The Chemistry Department advising program encompasses multiple activities which support student-centered outcomes. A notable challenge for Chemistry is adequately serving the needs of majors as well as non-majors, as there are thousands of non-majors taking Chemistry courses each semester. While there are many areas of strength in the advising program, improvements could be realized by a deeper consideration of student needs.

A departmental advisor focus group used the advising assessment tool from UC Berkeley to articulate student outcomes, link current practices to student outcomes, and begin the process of formulating assessment plans for Chemistry. The report is divided into three parts: Current Practices; Goals; Action Plan.

Current Practices

Mission: The Chemistry advising program helps majors identify courses, research opportunities, and explore extracurricular experiences that will promote their intellectual growth and initial career goals. A secondary mission is to help non-major students navigate chemistry courses required for their degree.

This mission suggested an appropriate scope for this advising program, as well as led to a number of student-centered learning outcomes. The student outcomes were refined through the course of several faculty discussions, as student outcomes are central to assessing program activities. Further, clearly defining these outcomes will help to calibrate student and staff expectations, as well as clarify how Chemistry advising fits within the activity of the other advising programs across campus.

Student centered outcomes for advising

KNOWLEDGE

1. Students will understand degree requirements, options, and how chemistry skills relate to broader educational and career opportunities.
2. Students will identify research opportunities as related to their interests.

SKILLS

3. Students will select courses and plan an academic pathway consistent with their long range goals.
4. Students will be able to locate and utilize resources to support their academic and professional goals.

VALUES

5. Students will identify as members of a cohort and the department.
6. Students will grow in their ability to reflect upon how academic experiences relate to their goals.

It is notable that our mission to non-major students is largely in the area of Knowledge; however, due to the large number of nonmajors from varied departments who take chemistry courses, our advising program has the potential to impact thousands of students each semester.

Advising Activities: There are three pillars of advising for Chemistry majors: media for broadcast information, faculty-led courses or meetings, and peer-based informal advising. Many strengths are inherent to this multimodal advising approach, however some activities hold the potential for greater impact based on limited assessments and anecdotes. A survey of student perceptions of advising, administered during several majors-required courses in Fall 2014 (attached), was used to supplement anecdotes in calibrating the potential improvement in various activities.

Media: The use of media excels in listing course requirements and recommended course sequencing for majors. Media includes email announcements, static Internet postings, and physical copies. The student survey indicated that students felt that they understood degree requirements and were prepared for selecting courses. It is very likely that media is the dominant avenue for advising non-majors about course requirements, however a large burden falls onto staff to address non-majors and their questions. In addition, faculty who teach non-majors could fulfill a significant role in connecting chemistry to broader academic interests.

Faculty: Faculty, both tenure-track and non-tenure-track, contributed to advising in their roles as primary advisors, event facilitators, and research group supervisors. It was noted that student advising is not an activity that supports the career development of tenure-track faculty, which creates significant challenges in coordinating an advising program and in ensuring continuous training.

The bulk of advising for majors occurs during 1:1 meetings with faculty, as Chemistry imposes an EN1 hold each semester. Students felt that faculty were accessible and that course requirements were clear. An area for improvement is in connecting student interests to research opportunities and career opportunities, both on and off campus. A challenge in moving forward is the need for greater training for faculty advisors in order to meet this student need, and the consequent imposition upon faculty time.

Faculty serve during a number of events directed at new students, such as NSO, open houses, and the major fairs; as well as a variety of events that are tailored at community building within Chemistry, such as the annual awards night and undergraduate poster session. There is no current data, outside of anecdotes, regarding the efficacy of these events. Faculty participation in community-building events was reasonable, and viewed as positive.

Research group supervision provides a crucial avenue for career advising as well as assessing and shaping student interpersonal skills in team work. This is the one mode where students could form strong personal connections to University staff and near-peers, and may be highly beneficial to helping students feel a sense of belonging. Tenure-track faculty may be uniquely positioned to fulfill these crucial roles. Students reported that they desired greater help connecting their interest to career development and off-campus research opportunities, suggesting that growth could be realized at the research group level.

