Department of Veterinary and Animal Sciences

Recommendations

- Formalize Pre-Vet advising with its own webpage. Name an official Pre-Vet advisor, who will then have access to VMCAS application data. This will help us move up in the national Pre-Vet program ratings.
- Invest in improving large animal facilities at the Hadley and Deerfield Farms. This includes the general physical plant to appeal more to prospective students and parents online and at open houses, as well as lighted, heated and plumbed amphitheater classroom and laboratory area in which to conduct our animal management classes safely without regard to weather and season. The improved physical plant and classrooms would be a recruiting draw for students prepared to succeed in our science-based curriculum. Better performing students would increase the percentage of our majors who gain admittance to veterinary medical college, graduate school, or who rise to the top of their field after graduation.
- Identify earlier which students can graduate from our major and provide them with meaningful support, experiences and alternative career training. Advise students not likely to be successful in our major to change their major to one in which they will likely succeed and graduate in a timely manner.
- Invest in more lab classrooms. It has been difficult to revamp our curriculum to provide meaningful small lab classes largely because of a lack of lab classroom space. For example, we could develop a Histology class for our majors with a multi-ocular microscope capable of projecting onto computer screens and access to classrooms with multiple computer screens.
- Better preparation for success in General and Organic Chemistry, upper level Animal Science courses by collaboration with Math & Stat department on teaching of Math 101/102 and Math 104 with life science problems.
- Continue support of meaningful experiences for undergraduates beginning in the freshman year with independent study research projects. We are developing new Embryology and Cancer Immunology courses and expanding the existing hands-on course ANIMLSCI 385 Introduction to Cellular and Molecular Biology Laboratory Techniques so that it is offered alternative semesters with MICBIO 385 Introduction to Biotechnology Lab.
- Honors research grants for honors thesis should be $2000 per student and should go to laboratory without need for the student to apply.
- Integrate students with large animal interests more effectively into the department by sponsoring a “Farm Day” counterpart to our long running Science Day.
- Formalize placement in internship opportunities to improve students’ ability to solve real-world problems. Administrative support needed for assembly of internship opportunities and communication to advisors and

students, webpage, liaison between advisors, students, and internship sponsors.
- Closer integration of Career Services with curriculum (e.g. introduce resume and interview skills into our Careers in Animal Science seminar).
- Remove or increase flexibility in fulfilling Gen Ed IE
- Additional services in writing preparation.

Self Evaluation

1. **Program Attractiveness and Competitiveness**

The Department of Veterinary and Animal Sciences attracts most of its majors on the basis of its strengths in preparing students for application to veterinary medical school and its hands-on exposure to domesticated animal species from the beginning of freshmen year. At the UMass Amherst Fall and Spring Open Houses, 80-90% of prospective students say that they plan to apply to veterinary medical school. However, 20-25% of our Animal Science and Pre-Veterinary Science majors apply to veterinary medical school in the fall of their senior year, in part because students with lower grades in science courses are not competitive for admission. Analysis of data collected from our majors shows that a minimum of a 3.4 UMass Amherst GPA is required for admission to at least one US veterinary medical school; the average GPA of admitted veterinary medical school students in 2013 was 3.59[1]. Veterinary medical school admission is extremely competitive, with approximately 3,000 seats available in the US compared to over 20,000 human medical school seats. There are 2-2.5 times the number of applicants as there are available seats[1]. Of those 20-25% of our majors who apply to veterinary medical school in the fall of their senior year, approximately 95-100% are accepted by at least one veterinary medical school, showing that graduates from our program are competitive with their peers from other institutions. UMass Amherst is the top feeder school of Tufts Cummings School of Veterinary Medicine: more of their students have graduated from UMass Amherst than from any other single university or college. We are clearly already known for the excellence of our program. UMass Amherst and its Pre-Veterinary Science major is listed as the best college for future veterinarians on Ivywise.com. [2] Campus explorer.com lists UMass Amherst as the fifth most popular of Pre-Veterinary Studies Colleges based on National Center for Education Statistics data, after competitor institutions University of Arizona, University of Delaware, Pennsylvania State University, and the University of Findlay in Ohio.[3] Other competitor institutions include University of Connecticut and University of Vermont, based on frequent requests by parents at open houses to compare the UMass Amherst veterinary and animal science program to that of these universities. Our Animal Science major is also highly ranked nationally at number sixteen[4] with a score of 92 out of 100. Competitor Animal Science programs with scores ranging from 97- 93 include Cornell University, University of Florida, University of Illinois at Urbana-Champaign, University of Minnesota, University of Wisconsin, University of Georgia, Pennsylvania State University, University of Connecticut, University of California Davis, College of

the Ozarks, Clemson University, Ohio State University, Texas A&M, California Polytechnic State University, and University of Denver.

