

BioMap Degree Plan: A project to guide students in exploring, defining, and building a plan to achieve career goals

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Abstract

Traditional college students begin their academic journey with a variety of ideas about the careers they might ultimately pursue. Some students have always known what they want to do, some have ideas about possible careers, while others have never thought seriously about their future career. The BioMap Degree Plan Project teaches students in any of these stages a process for exploring biological sciences careers and guides them to build an academic plan to pursue a career. Students begin by identifying their interests and values and use the information to examine plans to pursue a specific career and broaden the scope of careers they are considering. They learn about academic programs and co-curricular learning experiences available at their institution, identify the programs and experiences that will prepare them for their career, and build an academic plan. The process of building the BioMap Degree Plan teaches students to think critically about their time in college, define their goals, and reflect on what it will take to reach those goals. The project guides students to develop the first draft of their plan, which they are encouraged to update and revise as they progress through their academic and professional careers.

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Supporting Materials: S1. BioMap Degree Planning - Project Packet and S2. BioMap Degree Planning - Advising Appointment Worksheet.

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Learning Goal(s)

Students will:

- Understand how to define career goals that align with their interests and values.
- Know how to articulate a plan to achieve their career goals.
- Appreciate the networks and resources available to them and understand how to utilize them to carry out their plan.

Learning Objective(s)

Students will be able to:

- Identify their values and interests.
- Identify careers that align with their values and interests.
- Identify academic programs and co-curricular experiences that will prepare them for a career.
- Create the first draft of a BioMap Degree Plan to support achievement of their career goals.
- Articulate how their undergraduate academic experience will prepare them for their future career.
- Use professional communication skills

INTRODUCTION

The BioMap Degree Plan Project guides first-year students to develop a 4-year comprehensive academic plan. It combines the strategies and features of traditional academic planning

documents used by academic advisors, career development plans used by career counselors, and individual development plans used by disciplinary mentors. Its goal is to encourage students to begin to explore possible majors, careers, and extracurricular activities that will help them define and meet

their life goals (for more resources on academic and career advising see the National Association for Academic Advising Association website - <http://www.nacada.ksu.edu/> and the American Association for the Advancement of Science's myIDP Science Careers website - <http://myidp.sciencecareers.org>).

The focus on biology makes this plan unique and allows students to align their discipline-based academic goals with their career goals. Like an Individual Development Plan (1), the BioMap requires students to develop long-term goals as future biologists and to build a plan to achieve them. Unlike an IDP, the BioMap Degree Plan focuses on academic majors, college extracurricular activities and possible careers, rather than professional development activities. Doing this in an introductory biology course has special value, since many first-year students, even those who have "decided" they will major in biology, may still change their mind, and because within the biological sciences there are many subdisciplines. Resources and approaches that were developed to support undecided students find their way were used to develop the BioMap Degree Plan project (2).

The transition to college is difficult, especially at large institutions. We were motivated to develop the BioMap Degree Plan as a tool to guide students to build their social and academic networks of support. The assignments require students to explore and meet others in the biological sciences community who will help them succeed at our institution. The wholistic approach of simultaneously exploring and considering academic majors, careers and co-curricular activities provides a framework to develop an integrated undergraduate learning experience (3).

Development of career plans has been shown to correlate with greater career success and satisfaction across a wide range of career stages (4-6); starting career planning early, as an activity in an exploratory discipline-based first-year course, is recommended (7-8). The BioMap Degree Plan project follows the Developmental Advising process (9), which proposes a linear progression of five broad steps as part of the degree and career investigation processes: exploration of life goals, identification of career/vocational goals, choice of degree/academic program, choice of courses/experiences, and finally selection of scheduling options. The BioMap Degree Plan project is modeled after these broad steps and operationalized through eleven specific tasks (9). The eleven specific tasks are aligned with the three major parts of the BioMap Degree Plan project in the Lesson Plan Timeline (Table 1). In reality, however, career investigation is rarely a linear process and career goals change over time. Therefore, the steps of the BioMap Degree Plan project walk students through a process to develop a complete draft plan, which they are encouraged to revisit and revise throughout their academic career.

Students begin exploring careers using surveys to help them identify and match their interests and values with possible careers. They complete an interactive lesson exploring majors and interpreting degree requirements, followed by an exploration of high impact learning opportunities (10), such as study abroad, undergraduate research, and service learning, to determine how these co-curricular experiences can be incorporated into their plan. Once their plan is drafted,

they meet with an academic advisor to get feedback to guide revision of their plan. As a final assignment, students select one co-curricular activity from their plan, update their resume, and write a professional email to the organization or program that offers the activity to pursue involvement. This project teaches students the skills they need as biologists to set goals, develop a plan to achieve those goals, and revise the plan as their career aspirations change over time.