Faculty lead a sophomore seminar and a junior year writing course, each of which supports specific student advising outcomes. Both courses provide support in the area of identifying research and career connections, and in building a sense of community. As such, actions to improve the ability of students to connect their interests to careers and research opportunities may be partially realized through these courses.

Peers: Peer based advising is informal within Chemistry, however there are two student-led clubs (one is a formal student chapter of the American Chemical Society). These peer-led clubs provide crucial opportunities for community building and to help students grow in their ability to reflect upon academic experience. Anecdotal data suggests that peer advising could be used more effectively through more explicit awareness of their value. A key to making these clubs function well for students is the assignment of space to the club, as it helps to provide identity. We have had mixed success in this, largely due to flux in space within the Department. A key goal would be to acquire long term dedicated (shared) space for Chemistry clubs.

Below is a matrix listing activities and outcomes, developed from the recommendation of the UC Berkeley guide for assessing advising programs. The value in this matrix is that it illustrates how well current actions address each of the student-centered outcomes, and suggests which actions might be modified to improve student outcomes.

Linking Advising Outcomes (columns) to Activities (rows)

	Knowledge		Skills		Values	
Activity	**1. Understand degree reqs, options, and relation to professional opportunities.**	**2. Identify research/prof opportunities that relate to interests**	**3. Select courses, and plan acad. path matching long range goals.**	**4. Locate resources for academic and professional goals.**	**5. Identify as members of a cohort and the department.**	**6. Grow in ability to reflect upon and relate academic experiences to their goals.**
Email announcements	N Y (direct students to advising)	N research Y internship (potential overload)	N	Y direct students	N	N
Web	Y	Y list N interests	Y list N interests	N	Y (pulse for clubs)	N
Print	Y list N reasons	N	Y list N linked to goals	N	N	N
New Student Orientation	Y	Y (1 credit FY experiences)	Yes. Core mission	Y	N	N
1:1 meetings with faculty	Y	Y research N professional	Y	Y	N	Y (student initiated, spotty)
Research group mentors	N	NA	N reqs Y path	N Y (serious needs)	Y	Y

Sophomore Seminar	N	Yes. Core mission	N	Yes (via discussion)	Y	Y
Junior Year Writing	N reqs Y (the "why" of the requirements)	Y (research shadow and/or proposal)	N	N	Y (cohesive)	Y (achievements, pitching to employers)
Peer: ACS and Chem Club	Y informal	Y	Rumor mill	Rumor mill	Y	Y informal
Events (awards, poster sessions, open houses, etc)	N	Y, partial for interests	N	N	Y	Y
Activity	**1. Understand degree reqs, options, and relation to professional opportunities.**	**2. Identify research/prof opportunities that relate to interests**	**3. Select courses, and plan acad. path matching long range goals.**	**4. Locate resources for academic and professional goals.**	**5. Identify as members of a cohort and the department.**	**6. Grow in ability to reflect upon and relate academic experiences to their goals.**

It appears that most outcomes are supported by multiple activities, however a few activities could be modified to better support student outcomes. Outcomes that link student interests or goals to academic or professional opportunities are under-supported at present. This suggests a few short-term actions that could improve student outcomes.

External data

The advising group considered external data, such as that from the senior survey, but did not know how to use that data for improvement. Chemistry would hope to increase student satisfaction, retention, and co-curricular activities that lead to careers or graduate school. Instead, the limited student survey from 2014 was very informative in identifying several areas in need of improvement.

The Chemistry advising program is very strong in helping students to acquire knowledge about courses, in providing research opportunities, and in helping students to identify as members of a cohort. Weaknesses were perceived in the critical connection between student interests and academic options, and in helping students to identify resources to help them realize their goals.

Goals

The goals include program-level goals, as well as student-centered goals. This distinction is made as a way to help with interpreting assessment data, and with relating actions back to specific outcomes.

