

Engineering Disciplines

by Melissa Ladowitz

★ TASK ★ LADDER

After researching a variety of engineering disciplines, students will write a report on the engineering discipline that appeals most to them. The report will define the discipline and explain the preparation for and work done in the discipline.

GRADES	DISCIPLINE	COURSE	PACING
9	∐ Science	Engineering Lab	⑦ N/A

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Section 1: What Task?

Teaching Task

Task Template 11 - Informational or Explanatory

After researching a variety of teacher-selected texts, websites of engineering technical societies, and studentselected articles on engineering disciplines, write five page report in which you define an engineering discipline of choice and explain job responsibilities, profile of a specific individual in the field, education and training required, advancement possibilities, average salary, and future outlook. Support your discussion with evidence from your research.

Standards

Common Core State Standards for English Language Arts & Literacy in History/Social Studies, Science, and Technical Subjects

CCR.R.1

Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

CCR.R.2

Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

CCR.R.4

Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCR.R.6

Assess how point of view or purpose shapes the content and style of a text.

CCR.R.10

Read and comprehend complex literary and informational texts independently and proficiently.

CCR.W.2

Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

CCR.W.4

Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCR.W.5

Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach.

CCR.W.9

Draw evidence from literary or informational texts to support analysis, reflection, and research.

CCR.W.10

Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

WHST.9-10.1

Write arguments focused on discipline-specific content.

WHST.9-10.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

Focus

Focus

Texts

Article Highlighting 4 Different Engineers Pierce, Julia. "Welcoming in the New Breed." Welcoming in the New Breed. 193.2589 (2007): 50. Print.

% Engineering by Crawford B. Bunkley III

- List of Best Undergraduate Engineering Programs U.S. News & World Report (Sept 2010)
- Article detailing news briefs related to mechanical engineering Pappalardo, Joe; Hutchinson, Alex. (Apr 2008) Popular Mechanics

Description about empirical software engineering

Wilson, Greg & Aranda, Jorge (2011-11-01). Empirical software engineering: as researchers investigate how software gets made, a new empire for empirical research opens up.(FEATURE ARTICLES)(Report). In American Scientist. 99 (6), 466(8)

- Article about Edison's and Tesla's advances in electrical engineering Bailey, Ronald H. "Tesla: The Wizard Who Electrified the World." American History 45.2 (2010): 52-59.
- Article about designing electrical systems Widhalm, Shelley. "The Power of Electricity: Engineers Work Behind the Scenes." World & I, Jun/Jul2005, Vol. 20 Issue 6/7, pN.PAG, 0p.
- Article about seismic engineering design PARTING THE WAVES. Storrs, Carina // Popular Science;Nov2009, Vol. 275 Issue 5, p34.
- Article about impact of engineering projects on the Niger river Pearce, Fred. (3/24/2012). Aral Sea disaster will be repeated in Mali. New Scientist.
- Article about construction of the Hoover Dam Stevens, Joseph E. (April 2002). DAM IT! American History.
- Project-based introductory engineering textbook Engineering Your Future, Second Edition

Student Work Rubric - Informational or Explanatory Task - Grades 9-12

	Emerging	Approaches Expectations	Meets Expectations	Advanced
	1	2	3	4
Controlling Idea	Presents a general or unclear controlling idea.	Presents a clear controlling idea that addresses the prompt , with an uneven focus .	Presents and maintains a clear, specific controlling idea that addresses all aspects of the prompt and takes into account the complexity of the topic.	Presents and maintains a precise, substantive controlling idea that addresses all aspects of the prompt, takes into account the complexity of the topic and, where appropriate, acknowledges gaps in evidence or information.
Selection & Citation of Evidence	Includes minimal details from sources. Sources are used without citation.	Includes details, examples, and/or quotations from sources that are relevant to the controlling idea. Inconsistently cites sources.	Includes details, examples, and/or quotations from sources that support the controlling and supporting ideas . Consistently cites sources with minor formatting errors.	Includes well-chosen details, examples, and/or quotations from sources that fully support the controlling and supporting ideas. Consistently cites sources using appropriate format .
Development / Explanation of Sources	Explanation of ideas and source material is irrelevant, incomplete, or inaccurate.	Explains ideas and source material to support the controlling idea, with some incomplete reasoning or explanations.	Accurately explains ideas and source material and how they support the controlling idea.	Thoroughly and accurately explains ideas and source material to support and develop the controlling idea.
Organization	Lacks an evident structure. Makes unclear connections among ideas, concepts, and information.	Groups ideas and uses transitions to develop the controlling idea, with some lapses in coherence or organization.	Groups and sequences ideas to develop a cohesive explanation. Uses transitions to clarify the relationships among complex ideas, concepts, and information.	Groups and sequences ideas in a logical progression in which ideas build to create a unified whole. Uses varied transitions to clarify the precise relationships among complex ideas, concepts, and information.
Conventions	Major errors in standard English conventions interfere with the clarity of the writing. Language or tone is inappropriate.	Errors in standard English conventions sometimes interfere with the clarity of the writing. Uses language and tone that are sometimes inappropriate for the audience and purpose.	Consistently applies standard English conventions; minor errors, while noticeable, do not interfere with the clarity of the writing. Uses language and tone appropriate to the audience and purpose.	Consistently applies standard English conventions, with few errors. Demonstrates varied syntax and precise word choice. Consistently uses language and tone appropriate to the audience and purpose.
Content Understanding (Generic)	Attempts to include disciplinary content in explanation or argument but understanding of content is weak; content is irrelevant, inappropriate, or inaccurate.	Briefly notes disciplinary content relevant to the prompt; shows basic or uneven understanding of content; minor errors in explanation.	Accurately presents disciplinary content relevant to the prompt with sufficient explanations that demonstrate understanding.	Integrates relevant and accurate disciplinary content with thorough explanations that demonstrate in-depth understanding.

