

Developing a Backup Plan: Implementing a Career-Planning Course for Undergraduate Biology Majors[†]

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Career-planning courses are known to be effective career interventions for undergraduates, but their effect on developing alternate career plans was previously unknown. Forming alternate career plans increases the likelihood that students have viable career options available to them upon graduation because it encourages students to realistically consider multiple possibilities. Here we describe a one-term career-planning course developed in the context of an undergraduate biology curriculum. We assessed whether this course promoted development of primary and alternate career plans using a pre/post survey. We saw a significant increase in the percentage of students indicating they had plans aimed at achieving primary (increase of 37%) and alternate (increase of 48%) career goals from the beginning to the end of the course. Preliminary outcomes suggest that implementation of this course correlates with an increase in the percentage of students who indicate they have a job after graduation (increase of 16%). This type of course could be implemented in many other contexts to support career development in diverse fields.

INTRODUCTION

Career-planning courses have been offered to undergraduates since at least the 1920s, with discipline-specific courses of this type described as early as the 1970s (1). It is clear that these courses are an effective career intervention, providing a number of gains for participating students (1–8). These gains include reduction in time to graduation, increased confidence in career plans, and increased career self-efficacy.

In 2012, a career-planning course developed at St. John Fisher College for biology majors was described (8). To our knowledge, this was the first Biology-specific career-planning course described in the literature. This course was intended to do the following: encourage students to research future opportunities for training, allow students to understand what is needed for a successful application for such training, provide opportunities to understand what is necessary for students to achieve their career goals, educate students about career options available to biology students, provide

opportunities to develop communication skills, and instruct students about professional behavior. While the author describes the need for students to consider alternate career plans for their future, no specific assessments were conducted to determine whether this course allowed students to effectively develop these alternate plans.

There are many reasons why students should consider alternate career plans. Undergraduates often select career paths before fully considering their professional interests (8). This can lead students to enter a major field of study without really knowing what they want to do professionally (8). When students select primary careers in highly competitive fields or in positions that are not practical to pursue long-term, broad exposure to career options and assistance in considering alternatives can help them develop viable plans for long-term success (6, 8–10).

At our institution, biology majors especially need help with understanding the viability of their career goals and how to develop effective plans to achieve these goals, since most are interested in pursuing competitive post-graduation options. As one example, many (63%) of our incoming freshman biology majors hope to enroll in medical school (data collected from student surveys about career intent). The rate of acceptance into US medical schools is approximately 39% (11). Considering that the average overall grade point average (GPA) for students accepted into US medical schools from 2006–2015 was 3.67, and the average Medical College Admission Test (MCAT) score during

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that time frame was 31 (out of 45) (12), it is clear that not all interested students will gain immediate acceptance to medical school, and some may never successfully matriculate. Other graduate-level training programs of interest to our biology majors are similarly competitive. Despite this, in surveys conducted at the beginning of the senior year (before instituting the career-planning course), 27% of our biology majors who planned to pursue additional schooling indicated that they lacked backup plans (data collected on student surveys about career intent).

To help students develop viable career plans, we developed and instituted a required, one-term career-planning course in 2012. This course is distinct from the course developed by Freeman (8). The career-planning course we developed used a model derived from the career and management development literature called intentional change theory. Intentional change theory is a theoretical framework that has been proposed as useful in inspiring individual awareness of career progress (13–16). This theory uses self-directed learning to implement change in an individual's behavior, following steps focused on identifying 1) what I want to be; 2) who I actually am; 3) overlaps and gaps between who I am and what I want to be; 4) how to build strengths and reduce weaknesses; and 5) resources to help accomplish goals (14). Through this approach, participants develop a personalized plan to meet their goals. We used intentional change theory in the development of our course structure (Table 1). Students considered all aspects of intentional change theory through the course. We hypothesized that this structure would encourage student development of primary and alternate career goals and plans. Here we describe the career-planning course we developed and the initial outcomes from its implementation.

Intended audience

The described career-planning course is required of sophomore biology majors. This type of course could be used, with minor modifications, for students in any undergraduate major. It is recommended that this course be taken prior to the senior year to help students better prepare for future career prospects. In our context, the class sizes were 30 or fewer students, and in most instances, we had multiple sections running simultaneously.

