Chapter 5

Advising and Mentoring

I reflect on my role as an advisor and mentor at Whittier College below. I have mentored both first-year students, before they select their department and major, and majors in the STEM area. In Sec. 5.1, I reflect on the connection between advising and teaching. Also in Sec. 5.1, I reflect on mentoring and welcoming first-year students to Whittier College. In Sec. 5.2, I review my experiences guiding Physics, ICS, and 3-2 engineering majors to graduation. Finally, in Sec. 5.3, I reflect on my experience guiding a student to graduate through the Whittier Scholars Program.

5.1 Connections to Teaching, Advising First-Year Students

Advising and mentoring students resembles our teaching practice, because we must create a sense of *order and shared meaning* in the mind of the student surrounding the curriculum. The curriculum must be broken into its constituent parts, and the student must be shown how the parts fit together into a whole. Good advising also follows the teaching form of discovering the perspective of the student in a student-teacher partnership. This partnership takes on different forms, depending on the type of student. It is important to note that I have already given examples of *developing a sense of belonging* with the first-year students in Secs. 2 and 4, so I will move forward with details about my advising practices. What follows is a reflection on the type of advising that is appropriate given the types of students we encounter.

Physics professors often classifiy students into two broad categories: *non-majors* and *majors* (see Sec. 2.1). Most of our advisees as teachers fall into the first category. Table 5.1 contains the distribution of my advisees since 2019. In fact, according to Tab. 2.1 (Sec. 2), I have instructed 402 students since Fall 2017, and 206 students were non-majors taking algebra-based physics. This implies that that 51 percent of my students are non-majors. Thus, I am accustomed to teaching and advising outside of my field. Like teaching, advising students outside of my field of study requires emphasis on different goals than my students that are STEM majors. I have taken first-year advisees on two occasions: Fall 2019, and Fall 2020 (Tab. 5.1), for a total of about 30 advisees.

Advising non-majors follows a basic progression: introducing them to the curriculum and campus (*order*), beginning a conversation surrounding major selection (*shared meaning*), and future course selection. First-year students need careful instructions on how to best take advantage of our liberal arts curriculum. If the students are first-generation, they might need an introduction to the structure of college in general. In Fall 2019, along with the help of a wonderful student coordinator named Kat Garrison (KPOET radio), we introduced my new advisees to the curriculum. We find another classification useful for first year advisees: those are are certain of their major selection immediately, and those are still deciding.

One advisee of mine named Shengyi Liu felt comfortable taking 19 credits, and he had the desire to go to medical school. He knew what major to choose and he was highly organized. Thus, I shifted my advising to discussions about passing college writing seminar, letters of recommendation, and research. An example of a student that was not at all sure about major selection was my advisee Andrea Wainwright. She excelled at French in high school, but I could tell from our conversations that she was interested in art history and history as well. I led her towards the Whittier Scholars Program, in addition to encouraging that she master French in our time with us. Another first-year mentee of mine, Wyatt Killien, was at first interested in physics. After our conversations, we realized it was not actually physics that he wanted, but merely physics as a means to an end in graphical design and digital art. After he discussed the change with his family, we directed him to the Art and Digital Design program.

Some students require more conversation to identify their main reason for attending college. Student-athletes, for example, want to play varsity sports but are unsure what courses make sense for them. Others have only the general

Semester	**Number of First Year Advisees**
Fall 2019	15
Fall 2020	14
All semesters	**Physics, ICS, and 3-2 Majors**
	Cassady Smith (Physics '20)
	John Paul Gómez-Reed (Math/ICS '21)
	Nicolas Clarizio (Physics, Business Admin. '19)
	Alex Ortiz-Valenzuela (3-2 Engineering/Physics '22)
	Raymond Hartig (Physics and Math '23)
	Adam Wildanger (3-2 Engineering/Physics '21)
	Matthew Buchanan Garza (ICS/Physics '23)
	Natasha Waldorf (ICS/Physics '24)
All semesters	**Whittier Scholars Program Majors**
	Nicolas Bakken-French (WSP '21)

