Department of Astronomy – Departmental Scan – Fall 2014 – First Draft

I. Destination of Choice

In this section we examine primarily the undergraduate program in Astronomy based in large part upon the data tables collected for each Department. We have generally averaged the data in these tables over 5 or 10 years to obtain better statistics, and conversely we have also examined more-detailed breakdowns of Student Response to Instruction (SRTI) data for our courses.

A. Attractiveness/Competitiveness

The number of students applying to enter in astronomy has generally been trending higher over the last decade, rising from the high 40s to an average of about 70 per year for the last few years. The yield rate of accepted students averages 35%, which is relatively high for the College (24%) and the University (24%). This yield rate probably reflects that students interested in Astronomy have only the option of UMass among New England public universities. Our students tend to be mathematically strong (based on their self-reported data), but otherwise have average academic ability, drive, confidence, and writing skills based on means of the last 10 years of data.

The unique opportunity to major in Astronomy probably also helps to explain the notably high percentage of out-of-state students attracted to our major, averaging 49% over the last 10 years. Factors such as cost or academic reputation of UMass appear to be less significant factors for students selecting Astronomy than most other majors, again probably because there are not many schools that offer the major. We lack much research in some "hot topic" areas like planetary science and searches for exoplanets, but this is partially addressed by some of our colleagues in the Five Colleges.

Based on just two years of data (with small number statistics) we have matched the College and exceeded the University in attracting first- generation and Pell recipient students. However, Astronomy does not attract the number of women or under-represented minorities that it might, certainly less than the averages of the College and University as a whole. This seems to be a problem for the field and physical sciences generally, but we have several ideas and would welcome others:

- Do more outreach to high schools, perhaps with the help of graduate and undergraduate students, highlighting whenever possible the work of under-represented minorities and women in the field.
- In other states universities have run outreach programs that provide support to graduate students through the NASA state Space Grant program. We should investigate that in Massachusetts.
- Recruitment efforts could be coordinated with other physical science departments that have low numbers of women and minorities.
- Advertise that our major includes courses taught at elite women's colleges Mt. Holyoke and Smith, and highlight the work of our Five College faculty colleagues.
- Reach out to first-year students who are doing well in our introductory gen-ed classes, and invite them to an open house for possible majors.

B. Overall Effectiveness

Based on averages of data collected since 2003, of students entering in Astronomy, only 27% complete an Astronomy degree in 4 years. This number climbs slightly to 32% by 6 years. These values are similar to the College and University, and reflect that the majority of students change their major before they graduate. Of greater concern is that 35% of entering Astronomy majors eventually withdraw, which is higher than the College or University (both about 30%). This may reflect a lack of realism among entering students about the high level of Math and Physics that the field of Astronomy entails, and it would be good if we could identify students unlikely to succeed earlier so they don't lose their way.

The one-year retention rate for astronomy is about 64%, close to the rates for the College and University. The 16% who withdraw before their second year have a GPA of 1.8 despite coming to UMass with a GPA of 3.3. Knowing how challenging some of our first year Math and Physics courses are, it's possible that these students could have gone on to another degree or completed Astronomy with additional courses that built up their skills during their first year—although this would probably require more years to graduate.

Looking at our graduates retrospectively, 74% of our graduating students completed their degrees in 4 or fewer years, which is close to the average of the College and University. Another 18% completed their degrees in 6 or fewer years, leaving 8% who take longer. This last number is one of the highest in the College (matching only Computer Science, and exceeded only by the interdisciplinary science major). These long-term students probably struggled in their early years, repeated courses, and perhaps spent some time away from the University. It would be useful to know what career direction they eventually followed and to see if they might have been happier in a different major.

Because the number of graduating seniors in Astronomy each year is small, the annual senior survey ratings were not included in the table data provided. However, we do have the composite senior survey data for 2011-2013 based on 14 of 18 graduating seniors (see attached). The data for all departments is sorted in order of "Overall Experience" in the major and each item is color coded greener for more positive responses and redder for more negative.

In this composite listing, Astronomy has fairly average ratings overall. Astronomy has one outstanding area, "Writing Preparation," which is ranked highest in the College and 6th highest among 54 Departments ranked over the last 3 years. We believe this is the result of a redesigned Junior Year Writing course developed by one of our faculty members (Todd Tripp) ten years ago and taught by him since then. A large percentage of our graduating seniors have also conducted "Research with faculty member" (64%) and/or had a "Culminating senior experience" (57%), both well above the University averages (33% and 42% respectively).

Two areas of dissatisfaction are also evident in the survey, the "Quality of teaching" and "Career preparation & guidance" for our majors. We need to explore with our students how we can serve them better in both these areas. The American Astronomical Society has identified the career advice issue as a problem for Astronomy departments around the country. This is thought to arise from the limited number of graduate student positions available and the lack of obvious Astronomy career tracks in industry compared to other sciences. On the other hand, there are many data analysis skills that make Astronomy an excellent background for a variety of careers. This appears to be an area where we can draw on resources currently being developed by the AAS to help us advise students better.

- We need to do a better job of informing incoming potential majors of the challenges of completing a degree in astronomy, perhaps through summer advising and improved website information.
- It would be very helpful if we could draw on past graduates to help us present roundtables to our current students about job opportunities.
- In addition to our first-year seminar, where we make some initial presentations about opportunities after graduation, we should add a junior-level 1-credit seminar where we could go into career opportunities, offer some GRE coaching, and help students plan for internships.
- We should investigate developing a Data Science minor or certificate based on a set of appropriate courses that emphasize our major's unique mix of analysis and abstraction skills.
- We need a much improved website for presenting the complicated set of courses and opportunities at the five campuses of the Five College Astronomy Department.
- We are beginning to explore the use of "indicator courses" to help identify students unlikely to prosper in our major, and we are also investigating whether we can develop better tracks for both those students who do not have an adequate initial background in math and science, or who are interested in something other than a research career.

