be a better steward of precious Earth. It's about how we live here on Earth together and what type of future we want for ourselves and children. Manned space exploration is the path to how we build a better life for ourselves here on Earth, and how we can give hope and provide inspiration for our youngsters to grow up, do the schoolwork, and accept the challenges that await them to make our world even better. Whatever we spend on manned space exploration is a bargain and our investment will be returned to us many times over, both quantitatively and qualitatively.

The Space Review © 2008 Used by permission of Dr. David Livingston, www.thespaceshow.com.

Source B

National Aeronautics and Space Administration (NASA) photo

The following photo is taken from the NASA photo archive.

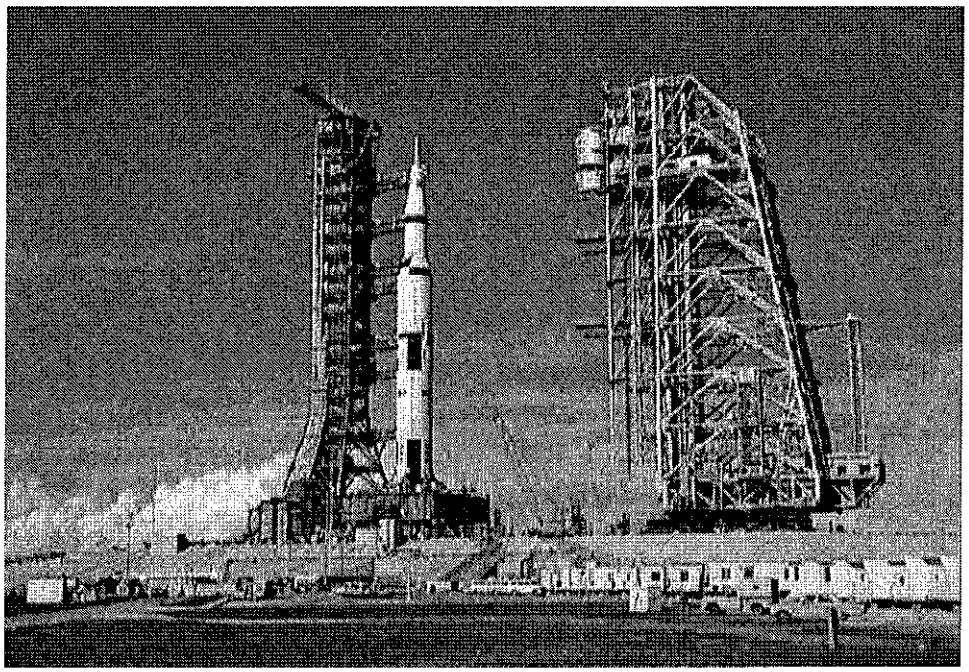


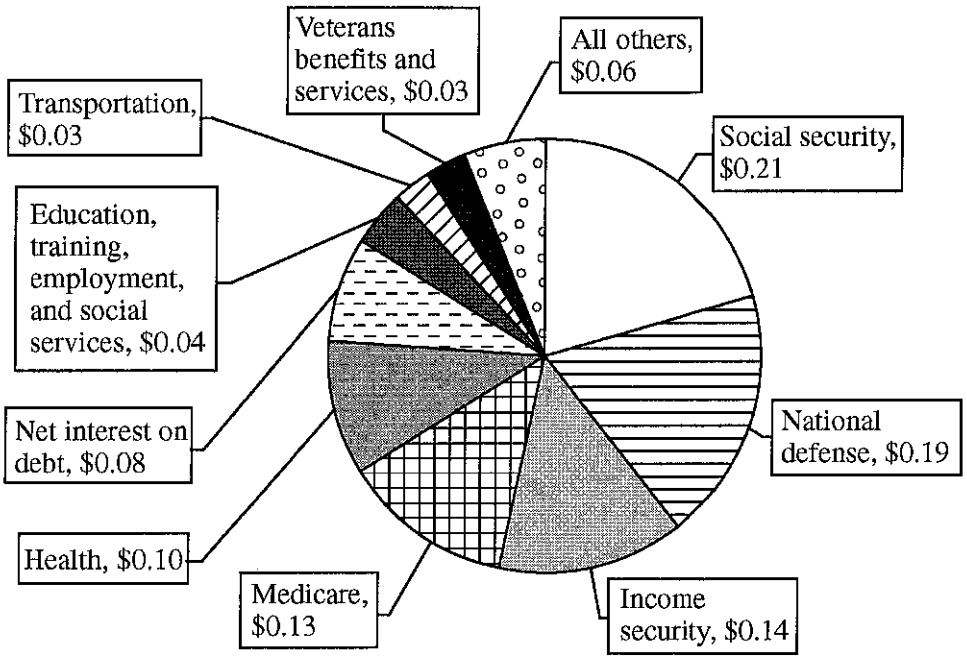
Photo Credit: NASA

Source C

Chamberlain, Andrew. "Pennies of Each Federal Spending Dollar." 7 Apr. 2006. The Tax Foundation. 1 March 2008 <http://www.taxfoundation.org/blog/printer/1420.html>.

