

Bridging the Gap between Higher Education and Career through a "Job Talk" in an Upper-Level Environmental Engineering Course

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**Bridging the gap between higher education and career through a
profession-oriented "job talk"**

Abstract

Students pursue higher education to improve their professional opportunities, yet education does not always directly relate to professional practice. This report discusses an assignment in a graduate-level water quality engineering course meant to explicitly connect course content to working in a related sector. To complete the assignment, students investigated a job of their choosing and networked with someone currently in that job to inform their ultimate appraisal of whether the position is one they are still interested in. The impact of the assignment was assessed quantitatively (via students' post-assignment responses on a Likert scale) and qualitatively (via open-ended questions). Students reported that the assignment was beneficial in connecting the course to relevant professional opportunities, but they saw concrete ways to improve the assignment for the future.

Introduction

Many students pursue undergraduate and graduate degree programs to enhance their job prospects [1]. For many, this is the primary driver influencing their decision to continue their studies after high school [1]. In the United States, higher education is increasingly expensive [2]. To justify the expense, many students likely increasingly want assurance that their professional success will be enriched, financially and in other ways.

Despite professional success being a primary driver of students attending higher education, engineering courses often still focus on theory [3]–[5]. Students complete homework and maybe in-class problems. There is likely an assumption (often implicit, in my experience) that these problems are relevant to the professional context, but rarely is that explicitly demonstrated. Students are motivated by myriad factors [6]. This has been demonstrated specifically for engineering students, too ([7], [8]). This work builds upon that of others to ask whether clearer connection of course content to professional opportunities will help to motivate students.

In past years, I have tried to convey the professional relevance of course material with the help of guest speakers. In my courses, guest speakers give students an idea of what real-world engineering looks like and provide students a connection to a practicing environmental engineer in a related profession. Students have appreciated these guest speakers, but I wanted to do more to connect my course content to relevant professional opportunities.

My Fundamentals of Water Quality Engineering course attracts upper-level undergraduate or, even more so, entry-level graduate-level course in our Civil and Environmental Engineering department. Because the course is designed to serve students with

limited exposure to environmental engineering, it seemed to me to offer a great opportunity for improving students' understanding of professional opportunities.

In the "Job Talk" assignment I introduced in Fall 2022, I aimed for students to explicitly connect course content to their careers after higher education. The "Job Talk" assignment had the following goals: (a) exposing students to the types of jobs they are likely to pursue directly after their studies, (b) demonstrating the relevance of course content to their future careers, and (c) improving their professional networks by requiring them to connect with a professional.

To complete the assignment, students teamed up in small groups (of two or three) and identified a job that they could imagine pursuing directly after their studies. They investigated details about the job, e.g., typical work, salary, opportunities for remote work, work-life balance, and next professional steps beyond this job. They then connected with someone working in this job (or in a very similar position) to conduct an informational interview. Again, specific information was required: what they typically do, what they like most/least about their job, and what their long-term goals are. Students then re-assessed whether the job they envisioned aligns with what they learned from their informational interview. The final piece of the assignment was for students to reflect: Who might be best served by working in this job? What is the future prognosis of this job, especially in light of climate change? And would this be a job that you would actually want? The assignment culminated with short (less than 10 minute), in class presentations where other groups were able to ask questions.

I assessed the assignment by quantifying students' perception of it in four categories. I also collected qualitative data by asking students open-ended questions about their experience.

In this report, I share students' assessment of the Job Talk assignment and discuss broader lessons I learned from implementing it. Along with the results, I share ideas for improving upon such an assignment in the future and potential follow-up questions I could ask of students to further assess the impact of the assignment.

Methods

In Fundamentals of Water Quality Engineering, we briefly introduce important water quality parameters, e.g., biochemical oxygen demand (BOD), suspended solids, biological agents, and natural water bodies. We also quickly tackle wastewater treatment systems. By and large, the course focuses on applying mass balance principles to drinking water treatment technologies. The course is lecture-based (not lab-based), meeting twice a week for 80-minute class sessions over the 14-week semester.

Because one of its goals it to make course content feel more relevant to students, I introduced the Job Talk assignment at the start of the third week of the class. (The assignment sheet is provided at the end of this report.) Before introducing it, I asked students to share what types professional fields related to the course they were interested in as part of an early course feedback survey. On the day I introduced the assignment, I grouped students according to their responses to encourage them to find a partner or two that had similar interests with whom they could complete it. Students were asked to select a group and a specific job by the end of the week. Presentations began at the end of the sixth week, with two or three groups presenting at the beginning of class. Presentations took about 10 minutes. Students were encouraged to ask questions of one another, but were not required to do so – nor were they rewarded.

After the assignment, I published a required Canvas survey asking students to review the Job Talk assignment. Students completed Likert scale questions (1 to 4) about the assignments' overall productivity, how well it guided them in investigating a single job, how well it exposed them to diverse jobs, and how well the assignment demonstrated the relevance of course content. They also responded to open-ended questions about the best part of the assignment and how best the assignment could have been improved. Anecdotally, during the presentations, I observed students more eager than for any other presentation I recall to (voluntarily) question their fellow students. I also asked students to report how many hours they spent on the assignment.