Engineering Disciplines

Background for Students

Not provided

Extension

Not provided

Section 2: What Skills?

Preparing for the Task

BRIDGING CONVERSATION > **TASK ENGAGEMENT**: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.

TASK AND RUBRIC ANALYSIS > TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric.

Reading Process

PRE-READING > TEXT SELECTION: Ability to identify appropriate texts.

ACTIVE READING > **ESSENTIAL VOCABULARY**: Ability to apply strategies for developing an understanding of text(s) by locating words and phrases that identify key concepts and facts, or information.

ACTIVE READING > **NOTE-TAKING**: Ability to read purposefully and select relevant information; to summarize and/or paraphrase.

ACTIVE READING > IDENTIFY CENTRAL POINT AND SUPPORT: Ability to identify the central point and main supporting elements of a text.

POST-READING > ACADEMIC INTEGRITY: Ability to use and credit sources appropriately.

Transition to Writing

BRIDGING CONVERSATION > PREPARING FOR WRITING: Ability to begin linking reading results to writing task.

Writing Process

INITIATION OF TASK > ESTABLISHING THE CONTROLLING IDEA: Ability to establish a controlling idea and consolidate information relevant to task.

PLANNING > PLANNING THE WRITING: Ability to develop a line of thought and text structure appropriate to an information/explanation task.

DEVELOPMENT > INITIAL DRAFT: Ability to construct an initial draft with an emerging line of thought and structure.

REVISION, EDITING, AND COMPLETION > EDITING: Ability to proofread and format a piece to make it more effective.

REVISION, EDITING, AND COMPLETION > REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose.

REVISION, EDITING, AND COMPLETION > FINAL DRAFT: Ability to submit final piece that meets expectations.

Section 3: What Instruction?

PACING	SKILL AND DEFINITION	PRODUCT AND PROMPT	SCORING GUIDE	INSTRUCTIONAL STRATEGIES		
Preparin	Preparing for the Task					
Not provided	BRIDGING CONVERSATION > TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.	SHORT CONSTRUCTED RESPONSE In a quick write, write your first reaction to the task prompt. Add some notes of things you know about this topic.	Work meets expectations if reaction demonstrates thoughtful reflection and includes at least two items the student knows about the topic.	 Students round-robin report out in small groups. Small groups report out commonalities to the class. Clarify timetable as presented in student constratins and support plans for the task. 		
10 mins	BRIDGING CONVERSATION > TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.	SHORT CONSTRUCTED RESPONSE What do you want to be when you grow up? Explain why you think this would be a good career for you.	Not Provided	 Students report out their career goal to the class. As a class, identify commonalities. 		
Not provided	BRIDGING CONVERSATION > TASK ENGAGEMENT: Ability to connect the task and new content to existing knowledge, skills, experiences, interests, and concerns.	LIST After reading the Engineering Disciplines chapter from Engineering your Future, Second Edition, identify the top three engineering fields that appeal to you and why, as well as the three engineering fields that do not appeal to you and why.	Not Provided	 Students report their "top three" and "bottom three" to the class. Ask the class to identify commonalities. Ask each student to commit to the discipline that is most appealing and list that discipline on the class roster. Once all students have committed to an engineering discipline, re-group students into small groups with common interests (all mechanical engineers together, etc.) 		
Not provided	TASK AND RUBRIC ANALYSIS > TASK ANALYSIS: Ability to understand and explain the task's prompt and rubric.	SHORT CONSTRUCTED RESPONSE Study the rubric, paying particular attention to "meets expectations" and "advanced." In your journal, write down characteristics of a high quality response.	Work meets expectations if student identifies at least five characteristics of a "meets expectations" or "advanced" response.	 Students round-robin report out in small groups. Small groups report out commonalities to the class. Emphasize components that tend to be difficult for students, such as appropriate citation of sources. Generate a classroom list of characteristics of a high quality response; post on whiteboard throughout the module. 		
Reading	Reading Process					
Not provided	PRE-READING > TEXT SELECTION: Ability to identify appropriate texts.	SHORT CONSTRUCTED RESPONSE What makes a source "credible?"	Work meets expectations if includes reasonable	 Ask students to brainstorm in their journal what makes an author credible and/or worthy of study. Report out as a class what makes an author credible and/or worthy of study; students add to their own 		