Prerequisite student knowledge

There is no prerequisite knowledge required to engage in this career-planning course. This course was designed to support all students, regardless of where they are in their career-planning process.

Learning time

This course was designed as a one-credit course in a quarter-system curriculum. The course meets for 50 minutes

per week for ten weeks, during one term. This structure could be adapted to add more time for discussion or include additional career planning activities.

Learning objectives

As a result of this course, students will:

1. Explore career options available to them as Biology majors, and identify their strengths and weaknesses relevant to these possible options
2. Develop a primary and alternate plan for their future careers
3. Learn how to brand themselves effectively in job and professional school applications
4. Create a cover letter and resume for a specific job, and receive feedback on these submitted materials
5. Develop strategies to best utilize the resources available during their remaining time in their undergraduate careers to allow them to best prepare themselves for their intended careers

These learning objectives are closely tied to the class sessions and work that students were expected to do in the course (Table 1). Career exploration, together with identification of strengths and weaknesses, takes place in the first few weeks of the course through in-class discussions and the use of assignments that focus on career interests, values, and personality, as well as strengths and weaknesses. The development of a primary and alternate plan for careers is done through a career-planning worksheet. Personal branding is discussed in class, and is addressed through a resume, cover letter, and personal statement assignments. Feedback on all assignments is intended to support students in their development of strategies to facilitate career preparation.

PROCEDURE

Materials

This course includes activities that encourage students to define goals, consider strengths and weaknesses, learn about career options, outline plans of study, and develop job portfolio materials (Table 1). TYPEFOCUS™ is an online assessment of personality, interests, and values that was used to help with career-planning (<https://v6.typefocus.com/>). To use TYPEFOCUS™, students need a computer with internet access, and the institution needs to have access codes to allow students to use TYPEFOCUS™ for career counseling purposes. Administration of TYPEFOCUS™ does not require any additional training. At our institution, there is no cost to the students because the university has incurred the cost for participation. Course instructors partner with individuals from the career counseling center to provide feedback to the students on their TYPEFOCUS™ outcome. Alternative approaches that provide students with information about

TABLE 1.
Outline of the career-planning course and its overlap with intentional change theory.

Week	Class Session	Assignment Due	Intentional Change Step ^a
1	Course introduction		
2	Career-profiling discussion with career counselors	TYPEFOCUS™ assessment of interests, values, and personality	1, 2
3	Careers in biology	Career-planning worksheet	1, 2, 3
4	Applying to graduate or clinical programs		1, 2, 3, 5
5	Plan of study development	Reflection on viability of career goals	3, 5
6	Professional networking	Plan of study	3, 4, 5
7	Personal branding (e.g., resumes, cover letters)		1, 2, 4, 5
8	Personal statements for graduate/clinical programs	Resume and cover letter for mock job application	1, 2, 4, 5
9	Personal statement peer review	Personal statement for mock graduate/clinical program application	1, 2, 3, 4, 5
10	Review	Final career-planning worksheet	1, 2, 3, 4, 5

^aSteps in Intentional Change Theory: Identifying 1) What I want to be; 2) Who I actually am; 3) Overlaps and gaps between who I am and what I want to be; 4) How to build strengths and reduce weaknesses; 5) Resources to help accomplish goals.

their personality and interests related to career exist and could be used as a substitute. The syllabus and other course assignments can be found in the supplemental materials. In brief, the career-planning worksheet requires students to indicate primary and alternate career goals, why those goals are of interest, educational paths needed to achieve goals, current GPA, relevant extracurricular activities, current recommenders, and perception of goal viability. Students are also asked to complete assignments that require them to reflect on the viability of their career plans, develop a plan of study (plan for taking particular courses toward graduation) for their academic career with support from their advisor, develop a resume and mock cover letter, and write a personal statement (supplemental materials). Through feedback on all assignments, course faculty help students tailor their individual career plans.