Table 5.1: A summary of my advisees, broken into three categories: first-year advisees, STEM majors, and WSP majors. There are some first year advisees who have chosen ICS/Math for their major, for whom I remain a mentor. One example is Emily List (ICS/Math '23).

area but not a specific idea for a major. For the students who have more uncertainty about their path to a degree, I have begun the practice of completing a LinkedIn Profile with them. We use the job search feature to locate geographically the firms they feel match their employment goals. Then I have them examine the skills required, and we try to arrive at a major selection that aligns with these skills. This approach works because it helps the students to *order* their thinking in a practical way. It also creates a sense of *shared meaning*, because the students and I share an understanding of their goals after graduation. A side benefit of this procedure is that we remain connected on LinkedIn after graduation, and we can contact each other.

Though advising STEM majors is a smaller fraction of the work I have done in the area of advising and mentoring, it is a more involved process. In my experience, people who wish to major in the STEM areas listed in Tab. 5.1 already have a firm idea of major selection before they arrive at Whittier College. Part of the challenge is to assess the mathematics and computer programming skill they gained in high school, and guide them to the correct introductory courses. The next task is to draw from the student their ideas about the purpose of their major selection, and whether it falls under any broad category like theoretical physics, experimental physics or engineering, or business applications. I pay extra close attention when I have an advisee in the 3-2 program, because the core requirements plus liberal arts requirements must all be satisfied in three years.

The connections between research (both mine and the students') and course/major selection also becomes apparent in these conversations. Students in the STEM area often base their major selection on the kind of research or job role they prefer in the long run. For this reason, completing LinkedIn profiles with my STEM students is also a good idea. For Cassady Smith and John Paul Gómez-Reed, I worked closely with the Career Center staff to help them craft resumés. Recently, I have restarted that practice, since my students will be applying for internships with the Navy research laboratory (see Sec. 3). However, it is also my role as an educator to introduce them to the intellectual variety of their chosen area. *Sometimes the interests of the student align with my research, and sometimes they do not. I advise them nonetheless, and do my best to meet the student where they are to guide them forward.*

There have been times a student has drifted towards another professor (John Paul, for example, worked with Prof. Fred Park for a while because he was interested in learning more about machine learning). Sometimes I develop shared interests with a student, and we develop a project idea together that is related to my research experience but not perfectly aligned. Finally, and rarely, a student knows that my research is what they want to do, and they are eager to get started (Raymond Hartig, for example, plans to attend graduate school for physics). In the supporting material, I have included two letters from two of my advisees regarding projects we developed together from start to finish as a team. The first is from Raymond Hartig regarding our novel mathematical physics model of Askaryan radiation. I know that Raymond wants to double-major in math and physics and then apply to graduate school, so I have been coaching him for that process. The second note is from Nicolas Bakken-French, who graduate from the Whittier Scholars Program after creating a holistic study of glaciology with me that included travel around the world.