The most frequently asked questions by prospective students and their parents are:

- What percent of your students do you get into vet school?
- When do the students get to handle animals?
- Do you help students get internships?
- How big are your classes? Can students get into required classes?
- What do you do with a BS in Animal Science?
- How does your program compare to that of another university? University X has nicer large animal facilities.

Prospective parents and students react most favorably to:

- While it is up to the student to earn a GPA that is competitive for vet school admission, our pre-vet advising committee and undergraduate program assistant works with students to optimize their portfolio so that they gain admission to a larger number of vet schools and thus have the maximum choice in terms of prestige, location, program, and cost. We also advise on the probability of admission to individual vet schools since each application costs money. In addition, individual vet school requirements can differ. We research these requirements and pass the information on to students, along with advice on how to fulfill these requirements.
- Students have hands on experience with animals starting from the beginning of freshman year.
- We have a special relationship with Tufts Cummings School of Veterinary Medicine, which includes an early admission program and close consultation on curriculum.
- Students do not have to major in Animal Science or Pre-Veterinary Science to apply to vet school; they simply have to complete the requirements. We advise students from all majors. However, most UMass Amherst students who apply to vet school do major in Pre-Veterinary Science because we have structured the curriculum to meet the prerequisite classes of most veterinary medical colleges and to prepare students for success in the extremely demanding veterinary medical school curriculum.
- We are expert in advising for career paths other than entry into a veterinary medical school, since the majority of our students change their mind because of academic or cost concerns or because they have found something that appeals more to them. Some of our students discover that they love biomedical research, and enter a graduate program to earn their master's or Ph.D. We also offer a 1-credit seminar on Careers in Animal Science, offer practicum credit for internships to gain practical experience, and train students in skills that will position them for a career in

independent study, labs, and species-specific animal management classes.

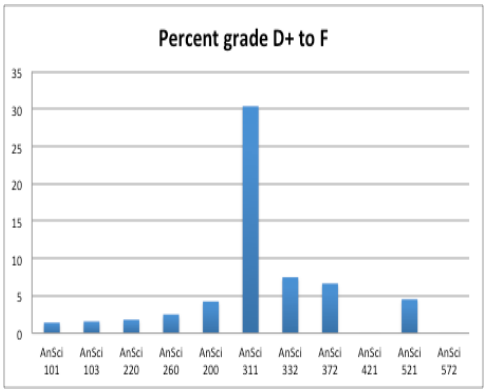
- Every student in our major is assigned an advisor, with whom the student must meet twice a year. The advisor provides continuity over the student's college career and serves as an advocate and navigator for the student in the larger university. Advisors help students get the courses they need and can refer students to university academic, psychological health, and career counseling services. We are focused on getting the student to graduation in four years.
- Our majors' classes are relatively small.
- We encourage students to engage in independent study research projects, in which they make new discoveries, practice critical reasoning skills, build relationships with faculty members, and gain skills for alternative careers. One alumna learned how to inject eggs as part of her independent study project, and parlayed that skill into a $60,000 starting salary job at a human IVF clinic (Harvard's Brigham & Women's). This is consistent with the department's areas of strengths, Immunology and Reproduction, for which we are nationally recognized both in research and teaching.