C. Student Engagement

Since the number of Astronomy majors is small, all of our upper level courses are small. As a result, Astronomy majors enjoy much more personalized instruction throughout their career at UMass. Overall, 47% of their courses are taught in sections smaller than 30 students, which is the highest percentage in the College, and one of the highest of any major at UMass. There is little difference between honors and non-honors students in this regard.

To help balance our Department's overall teaching load, we teach a number of large introductory astronomy courses. This translates into an overall number of student credit hour (SCH) per organized class section (OCS) of 291 averaged over the last 5 years for our undergraduate classes. (This value translates to about 80 students per class on average given that classes of 3 and 4 credits are offered.) This value of SCH/OCS is about in the middle of the values across our College, and it is about 1.22 times the comparable value for the peer schools in the Delaware study. Note that because there were not enough comparison schools with Astronomy Departments in most years, the comparison sample is limited to the years 2008-2010, and we compare this to the averages across all years available for our own department.

Astronomy reorganized its large non-major undergraduate courses at the time general-education courses went from 3 to 4 credits in 2009. We added lab sections, the number of students per lecture section declined, and at the same time began teaching more small honors sections. This is reflected in a corresponding shift in SCH in smaller classes, although the bulk of our teaching remains in classes with more than 100 students.

Senior survey data was again unavailable for Astronomy in the "Faculty Contact and Engagement" spreadsheet, but we can look at the 3-year departmental average spreadsheet (attached). In the "engagement" categories of academic advising, faculty accessibility, and faculty concern, we fare moderately well at about the average of other Departments.

The SRTI results presented in the "Faculty Contact and Engagement" spreadsheet were confusing because they do not divide up different types of classes. The department has collected SRTI data from all of our courses for about 15 years and has a composite spreadsheet that breaks down the results into specific categories of classes. The attached table also splits the results between earlier data (1999-2008) and more recent results from the last 5 years. SRTI results for similar size classes are reported for the College and University as well. Green and red shading is again used to show changes from the previous decade to the courses taught in the last 5 years, as well as to compare our courses to the mean SRTI values for CNS courses of similar class size.

The color coding indicates some successes and weaknesses in areas that might be grouped under "Student Engagement." In our non-major introductory courses we are consistently low in the category of providing "useful feedback." This is something we can perhaps learn from our own faculty members who score better in this area. Our introductory honors courses as well as our introductory course for majors have both improved and are doing well within the College.

We have also been revamping our introductory 1-credit seminar for new students, to help improve student engagement within the major, and this is generally quite well-received. It scores a bit low in "useful feedback" and "how much learned overall," but the comparison of a 1-credit seminar with standard lecture courses is probably not particularly valid in these categories.

One of our faculty (Ron Snell) specifically redesigned our introductory majors' course to be more challenging and to be clearly labeled as such (including a co-requisite of introductory calculus), so it is gratifying that the course is well-received and has been growing steadily in size. Overall our major's courses are rated slightly low compared to other small CNS courses, particularly in the engagement category of "stimulated participation," and this is another area we need to address. We examine the courses we teach more fully in the following section.

D. Teaching Effectiveness

Astronomy Majors' Courses

It is a serious concern that in the 2011-2013 composite senior survey, Astronomy students report that the overall quality of teaching was significantly (>1 sigma) below the average for all Departments. This is not easily disentangled from the data presented in the OIR tables, but the summary of SRTI teaching scores by course type provides some additional insight into the areas where we have problems.

As already noted, we frequently get low marks for "stimulated participation" across our majors' curriculum. This is perhaps more in the category of student engagement, but many studies show that more engaging active-learning techniques stimulate student learning (see for example the list of studies in the NSF call for proposals here: http://www.nsf.gov/pubs/2013/nsf13552/nsf13552.htm). The center for teaching offers numerous workshops about student-centered learning, and perhaps we should invite them to present to the whole Department.

The good news is that our introductory astronomy courses for majors are well received overall. Our first-year 1-credit seminar is well rated and gets our students off to a good start. This is generally followed in the second semester with Astronomy 228 (formerly 114), which has excellent ratings (except for the "participation" score). This course has been filling to capacity in recent years, with as many non-majors as majors, perhaps providing a source for recruiting new majors.

Our other 200-400 level courses have not scored particularly well despite being small and thus offering an opportunity for more personal faculty-student interaction. A notable exception to this has been the Junior Year Writing course, which has consistently scored at or above the SRTI rankings of similar-sized CNS classes, and as we noted earlier writing preparation is singled out by our seniors as one of the strongest aspects of the major. We think that one of the issues with most other of our upper-level courses is that many students struggle with them because of the high level of mathematics and physics required, and this in turn may be a problem with our requirements in different majors' tracks.

Together with providing better career advising, improving our majors' courses is one of the most important steps we need to take to improve the major overall.

General Education Courses

Astronomy has been teaching two large-lecture general-education courses for well over a decade: Astro 100 (Exploration of the Universe) and Astro 101 (Solar System). 80% of students taking these courses are doing so to meet their gen-ed physical-sciences requirement—the highest percentage of all Departments.