Intended Audience

The intended audience for the BioMap Degree Plan is first-year college students interested in pursuing a degree in the biological sciences at a large research university. The BioMap Degree Plan was developed for a two-credit biological sciences first-year seminar course (Exploring Biology, 11) that meets once per week for two hours in a 15-week semester. The course serves 100-120 students with a team of 3-5 instructors and a similar number of undergraduate peer leaders. Students from a variety of biological/life sciences majors take the course. The course has no prerequisites and is open to all students. Consequently, the demographics of the students reflect those of the university, which is majority white, and their college-readiness spans a broad spectrum.

The course is taught in a SCALE-UP (12) style active learning classroom (<http://www.wiscel.wisc.edu/>), with students seated at tables of 6 where each student has access to a laptop and each table has an LCD display. These situational factors significantly impact pre-semester preparation planning and have also influenced the structure of the lesson plan. The assignment timeline is included in Table 1.

Required Learning Time

The BioMap Degree Plan project includes three parts that are completed over 1 semester (15 weeks):

- 1) Exploring Interests, Skills and Values (weeks 1-5) - students brainstorm career interests, complete surveys to identify careers that align with their interests and skills, and write a reflective essay on their career interests and goals.
- 2) Identify and Plan for Careers of Interest (weeks 6-10) - students explore majors and co-curricular opportunities that will support their career goals, while they craft an academic plan. and write a reflective essay on their choices and the planning process.
- 3) Getting Involved (weeks 11-15) - students write a resume and a professional email to the leader of a co-curricular activity of interest to them. Students also write a short essay outlining their plan for getting involved. The assignments are largely completed out of class, while in class time is spent brainstorming, providing background information, and reviewing draft documents.

While the timeline could be shortened, developing the project over an entire semester allows time to reflect and to incorporate new interests as they develop during the transition to college. Additionally, leaving time for in class discussion provides students the opportunity to hear from their peers (both their classmates and the peer leaders), and gain a student perspective on the degree planning and college navigation process. This supports the achievement of all of the learning objectives in a way that purely didactic instruction or completing the assignments solely as homework would not.

Pre-requisite Student Knowledge

None.

Pre-requisite Teacher Knowledge

There is no specific knowledge required by instructors, but familiarity with academic and career planning resources and co-curricular learning opportunities on one's campus is helpful. For example, knowing how and when students are directed to meet with their academic advisor to select courses for the next term can help an instructor integrate this component of the BioMap project at a time when advisors are most available.

SCIENTIFIC TEACHING THEMES

Active learning

The BioMap Degree Plan project guides students through an individual learning experience and most of the assignments are completed outside of class. However, the in-class components include interactive lectures, group discussions and feedback sessions. During these sessions students learn about majors, careers, and co-curricular activities, receive feedback and new perspectives from peers, and receive information to complete the out-of-class assignments.

Assessment

Each of the three parts of the BioMap Degree Plan project, which consist of a combination of worksheets and written assignments, is graded independently using the rubrics in the Project Packet (Supporting File S1: BioMap Project Packet).

Inclusive teaching

Students' individual values and interests guide the identification of their possible careers and the development of their BioMap Degree Plans. This frequently yields a variety of possible careers and, consequently, the opportunity for instructors to highlight and affirm the value of a diversity of career paths. Students discuss their career and degree interests with one another in class, which allows them to learn about their classmates' diversity of interests, values and possible careers.

LESSON PLAN

The BioMap Degree Plan project includes three parts that take place over the length of a 15-week semester. Each part includes a brief in-class component to prepare or guide students through the out-of-class assignments, which take varying amounts of time to complete. The instructors and peer leaders guide students as they individually work through the decision-making and degree-planning process.

Pre-semester Preparation

Instructors should answer questions about logistics and goals to prepare to implement the BioMap Degree Plan project and to determine specific project parameters. Our answers to the questions are presented here. Other possible implementation strategies are addressed in the discussion.

- **What career exploration survey(s) will be used to identify students' values, interests and possible careers?** We chose to use three surveys that are part of a service available to

all students at our institution. These surveys help students identify their interests, values and skills, and align the survey results to possible careers (Table 2). Instructors are encouraged to check with their campus career development office to find similar surveys. We have also compiled a list of free surveys (Table 3) for institutions that do not have such resources, though these surveys are more broadly constructed, and do not exactly align with the three distinct categories (interests, values, skills) found in the surveys that we use.