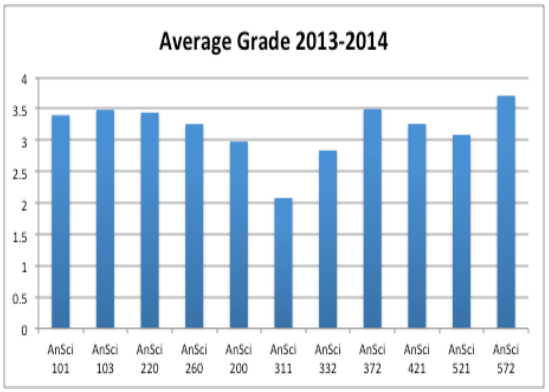
We can further improve our program attractiveness and competitiveness through better publication of our program and pre-vet advising services on departmental, college, and university websites, leading to enhanced recruitment of students who will attain a GPA and GRE score that is competitive for veterinary medical school, graduate school or career placement. This will lead to increased retention rates and student satisfaction. This should be coupled with maintaining and improving our advising and internship placement, improving our support for students in the acquisition of the basic math and science skills, and continuing to improve upon our animal management and laboratory course offerings. Increased investment in improving the physical plant of the large animal facilities (i.e. Hadley and South Deerfield farms) so that it serves our teaching needs and is comparable to that of our competitor institutions[5] will also help recruit the best and brightest students.

2. Overall Program Effectiveness.

20-25% of our majors apply to veterinary medical college in the fall of their senior year. Of those, approximately 95-100% gain admission to at least one veterinary college. Students who do not gain admission as senior applicants are usually rejected because their grades or GRE are not competitive, or because they only applied to the most selective veterinary medical colleges. Our pre-vet advising addresses the needs of some students with a non-competitive GPA (i.e. 2.7-3.39) as to how they can rehabilitate their portfolio with academic and work experience after they graduate from UMass Amherst. Some students defer their application to veterinary medical college for a year or two and gain admission to veterinary medical school at that juncture.

80-90% of freshmen entering the Animal Science major plan on attending veterinary medical college, but the majority change their minds and don't apply. 10-20% plan to graduate with a BS-Animal Science and enter the work force,

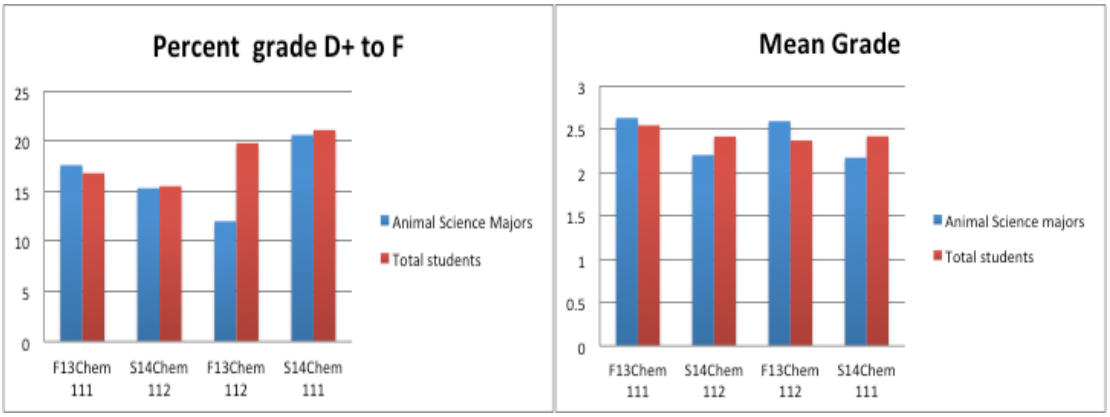




although they generally do not have any definite career plans other than they want to do something with animals. The Department of Veterinary and Animal Sciences has worked hard in past three years to better address their needs by remodeling our Animal Science major to include Animal Management and Biotechnology concentrations. As part of that renovation, we have improved our course offerings so that we can prepare students who change their mind about applying to veterinary medical schools for an alternative career. Examples of these include a revamped ANIMLSCI 220 Anatomy and Physiology and new courses ANIMLSCI 365 Fundamentals in Veterinary and Biomedical Lab Techniques, ANIMLSCI 390A Veterinary Microbiology Laboratory, ANIMLSCI 390C Animal Business Management, ANIMLSCI 390L Advanced Animal Health & Management (problem-based learning), a year of Research and two semester species-specific series in management of beef or dairy cattle, sheep, goats, horses, and poultry.