Overall, these courses are rated at about the average of other large courses in CNS with the notable exception of the SRTI question about "useful feedback" where we score quite low. This is consistently true over the years as can be seen in the *SRTI Ratings of Courses by Gen Ed Status* spreadsheet. This is an area we need to learn how to address in a more satisfactory way.

The near-average values posted for our general-education courses fails to show what a wide range of scores are posted for the individual classes taught by different instructors of these courses. The SRTI scoring tends to be consistent for a given instructor over time, suggesting that the satisfaction or dissatisfaction reflects a response to various approaches to teaching.

Most of our faculty teach introductory astronomy at various times, and we do not have the capacity to have only the most successful instructors teach these courses if we are to cover all of our other teaching commitments with faculty with the relevant expertise. There is also a split among the faculty, with a sizable fraction arguing that student ratings on the SRTI surveys are nearly meaningless, that students do not know what a good education is, but instead give high ratings based primarily on easy grading and entertainment value. With this kind of predisposition, it is very difficult to pursue change.

Since general-education teaching represents the bulk of our teaching in terms of student credit hours, in most budgetary models this is our biggest positive budget item. We need to attend to this.

To improve our undergraduate teaching, there are a variety of possible approaches to this that we might consider:

- It would be very helpful if we could obtain more in-depth feedback from students that might help us to better interpret low SRTI scores and persuade faculty that efforts at change are worthwhile.
- Have peer review of teaching methods, perhaps asking faculty to sit in on each other's classes and provide feedback about why students might be responding the way they do.
- We could develop a forum to share effective teaching strategies from among our own ranks or from the Center for Teaching. However, past attempts at teaching seminars suggest that the instructors who score the lowest are not interested in participating.
- Share teaching scores more broadly to stimulate conversation between faculty in areas where they are struggling and others are succeeding (e.g., the feedback issue).
- Reward teaching innovation and success through the merit process.
- We could concentrate our standard gen-ed courses to a smaller number of very large lecture courses led by our most successful instructors. Note that our overall SRTI averages in the 300-seat sections are about the same as our 120-seat sections, and some of our faculty have actually achieved some of the highest ratings in the largest lecture sections.
- Develop a wide variety of other general-interest (and general education) courses on a variety of current topics that might match individual faculty members' interests.
- Examine the requirements of our different tracks to see if they make sense for our students.

E. Student Outcomes

Little data has been gathered in recent years about our majors' careers after they graduate, but we did some sampling over a decade ago that gives us some idea of student outcomes. At that time, in very rough numbers we found that 1/4 of our students went on to graduate careers in astronomy or related fields, 1/4 went on to teaching science (middle and high school), 1/4 went on to technical jobs with closer or further links to astronomy (from technical support for NASA missions to various industries), and 1/4 went on to miscellaneous careers (music, art, writing, etc.).

Updating information about our more-recent graduates would be useful in at least two ways: it would help us to understand the ways in which our program might better help our students in their professional careers, and it would identify a cadre of past students whom we could ask to help us to guide our current students. This would enable us to be more effective in career advising—an area where we are doing particularly poorly.

It should be obvious that very few of our students will ever become research faculty at universities like ourselves. Given that there is relatively little growth in the availability of such positions, it follows that, on average, we can guide only about one student into a career like our own over our professional lifetimes—that will provide enough students to replace ourselves. However, the major in Astronomy is not just about replacing ourselves, but about providing students with a set of critical-thinking skills, a strong understanding of mathematics and the physical sciences, and a deep appreciation of our universe. This background can lead to the wide variety of careers that our graduates do in fact pursue.

Recognizing that many of our students go on to teaching and non-technical careers, we designed our B.A. track to provide a broad background in the sciences with less of a focus on upper-level physics and math. We have learned over the last decade that in making this track so broad, most of our B.A. majors struggle with our 300- and 400-level courses. These students are sometimes driven to repeat these courses, often unsuccessfully, or to drop the major. It is important to realize that even students who fail our upper-level courses are still stronger than the average high-school physics teacher. If we drive

these students out of the major, we are depriving K-12 schools of a possible talent pool a time when the nation is desperate for better-qualified science teachers.

The College has a little-used general science major with requirements and a structure that don't make much sense except as a last resort for students who are having difficulty graduating within any of the department majors. Working with colleagues in the College of Education, we could tailor this major to provide physical science, biological science and other degrees aligned with state licensure requirements for middle- and high-school science teaching. The college could develop (or identify) a set of upper-level courses, such as junior-year writing, integrative experience courses, and science pedagogy courses that would provide a better alternative for our students who are thinking about a career in teaching.

The American Astronomical Society is pursuing this issue currently as well, because many astronomy Departments are facing a similar challenge. They note that unlike many other sciences, where there is a clear non-academic profession, astronomy appears on its surface to be very impractical. We need to help our students (and ourselves) see that their skills in data analysis, mathematics, and physical sciences gives them an excellent preparation for a wide variety of careers.

To improve student outcomes we should look into several areas:

- Collect up-to-date information about our graduates.
- Realign our B.A. track in ways that better support students with an interest in majoring in Astronomy but who may not develop the skills required to pass our upper-level courses.
- Develop a "teaching track" for physical (and other) science majors.
- Develop a "Data Analysis" minor or certificate to guide and highlight the attainment of these skills.