			evidence that work is credible and/or worthy of study.	 lists. Discuss credibility of websites (type of url, research/academic sites, professional societies, author credentialing, etc). Model on the SmartBoard how to serach for information from credible sources using key words such as: engineering careers, chemical engineering, or engineering degrees. Give students an opportunity to research during class. Circulate through the room, providing support and intervention when necessary. Notes: Students should be grouped with other who have chosen similar topics. Encourage students to confer with each other while researching.
Not provided	ACTIVE READING > ESSENTIAL VOCABULARY: Ability to apply strategies for developing an understanding of text(s) by locating words and phrases that identify key concepts and facts, or information.	LIST In your journal, list words and phrases essential to the texts. Add definitions and context.	 Work meets expectations if: Lists appropriate terms and phrases Provides accurate definitions 	 Students round-robin report out their essential vocabulary lists in small groups periodically, adding to their lists when appropriate. Notes: Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working.
1 hr	ACTIVE READING > NOTE-TAKING: Ability to read purposefully and select relevant information; to summarize and/or paraphrase.	NOTES For each text, make a list of the elements that look most important for answering the prompt. Do whe you need to do to avoid plagariasm. L2(a) What strategies will you use to discern "credible sources?"	 Work meets expectations if: Identifies relevant elements. Includes information to support accurate citation (for example, page numbers for a long text, clear indication when quoting directly). 	 Introduce students to the Notetaking tool (attached). Remind students to seek information to address each component of the prompt from multiple sources. Point out that each note be accompanied by a mark indicating whether it is a direct quote or paraphrased and include the citation with each note. Using a sample article, model how to paraphrase. Review how to determine the credibility of a source. Give students time to research during class. Circulate to ensure that notes are in the assigned format and completed appropriately. Notes Laptops will be needed. Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while researching. For the sample article, chose any article students might find interesting, being mindful of student reading levels. Grouping students by reading level and providing differentiated articles is helpful in classes where there is a wide range.
	Additional Attachments:			
Not	ACTIVE READING >	NOTES	Work meets	Provide students with Critical Reading Strategies

Engineering Disciplines

provided	IDENTIFY CENTRAL POINT AND SUPPORT : Ability to identify the central point and main supporting elements of a text.	Using the critical reading strategies modeled in class, actively read the Engineering Diciplines chapter of Engineering Your Future, Second Edition.	expectations if after reading, the text includes: highlighed titles, subheadings, vocabulary, and key concepts and questions and comments written in the margins.	 (attached), explain how to perform each, and the rationale for each. Students read the chpater in small groups using a "group read around" in which students take turns reading orally. Circulate thorugh the room, ensuring that critical reading strategies are being used effectively, providing support and intervention when needed.
	Additional Attachments:	tegies Worksheet		
Not provided	ACTIVE READING > IDENTIFY CENTRAL POINT AND SUPPORT: Ability to identify the central point and main supporting elements of a text.	SHORT CONSTRUCTED RESPONSE For each text, article, and website used, identify the "big idea" and supporting details.	Not Provided	 Provide students with Big Idea (attached) and model its use. Notes Laptops will be needed. Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working.
	Additional Attachments:			
Not provided	POST-READING > ACADEMIC INTEGRITY: Ability to use and credit sources appropriately.	SHORT CONSTRUCTED RESPONSE Define "plagiarism" and list ways to avoid it.	 Work meets expectations if: Provides accurate definition. Lists several appropriate strategies. 	 In their engineering journals, students should define "plagiarism" and list ways to avoid it. Discuss respect for others' work to assemble evidence and create texts. Discuss academic penalties for stealing others' thoughts and words. Provide additional strategies for synthesizing the ideas of others, rather than simply repeating the ideas of others. Generate a classroom list of strategies for avoiding plagiarism; students add to their own lists in their journals; post on a whiteboard throughout the module.
Not provided	POST-READING > ACADEMIC INTEGRITY: Ability to use and credit sources appropriately.	LIST In your engineering journal, list the needed bibliographic information for each text you use as a resource.	 Work meets expectations if: Identifies author, title, publisher, date, and any other needed information (for example, the volume for a periodical or the editor for an anthology) Identifies how the text will be cited within the 	 Discuss why citations are needed (both in-text and on a works cited page) and what components are required. Model the use of Purdue OWL, drawing attention to the resources for grades 7-12 instructors and students. Notes As the module progresses, ask to see students' lists of bibliographic information. Provide feedback and intervention as needed.