The following are two visual representations of the same information about how each federal tax dollar is spent.

PENNIES OF EACH FEDERAL DOLLAR SPENT ON VARIOUS PROGRAMS, 2006 ESTIMATES



Pennies of Each Federal Dollar Spent on Various Programs, 2006 Estimate

Function	Amount
Social security	$ 0.21
National defense	$ 0.19
Income security	$ 0.14
Medicare	$ 0.13
Health	$ 0.10
Net interest on debt	$ 0.08
Education, training, employment, and social services	$ 0.04
Transportation	$ 0.03
Veterans benefits and services	$ 0.03
All others*	$ 0.06
Total	*$ 1.00*
*Includes community and regional development; administration of justice; international affairs; natural resources and environment; agriculture; general science; space and technology; general government; commerce and housing credit; energy; and undistributed offsetting receipts.	
Source: Office of Management and Budget, Analytical Perspectives, Budget of the United States Government, Fiscal Year 2007 (available at http://www.whitehouse.gov/omb/budget/fy2007/); Tax Foundation calculations.	

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GO ON TO THE NEXT PAGE.

Source D

National Institutes of Health. 26 Feb. 2008
<http://www.nih.gov/about/NIHoverview.html>.

The following is a description of the National Institutes of Health (NIH), a government-funded agency whose mission is to improve health.

The Nation's Medical Research Agency

The National Institutes of Health (NIH), a part of the U.S. Department of Health and Human Services, is the primary Federal agency for conducting and supporting medical research. Helping to lead the way toward important medical discoveries that improve people's health and save lives, NIH scientists investigate ways to prevent disease as well as the causes, treatments, and even cures for common and rare diseases. Composed of 27 Institutes and Centers, the NIH provides leadership and financial support to researchers in every state and throughout the world. . . .

In the past several decades, NIH-supported research, and its national programs to communicate the results of research, played a major role in achievements such as:

- Death rates from heart disease and stroke fell by 40% and 51%, respectively, between 1975 and 2000.
- The overall five-year survival rate for childhood cancers rose to nearly 80% during the 1990s from under 60% in the 1970s.
- The number of AIDS-related deaths fell by about 70% between 1995 and 2001.
- Sudden infant death syndrome rates fell by more than 50% between 1994 and 2000.
- Infectious diseases—such as rubella, whooping cough, and pneumococcal pneumonia—that once killed and disabled millions of people are now prevented by vaccines.
- Quality of life for 19 million Americans suffering with depression has improved as a result of more effective medication and psychotherapy.

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Source E

McLean, Margaret R. "To Boldly Go: Ethical Considerations for Space Exploration." Feb. 2006. Markkula Center for Applied Ethics. 29 Feb. 2008 <http://www.scu.edu/ethics/publications/ethicalperspectives/space-exploration.html>.

The following excerpt appeared on the Web page of a group dedicated to ethics.

In the budget unveiled on Monday, almost $17 billion will fly into NASA's coffers with around $5.3 billion dedicated to space exploration. The Crew Exploration Vehicle and Launch Vehicles will be built; new spacecraft on their way to the moon and Mars will be whizzing overhead by 2014. NASA chief Michael Griffin claimed that this new budget would set the stage for "the expansion of human presence into the solar system."

But before we think about exploring—and potentially exploiting—"the final frontier," we would do well to remember that we do not have a very good track record in protecting our planet home. We have expanded human presence into pristine forests resulting in the disruption of migratory routes, soil erosion, and species extinction. What can be learned from our presence on Earth about the potential impact of our forays into the outer reaches of the solar system?

We are the only earthly creatures with the capacity to extend our influence beyond the 4 corners of the globe. This puts on us the responsibility to acknowledge that, despite the depths of space, it is not so limitless as to be able to weather mistreatment or suffer every demand we may place on it.