F. Effective Use of Resources

Astronomy teaches about 0.9 "organized class sections" per FTE faculty member according to the collected data averaged over the last five years. This does not appear to count our labs or perhaps some of our other <3 credit courses (e.g., our first-year seminar). This is about 3/4 of the number in our Delaware comparison institutions (remembering, however, that the Delaware data is quite limited in both years it is available and number of institutions it includes). In terms of student credit hours, we have taught a nearly identical number of student credit hours per FTE faculty member as the Delaware sample.

According to the data tables, 95% of classes (88% of SCH) of our teaching is done by tenure-track faculty members. The Delaware peer comparison sample has about 81% (64% of SCH) of the teaching done by tenure-track faculty. This is a statistic we might use to advertise UMass Astronomy as a destination of choice.

While the data suggest that our peer institutions teach more sections and SCHs with non-tenure-track instructors and teaching associates, it appears that the data does not include our online courses through CPE, which have mostly been taught by non-tenure-track instructors. I think this is a good way for us to distribute our teaching, since it provides students with more direct contact with our regular tenure-track faculty.

Not surprisingly, 100% of our graduate teaching is carried out by tenure-track faculty. This is essentially true of the Delaware sample as well (98%).

It is a little discouraging to see that the number of TAs per faculty member in Astronomy is so low, just 0.29 per tenure-track FTE. This is one of the lower values in the college, and about 20% lower than our Delaware peer sample. The moves by CNS to reduce the number of TAs in the last few years are making it extremely challenging to successfully teach our undergraduate courses, and at a time when federal funding is growing scarce this is making it more challenging to maintain a healthy number of graduate students per faculty member.

II. Investment of Choice

Astronomy has a wide range of exciting areas of research. Much of this was examined in detail in our recent Graduate Program Review, so we will focus here primarily on our examination of ways to improve our graduate teaching and mentorship.

A. Attractiveness/Competitiveness

Over the past five years Astronomy has admitted 22% of applicants to the program, 37% of whom have decided to attend. These numbers are close to the college values overall, as are the applicants' GRE scores.

Our graduate students are 26% female and 26% under-represented minorities or other ALANA students. The percentage of women is low, but not unusual for a physical science, while the percentage of minorities is about twice as high as the average for the College over the last five years.

Our percentage of international students has declined from 70% to just under half (48%) between 2004-8 and 2009-13. This has partly been due to a conscious effort to increase our number of students from within the United States, in part because of some of the language challenges faced both in classes and as teaching assistants. The percentage is now similar to the College overall (46% averaged over 2009-13).

The numbers do not obviously reflect how challenging it is to attract the strongest students to apply or to get them to come when they are accepted. We are looking forward to using the new flexibility in offering graduate fellowships to attract some of our top candidates. We note, however, that this ability to offer fellowships has come at the expense of the number of TAs we can offer, and this presents a set of other challenges to the success of our Department as a whole.

B. Impact in the Discipline

The University's spreadsheet includes a summary of data from *Academic Analytics*. This is slightly updated from the information used for our Graduate Program Review, however it lacks the peer analysis information used previously. Our Graduate Program Review examined the data from *Academic Analytics* in great detail, and for the time being we will defer additional analysis in this area.

C. Effectiveness in Graduate Education

Graduate instruction in Astronomy has generally been close to the mean levels in the College, which are consistently rated by students between 4 and 5 (4 = "frequently" "more than most" or "better than"; 5 = "almost always" "much more than most" or "one of the best"). These are all very good scores, but there are a few areas where students rate graduate Astronomy courses slightly below the College averages fairly consistently.

When averaged over the last 5 years, the lowest ratings (relative to the College) for our standard lecture courses have been in the areas of "useful feedback," "evaluated fairly," and "stimulated participation." The first two of these are usually closely related--students who don't receive useful feedback are often confused about the final evaluation of their work. The third area often relates to a teaching style that encourages things as basic as asking questions to more complex forms of student engagement.

There is a sizable spread among classes, and even for the same course and instructor in different semesters, but curiously, these same three SRTI areas were the ones that have declined since earlier offerings of our graduate courses. We have less flexibility in assigning the instructors of these classes because of the very specific expertise needed, so to raise the overall teaching, we need the individual instructors to identify how they can make their own courses stronger. Getting our graduate students to provide more detailed responses about how these courses could be made more effective would be a

good first step, but there is a potential issue with graduate students feeling intimidated about reporting negative results, so we would want to approach this carefully. This seems like something that our graduate program committee can investigate and work together with the faculty and graduate students to set guidelines for best practices for our courses.

Our graduate seminar has had many of the lowest scores among our graduate courses. The goals of this course are primarily to get our graduate students to engage with the current literature in astronomy, learn stronger critical thinking abilities, and develop their own speaking skills. While individual semesters have been more or less successful, over the long term as well as for the last five years the ratings of "how much was learned" and the overall rating of the course have been some of the lowest of any course we teach, graduate or undergraduate. This suggests that we need a complete overhaul of the course.

The time to the doctoral degree averages about 6.8 years, which is one of the longest times in the College. We have recognized that students in our graduate program are taking longer to finish than is good for them or the program, and we have begun discussing ways to shorten the time to degree. Currently we also have the problem that the completion of coursework and first- and second-year research projects. One of the issues is that most students are nearing the end of their third year before they are ready to be admitted to candidacy. We would like to reach this point earlier so that students who are not admitted to candidacy will be at a better point to complete a M.S. and move on to another graduate school or in a different direction entirely.