- **Will students be required to meet with their advisors?** We required this when first developing the lesson, but found that it was difficult to enforce and coordinate. The large number of students in our course (100-200), overwhelmed the academic advisors' meeting schedules. Therefore, we now strongly encourage, but do not require, students to meet with an advisor. We also emphasize the wide-range of individuals who students should recognize as advisors and provide the option of meeting with an academic, support program, career, or pre-professional advisor.
- **When is the course schedule available and when does registration open? When would it make sense for students to meet with an advisor?** Our course is taught in the fall semester. The spring class schedule is available in late October, and first-year students are able to register for classes at the end of November. Therefore, we set the assignment deadlines to ensure that students' BioMap Degree Plan drafts are ready for use when they meet with their advisor in early November to plan for spring semester class registration.
- **Do I need undergraduate peer leaders to implement this project? What training do peer leaders need to successfully aid students in this activity?** Undergraduate peer leaders are not required to implement this project; however, they can provide a student perspective on programs, courses, and co-curricular activities. Our peer leaders participate in a semester long course on peer leadership and mentoring. More information on the utilization of peer leaders and their training is included in the Teaching Discussion.

Part 1 - Exploring Interests, Skills & Values (weeks 1-5)

In-class Instruction

The BioMap Degree Plan project packet (Supporting File S1: BioMap Project Packet) is distributed to students and they are briefly introduced to the three parts of the project, their associated learning objectives, and the overall project goals. Students are encouraged to incorporate the project assignment deadlines into their semester schedules. In preparation to complete the interest, skill and career inventory surveys, students work in small groups to brainstorm possible careers of interest. They reflect on their career interests/aspirations and discuss how their motivations for pursuing various careers align with their skills and personal values. Peer leaders and instructors circulate around the room and join groups to ask questions about the career paths students are considering. They also let the students know that new careers may be suggested by the surveys they will be completing and encourage students to be open-minded about newly suggested careers. The

following question prompts can be used to initiate and guide discussion:

- What careers are you considering pursuing and why are you interested in those careers?
- What do you know about the careers you've identified and from where did you learn that information? Do you know people who are in those careers? Did you look up information on your own?
- How do the careers you're interested in pursuing align with your values and interests? How will they allow you to realize your vision of how you want to live your life and what you hope to accomplish in life?
- What academic majors are you considering and how do you think those majors will prepare you for the careers you've identified?

Out-of-class Assignment

Students complete a suite of three surveys that identify their work interests, values and skills (Table 2). Each survey generates results that suggest broad career areas, as well as specific jobs that align with the survey responses provided by the student. The results do not always align with the careers previously identified by students, which can create some anxiety. Reassure students that they are using the surveys to broaden, not narrow or eliminate, their potential career choices.

Students select two or three careers identified by the survey results to investigate; they may include an additional career if any in which they were interested is not identified by the surveys. They create a career comparison table (Supporting File S1: BioMap Project Packet - Part 1B) by identifying at least three positive and three negative aspects of each career, and identify academic majors that would prepare them for each career. Students use the Occupational Outlook Handbook (<https://www.bls.gov/ooh/>), which is maintained by the Bureau of Labor Statistics, and a campus website with links to descriptions of each academic major, as references when creating their comparison table.

After completing the survey and career comparison table, students write a 1-page reflection essay on what they learned about themselves and their career options (Supporting File S1: BioMap Project Packet - Part 1C). Students' essays are assessed on thoughtful reflection on their survey results and goals and whether they made effective comparisons between career paths (Supporting File S1: BioMap Project Packet - Part 1 Reflection Essay Rubric).

Part 2 - Identify & Plan for Careers of Interest (weeks 6-10)

In-class Instruction

Students identify an academic major that could well prepare them to achieve their career goals and learn about the specific requirements of that major. Importantly, students are not officially declaring the major, but rather developing the skills to navigate and interpret information provided about majors. Undergraduate peer leaders spend 5-10 minutes showing small groups of students how to find information about degree requirements using online tools (e.g. program and registrar

websites, course catalogue, etc.) and share the process they used to pick their major. Peer leaders also show students how to interpret information found in these campus resources. Students begin their search for their academic major's specific requirements during class, while the peer leaders and instructors are available to support them. Searching for and exploring the requirements for their major alongside their peers allows them to ask questions and make comparisons between possible majors.