In the past few years, we have focused on identifying majors who will have trouble graduating in the major and encouraging them to think about transferring to other majors in which they will be more successful. In lieu of a continuation policy, we have put several prerequisites in place so that students who haven't learned the material in earlier courses have to retake the earlier course before they can progress to the upper level course. An analysis of mean grade and failure to progress rates (i.e. D+ through F) for our departmentally-taught courses shows there is a problem with students mastering Genetics (AnSci 311), which comes too late in the student's career to be solved by major change. While the high percentage failure to progress rate may be addressable directly with more review/tutoring support, it also may be caused by an earlier lack of preparation, especially in math (see below). It currently has a prerequisite of Bio 151/152 with a C or above and AnSci 200 with a C- or better. Bio 151/152 and Chem 111/112 are generally taken as freshmen and completed by the end of sophomore year. The Chem 111/112 series can be delayed by remediation of the student's pre-calculus by Math 101/102 and Math 104.

An examination of our students' performance in Chem 111 and 112 shows that their mean grades (*right panel*) and percent of D+ to F grades (*left panel*) is comparable to the entire class, although they are considerably lower than grades within the major. The only notable difference between Animal Science majors and other students seen in this data set is a *decrease* in the percentage of students who received a D+ to an F in Chem 112 during the fall semester (F13Chem 112). The majority of VASCI students take Chem 111 in the fall and Chem 112 in the spring. Students who require Math 104 in their freshman fall



semester will delay the general chemistry courses by one semester and will be taking Chem 112 in the fall. Therefore, the decrease in lower grades among students taking Chem 112 in the fall may be related to passing Math 104 and overall math skills.

Overall, our goal is to help our majors to perform better in General Chemistry 111 and 112, which should lead to better grounding in chemistry for ANIMLSCI 200, ANIMLSCI 311, ANIMLSCI 332, organic chemistry, and biochemistry. The Chemistry department has data showing that performance in Chem 111 and 112 is tied to previous mastery of pre-calculus, so it is reasonable to hypothesize that integration of life science examples into the math curriculum could motivate the students to master what they might view as arcane and abstract concepts and to apply them to later courses. We have started integrating more math (e.g. measurement, unit conversions, and fractions) into ANIMLSCI 200. Since our students rate themselves lower in math skills than other majors, there has been some student resistance, but they learn the concepts when they see that the problems that they were given have real-world applications.

3. Student Engagement.

The Department of Veterinary & Animal Sciences is committed to the campus-wide goals of active and engaged learning and building strong advising and teaching relationships. We address these goals by sponsoring trips to local conferences such as the Tufts Wildlife, Aquatic, Zoo & Exotics symposium, an artificial insemination course, Winter Traveling Dairy. We support the student-run peer mentoring group, which has 80 members (28 juniors and seniors, 52 freshmen and sophomores) and meets every other week, and supporting student participation in the Northeast Student Affiliate animal science competition (NESA, 95 students, held at UMass in 2013 with faculty support). We have hosted five

seminar speakers in the past five semesters whose work is accessible to our students. We provide faculty support for the Pre-Vet and Animal Science club, hosted veterinary medical school admission counselors, and a panel of alumni currently attending Tufts Veterinary Medical School, who talked about the academic and personal realities of life in vet school. Sixty-six undergraduates are involved in research experiences in our labs in the past year. Seventy students presented the results of their research at Science Day, which is held yearly in May. We offer extra credit to younger students for written summaries of their classmates' research so we can further engage them in the departments' research mission. This year we started a RAP program in Animal Science, something that incoming students had requested for many years.