	on to Writing			
Transitio	BRIDGING			
Not provided	CONVERSATION > PREPARING FOR WRITING: Ability to begin linking reading results to writing task.	SHORT CONSTRUCTED RESPONSE In your engineering journal, write your answer (to date) to each aspect of the prompt. Then, write what questions you still have about your topic.	Work meets expectations if identifies multiple key pieces of content from the text that are critical to the task and omits irrelevant information from the text.	 Round-robin report out in small groups of students with similar topics. After discussion, ask students to add in-class follow-up to their responses so that they have a more complete picture of the topic. Circulate among groups answering clarifying questions and pointing students toward appropriate resources for answering specific content-related questions.
Writing F	Process			
Not provided	INITIATION OF TASK > ESTABLISHING THE CONTROLLING IDEA: Ability to establish a controlling idea and consolidate information relevant to task.	SHORT CONSTRUCTED RESPONSE Write an opening paragraph that includes a controlling idea and sequences the key points you plan to make in your composition.	 Work meets expectations if: Writes a concise summary statement or draft opening. Provides direct answer to main prompt requirements. Establishes a controlling idea. Identifies key points that support development of argument. 	 Briefly discuss the importance of the opening paragraph (it's the hook that grabs the reader's attention and sets the reader up for waht is to come). Students read their opening paragraphs in their small grous. Group members take notes, then provide verbal feedback and ask questions. Discuss commonalities - what makes an opening paragraph strong or weak? Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working.
1 hr and 30 mins	PLANNING > PLANNING THE WRITING: Ability to develop a line of thought and text structure appropriate to an information/explanation task.	OUTLINE Create an outline based on your notes and reading in which you state your claim, sequence your points, and note your supporting evidence.	 Work meets expectations if: Creates an outline. Supports controlling idea. Uses evidence from texts read earlier. 	 Ask students to respond to the following question in their engineering journals: What is the purpose of pre-writing? Report out to the class. Emphasize that pre-writing helps the writer organize throughts and ideas, while identifying gaps. Using a topic the students find interesting (sports, pop culture, music, etc.) model how to create an outline. Students should take notes. Give students an opportunity to ask clarifying questions about the format of an outline. Give students time to develop their outlines. Ask students to share their outlines with a peer and provide written feedback. Peer readers should pay particular attention to organization (is the information organized in a logical manner) and detail (are sufficient details provided to support the controlling idea). Notes Students should be grouped with others who have