During the same class period or in a subsequent class period, undergraduate peer leaders give a 5-10 minute presentation about the co-curricular activities in which they have participated. They start the presentation by introducing students to campus resources on student organizations, club sports and other available activities using campus websites. They share how and why they got involved in each activity, then circulate around the classroom to aid (along with course instructors) small group discussions about how to find (e.g. via Office of Student Life, Student Organization, and other campus websites - as appropriate to your institution) and engage in co-curricular activities of interest (10-15 minutes). The following question prompts can be used to initiate and guide discussion:

- What skills and knowledge will you need to be successful in your career?
- Which of these skills and knowledge will you gain in classes as part of your major? Which could you develop by participating in co-curricular activities?
- Which co-curricular activities will provide opportunities to develop these skills and knowledge and how?
- Which co-curricular activities are not directly related to the career or major you plan to pursue, but are of general interest to you?

Students are required to identify five to ten co-curricular activities they are interested in and to consider how each of these activities would prepare them to achieve their career goals and/or support their overall well-being. They can begin filling out the planning table during this class period. Whether the co-curricular activity discussion is in the same or a subsequent class period, it is important to allow enough time for the peer leaders to circulate and answer questions. Alternatively, peer leaders can hold office hours outside of class to meet with students individually to discuss their academic major and/or co-curricular interests.

When the course schedule for the following semester is released, a group of advisors representing a wide range of academic majors is invited to give a brief (10-15 minute) lesson to help students prepare for a productive meeting with their advisor. This session includes information on the different types of advisors, questions students should ask their advisors, how and when to schedule meetings with their advisor, and things to consider before the meeting to be prepared for a focused and productive discussion. Students should bring their Degree Map Planning table (Supporting File S1: BioMap Project Packet - Part 2A) to this discussion. After the presentation, students work in small groups to apply what they learned, drafting questions they would like to ask their advisors. Peer leaders, instructors and the advisors who presented circulate to answer questions and to provide feedback on the draft questions. Students are encouraged to schedule an appointment with their advisor to talk about classes for the upcoming semester and

ask their questions. They are encouraged to use the Advising Appointment Worksheet (Supporting File S2: BioMap Advising Appointment Worksheet) to structure the meeting with their advisor. Students are also told that their advisor is just one person who can support their success and are encouraged to identify other advisors and mentors on and beyond campus with whom they could meet to discuss their BioMap Degree Plan.

Out-of-class Assignment

Outside of class, students continue mapping their plans for courses and co-curricular activities using the Degree Map Planning table (Supporting File S1: BioMap Project Packet - Part 2A). When filling in their first and second years, the information should be specific - especially in terms of courses, because for most science majors the first two years are generally prescribed, and electives begin in the third and fourth years. *Interests and opportunities evolve over time, so knowing how to make and revise a plan is more important than the actual plan.* It is important to remind students that this isn't a contract and it isn't likely that they will follow this exact plan. They should plan to incorporate new and exciting opportunities along the way. It is also important to remind students to allow time for fun activities and experiences that feed their personal interests - not just activities that directly relate to their degree completion or career goals.

Based on their Degree Map Planning table, co-curricular list, and advisor meeting, students write a 1-page reflective essay addressing why they chose their particular major and how it will prepare them to achieve their goals (Supporting File S1: BioMap Project Packet - Part 2C). In addition, they are instructed to address how they anticipate their academic career will progress from the first year to graduation. Students are assessed on their thoughtful reflection about their meeting with an advisor and their evaluation of their major and degree planning process (Supporting File S1: BioMap Project Packet - Part 2 rubric).

Part 3 - Getting Involved (weeks 11-15)

In-class Instruction

Students bring draft resumes and email messages (see below) to class for peer review, which can happen either in small groups or pairs. Students are directed to give feedback based on their experience with professional communication, using rubrics for guidance (Supporting File S1: BioMap Project Packet - Part 3). While students are doing peer review, the peer leaders and instructors circulate to prompt discussion and answer questions.

Out-of-class Assignment

Students write a short essay (200-500 words) outlining a plan of action to get involved in one of their co-curricular activities in the next semester (Supporting File S1: BioMap Project Packet - Part 3A). The essay addresses why this activity is of interest, how it will benefit them, and identifies the steps they will take to get involved.

To prepare for co-curricular activity involvement, students

develop or update their resume and draft a professional email to the leader/coordinator of the activity they intend to pursue (Supporting File S1: BioMap Project Packet - Part 3B/C). As mentioned above, provide time in class for students to give and receive feedback on their draft documents from the instructors, peer leaders and peers. The rubrics contained in the project packet (Supporting File S1: BioMap Project Packet - Part 3 Grading) should be used to guide this feedback, as should personal experience with professional communication. This feedback process can be made informal by asking students to pair and share, or more formal by assigning small groups to review. The email should express their interest in participating and some information about why they are interested. Students are not required, but strongly encouraged to send the email and to participate in the activity the following semester.