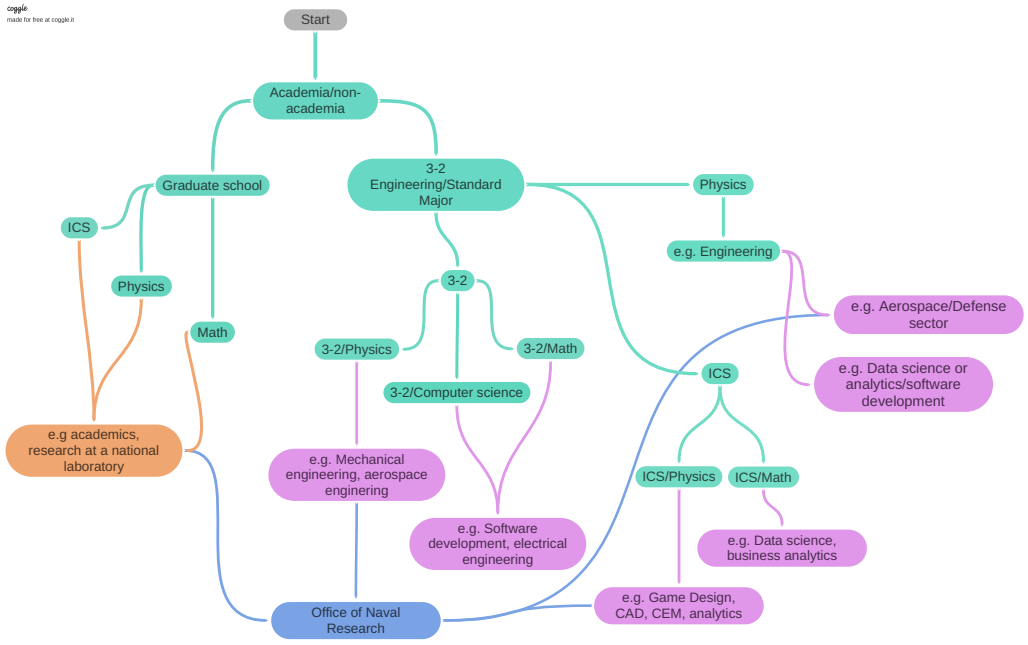

Figure 5.1: A decision-tree that orders my thinking around the advising of my STEM students.

5.2 Advising and Mentoring Majors in Physics, ICS, and 3-2 Engineering

After reflecting on my advising practices with my STEM students, I realized that there is an implicit decision-tree that lives in my mind (see Fig. 5.1). I use this decision-tree to guide students in LinkedIn profile creation, resumé-writing, and writing letters of recommendation[1]. *It is important to note that Fig. 5.1 just represents the order in which I help the students discern their proper path, and not a particular hierarchy.* Practical concerns about potential salary, proximity to family, and technical ability all factor into the path of the student through the process described by Fig. 5.1.

5.2.1 Discernment within STEM: Major Selection, and Diverse Pathways to Graduation

Discernment means the ability to understand oneself, while seeking honest guidance to make one more spiritually and mentally sound. Advising STEM majors sometimes requires me to provide them a form of "professional candor" that the FPC is tasked with providing me. We must identify where we need to grow, after proper reflection and discussion with mentors. This was the case when one of my first year students, Wyatt, shared with me that he wanted to study physics. He shared with me that he was not keen on taking calculus, and that his computer science course was not engaging. A physics *major* would sink his or her teeth into these courses. After a period of discernment in Spring 2021, we found that Wyatt was not interested in physics because of the *scientific* portion of it. He was interested in physics because he liked playing with the way the world fits together in his mind. Given his interest in manga and anime, I recommended he talk to his family about digital art and design. Wyatt later changed his major to Digital Art and Design.

Sometimes students arrive in my office already having discerned that they want to make a career in science. At the first decision point, we have *academia or non-academia.* This decision is usually the first decision, because the course list our department requires for the academic track in physics contains more theoretical physics and math courses. The next task in that case is to discern which area of academia they wish to explore. Since we now require COSC120, Computer Science I, for physics majors, students can experience computer science before deciding between ICS or PHYS as a major track. During the middle of the junior year, we begin the graduate school search and application-building process. If there is an academic connection to my CEM/ONR research, we can explore potential connections in their senior projects if the student desires.

[1] Examples of letters of recommendation for a variety of students are included in the supporting materials.

On the other side of the decision point, there is the private or public-sector path. In Fig. 5.1, the rest of the decision tree branches into the different topics and example career selections. Common private sector career selections involve CAD design for engineering firms and software development for gaming companies. The decision regarding 3-2 program versus ICS needs to be made during the first or second semester in order to plan the student's courses. Once I see a committment to the 3-2 program, I help the student plan their courses for every semester. Though the 3-2 majors do not complete a senior project, I involve them in my CEM/ONR research during Summer. They gain the experience necessary to secure valuable internships and projects at their next institution (usually USC).