To analyze the data, I calculated the average and standard deviation of the students' Likert scale responses for the overall group (16 of 17 students responded). To assess generalizability, i.e., statistical significance, of differences across the Likert scale responses, I used both one-sided and paired Wilcoxon Signed Rank tests [9]. I performed statistical analyses in SPSS.

Results and Discussion

I introduced a Job Talk assignment into an entry-level graduate course with multiple goals in mind: (a) exposing students to the types of jobs they are likely to pursue directly after their studies, (b) demonstrating the relevance of course content to their future careers, and (c) improving their professional networks by requiring them to connect with a professional. I then captured quantitative and qualitative data about students' perception of the value of the assignment to these goals. Student responses to the four Likert scale (1 to 4) questions are depicted in Table 1. The means of student responses show that students generally felt like the assignment was productive and addressed the sub-goals well.

Table 1.

	N	Minimum	Maximum	Mean	Std. Deviation
Overall Productivity	16	3	4	3.38	.465
Helps with Investigating Job	16	2	4	3.59	.638
Helps with Diversity of Job Opportunities	16	2	4	3.41	.841
Demonstrates Relevance of Course Content	15	3	4	3.70	.455
Valid N (listwise)	15				

Tables 2 to 5 provide the student responses in higher resolution, providing the number of students who selected each Likert scale rating. These data again show that students were generally positive about the productivity of the assignment. They also align in showing that most students felt that the assignment met the sub-goals – helping investigate (and become familiar) with a single job; helping appreciate the diversity of related job opportunities and demonstrating the professional relevance of course content.

Table 2. Overall productivity.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 3	9	56.3	56.3	56.3
3.5	2	12.5	12.5	68.8
4	5	31.3	31.3	100.0
Total	16	100.0	100.0	

Table 3. Helps with investigating a single job.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2	1	6.3	6.3	6.3
2.5	1	6.3	6.3	12.5
3	2	12.5	12.5	25.0
3.5	2	12.5	12.5	37.5
4	10	62.5	62.5	100.0
Total	16	100.0	100.0	

Table 4. Helps with diversity of job opportunities

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid 2	3	18.8	18.8	18.8
2.5	1	6.3	6.3	25.0
3	2	12.5	12.5	37.5
4	10	62.5	62.5	100.0
Total	16	100.0	100.0	

Table 5. Demonstrates relevance of course content. One of the 16 students did not complete this question, hence the top column of the table.

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6.3	6.3	6.3
3	4	25.0	25.0	31.3
3.5	1	6.3	6.3	37.5
4	10	62.5	62.5	100.0
Total	16	100.0	100.0	

Student responses were unanimously positive about the Job Talk's overall productivity and its achievement of the sub-goals, but slight differences in the distribution of scores and their means were evident (Tables 1-5). I decided to test whether there were statistically significant differences among the means using one- and two-sided Wilcoxon Signed Rank tests (the non-parametric equivalent of t tests). No differences in the Likert scale ratings were statistically significant (Table 6).

Table 6. The results of one- and two-sided Wilcoxon Signed Rank test.

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				One-Sided p	Two-Sided p
					Lower	Upper				
Pair 1	Overall Productivity - Helps with Investigating Job	-.219	.752	.188	-.620	.182	-1.163	15	.131	.263
Pair 2	Helps with Investigating Job - Helps with Diversity of Job Opportunities	.188	.854	.213	-.268	.643	.878	15	.197	.394
Pair 3	Helps with Diversity of Job Opportunities - Demonstrates Relevance of Course Content	-.200	.922	.238	-.711	.311	-.840	14	.207	.415
Pair 4	Overall Productivity - Demonstrates Relevance of Course Content	-.300	.676	.175	-.674	.074	-1.718	14	.054	.108

Along with the quantitative data, I collected qualitative data in response to the following prompts.

Identify at least one productive aspect of the Job Talk assignment and describe why it was productive.

Identify at least one way the Job Talk assignment could be improved. Please explain your idea for improving the assignment in some detail.

Students' responses regarding a productive aspect of the assignment featured consistent themes (Table 7). They appreciated that the Job Talk made clear the relevance of course content. They also appreciated the opportunity to network with people in the field. And students thought they were benefiting from having to explore different water-related jobs that they will consider in the future.

Students also identified similar ways to improve the Job Talk assignment (Table 8). One consistent theme is that students would have preferred for their classmates to consider and present on a wider diversity of jobs. Only two groups had the same job, but when it came to presenting, many of the jobs sounded very similar to one another. Other students wanted more support connecting with a professional for the assignment, while one student asked that the assignment require multiple professionals. And one student expressed frustration that their job was limited by the partner they ended up with.

Table 7. Responses to the prompt about one productive aspect of the Job Talk assignment.