Students final essays and email messages are assessed on their thoughtful consideration of a co-curricular activity, and the professional construction of their email (Supporting File S1: BioMap Project Packet - Part 3 Grading).

TEACHING DISCUSSION

The BioMap Degree Plan project guides students to develop the skills and self-awareness they need to define career goals that align with their interests and values, articulate a plan to achieve their career goals, and identify and learn to utilize the networks and resources they will need to carry out their plan. The project includes several assignments and class discussions that guide students through these steps.

Effectiveness

A large-scale evaluation of the course in which the BioMap Degree Plan project is implemented was done and data relevant to the BioMap Degree Plan is summarized here. This evaluation (11), was a cross-sectional study that reviewed course evaluations and data from a course alumni survey that was completed 1 to 3 years after participation in the course. In the course evaluations, we asked students to rate the helpfulness of the BioMap Degree Plan project directly, and to rate their confidence in achieving the learning goals related to the project. Among respondents, 79% found the project helpful, 82% were somewhat confident or confident that they had learned of career opportunities in the biological sciences, and 77% were at least somewhat confident that they could find and integrate biology co-curricular learning experiences into an academic plan (11).

In the alumni survey, we asked students to identify the most valuable thing they took from the course. Categorizing the responses according to which of the BioMap Degree Plan learning objective(s) each addressed (Table 4), over 50% of the responses aligned with aspects of the BioMap Degree Plan, indicating students highly valued this activity. Ten percent of students' responses specifically identified the Degree Map planning activities as the most valuable thing ("how to do a four-year plan;" "planning ahead in college and beyond). Another 41% of the responses fell across the other five BioMap Degree Plan learning objectives, with the highest values placed on identifying academic and co-curricular experiences, and using professional communication (19% each). The remaining 39% of responses noted other aspects of the course unrelated

to the BioMap Degree Plan, most often referencing the variety of biological topics covered in the course.

After implementing the BioMap Degree Plan as part of the Exploring Biology first-year seminar six times, we documented several benefits to students. Former Exploring Biology students who have returned to serve as peer leaders regularly mention the value of having this plan and describe how they revise it each semester. Likewise, data from a focus group (N = 5 participants) showed that the biggest impact came when students used the Degree Map Planning table and their list of potential co-curricular activities as the starting point to continually review and revise their progress towards graduation.

- Interviewer: “So did either of you refer back to this [4-year plan] or did you ever do it again?”
- Student A: “I’ve done it like 3 times now.”
- Student B: “Yeah. I still have it on my bulletin board. Like, now, I just kind of like scratch it out by hand, but just, like, try to plan exactly my schedule.”
- Interviewer: “When do you look at it?”
- Student B: “When I’m trying to make my next schedule.”
- Student A: “Like a week before enrollment. And I, like, look and ‘Okay, what was I thinking when I made this?’ I kind of look at it and ‘is that still going to work?’ Think of external things: am I going to have a job? Am I going to be volunteering? What am I going to be doing? Like, can I handle these classes? And then kind of make adjustments from there.”

Focus group participants have also mentioned feeling more organized and confident when going to meet with their advisors.

- Student C: “I meet with mine [advisor] at least twice a semester. And, just, she does the Degree Audit Report... With my 4-year plan, like, I’m always like, I’m completely on schedule with everything just because I’m well prepared.”

Additionally, all focus group participants, described the resume and cover letter activities as one of the strongest aspects of the course.

- Student D: “They had us do a cover letter and a resume and I thought that was really beneficial coming into college because that’s not something I really had to do in high school.”

Interestingly, some students indicated that they realized they did not want to major in the biological sciences after completing the course. Since one of the goals of the BioMap Degree Plan is to guide students to identify their values and interests and careers that align, regardless of whether that alignment results in a biology major, this suggests that the project is effectively achieving this goal.

Alternative Approaches

Depending on the types of first year courses offered on an instructor’s campus, the BioMap Degree Plan project may be incorporated into a first-year seminar course for majors or into

an introductory biology course. The timing of this project in the first semester of college was important to us, as navigating college can be overwhelming. It allowed students to reflect on their initial goals, identify what excites them about possible future careers, and, possibly, buffer some of the loss of excitement and/or interest that can come with challenging first-year courses and heavy workloads. It also allowed students to explore the best degree paths for their particular career goals and identify alternative majors that could still get them to “where they want to go,” but may align better with their skills and interests. It is possible to adapt this project for use later in the curriculum. For example, one could implement an initial BioMap Degree Plan during the second year, then incorporate assignments to revise it into courses in each subsequent year to provide the opportunity for ongoing reflection and revision of goals.