4. Teaching Contributions and Effectiveness.

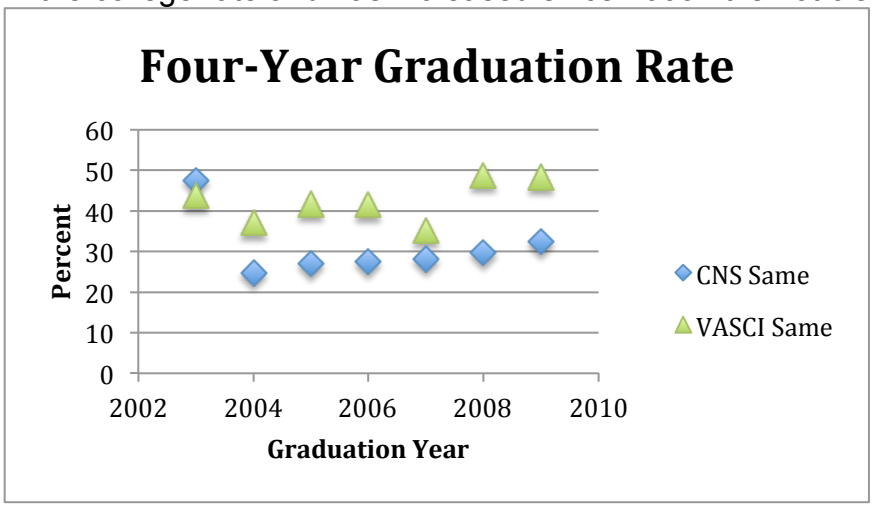
Our department non-tenure track faculty have a high Instructional productivity rating of 210%, while our tenure-track faculty have a low rating of 17%. One reason for the lower rate among tenure-track faculty is that four of our fifteen tenure-track faculty members are exempted from teaching because of research, administration, and leadership positions on and off campus. The remaining eleven tenure-track faculty members teach. Their productivity ratings are further negatively impacted by lower enrollments in upper-level lectures and laboratory courses and co-teaching classes to preserve time for research and grant writing activities, as well as graduate teaching. Tenure-track faculty also invest substantial time in teaching students in their labs as part of independent study research projects with student to faculty ratios of 1-3:1. These represent meaningful experiences for the students, but faculty time investment is not adequately represented in instructional productivity because of the low student to faculty ratio and because faculty are not listed as faculty of record since there can only be one instructor assigning grades. Our tenure-track faculty teach in non-departmental graduate classes. In addition, four tenure track faculty will be offering new classes in Cancer Immunology, General Embryology, and Introduction to Cellular and Molecular Biology Laboratory Techniques.

We currently have 4.75 non-tenure track lecturers who participate in teaching core and applied courses. With the exception of one long-term and productive instructor, all of them have DVM or Ph.D. degrees, and significant teaching experience. Most faculty members, especially the non-tenure track faculty members, are assigned 10- 45 advisees that they advise during their college career. Faculty advisors must meet with their advisees at least twice a year, prior to registration for courses. This is enforced by the placement of holds that block the student from registering until their advisor removes them. Advisors are available to help students with issues at other times, ranging from graduation requirements, university regulations, registration for classes, internships and career counseling, veterinary medical or graduate school admission strategies, to mental health issues. Despite this high level of service, only 44.6% of seniors respond that they are "very satisfied". This is above the CNS average of 41.1%. Since eighty percent of our majors enter planning to attend veterinary medical school and the majority change their minds, graduating seniors may be reflecting

their anxiety about an unknown career path. If this is the case, then incorporating more teaching of marketable skills in our curriculum, promoting internships, and teaching job-related oral and written communication skills will be the best way to promote student satisfaction in this area. We have started improving our internship advising by reaching out to local veterinary clinics with an offer of a generic liability waiver (for practices unused to having interns) and a request to include them on a list of local practices hosting UMass Amherst students. Next steps include expanding that list to include wildlife, zoo, animal behavior, and biotech opportunities (e.g. the Massachusetts Life Sciences Center Internship Challenge) and disseminating that information to advisors and students.

5. Student Outcomes

Our goal is for our students to succeed in a science-based curriculum and graduate in 4 years without having to repeat classes because of grades of C- or below. They should be competitive for admission to veterinary medical school or graduate school and/or possess marketable skills. The four-year graduation rate for Animal Science majors in the major is higher than that of the CNS graduation in the college rate and has increased since 2003. It is not clear that graduation in the Pre-Veterinary Science major is counted as graduation in the same major, since most Pre-Veterinary Science majors start as Animal Science majors and can only change their major to Pre-Veterinary Science after they have earned a minimum 2.700 GPA in nine UMass courses. The four-year graduation rate for Animal Science and Pre-Veterinary Science majors transferred to other majors is lower than that of CNS transferred to other majors, but has also increased since 2003.