One way to think about expanding our presence in the solar system is through the lens of stewardship. Stewardship envisions humans not as owners of the solar system but as responsible managers of its wonder and beauty.

Stewardship holds us accountable for a prudent use of space resources. Such responsibility may support exploration of the final frontier, but at the same time it warns against exploitation of its resources. We must account for our urges and actions in terms of their impact on others, the universe, and the future.

As we boldly plan to extend ourselves to places where no one has gone before, we would do well to consider the following principles:

1. Space preservation requires that the solar system be valued for its own sake, not on the basis of what it can do for us.
2. Space conservation insists that extraterrestrial resources ought not to be exploited to benefit the few at the expense of the many or of the solar system itself.
3. Space sustainability asks that our explorations "do no harm" and that we leave the moon, Mars, and space itself no worse—and perhaps better—than we found them.

As we expand human presence into the solar system, we ought not to park ethical considerations next to the launching pad. We must take our best ethical thinking with us as we cross the frontier of space exploration.

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Source F

Greenberg, Richard, and B. Randall Tufts. "Infecting Other Worlds." American Scientist Jul.-Aug. 2001. 24 Feb. 2008 <http://www.americanscientist.org/issues/num2/2001/7/infecting-other-worlds/1>.

The following is excerpted from an article about spreading infection via space.

Because extraterrestrial life may exist, planetary exploration could bring trouble if people are not careful enough. This danger was recognized decades ago, when astronauts ventured to the Moon. When the crews returned, they were quarantined to prevent "back contamination," the hazard that some infectious extraterrestrial germ might be riding with them. The safety procedures were largely symbolic: After all, who knew the incubation period for some hypothetical other-worldly microbe? Whether the hardware and samples returned needed sterilization was also largely a matter of speculation. Subsequent planetary exploration has not involved astronauts, nor have samples or hardware been returned, so back contamination has not been an issue. But forward contamination—that is, the infection of alien ecosystems by terrestrial organisms hitchhiking on a spacecraft—is a distinct possibility.

American Scientist, magazine of Sigma Xi, The Scientific Research Society.

Source G

Collins, Michael. Carrying the Fire: An Astronaut's Journeys. New York: Farrar, Straus and Giroux, 1974.

The following is excerpted from a book written by one of the first astronauts in space.

I really believe that if the political leaders of the world could see their planet from a distance of, let's say, 100,000 miles, their outlook would be fundamentally changed. That all-important border would be invisible, that noisy argument suddenly silenced. The tiny globe would continue to turn, serenely ignoring its subdivisions, presenting a unified façade that would cry out for unified understanding, for homogeneous treatment. The earth *must* become as it appears: blue and white, not capitalist or Communist; blue and white, not rich or poor; blue and white, not envious or envied. I am not a naïve man. I don't believe that a glance from 100,000 miles out would cause a Prime Minister to scurry back to his parliament with a disarmament plan, but I do think it would plant a seed that ultimately could grow into such concrete action. Just because borders are invisible from space doesn't mean that they're not real—they are, and I like them. . . . What I am saying, however, is that all countries must begin thinking of solutions to their problems which benefit the entire globe, not simply their own national interests. The smoke from the Saar Valley may pollute half a dozen other countries, depending on the direction of the wind. We all *know* that, but it must be *seen* to make an indelible impression, to produce an emotional impact that makes one argue for long-term virtues at the expense of short-term gains. I think the view from 100,000 miles could be invaluable in getting people together to work out joint solutions, by causing them to realize that the planet we share unites us in a way far more basic and far more important than differences in skin color or religion or economic system. The pity of it is that so far the view from 100,000 miles has been the exclusive property of a handful of test pilots, rather than the world leaders who need this new perspective, or the poets who might communicate it to them.

Source H

Roberts, Russell. "Funding Space Travel." Morning Edition. 26 Jan. 2004. National Public Radio. Transcript. 19 Feb. 2008 <http://www.invisibleheart.com/Iheart/PolicySpace.html>.

The following excerpt is the text of an oral commentary aired on the radio.

I own a telescope.

I own a lot of books on the nighttime sky and cosmology and the big bang.

I get goose bumps when I see a picture of the earth from space.

The Imax space movies bring tears to my eyes.

But I get no thrill from the Bush plan to put Americans on Mars.

As much as I like space and the idea of people on Mars, I don't see the case for using taxpayer money to get it done. Don't tell me about all the spin-off technologies . . . . Leave the money here on earth.

By permission of Professor Russell Roberts.