Student instructions

Students receive a variety of instructions throughout the term. Faculty provide instructions to students regarding topics such as types of careers in biology, how to apply to graduate and/or clinical programs, how to successfully network to identify individuals who can serve as effective references for future job or school applications, and how to develop appropriate personal branding materials (i.e., resumes, personal statements). For more information on topics covered within the course, see Table 1 and the course syllabus in the supplemental materials. Students also receive instructions on how to complete course assignments (see supplemental materials for detailed course assignments). Of note, it is discussed in class that students should be honest when they respond to assignments so that they can be effectively mentored with regard to their career plans and progress.

Faculty instructions

Faculty who teach this course receive the syllabus and course assignment descriptions (supplemental materials). In addition, faculty are provided with suggestions for what to teach and how to teach each week's class session. Below are some of the suggestions we provide, with some alternative suggestions to consider:

- Week 1: Discuss goals and expectations of the course. Provide time for introductions, including a discussion of career interests and any concerns students want to share about achieving their goals. Complete a survey about current career-planning status. Discuss the importance of back-up plans.
- Week 2: Arrange for a career counselor to attend class and speak about the TYPEFOCUS™ assessment. Alternative suggestion if a career counselor is unavailable: discuss possible outcomes from the assessment and what they might mean for career planning.
- Week 3: Discuss stages of career planning (explore careers, gain experience, develop career management skills, implement career goals). Explain how to find resources to support career planning. Explore a range of careers that are possible with a degree in biology through the use of worksheets that describe possible careers and directing students to relevant websites.
- Week 4: Discuss the planning required to apply for graduate school (MS, PhD) and clinical programs (MD, DMD, DDS, etc.). This discussion should include: plan of study, extracurricular activities that are essential or useful, types of programs and how

they may differ, how to choose programs, and how applications are evaluated. One way to accomplish this is to split the class into those who are more interested in learning about graduate programs and those more interested in learning about clinical programs. Having the support of a colleague or pre-professional health advisor in teaching this session is useful in that structure. If students are interested in both venues, materials from both sessions can be made available to all students.

- Week 5: Arrange for an undergraduate advisor to come to class. On our campus, the undergraduate, or academic, advisor is a staff member who helps students plan their courses toward graduating with a particular major and/or minor, assists with registration, and helps to keep track of their credit hours. The advisor should speak about how to effectively develop a plan of study (in other words, a plan for which courses they should take during their undergraduate career) to allow students to meet their learning and professional goals. Alternative suggestion if an advisor is not available: invite a staff member or colleague who helps students with course planning to attend this session.
- Week 6: Discuss effective approaches to professional networking, such as thinking broadly about your professional network; how to use your network to identify additional contacts; how to build relationships with faculty and others; informational interviewing; shadowing; and acknowledging the help you receive.
- Week 7: Discuss what could be considered part of a student's personal brand (resume, CV, portfolios, website, blog). Describe the differences between a CV and a resume. Explain how to write a good cover letter.
- Week 8: Describe the goals of a personal statement. Discuss common pitfalls of personal statement writing. Provide tips on how to write a personal statement, such as which elements to include.
- Week 9: Have students exchange and provide feedback on each other's personal statements during class.
- Week 10: Follow up on topics that required more discussion. Discuss the progress that students have made in their thinking during the term, based on their reflections on the career-planning worksheet. Remind students of resources for career planning and success.

Additional suggestions that may help with course implementation at other institutions are provided in the supplemental materials.

Suggestions for determining student learning

To assign grades, we have a variety of assignments (see supplemental materials). We focus on providing students

with feedback on their career planning and preparation, rather than on grades. The expectation is that if students complete the assignments as described, are coming to class, and are engaging in course discussions, they will earn the vast majority of the points allocated in the course, and in implementation, most students did complete all assignments. "Grading" of assignments instead focuses on providing detailed feedback to promote thinking about career plans and practical work on those plans.

To additionally assess whether students are meeting course learning goals, anonymous pre- and post-course surveys were administered to all students taking the career-planning course in the five terms it ran between 2012 and 2014. We administered pre-course surveys on the first day of class (63% response rate), and post-course surveys online after course completion (50% response rate). Both pre- and post- surveys included four Yes/No questions asking whether students had primary and alternate career goals and plans, and one additional Yes/No question asking whether students felt they had a good plan for their future. The post-course survey also included follow-up questions to assess why students had or had not developed career plans and the usefulness of specific course elements. To assess whether the course was successful in promoting student development of career goals and plans, we conducted a post-hoc, two-proportion, two-tailed z-test, using G*Power, to determine the significance of observed results.