Theme	Student Response Excerpt
Course content relevance	Being able to see how some of the specific topics in this course are 100% relevant and are used daily by professionals in the field was very interesting and encouraging.
Course content relevance	I liked having to connect the job description to the class content because it shows the direct relevance of what we are learning and what gaps still may exist in the knowledge needed to be completely ready for the job
Networking	One aspect of the job talk which was very productive was interacting with the personnel involved in water quality management.
Networking	I really appreciated speaking with some professionals and making connections. It gave me a better understanding of some of the expectations and helpful skills for jobs I'm interested in. I feel like I really saw the value of this class in relation to a future job.
Networking	Engaging with industry professionals and others within the water-related field and gaining their perspectives was definitely the most productive part of the assignment.

Gain
familiarity
with jobs

One productive aspect of this Job Talk assignment is that it helped me determine what types of water-related job positions I may want to apply to, and what types of job positions may be less aligned with my career goals.

Table 8. Responses to the prompt about one way the Job Talk assignment could be improved.

Theme	Student Response Excerpt
Job diversity	Maybe having groups choose between consultant, modeler, engineer, researcher, etc. regardless of what field they wanted to look into (wastewater, drinking water, water resources) would help increase the variety of the presentations and the effectiveness of the assignment as a whole.
Job diversity	Maybe, instead of focusing on a job title (which may or may not correlate with specific duties), focusing on a specific company/type of company may create better distinction between the presentations.
Ease networking	I think maybe providing a list of recent graduates would help with getting started with the search process and potentially these grads would be more willing to respond.
Partner	I appreciated you pairing us up based on general job interest, but I ended up with my partner not because of similar interest but more process of elimination, so I didn't get the chance to do the job I was interested in.
More networking	Personally, I feel that we could have interviewed more people. The job talk could include more than one job prospect and we could investigate the connection between them. That way we could study both jobs and at the same time interview more personnel.

Conclusion

Many students pursue undergraduate and graduate studies to improve their professional prospects [1]. Yet higher education is not always relevant to post-education professional work [3]–[5]. I sought to make clear the professional relevance of the course content in one of my entry-level graduate courses with the creation of a Job Talk assignment. Students deemed the assignment productive quantitatively, including the sub-goals I inquired about (Tables 2-5). They could also identify productive aspects of the assignment qualitatively (Table 7).

The Job Talk assignment was seemingly a success, but there is certainly room for growth. Too many of the student presentations felt very similar. In the future, I will provide different types of water quality-related jobs before grouping them. I am considering whether I should have them focus on different water sectors to further ensure that they differentiate themselves. To ensure that students explore a job of interest, I will encourage them to conduct the assignment individually if they are not in agreement with their partner(s). I repeatedly offered to connect students with a professional, but it was only as the presentations approached that any groups took me up on the offer. Based on this experience, I will try to emphasize even more the need for students to network early.

I want to make the assignment better for the students. I am also interested in better understanding the value of this type of assignment. In the future, I intend to ask students if they

stayed in touch with the professional connection and if the assignment changed any aspect of the classes they registered for and/or the types of careers they considered.

Works Cited

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12-702 F22
Job Talk Presentation
Assigned: September 14
Due: October 5 (or after)

For the Job Talk Presentation, you will work in a small group (with one or two other students) to gain exposure to a relevant career opportunity within the realm of water engineering (or closely related to it). You will learn about the position, e.g.:

- the type of work the position entails
- salary range
- typical education level required
- best preparation (skills, software, content, etc.)
- what people in this position might be promoted to next

You will connect with someone in this (or a similar) position to see whether your understanding of the position is correct. And you will reflect on the future of this position and for whom the job might be good for – you? The ultimate goal of the Job Talk is to help you learn about the types of professional opportunities within water engineering that best fit your unique interests, passions, and goals.

The assignment will culminate with students sharing their findings with the rest of the class in the middle of the semester.

The table below will be used for grading your group's Job Talk presentation.

Grading Criteria	Points Possible	Points Earned
Job selected and group created by Friday, Sept 16	2	
Presentation content:		
<i>The job:</i> 30 points	4	
--Why you are interested in this job	3	
--Connection to 12-702	4	
--Summary of the work	4	
--Education level required	3	
--Best preparation	3	
--Next steps	3	
--Salary range; Work-life balance; Opportunity for remote work	6	
<i>Networking:</i> 20 points		
--Identify person: who, what they do, where, etc	10	
--Their satisfaction with the position: what they like best/least about their position	4	
--Their long-term goal	2	
--Aligns with your understanding?	4	
<i>Overall impression:</i> 15 points		
--Who is this job good for? Not good for?	5	
--Future prognosis: How is this job likely to change in the future, especially because of changes to water availability/use?	5	
--A job you want? Why or why not?	5	
Presentation best practices: 10 points		
<i>Timing:</i> Finish between 5-8 minutes	4	
<i>Be personable:</i> Tell a story, Share personal anecdotes, Engage the audience, Etc.	3	
<i>Assertion-evidence slides:</i> Highlight the main point for each slide and limit text	2	
<i>Number slides</i>	1	
TOTAL	77	