Since the majority of the work on this project occurs outside of class time, we don’t anticipate that it will significantly detract from the basic biology content taught in an introductory biology course. Instead, we suggest that one could add a component to the project that requires students to reflect on how the content of the introductory biology course relates to the careers they aspire to pursue. In our course, the in-class portions took place during lecture; however, they could be adapted to laboratory or discussion/recitation classes. Regardless of the course into which this project is incorporated, instructors should invite local professionals who have expertise in career planning and advising to review the Project Packet and lesson plan, to recommend adaptations to customize the project in ways that incorporate specific resources available on the instructor’s campus.

Currently, students write or update their resume, but since they are early in their academic careers, their resumes tend to be sparse, which can be discouraging. An alternative approach would be to have students write a “reverse” resume based on what they would like it to reflect when they graduate. Students would be prompted with the question “Imagine you are handing an employer a resume at the end of your college career. What do you want it to show?” This alternative approach would still achieve the project goal of preparing a professional resume, but would also provide an opportunity to set goals and think about what employers may find important. It would also highlight the fact that most of what is included in a resume is not coursework, but rather co-curricular activities and the skills and knowledge that are developed through participation in those activities.

Additional Student Contexts

The students enrolled in the course in which this project is implemented are in their first year of college, attending university full time. The project could easily be adapted for students who are not full-time and/or who are at different stages of their degree progression. Similarly, it could be modified for the community college setting. Either way, the Degree Map Planning table would need to be modified and some of the goals for the students changed.

For example, part-time students attending a community college and working a full-time job might have different expectations for the number courses they choose each semester and the list of co-curriculars in which they are able

to participate. Their job and/or family demands should also be included in the planning table. A branching set of questions may be required when discussing career goals and majors: What careers are you considering? Do those careers require that you transfer to a 4-year institution? If so, what institutions and majors are you considering?

Regardless of the context, the overall goal of this project is to provide a framework to plan for achieving goals and being successful, whatever the career. There is neither a correct answer nor a correct plan; students should be encouraged to explore what is important to them and what will help them achieve their goals.

Navigating the Biological Sciences

Students enrolled in the first-year seminar course in which the BioMap Degree Plan project is taught on our campus may choose from over 30 different biological sciences majors, across several schools and colleges. Consequently, it is impossible for the instructors of the course to know the requirements of all of the potential majors, so students are responsible for finding their academic advisor and discovering the nuances of their particular degree program. To support them, the undergraduate peer leaders provide unique, on the ground, insider perspectives. In addition, we invite selected academic advisors, who have broad knowledge of the various biological sciences majors, to offer general advice to the entire class. We also have invited members of campus career centers to share general advice with the class. These types of added support may not be necessary at smaller institutions, with less breadth of academic majors and at which it is possible to directly provide degree requirement information as part of the class.

Advisor Meetings

Though asking students to meet with an advisor to discuss their BioMap Degree Plan is an important part of the project, we could not require this at our institution, given the number of students in the course and the overall number of students at the university who schedule appointments with their advisors. However, there are many types of mentors available on a college campus, and the students' official academic advisor does not have to be the only person to guide them through their academic decision making. Students should be encouraged to seek out additional mentors and advisors. This is one of the reasons that this course employs undergraduate peer leaders and asks students to discuss and give feedback to one another on various components of the plan. We aim to help students build a network of mentors who supplement the support they receive from their formal advisors.

It is important to note that when we did require a meeting with an advisor or other support person, we provided students with a worksheet (Supporting File S2: BioMap Advising Appointment Worksheet) on which they generated specific questions to ask during the meeting and then required them to write a reflection about their experience.

Undergraduate Peer Leaders

As described previously, we utilize 3-5 peer leaders in each

large section of our course. Typically, a senior peer leader is identified, who served as a peer leader the previous year. The senior peer leader helps organize and coordinate the other peer leaders. This model allows students to take the course during fall of their first year, train to be a peer leader in the spring, act as a peer leader in fall of their second year, and then return in senior leadership roles for their third and fourth years. Large numbers of peer leaders are not necessary, and we have successfully run this course and project with only one or two peer leaders. However, more peer leaders provide greater numbers of opportunities for interaction with students in the course and represent a broad array of interests and experiences that can be shared with the class during presentations and discussions.

Surveys

Our institution provides a "CareerLocker" service (<https://careerlocker.wisc.edu/>) for all students, faculty, and staff members, which includes several surveys to help individuals assess their interests, values, and learning styles. These specific surveys may not be available to instructors at other institutions; however, numerous career interest surveys available through other venues can be used. In Table 2, we indicate the issues addressed in the surveys we use to help instructors identify equivalent tools. References for other surveys covering similar topics are provided in Table 3; however, it is important to note that these surveys do not exactly replicate the surveys from Table 2.