Sample data

Over two years, the career-planning course supported 491 sophomore biology majors. This approach streamlined advising, allowing ten course instructors to deliver common career planning information along with personalized career advising. If these students engaged in individual career mentoring with faculty, our biology faculty would each have had to mentor 22 sophomores individually, in addition to their other mentoring, research, teaching, and service responsibilities, which is currently not compatible with faculty workloads. As a result, this course allowed us to do something new to support our students in their career planning.

Students make progress in the development of their career plans in a variety of ways. Here are a couple of sample comments from student submissions on their final plans for their future careers:

- "I am very confident about my plans for PA school with the exception of my GPA performance. It is really the only thing standing in my way of having a sizable shot at entry. This class has reminded me of my goal, which can get diluted over time as classes seem endless and relentless. I have room/opportunity to improve, I just need to focus and commit the time."
- "I've learned that I am a visionary and my personality type is ENTP [Extroversion, Intuition, Thinking, Perception (a Myers-Briggs personality type)]. I've

learned some useful tips on where to start and what to aim for goal wise. My path is a bit unorthodox and will be a challenge, but I think with persistence, patience, and hard work I can attain my primary goal.”

Safety issues

This course takes place in a traditional classroom, non-laboratory, environment. It is not expected that there would be any safety issues in this course.

DISCUSSION

Field testing

This course was tested over five terms, from 2012 to 2014, in the Biology Department at Drexel University, which is a private, comprehensive research institution enrolling approximately 16,000 undergraduates and 9,000 graduate students. The Biology Department has 22 full-time faculty members who teach students and enrolls approximately 700 undergraduate students. Drexel is on a quarter system, with four 10-week terms per year.

To understand whether the course had any long-term consequences, we reviewed data from the Senior Exit Survey, administered yearly by the Drexel Office of Institutional Research. This survey contains questions about student career plans and how satisfied they are with their education at the time of graduation. Students are not incentivized for completing the survey. Survey data were stripped of identifiers by the Office of Institutional Research before distribution. Senior Exit Survey data from 2012 and 2015 were reviewed to look for changes in career outcomes and student satisfaction correlating with the incorporation of this course into the Biology Major curriculum in 2012. None of the students responding to the 2012 survey ($N = 80$; 70% response rate) took the career-planning course, whereas all of the students responding to the 2015 survey ($N = 140$; 85% response rate) took this course. As a result, outcomes from these two surveys allow us to assess whether the course had any impact on student satisfaction or career outcomes. We did not include the data from the 2013 nor 2014 exit surveys, because those years include data from both students who engaged in the career-planning course and those who did not. Since we do not have access to the non-anonymized dataset, we cannot determine which students participated in the course from these datasets. We looked at questions focused on career outcomes after graduation and satisfaction with their education. We conducted a post-hoc, two-proportion, two-tailed z-test (G^* Power) to evaluate whether differences between the 2012 and 2015 Senior Exit Survey responses were significant.

Evidence of student learning

To determine whether the course supported career development, we compared overall responses from pre- and

post-surveys. While this course is still a requirement of our curriculum, the data we are reporting on here were collected during the five terms the course ran from 2012 to 2014. In comparing student perceptions before (pre) and after (post) they took the course, there were significant increases in the percentage of responding students indicating they had primary and alternate career goals and plans after the course, with the greatest increase seen in the percentage of students indicating they had an alternate plan (Fig. 1). There was also an increase in the percentage of students indicating they had a good overall plan for their future.

To better understand whether the course promoted primary and alternate plan development, we asked follow-up questions of students indicating they had a primary and/or alternate plan on the post-course survey. Most of those with a primary plan (67%) felt they improved their pre-existing plan as a result of the course (Fig. 2). By contrast, most with an alternate plan (46%) believed it was devised in response to the course. Only 10% to 15% of students with primary and/or alternate plans indicated the course had no effect on career plan development.