Among our classes entering from 2000 to 2007, 10 out of 32 (31%) of our graduate students withdrew before completing a doctoral degree. This result appears to be fairly consistent with the College overall. It would be in the best interests of the Department and these students to identify them as early as possible so they can move on to other careers and we can invest scarce funding in other students. A retrospective look at the students who have stayed and left (grades, reports on research) might help us to identify better ways of making this decision earlier. We need to keep in mind, however, that this is difficult to do in a way that does not at the same time propagate some of the long-term gender and URM representation problems in the field.

The doctoral student experience survey reveals a high degree of dissatisfaction by our graduate students despite a very good track record in some tangible results such as first-authored papers and experience in presenting their research. We can blame a part of this on the great uncertainty facing our students as federal funding for astronomy has declined in recent years, but the level of dissatisfaction is a major concern. Like our undergraduates, our graduate students are concerned about their career guidance. We have actually had quite good success in getting our students into post-doctoral astrophysics positions and other related career areas (this is discussed at greater length in our graduate program review), but we need to do a better job of advising them on their options. There are a whole host of other marks of dissatisfaction that we need to explore with the graduate students to see if we can provide a better overall experience.

We have been attempting to address several additional issues in our graduate education. Meetings with our graduate students have shown a strong dissatisfaction with the one remaining Physics course we have required as part of their education. The main problem is that they feel the course lacks relevance to Astronomy research—which is quite different from the faculty's own experience in graduate school. We reduced the number of required Physics courses about a decade ago by adding a new Astronomy course that taught the Physics material from an astronomical perspective. We could address this issue by developing yet another Astronomy version of the last remaining Physics course, but that will add another course to be taught, and we are already stretched thin in this area.

We are also looking at redesigning our sequence of courses so that we can offer courses in alternate years. This will allow us to admit smaller and more-selective incoming classes as we adjust the size of our graduate student body downward to respond to the downturn in astronomy research funding.

Astronomy 2009-2013 SRTI averages by course category

		Enr	Resp	%Resp	Q1 - Preparedness	Q2 - Explained Clearly	Q3 - Cleared up confusion	Q4 - Used time well	Q5 - Inspired interest	Q6 - Helpfulness	Q7 - Useful Feedback	Q8 - Evaluated fairly	Q9 - Stimulated participation	Q10 - How much learned?	Q11 - Teaching overall	Q12 - Course overall
Intro Astro (120 seats)																
Department	1999-2008	114	62	54%	4.80	4.11	3.96	4.55	3.92	4.13	3.32	4.36	3.65	3.42	4.04	3.50
change from <2009 to later					0.00	-0.04	0.04	0.08	0.04	0.09	-0.11	0.03	-0.06	0.08	-0.12	-0.06
	2009-2013				4.80	4.07	3.99	4.63	3.96	4.22	3.21	4.39	3.59	3.50	3.92	3.44
Astronomy – CNS					0.10	-0.03	-0.01	0.23	0.06	0.02	-0.39	0.19	-0.01	-0.10	-0.08	-0.16
CNS		60-119			4.70	4.10	4.00	4.40	3.90	4.20	3.60	4.20	3.60	3.60	4.00	3.60
Campus		60-119			4.60	4.20	4.10	4.40	4.00	4.30	3.80	4.30	3.80	3.70	4.10	3.70
Intro Astro (300 seats)																
Department	1999-2008	265	119	45%	4.78	4.09	3.96	4.51	3.88	4.20	3.28	4.34	3.63	3.37	4.00	3.46
					-0.03	0.03	0.06	0.08	0.09	0.04	0.03	0.01	0.10	0.10	-0.04	0.03
	2009-2013				4.75	4.12	4.02	4.59	3.97	4.23	3.31	4.35	3.73	3.47	3.97	3.50
					0.05	0.02	0.02	0.19	0.07	0.03	-0.19	0.05	0.03	-0.03	-0.03	0.00
CNS		>120			4.70	4.10	4.00	4.40	3.90	4.20	3.50	4.30	3.70	3.50	4.00	3.50
Campus		>120			4.70	4.20	4.10	4.40	4.00	4.20	3.50	4.30	3.70	3.60	4.10	3.60
Intro Astro Honors																
Department	1999-2008	18	15	87%	4.85	4.45	4.40	4.64	4.19	4.66	4.12	4.67	3.99	3.81	4.27	3.77
					0.06	0.29	0.24	0.10	0.30	0.04	0.32	-0.02	0.27	0.34	0.24	0.38
	2009-2013				4.91	4.74	4.64	4.74	4.50	4.70	4.44	4.66	4.26	4.15	4.50	4.14
					0.21	0.34	0.24	0.24	0.20	0.10	0.24	0.16	0.06	0.15	0.20	0.14
CNS		<25			4.70	4.40	4.40	4.50	4.30	4.60	4.20	4.50	4.20	4.00	4.30	4.00
Campus		<25			4.70	4.50	4.50	4.50	4.40	4.60	4.40	4.60	4.40	4.10	4.40	4.10
First-Year Seminar																
Department	1999-2008	21	17	78%	4.56	4.56	4.56	4.53	4.61	4.73	4.03	4.75	4.39	3.66	4.38	3.98
					0.22	0.00	-0.08	0.05	0.05	0.05	-0.01	-0.07	0.07	0.02	0.06	0.10
	2009-2013				4.78	4.56	4.48	4.58	4.66	4.78	4.02	4.68	4.46	3.68	4.44	4.08
					0.08	0.16	0.08	0.08	0.36	0.18	-0.18	0.18	0.26	-0.32	0.14	0.08
CNS		<25			4.70	4.40	4.40	4.50	4.30	4.60	4.20	4.50	4.20	4.00	4.30	4.00
Campus		<25			4.70	4.50	4.50	4.50	4.40	4.60	4.40	4.60	4.40	4.10	4.40	4.10
Sophomore Courses																
Department	1999-2008	18	14	78%	4.71	4.15	4.16	4.23	4.14	4.39	3.97	4.43	4.11	3.68	4.10	3.75
					0.06	0.01	0.20	0.11	-0.14	0.31	0.40	0.21	-0.35	0.28	0.10	0.09
	2009-2013				4.77	4.17	4.37	4.33	4.00	4.70	4.37	4.63	3.77	3.97	4.20	3.83
					0.07	-0.23	-0.03	-0.17	-0.30	0.10	0.17	0.13	-0.43	-0.03	-0.10	-0.17
CNS		<25			4.70	4.40	4.40	4.50	4.30	4.60	4.20	4.50	4.20	4.00	4.30	4.00
Campus		<25			4.70	4.50	4.50	4.50	4.40	4.60	4.40	4.60	4.40	4.10	4.40	4.10