				chosen similar topics. Encourage students to confer with each other while working.
Not provided	DEVELOPMENT > INITIAL DRAFT: Ability to construct an initial draft with an emerging line of thought and structure.	LONG CONSTRUCTED RESPONSE Write an initial draft complete with opening, development, and closing; insert and cite textual evidence.	 Work meets expectations if Provides complete draft with all parts. Supports the opening in the later sections with evidence and citations. 	 Review the classroom list of the key features of a high quality response (generated from the rubric on Day 1). Remind students to use their outlines as a guide as they write their initial drafts. Encourage students to re-read prompt partway through writing, to check that they are on track. Remind students to include in-text citations as they write. Circulate through the classroom, providing feedback and intervention as needed. Encourage students to go to the hallway or another quiet workshpace to read essays aloud to themselves. Notes Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working.
50 mins	REVISION, EDITING, AND COMPLETION > EDITING: Ability to proofread and format a piece to make it more effective.	LONG CONSTRUCTED RESPONSE Revise draft to have sound spelling, capitilization, punctuation, and grammar. Adjust formatting as needed to provide clear, appealing text.	 Work meets expectations if: Provides draft free from distracting surface errors. Uses format that supports purpose. 	 Briefly teach a short list of proofreading marks. Assign students to profread each other's texts. Model the use of Feedback and Revision Process (attached). After students have had the opportunity to read, edit, and revise each other's texts, go over 1st Draft Feedback & Tips (attached). Students should work on their second drafts based on the feedback received. Notes Students will complete EDITING and REVISION of each other's texts simultaneously. Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working.
	Additional Attachments: Feedback and Revisi	ion Process Worksheet Tips		
Not provided	REVISION, EDITING, AND COMPLETION > EDITING: Ability to proofread and format a piece to make it more effective.	LONG CONSTRUCTED RESPONSE Revise draft to have sound spelling, capitalization, punctuation, and grammar. Adjust formatting as needed to provide clear, appealing work.	 Work meets expectations if: Provides draft free from distracting surface errors. Uses format that supports purpose. 	 Students should share their second drafts with an adult who will provide additional written feedback using Feedback and Revision Process (attached). Students should work on their third drafts based on the feedback received. Notes Students will ask an adult to complete EDITING and REVISION simultaneously.
	Additional Attachments:	ion Process		

50 mins	REVISION, EDITING, AND COMPLETION > REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose.	LONG CONSTRUCTED RESPONSE Refine composition's analysis, logic, and organization of ideas/points. Use textual evidence carefully, with accurate citations. Decide what to include and what not to include.	 Work meets expectations if: Provides complete draft with all parts. Supports the opening in the later sections with evidence and citations. 	 Provide examples of useful feedback that balances support for strengths and clarify about weaknesses ("You've provided great detail about what education and licensing are required to become a chemical engineer. What more can you tell me about the future outlook for the field?") Model the use of Feedback and Revision Process (attached). After students have had the opportunity to read, edit, and revise each other's texts, go over 1st Draft Feedback & Tips (attached). Students should work on their second drafts based on the feedback received. Notes Students will complete EDITING and REVISION of each other's texts simultaneously. Students should be grouped with others who have chosen similar topics. Encourage students to confer with each other while working. 	
Not provided	REVISION, EDITING, AND COMPLETION > REVISION: Ability to refine text, including line of thought, language usage, and tone as appropriate to audience and purpose.	LONG CONSTRUCTED RESPONSE Refine composition's analysis, logic, and organization of ideas/points. Use textual evidence carefully, with accurate citations.	 Work meets expectations if: Provides complete draft with all parts. Supports the opening in the later sections with evidence and citations. Feedback from the first draft revision has been implemented. 	 Students should share their second drafts with an adult who will provide additional written feedback using Feedback and Revision Process (attached). Students should work on their final drafts based on the feedback received. Notes Students will ask an adult to complete EDITING and REVISION simultaneously. 	
	Additional Attachments: Feedback and Revision Process Worksheet				
Not provided	REVISION, EDITING, AND COMPLETION > FINAL DRAFT: Ability to submit final piece that meets expectations.	LONG CONSTRUCTED RESPONSE Turn in your complete set of drafts, plus the final version of your piece.	Work meets expectations if fits the "Meets Expectations" category in the rubric for the teaching task.	Not Provided	

Instructional Resources

No resources specified

Section 4: What Results?

Student Work Samples

Advanced

Sample - Advanced

Meets Expectations

- Sample Met Expectations
- Sample Met Expectations 2

Approaches Expectations

Sample - Approaching Expectations

Teacher Reflection

Student Background

Students are ninth graders in Engineering Lab. Students are from a variety of backgrounds and have a wide range of experiences. Their grade equivalent reading levels vary from 2.5 through 12.9+. Engineering Lab is a double-block, semester course, and individual class periods are 85 minutes in length.

All Attachments

% Engineering by Crawford B. Bunkley III : https://s.ldc.org/u/2w1hi63fjg20mz55cmjqmdk6y

- Sample Advanced : https://s.ldc.org/u/57tqkv33cp0q5k8vote1qlafd
- Sample Met Expectations : https://s.ldc.org/u/50sarfotv9hcuui85ap4hiefm
- Sample Met Expectations 2 : https://s.ldc.org/u/82105gjxbn37n6uut65qokran
- Sample Approaching Expectations : https://s.ldc.org/u/ezdr1loys4dwrazzxmedxkyrn