The 2013 UMass Senior Survey/NSSE results show that our department falls within the average range for all departments at UMass, with the exception of being below 1 SD for all departments (2.54 VASCI vs. 2.85 CNS vs. 2.84 all departments) in “How much has your experience at this institution contributed to your knowledge, skills, and personal development in solving complex real-world problems?” The 2014 NSSE question rated us within the average for all department ranges for the “extent to which courses challenged you to do your best work” (5.26 VASCI vs. 5.43 all departments). In the 2014 Senior survey, the department was 1 SD below the average for teaching quality in the major (3.28 VASCI vs. 3.49 all departments). On the other hand, the department was rated 1

SD above the average for “Instructor used class time well” in the SRTI and was otherwise within the average range for all departments. The Three Year Aggregate Senior Survey Department Comparison shows that we are within the average range for all departments for all questions, except that we are rated greater than 1 SD below the average for writing preparation (3.11 VASCI vs. 3.35 all departments). Since this was not the case for the 2013 and 2014 Senior Survey, this lower score in the three year aggregate may reflect the lack of capacity in our Junior Writing Course, which has since been corrected.

6. Effective Use of Resources.

We have invested resources to better support the majority of our students who are not applying to veterinary medical college or to graduate school. As part of this endeavor, we have designed and received approval for two new BS-ANIMLSCI major concentrations: Biotechnology and Animal Management. Both concentrations now require ANIMLSCI Careers in Animal Science seminar and the second semester of General Chemistry, so that students are better prepared for Organic Chemistry and other upper-level science courses. We have improved ANIMLSCI 220 Anatomy & Physiology by expanding its lab sections. We have developed ANIMLSCI 365 Fundamental Veterinary and Biomedical Laboratory Techniques, ANIMLSCI 390A Veterinary Microbiology, ANIMLSCI 390C Animal Business Management, ANIMLSCI 490R Research Animal Management II, and ANIMLSCI 390L Advanced Animal Health and Management. We are developing ANIMLSCI 385 to be offered alternatively with MICBIO 385, which will further train our majors planning to enter the biotech workforce after graduation. Our department is very highly ranked in research productivity and this synergizes with our efforts to provide meaningful experiences for our students in our labs. We promote these experiences as part of student preparation for veterinary medicine as well as training for alternative career paths. One example we cite at the Open Houses is that of a student who learned how to inject eggs during an independent study and parlayed that niche skill into a $60,000/year starting salary at a human *in vitro* fertilization clinic. She now is the Operational Laboratory Director at the Center for Advanced Reproductive Services at the University of Connecticut Health Center in Farmington, CT with a salary over $100,000.

We invested $8000 in our classes at the Hadley and Deerfield farm this year, providing gloves, microscopes, a chicken coop, and a new feeder for cattle. As part of our new BS-Animal Sciences concentration Animal Management, two full-year species-specific animal management courses are required. We are currently teaching courses in the management of sheep, goats, cattle, research animals, and poultry and are offering one semester in equine management that we plan to expand to a full-year two-semester series in equine management.

7. Diversity, inclusion and access.

Our major is 84% female vs. the campus total 49.1% female and 15% ALANA (African, Latino(a), Asian, and Native American) vs. the campus total 17%. Seven of our tenure-track faculty and 2 of our instructors are female. In

addition, five of our faculty are fluent in other languages including French, Spanish, and Portuguese. VASCI faculty member Dr. Sandra Peterson is the executive director of the STEM Diversity Institute at UMass Amherst, which leads the Northeast Alliance for Graduate Education and the Professoriate (NEAGEP). Multiple VASCI faculty members have trained graduate students from groups underrepresented in STEM who were recruited and supported by NEAGEP. Since graduate students help train undergraduate students in our labs, this has been a valuable opportunity to promote exposure to diverse perspectives among our undergraduate students. Dr. Lisa Minter has worked extensively to host Eureka/Holyoke Inc. summer science workshops composed of 10-12 8-9th grade Holyoke, MA students and a Science Quest event composed of 200 high school students. Both events were designed to educate students in groups underrepresented in STEM disciplines about these fields. Dr. Katie Beltaire recruited students a at STEM diversity Institute Research Opportunities Fair UMass STEM majors from underrepresented groups learned about paid summer lab research and graduate school opportunities by meeting with faculty and institutional representatives from a number of research institutions.
We plan to continue to work through the UMass Amherst STEM Diversity Institute to make our research opportunities more visible to groups underrepresented in STEM disciplines.