To identify limitations preventing career plan development, we asked follow-up questions of students indicating they lacked primary and/or alternate plans after the course. Most of those without a primary plan (56%) still felt they needed to make use of resources provided in the course (Fig. 3). For those without an alternate plan, the largest percentage of students (34%) indicated that they didn't have a strong plan because they only recently identified this career goal. Some students (20%) also indicated a lack of seriousness with regard to considering their selected alternate career. At the end of the course, fewer than 15% of students without a primary and/or alternate plan felt they did not know where to go for help. On average, students responding to the post-course

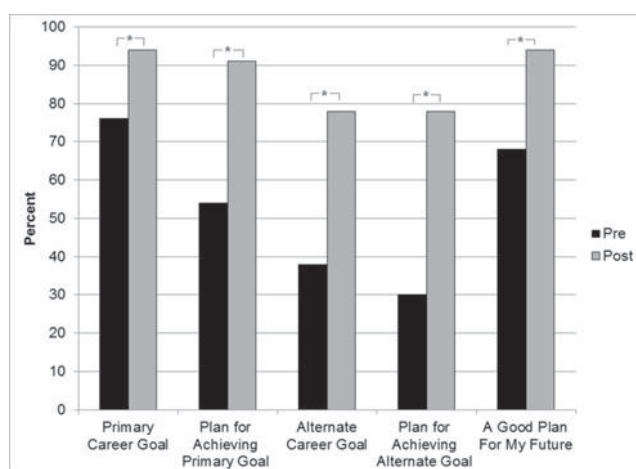


FIGURE 1. The career-planning course significantly increased the percentage of students who felt they had primary and alternate career goals and plans. Data represent the percentage of student respondents who indicated having the goals and plans designated on the x axis. Pre-course surveys had an $N = 304$; post-course surveys had an $N = 157$. $*P < 0.05$ (Power > 0.85)

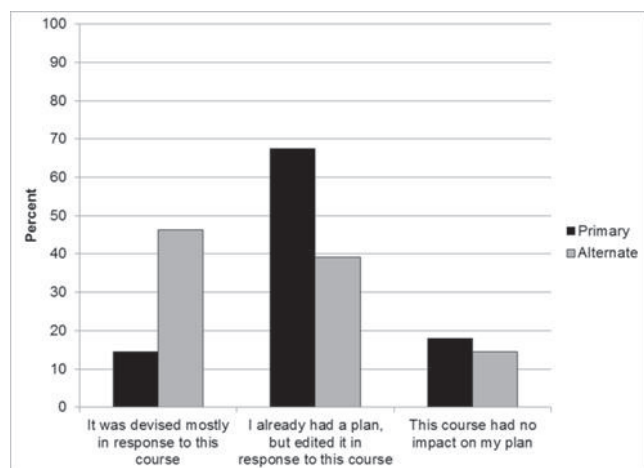


FIGURE 2. The career-planning course had different effects on many students' development of primary and alternate career plans. Data represent the percentage of students who selected each of these options regarding how the course affected their primary and alternate plans ($N = 157$).

survey reported that all aspects of the course were helpful, with means at 3.9 or above on a five-point scale where a score of 1 corresponds to "very unhelpful," and a score of 5 corresponds to "very helpful" (Table 2).

In comparing the data acquired from the Senior Exit Survey in 2012 (no graduating students had taken the course) with the data acquired from the same survey in 2015 (all graduating students had taken the course), we found an increase in the percentage of students indicating that they had a job upon graduation, from 15% of those who took the survey in 2012 ($N = 80$; 70% response rate) to 31% of those who took the survey in 2015 ($N = 140$; 85% response rate). This increase in job placement was statistically significant ($p = 0.0096$, power = 0.85) and is not correlated with a significant decrease in other outcomes (e.g., acceptance to medical school). Consistent with the reported increase in job placement, we also saw a significant increase in student satisfaction with their undergraduate education from 81.25% in 2012 ($N = 80$; 70% response rate) to 92.54% in 2015 ($N = 134$; 81% response rate; $p = 0.013$, power = 0.78).