SUPPORTING MATERIALS

- S1. BioMap Degree Planning - Project Packet
- S2. BioMap Degree Planning - Advising Appointment Worksheet

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Table 1. BioMap Degree - Teaching Timeline

Activity	Description	Time	Notes
Part 1: Explore Interests, Skills & Values - weeks 1-5			
Developmental Advising Process: Step 1 - <i>Exploration of career goals</i> ; Step 2 - <i>Identification of career/vocational goals</i> (9)			
Developmental Sequence of Tasks: Task 1 - <i>Awareness of individual values, abilities, and interests</i> . Task 2- <i>Clarification of life goals based on awareness of individual values, abilities, and interests</i> . Task 3 - <i>Exploration of the relationships between life and career goals</i> . Task 4- <i>Exploration of aspects of the world of work</i> . Task 5- <i>Clarification of career goals</i> (2)			
Students reflect on career interests, while exploring skills and values.	1.Students discuss their career goals and aspirations in small groups. 2.Students complete online surveys to assess their skills and values. 3.Students identify careers that align with their skills and values and compare them to their personal career interests. 4.Students write a reflective essay on their career exploration experience.	1. In Class (10-15 minutes) 2-4. Out of Class (1-2 hours)	• Instructors select surveys to use. • Students can get anxious if their survey results do not mirror their career aspirations. Instructors should point out they are adding new possible careers, not replacing their original career aspirations. • Career survey results can be extensive. Therefore, we only require submission of summary page screenshots.
Part 2: Identify & Plan for Careers of Interest - weeks 6-10			
Developmental Advising Process: Step 3 – <i>Choice of degree/academic program</i> ; Step 4 – <i>Choice of courses/experiences</i> ; Step 5 – <i>Selection of scheduling options</i> (9)			
Developmental Sequence of Tasks: Task 6- <i>Exploration of educational combinations leading to life and career goals</i> . Task 7- <i>Selection of an appropriate educational combination</i> . Task 8- <i>Exploration of elective courses</i> . Task 9- <i>Sequencing and selection of courses</i> . Task 10 - <i>Scheduling of courses</i> (2)			
Degree & Co-curricular Planning	1.Peer leaders lead an interactive lesson on interpreting degree requirements and using the university's degree audit system. 2.Small groups of students brainstorm and discuss co-curricular opportunities. 3.Students develop a degree planning table, including both courses and co-curricular experiences and bring it to class to discuss on advising day.	1.In Class (10-15 minutes) 2.In Class (15-20 minutes) 3.Out of Class (30 minutes to 1 hour) plus 15 min in class discussion	• If there is an online tool that generates a progress to degree report, then students will need to bring devices to class or just watch a demonstration and generate a report on their own later. • The undergraduate peer leaders describe their process for mapping their degree and talk about how they've gotten involved on and beyond campus. • The planning table should be brought, at least partially completed, to class for a discussion. It requires less specificity in years 3-4. Only general subjects and experiences need to be listed.
Advising	1.Students identify their advisor and schedule an appointment 2.Students participate in a lesson led by an academic advisor about getting the most out of working with your advisor. This is followed by a discussion of their planning tables. 3.Students meet with an advisor	1.Out of Class (15 minutes) 2.In Class (10-15 minutes for presentation, plus 10-15 minutes for discussion) 3.Out of class (15-30 minutes)	• Advising appointments should be scheduled when information for the next semester is available. • Making individual appointments may be difficult depending on the size of the program and number of available advisors. • To document that students actually meet with an advisor, provide a form the advisor must sign.
Reflection	Students write a reflection on the degree planning process.	Out of Class (1 – 2 hours)	
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Activity	Description	Time	Notes
Part 3: Getting Involved – weeks 11-14			
Developmental Advising Process: <i>N/A. The student implements the plan. Requiring students to prepare to engage in a co-curricular activity encourages them to actually participate and become part of the campus community, a key contributor to student success (3,10).</i>			
Developmental Sequence of Tasks: <i>Task 11- Evaluation of experiences for confirmation or redirection of plans (Upon meeting with their advisor, students will begin the confirmation/redirection process regarding their coursework. For the co-curricular activities, this task often doesn't begin to occur until after the semester they complete the BioMap. Overall this task will continue throughout progress to degree.) (2)</i>			
Co-curricular	Students choose one of the co-curricular activities identified in Part 2, and outline why it is relevant and how to get involved.	Out of Class – (time varies)	• Ideally, the co-curricular activity is something students would like to get involved in during the next year. • The co-curricular activity does not have to be directly related to their academic plan.
Resume & Email	1. Students draft a resume that would be appropriate for getting involved in the co-curricular activity. 2. Students compose a professional email to the leader of the co-curricular activity about getting involved.	Out of Class – (time varies)	The email does not have to be sent, but students can be encouraged to do so.
Feedback	Instructors, peer leaders, and peers provide feedback on draft resumes and emails in small groups.	In Class (15-20min)	Alternatively, feedback can be provided during office hours or some other out of class time, but being able to check in with each student is beneficial.