Intro Astro for Majors

Department	1999-2008	59	31	52%	4.83	4.28	4.29	4.59	4.30	4.36	3.61	4.48	3.74	3.75	4.23	3.84
change					0.04	0.27	0.19	0.04	0.12	0.19	0.69	0.07	-0.04	0.52	0.22	0.36
	2009-2013				4.88	4.55	4.48	4.63	4.43	4.55	4.30	4.55	3.70	4.28	4.45	4.20
					0.18	0.35	0.27	0.13	0.43	0.15	0.40	0.25	-0.20	0.48	0.35	0.40
CNS		25-59			4.70	4.20	4.20	4.50	4.00	4.40	3.90	4.30	3.90	3.80	4.10	3.80
Campus		25-59			4.70	4.30	4.30	4.40	4.20	4.40	4.10	4.40	4.20	3.90	4.20	3.90

Junior Courses

Department	1999-2008	11	10	85%	4.64	4.23	4.38	4.36	4.15	4.52	4.29	4.51	4.21	3.80	4.22	3.84
					-0.04	-0.10	-0.09	-0.11	0.06	0.02	-0.26	-0.13	-0.08	-0.06	-0.23	-0.17
	2009-2013				4.60	4.13	4.29	4.25	4.21	4.54	4.03	4.38	4.14	3.74	3.98	3.67
					-0.10	-0.27	-0.11	-0.25	-0.09	-0.06	-0.17	-0.12	-0.06	-0.26	-0.32	-0.33
CNS		<25			4.70	4.40	4.40	4.50	4.30	4.60	4.20	4.50	4.20	4.00	4.30	4.00
Campus		<25			4.70	4.50	4.50	4.50	4.40	4.60	4.40	4.60	4.40	4.10	4.40	4.10

Senior Courses

Department	1999-2008	9	8	83%	4.70	4.27	4.29	4.39	4.37	4.50	3.94	4.41	4.10	3.92	4.27	4.04
					0.15	-0.01	0.04	0.31	-0.22	0.03	0.26	0.02	-0.33	-0.12	-0.19	-0.39
	2009-2013				4.85	4.25	4.33	4.70	4.15	4.53	4.20	4.43	3.78	3.80	4.08	3.65
					0.15	-0.15	-0.08	0.20	-0.15	-0.07	0.00	-0.08	-0.43	-0.20	-0.23	-0.35
CNS		<25			4.70	4.40	4.40	4.50	4.30	4.60	4.20	4.50	4.20	4.00	4.30	4.00
Campus		<25			4.70	4.50	4.50	4.50	4.40	4.60	4.40	4.60	4.40	4.10	4.40	4.10

Graduate Courses

Department	1999-2008	7	7	89%	4.74	4.35	4.41	4.46	4.41	4.60	4.31	4.59	4.27	4.03	4.29	4.11
					-0.11	0.07	0.05	-0.02	-0.14	-0.11	-0.24	-0.19	-0.20	-0.08	-0.03	-0.01
	2009-2013				4.63	4.41	4.46	4.44	4.27	4.49	4.07	4.40	4.07	3.95	4.26	4.10
					-0.13	-0.11	-0.06	-0.12	-0.15	-0.15	-0.23	-0.22	-0.25	-0.15	-0.16	-0.10
CNS - grad		<25		89%	4.76	4.52	4.52	4.56	4.42	4.64	4.30	4.62	4.32	4.10	4.42	4.20
Campus - grad		<25			4.70	4.50	4.50	4.50	4.50	4.60	4.30	4.60	4.50	4.10	4.40	4.20

Graduate Seminar

Department	1999-2008	17	12	69%	4.54	4.39	4.42	4.26	4.20	4.55	4.43	4.61	4.22	3.43	4.15	3.68
					-0.07	-0.04	-0.08	0.04	-0.06	-0.20	-0.15	-0.31	-0.07	0.05	-0.03	-0.05
	2009-2013				4.47	4.35	4.33	4.30	4.13	4.35	4.28	4.30	4.15	3.48	4.12	3.63
					-0.29	-0.17	-0.19	-0.26	-0.29	-0.29	-0.02	-0.32	-0.17	-0.62	-0.30	-0.57
CNS - grad		<25		89%	4.76	4.52	4.52	4.56	4.42	4.64	4.30	4.62	4.32	4.10	4.42	4.20
Campus - grad		<25			4.70	4.50	4.50	4.50	4.50	4.60	4.30	4.60	4.50	4.10	4.40	4.20

Graduating Senior Survey - Calendar Years 2011-2013 - Comparison of Department Averages