The significant increase in the percentage of students indicating they had primary and alternate goals after the course is encouraging. Despite the fact that most students entered the course with a primary goal, the majority still found the course helpful in developing their primary plan, in accordance with the literature (1, 8). These data suggest that most students can benefit from career-planning support. This is of interest, because many undergraduate programs do not require students to engage in career-planning. Without required career mentoring, students may not reflect on their goals or seek career development support because they are not aware of their own knowledge gaps (1, 17). As instructors, we have noted that even students

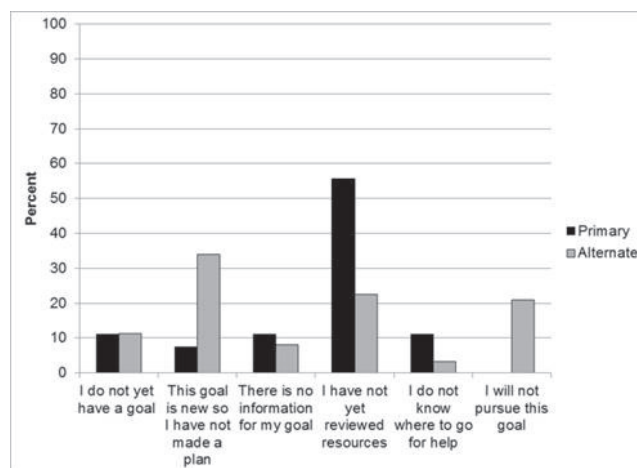


FIGURE 3. Students indicated distinct reasons for why they did not have primary or alternate career plans at the end of the career-planning course. Data represent the percentage of students who selected each of these options for why they do not yet have a primary ($N=14$) or alternate plan ($N=34$). The final option (I won't pursue this career goal) was only provided as an option for students without an alternate plan.

with viable plans need help preparing compelling applications for school programs or jobs. Requiring this course ensures that all students are exposed to career-planning resources, thus increasing the efficiency and reach of career mentoring. We predicted that this course would allow students to have at least one viable career option available upon graduation, thus increasing their chance of either having a job or being accepted into further schooling. According to our initial data, the implementation of this career-planning course is correlated with an increase in the percentage of students reporting having a job upon graduation, consistent with our prediction. We also saw an increase in student satisfaction with their undergraduate education after the implementation of the career-planning course. It is not possible to determine whether this increase in student satisfaction is due directly to the course, as other changes occurred at our institution between 2012 and 2015, but it is certainly conceivable that an increase in success in career outcomes would promote student satisfaction with their undergraduate education.

Very few students indicated that this course had no effect on career goal development. It is unclear whether these specific students lack the professional maturity needed to engage effectively or whether other factors drive their resistance to career development. Though career-planning in the sophomore year may seem early, we believe requiring the course at this stage allows students to consider their goals in the context of their recent college achievements with adequate time to adjust plans to effectively pursue career goals immediately post-graduation.

Despite the emphasis on the value of alternate plan development throughout the course, 20% of responding students without such a plan indicated they had no plans to pursue an alternate goal. Anecdotally, the instructors observed that

TABLE 2.
Student perceptions of the helpfulness of elements of the career-planning course.

How helpful was it to engage in each of the following:	Mean±SD ^a	N
Completing the TYPEFOCUS™ assessment and subsequent sessions with the career counselors	3.9±1.05	225
Learning about cover letters, CVs, and resumes	4.3±0.86	220
Learning about personal statements	4.4±0.86	220

^aResponses were on a scale of 1 (very unhelpful) to 5 (very helpful).

some students seem to resist developing alternate plans because of a firm belief in their ability to achieve their primary goal. This certainty exists even for some students with low GPAs (e.g., 2.0) and/or few relevant extracurricular activities.

Possible modifications

The described course is an efficient way to provide career mentoring to large numbers of students. We believe this approach could be used to promote career planning in many other contexts. With minor changes to reflect field-specific differences, course topics could support career planning for undergraduates in other disciplines.

SUPPLEMENTAL MATERIALS

- Appendix 1: Biology career planning course – example syllabus
- Appendix 2: Planning for your future career worksheet
- Appendix 3: Reflection on the viability of your future career plans
- Appendix 4: Plan of study assignment
- Appendix 5: Personal branding assignment
- Appendix 6: Personal statement assignment
- Appendix 7: Final plan and alternate plan for your future career
- Appendix 8: Additional suggestions for implementation

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