Table 2. BioMap Degree: Career Survey Descriptions and Examples

Survey	Topics Addressed	Sample Questions	Survey Output
Work Values Inventory	What are the workplace characteristics most valued by an individual? (e.g., independence, recognition, respect, and activity level.)	How important is this workplace quality or feature? - I want to be busy doing things all of the time. - I want to work alone.	Career clusters listing many jobs that align with the respondent's values.
Work Skills Inventory	How confident are individuals in performing specific skills? (e.g., leadership, interpersonal, data management, mathematical, mechanical, and self-management)	How confident are you in performing this activity? - State one's opinions and ideas with confidence. - Care for people with injuries or illnesses.	A list of occupations that emphasize skills aligned with the respondent's confidence levels.
Personal Globe Inventory	How interested and confident are individuals in performing specific activities? (e.g., realistic, artistic, social, enterprising, and investigative)	How much would you like to do the activity? - Manage a hotel. - Prepare financial reports. - How good would you be at doing the activity? - Manage a hotel. - Prepare financial reports	A list of occupations that emphasize activities aligned with the respondent's interest/ confidence scores.

Table 3. BioMap Degree: Other Potential Surveys

Survey	Topics Addressed	Survey Output
Career Cluster Interest Survey – Minnesota State https://careerwise.minnstate.edu/careers/clusterSurvey	What are activities that you enjoy? What personal qualities do you possess? And, what subjects do you like? Each of these areas includes simple Yes or No questions to rate different scenarios.	A top-3 list of career clusters that best match your results, with each career cluster acting as a link to more information. Other matching career clusters are also listed, beyond the top-3.
Holland Code Career Test – Truity https://www.truity.com/test/holland-code-career-test	Survey asks about enjoyment of various tasks and how well specific words describe you. This is used to determine a personality type on the RIASEC scale, and match careers accordingly.	The output is broken up into stages: First, a personality type on the RIASEC scale and a corresponding broad career type. Second, scores are broken down into interest areas (building, thinking, creating, etc) and rated on a low-high scale. Lastly, careers can be searched for based on interest areas.
Career Aptitude Test – What Career is Right for Me? https://www.whatcareerisrightforme.com/career-aptitude-test.php	Has four sections, asking the individual to rate skills, interests, working style, and work values. Also, asks for information on desired salary, education level, and whether they want a growing field. These last areas can be left blank.	Job outputs are provided with additional information on tasks and skills associated with that generic job. Also has information on current job listings that correspond with that field.
Career Cluster Activity – Education Planner http://www.educationplanner.org/students/career-planning/find-careers/career-clusters.shtml	Has four sections, asking the individual to rate personal characteristics, skills, interests, and best school subjects.	Provides a listing of the top-5 career clusters that correspond with the individual's results. These provide links to a separate site with more info on the jobs (ONet Online*).
*ONet Online – Dept. of Labor (www.onetonline.org) Has additional information on jobs as well as tools to assess ability, interests, and work importance, but they are paper based and appear to be by the user.		

Table 4. BioMap Degree: Learning Objectives Alignment

BioMap Degree Plan Learning Objective	% Responses	Example Responses
Identify their values and interests	7%	Learning what fields of biology I am especially interested in; A thorough glance at the life sciences
Identify careers that align with their values and interests	5%	The career ideas; There are many career options in the field of biology.
Identify academic programs and co-curricular experiences	19%	That I did not want to pursue a major in a biology field; Finding my major; Research involvement
Create the first draft of a BioMap Degree Plan	10%	How to do a four year plan; Planning ahead in college and beyond
Articulate how their undergraduate academic experience will prepare them	0%	N/A
Use professional communication to get involved	19%	Talking to the profs; Building my resume.
Not aligned to BioMap Degree Plan learning objectives (most commonly referenced a general exploration of the field of biology)	39%	A sense of the biology field; Learning about the various science fields that there are to offer
Note: Responses collected from former students who completed the BioMap Degree Plan project in response to the prompt: "What is the most valuable thing you took from Exploring Biology?" There were 95 individual responses, but some responses aligned with more than one objective resulting in 103 alignments.		