Department	#Grads	#Resp	Rate	Satisfaction With Your Major: Faculty Accessibility	Qualtiy of Teaching	Academic Advising	Faculty concern for progress	Writing Preparation	Access to Classes	Career Preparation & Guidance	Overall Experience	Number +1 sd	Number -1 sd	Satisfaction with Overall UMass Experience	Practicum, Internship, field exp.	Community service, volunteer	Research with Faculty Member	Study Abroad	Culminating Senior Experience
Classics	41	29	71%	+ 3.90	+ 3.90	+ 3.55	+ 3.79	+ 3.66	3.62	3.07	+ 3.86	6	0	3.59	38%	45%	24%	38%	21%
Food_Science	47	42	89%	+ 3.85	+ 3.85	3.44	+ 3.68	3.34	+ 3.85	+ 3.66	+ 3.83	6	0	3.61	57%	62%	60%	5%	24%
Geosciences	81	60	74%	+ 3.85	+ 3.85	3.22	+ 3.67	– 3.07	+ 3.72	3.28	+ 3.82	5	1	3.55	77%	44%	57%	27%	53%
Stockbridge School of Agriculture	148	88	59%	+ 3.83	+ 3.68	+ 3.74	+ 3.61	3.42	3.61	+ 3.44	+ 3.77	6	0	3.66	82%	55%	41%	14%	39%
Women, Gender, Sexuality Studies	42	26	62%	3.73	+ 3.77	+ 3.73	+ 3.65	3.54	+ 3.69	+ 3.46	+ 3.77	6	0	– 3.32	69%	68%	40%	17%	46%
STPEC	79	52	66%	+ 3.81	3.60	+ 3.71	+ 3.69	+ 3.73	+ 3.73	2.86	+ 3.73	6	0	– 3.50	96%	79%	18%	39%	33%
Sport Management	368	311	85%	+ 3.75	+ 3.75	3.27	3.43	3.40	3.52	+ 3.48	+ 3.73	4	0	+ 3.77	76%	74%	20%	20%	45%
Operations and Information Mgt.	131	102	78%	+ 3.79	+ 3.72	3.37	+ 3.61	3.40	3.48	3.35	+ 3.71	4	0	+ 3.79	59%	58%	14%	24%	59%
Education	10	10	100 %	+ 3.78	+ 3.70	+ 3.70	+ 3.60	+ 3.80	+ 3.70	+ 3.80	+ 3.70	8	0	– 3.50	100%	44%	11%	33%	44%
University Without Walls	622	207	33%	3.66	3.66	+ 3.63	+ 3.63	+ 3.69	3.39	3.23	3.66	3	0	+ 3.75	16%	19%	9%	1%	13%
Civil and Environmental Eng.	266	210	79%	3.60	3.48	3.16	3.38	3.43	3.51	3.34	3.61	0	0	3.70	63%	47%	32%	7%	80%
Computer Science, School of	228	160	70%	3.62	3.40	3.18	3.28	3.50	3.24	3.22	3.61	0	0	3.58	61%	28%	35%	5%	21%
BDIC	270	187	69%	3.55	3.58	3.36	3.37	3.43	– 2.92	3.15	3.61	0	1	3.59	74%	63%	35%	33%	60%
Hospitality and Tourism Mgt.	555	419	75%	3.56	3.46	3.03	3.37	3.35	3.48	+ 3.44	3.60	1	0	+ 3.75	69%	62%	8%	39%	70%
Anthropology	145	96	66%	3.62	+ 3.69	3.41	3.45	3.51	3.53	2.77	3.59	1	0	3.56	60%	67%	39%	37%	30%
Environmental Conservation	318	206	65%	3.65	3.65	3.45	3.43	3.30	3.42	3.23	3.59	0	0	3.65	56%	48%	29%	8%	32%
Accounting	558	457	82%	3.63	3.55	3.30	3.41	3.34	3.50	+ 3.53	3.58	1	0	+ 3.73	66%	75%	9%	19%	54%
Microbiology	120	100	83%	3.61	3.39	+ 3.56	3.41	3.35	3.58	3.20	3.58	1	0	3.65	67%	62%	75%	9%	36%
Nursing	391	233	60%	3.61	3.52	3.00	+ 3.57	3.33	+ 3.75	3.35	3.55	2	0	3.69	96%	68%	31%	5%	37%
Journalism	253	189	75%	3.67	3.56	3.28	3.39	+ 3.67	3.62	3.20	3.55	1	0	3.69	75%	64%	17%	35%	22%
Astronomy	18	14	78%	3.73	– 3.27	3.36	3.36	+ 3.64	3.55	– 2.36	3.55	1	2	3.57	50%	29%	64%	14%	57%
History	382	284	74%	3.62	3.60	3.09	3.30	+ 3.57	3.38	2.80	3.54	1	0	3.68	38%	52%	22%	27%	28%
Music and Dance	148	114	77%	3.73	3.54	+ 3.59	+ 3.59	3.32	3.53	3.12	3.51	2	0	– 3.53	49%	59%	24%	12%	58%
Sociology	433	299	69%	3.54	3.52	3.35	3.24	3.39	3.49	2.94	3.50	0	0	3.71	55%	56%	20%	22%	18%
Chemistry	93	72	77%	3.58	3.44	3.20	3.18	3.32	3.59	3.08	3.49	0	0	3.71	51%	36%	85%	7%	49%
Veterinary and Animal Sciences	210	168	80%	3.58	3.36	3.20	3.27	– 3.13	3.33	3.06	3.49	0	1	3.64	60%	54%	47%	10%	25%
Electrical and Computer Eng.	173	141	82%	3.63	3.33	3.09	3.33	3.32	3.43	+ 3.51	3.48	1	0	3.67	76%	40%	44%	3%	91%
Physics	59	44	75%	3.61	– 3.27	3.16	3.41	3.37	+ 3.84	3.30	3.48	1	1	3.59	67%	28%	70%	12%	36%
Theater	103	78	76%	3.62	3.51	3.29	3.36	3.36	3.42	2.95	3.48	0	0	– 3.49	31%	47%	27%	23%	27%
Kinesiology	520	445	86%	3.40	3.50	2.93	3.14	3.19	– 2.52	2.90	3.48	0	1	3.70	64%	67%	33%	11%	21%