If the student wants to be at Whittier for four years, but not major in physics, the choice is usually ICS/Physics or ICS/Math. A growing career selection for this area is data science, and we are now offering two new courses in data science at Whittier College. One trick I have added to my LinkedIn advising lately is the geographical job search. There are many firms in Southern California that specialize in data science. We generate search terms and then run a geographical search within LinkedIn for matches. We narrow the field by eliminating the organizations that are located too far from the family of the student. The narrowed list of firms provides the students with example jobs they can peruse for skill requirements. Finally, we think about ways in which final projects and course selections connect to the skill requirements. This was especially important for Matthew Buchanan Garza, one of my advisees, who wants develop software for gaming. Since algorithm development is important for software development and gaming roles, we prioritized the corresponding course in his schedule.

5.3 Advising and Mentoring Whittier Scholars Program Majors

I have had a wonderful time recruiting students for the Whittier Scholars Program. There are two moments that stand out for me. The first happened when I accompanied Nicolas Bakken-French to his final meeting with Profs. Rehn and Kjellberg, where his planned scholarship was approved. After the meeting, we were walking back to my office and Nick was electrified. As we parted ways, he gave me a big hug and thanked me for helping him gain this opportunity to graduate with a custom major in Environmental Analysis and Glaciology. We had argued that there is a useful connection between understanding the *science* of glaciers and glacial melt, the cultural impact of glaciers on communities, and the environmental science and policy decisions that affect glaciers.

The second moment that stands out is when I was meeting with my first-year advisee Emma Walston to talk about course selection. She knew that she wanted to continue with French, but I was also hearing remarks like "Well, I'm also interested in art history, but I just love the renaissance, and oh, there's history as well ..." At some point, I interjected: "You know we have a special program that allows you to design your own major, right?" Her eyes widened. "Oh, that sounds awesome, I think that is for me!" For some students who simply love learning and want to know everything, and for whom one major is not enough, I know to direct them to WSP101: The Individual, Identity, and Community. One near-term goal I have is to serve on the Whittier Scholars Advisory board, so that when students take that first step, I can help them form their educational plans in detail.

5.3.1 Organization of Field Deployments

In many ways, my student, Nicolas Bakken-French, was an exceptional case. Nicolas simply walked into my office with confidence, and said "I heard you do research in Antarctica. Is there a way I can help?" I could tell he had a fire in his belly, also called the *Nansen spirit* in my INTD255 course about Antarctic science and exploration. Fridtjof Nansen was the first human to cross Greenland, and held the record for furthest North latitude before the North Pole was finally reached by his protegé Roald Amundsen. Exploring Antarctica is not that different from operating in Nordic climates, and it turns out Nick had already been doing that for several years when visiting the Norwegian half of his family.

I knew right away to try to secure him a spot on the next ARIANNA expedition. We hoped to send him with our recently built drone (thanks to Nick Clarizio, Physics and Business '19), that he could use it to take aerial photos of glaciers feeding into the Ross Ice Shelf. My ARIANNA colleagues at UC Irvine agreed to add him to the roster. There are two stages required. First, one must pass medical checks, which are extensive the first time. Nick finished the process, which includes multiple medical appointments for blood and cardiovascular tests. The second stage is to acquire travel documents and airline tickets. We found resources to support Nicks' air travel. I met with VP Andrew Wallis (International Programs) to create a plan for keeping Nick enrolled as a student while he was away. Most Antarctic expeditions take place between November and February, when the sun is up. We coordinated with the instructors of Nick's courses to ensure the content he would miss could be completed remotely[2]. Nick was taking my INTD255 course (the Antarctica course), and I had hoped that he could video call the class from McMurdo to present on our work there.

[2]Just a few months later, we *all* had to create fully remote content.