Goals for Program: A set of measureable outcomes that would impact the Chemistry program were identified, from consideration of the needs of our current students and the areas of growth on campus. These programmatic goals may be connected to the broader campus goals of making UMass a destination of choice, and increasing student satisfaction.

1. Increase the number of Chemistry majors by 50% over 2015-2016.

This aspirational goal is quite blunt, however it amounts to converting Chemistry into a 'sticky' major for students interested in using molecular reasoning to solve problems in biology, energy, or nanomaterials. A successful outcome for this goal can be measured by counting total majors, and the number of second-majors. Our action plan is centered around connecting chemistry to student interests, and is described below in the *Goals for Student Outcomes* section. This follows from the theory that students will pick a major that fits their interests and helps them lead to a successful career entry.

2. Develop a clear presence or brand, in life science.

This aspirational goal is recognition of the important role that molecular reasoning plays in advancing life science research and teaching. A combination of new media materials along with faculty efforts will be used to promote the chemical aspects of life sciences.

Media: Updated research/internship vignettes about specific students. This will be part of our annual newsletter, and will appear on the departmental webpage.

Faculty: Delegate to the Undergraduate Program Committee the joint responsibility for hosting NSO, Open House, and the Majors Fair. Initiate a process of identifying desired elective courses, to be led by the UPC. Create a new award supporting summer research in life science.

3. 50% of majors will complete 2 semesters of research or internship experience.

This aspirational goal will be measured by simple numerical counts of students participating in research at each grade level – the target will be to place 50% of sophomores into research labs or internships by the end of their second summer on campus. The action plan will include two programmatic changes, student surveys, and designating one faculty member as 'research czar' to provide a consistent message.

The first programmatic change will be to create annual advising events on co-curricular options for student, beginning in their first year. This will take the form of a 10-minute presentation to a major-oriented class targeted to each grade-level, with a survey to aide in follow-up in case students need more help in identifying placement. The UPC will be the responsible organization. The second programmatic change is to initiate efforts at identifying ways to replicate the student outcomes of internships through on-campus research opportunities and training. As every BS Chemistry major performs on-campus research, it may be easier help students get the 'internship experience' by small tweaks to their current practices. This will start with a discussion with Rick

Robar and Chemistry alumni in order to distill some of the key internship outcomes down to practices that might augment the on-campus research. This will be the responsibility of the CUA.

Designating one faculty member as the undergraduate research czar will be done to ensure oversight of the undergraduate research experiences. This individual will be tasked with bridging any gap between faculty and students regarding research openings and pre-requisites, methods of applying for such positions, and student perspectives on what they want from this experience. This could take the form of a central application form to facilitate students in expressing their interests, along with a research fair in which each research group would provide a poster about training opportunities.

Goals for Student Outcomes:

A focused set of outcomes was selected for immediate attention, as part of a longer term continuous improvement effort. Three outcomes were prioritized after considering current strengths and weaknesses in the Chemistry advising program. These involve helping students connect their interests to opportunities or resources on campus, as that was a commonly cited weakness from anecdotes and student survey results. These student-focused outcomes will be combined with an assessment program to help monitor progress toward achieving goals. The annual survey will be under the direction of the CUA.

1. Students will identify research opportunities as related to their interests.
This will be addressed by a combination of programmatic modifications, and assessed by student perceptual surveys. The key changes are to rely on the research czar to present research opportunities to students at every grade level, and follow through with surveys assessing student perceptions, participation, and need for help. The metric is that more than 50% of students will perceive that they found research opportunities related to their interests.

2. Students will select courses and plan an academic pathway consistent with their long range goals.
This outcome will be addressed by both programmatic changes and student assessments. The program change will rely on bi-annual training workshops for the advisors, led by the CUA. This will require that faculty advisors commit to training.

Student surveys and enrollment trends in elective courses will be used to identify the impact of elective course programming. The crucial issue is to link elective course offerings to student interests – we need to learn what students want, so that appropriate programming is offered.

3. Students will be able to locate and utilize resources to support their academic and professional goals.
This outcome will be assessed by participation rates in selected resources, and as part of our student survey.