Linguistics	75	58	77%		3.58		3.65		3.20		3.40		3.35		3.46	–	2.60	3.48	0	1	–	3.51	23%	32%	40%	35%	28%
Marketing	367	300	82%		3.49		3.47		2.99		3.23		3.38		3.44		3.11	3.47	0	0	+	3.78	69%	68%	16%	40%	58%
Communication	783	600	77%		3.46		3.54		2.91		3.18		3.29		3.36		2.73	3.46	0	0		3.72	63%	58%	13%	31%	15%
Political Science	764	572	75%		3.52		3.52		3.06		3.19		3.42		3.38		2.77	3.46	0	0		3.62	52%	62%	26%	25%	21%
English	486	347	71%		3.53		3.52	–	2.81		3.28	+	3.59		3.15		2.76	3.45	1	1		3.59	41%	49%	19%	30%	38%
Chemical Engineering	191	164	86%	–	3.26	–	3.21		3.12		3.15		3.21		3.47		3.33	3.45	0	2		3.69	71%	40%	63%	8%	77%
Mechanical and Industrial Eng.	325	274	84%		3.56	–	3.18	–	2.76	–	3.09	–	3.15	–	3.08		3.36	3.43	0	5		3.61	71%	46%	27%	6%	93%
Languages, Lit. and Cultures	252	190	75%		3.44		3.37		3.08		3.37		3.29		3.40	–	2.57	3.42	0	1		3.55	34%	52%	24%	69%	41%
Biochemistry and Molecular Biology	181	145	80%		3.47	–	3.23		3.26		3.19		3.23		3.45		2.94	3.41	0	1		3.62	56%	63%	74%	9%	47%
Landscape Arch. and Reg. Plan.	144	101	70%		3.58		3.29		3.03		3.36	–	3.16		3.51		2.86	3.41	0	1		3.65	54%	51%	32%	36%	31%
Finance	437	352	81%		3.39		3.35		3.00		3.12		3.32		3.37		3.09	3.39	0	0		3.70	70%	59%	19%	30%	63%
Nutrition	102	78	76%		3.42		3.36		2.94		3.18		3.39		3.13		2.92	3.39	0	0		3.67	55%	85%	56%	12%	22%
Environmental Science	142	112	79%	–	3.34		3.32		3.20		3.13	–	3.08		3.49		2.72	3.39	0	2		3.57	56%	49%	45%	26%	33%
Philosophy	79	53	67%		3.41		3.43		3.27		3.16		3.49		3.49	–	2.53	3.38	0	1	–	3.41	26%	46%	26%	12%	22%
Management	366	264	72%		3.45		3.42		3.15		3.20		3.36		3.12		3.11	3.37	0	0		3.66	48%	54%	15%	27%	65%
Resource Economics	262	212	81%		3.56		3.31		3.48		3.31		3.31		3.43		2.93	3.37	0	0		3.63	50%	64%	17%	12%	37%
Psychology	1268	998	79%	–	3.22		3.41	–	2.77	–	2.93		3.18	–	3.03		2.72	– 3.34	0	5		3.64	59%	64%	38%	23%	24%
Biology	535	404	76%		3.39		3.30		2.94	–	3.01	–	3.01		3.12		2.76	– 3.32	0	3		3.64	51%	62%	55%	17%	35%
Communication Disorders	230	203	88%	–	3.19		3.33	–	2.78	–	3.08		3.28		3.51		2.94	– 3.32	0	4	+	3.73	50%	77%	34%	17%	13%
Public Health	269	236	88%	–	3.22		3.38	–	2.81	–	3.05		3.19	–	3.09		2.88	– 3.30	0	5		3.66	74%	88%	36%	28%	99%
Mathematics and Statistics	188	138	73%	–	3.31	–	3.10	–	2.67	–	2.98	–	3.01		3.48	–	2.65	– 3.30	0	7		3.65	31%	51%	21%	12%	31%
Economics	400	268	67%		3.40		3.32		3.07	–	3.07		3.37		3.32		2.74	– 3.29	0	2		3.63	43%	54%	19%	17%	16%
Art, Architecture and Art History	300	208	69%	–	3.30		3.35	–	2.83		3.25	–	3.07		3.18	–	2.57	– 3.29	0	5	–	3.50	50%	49%	23%	39%	54%
Judaic and Near Eastern Studies	24	18	75%	–	3.06	–	3.06	–	2.47	–	2.94		3.31	–	2.29	–	2.29	– 3.00	0	7	–	3.53	33%	47%	13%	67%	38%

Note: The following departments had fewer than 10 respondents for the three survey years combined and were excluded from the above analyses: Slavic and Eastern European Studies, Science, Afro-American Studies, and Bachelor of General Studies.