8. International experience (study abroad)

We encourage our majors to study abroad in our advising meetings and on our website, by promoting early planning. Students can either save the Gen Ed class requirements providing a wide choice of universities at which to study, or plan to attend universities or veterinary medical colleges that offer courses that meet the Animal Science or Pre-Veterinary Science requirements. An example of the former strategy is a student who studied at a university in Spain and received prior approval for courses that met UMass Gen Ed requirements. An example of the latter is a student who received prior approval and transferred in courses in Reproductive Physiology and Immunology from a university in St. Petersburg and a student who received prior approval and transferred in courses from an Australian veterinary medical college. We have an agreement in place with the University of Edinburgh veterinary medical college to take classes in their veterinary curriculum and we plan to promote this to students. A major obstacle for our majors in planning for study abroad or for domestic exchange is the UMass IE Gen Ed requirement, since it can only be fulfilled on the UMass campus. We also provide advising for students looking for an animal science or veterinary medical experience summer experience based on student feedback.

9. Co-curricular engagement

Our students engage in significant co-curricular engagement experiences. We sponsor our students in P/F practica (ANIMLSCI x98) for their work at zoos, veterinary clinics, wildlife rehabilitators, government agencies and aquaria. Our department offers a two-semester dairy herd experience course at the local Devine dairy farm. This course partners the Department of Veterinary and Animal

Sciences with a local dairy farm to provide an animal-intensive learning experience. Small groups (2-4) of participating students work in shifts and are expected to feed and care for dairy calves seven days per week under the direct supervision of the instructor. Students are also expected to meet weekly as a group to weigh, clean, and perform other management procedures that may be necessary. Additionally, students are expected to review and discuss recent research in the area of neonatal management, nutrition, housing, well-being, and health of calves from birth to weaning.

Drs. Katie Beltaire and Carlos Gradil participate in the summer 4-H veterinary medicine program with Carrie Chickering Sears. Students receive credit for organizing and participating in the Livestock classic, a UMass tradition and outreach to the public. We also fund the annual trip to show UMass Amherst animals at the Big E, where Alice Newth and Dr. Katie Beltaire assist the students in a demonstration of handling animals and our program receives wider exposure.

Footnotes

[1]Annual Data Report 2013-2014 [Internet] Washington, DC: Association of American Medical Colleges; 2014 March p. 1-24. Available from: http://www.aavmc.org/About-AAVMC/Public-Data.aspx

[2]http://www.ivywise.com/newsletter_oct13_schools_for_future_veterinarians.html
University of Massachusetts Amherst- Number 1 in a list of the five best pre-veterinary science programs.
"While many schools just provide a pre-veterinary program as an undergraduate track with a more specific major, the University of Massachusetts – Amherst is one of the few universities to offer a true pre-veterinary major for undergraduates.
Undergraduate students in the Department of Veterinary and Animal Science can choose between two bachelor of science degree programs, animal science and pre-veterinary. All undergraduate students enter as animal science majors and can either switch into the pre-vet program after qualifying, or continue in the animal science program. Students in either major are able to participate in research opportunities and the school is constantly helping to place pre-vet and animal science students in relevant internships.
What makes the pre-vet program at UMass-Amherst progressive is its partnership with the Tufts University Cummings School of Veterinary Medicine located in Grafton, MA. UMass-Amherst students have the opportunity to apply to the Tufts graduate program in March of their sophomore year. If admitted, students who maintain a 3.4 GPA and complete the prerequisite courses are guaranteed a spot in Tufts' vet school upon graduation.
Located in Amherst, MA, UMass-Amherst is a public research university

with about 22,000 undergraduate students. The school offers 108 bachelor's degree programs and boasts the tallest library in the US at 26 stories and 296 feet tall.
UMass-Amherst is also a member of the Five Colleges Consortium with Amherst College, Hampshire College, Mount Holyoke College, and Smith College. Students enrolled in one of the schools within the consortium can take classes at any of the other member institutions."

[3] http://www.campusexplorer.com/colleges/major/5A276464/Health-Medical-Preparatory-Programs/82400643/Pre-Veterinary-Studies/

[4] http://colleges.findthebest.com/d/o/Animal-Sciences,-General

[5] University of Connecticut http://animalscience.uconn.edu/facilities.php
University of Findlay http://www.findlay.edu/sciences/animalscience/
Cornell University http://ansci.cals.cornell.edu/about-us/facilities