

Department of Veterinary and Animal Sciences: a focus on the Undergraduate Curriculum & Student Experience.

Response 1

Response 1a. Curricular Coherence and accessibility

Response 1b. Clarity of communication

Response 1c. Class size goals by student levels

1a. Curricular Coherence and accessibility.

- Review of the curriculum

Students entering our major must declare one of two subplans of the Animal Science major: Animal Management or Biotechnology (see major and subplan checklists, Tables 2-3). These subplans are largely similar for the first two years, after which they divert markedly. A significant number of our students within these tracks can elect to enter the Pre-Veterinary major (Table 4) after completing 10 required courses and achieving a minimum weighted GPA of 2.700 in those courses. The Pre-Vet major is the choice of students interested in veterinary medical college or graduate school, which represents the majority of our incoming students.

Our Pre-Vet curriculum is carefully designed in great part to satisfy the prerequisites of U.S. veterinary medical colleges and graduate schools. Based on informal surveys we conduct at the UMass Amherst Fall and Spring Open Houses, Pre-Vet is the preference of 80-90% of our prospective students. 20-25% of our students decide to apply to veterinary medical colleges in their senior year, of whom 95-100% gain admittance. However, this leaves 55-70% of our majors graduating without fulfilling the career goal with which they entered UMass. The department has worked very hard in the past five years to implement curriculum to increase the workforce competitiveness and satisfaction of those students who choose not to apply to veterinary medical college, while at the same time increasing our advising support for those students applying to veterinary medical colleges.

The general recommendations for our students are as follows:

First year

ANIMLSCI 101/103 Introduction to Animal Science and Animal Management

BIO 151/152/ 153 Introductory Biology with lab

CHEM 111/112 General Chemistry with lab (may be deferred for pre-calculus prep)

MATH 101/102(<16 on math placement exam for pre-calculus) or MATH 104 (16-19 on math placement exam) or MATH 127 Calculus (pre-calculus waiver >20)

ENGWLP 112 College Writing

- In the past, obtaining seats for all of our students in Introductory Biology and General Chemistry was challenging, but this has been largely alleviated in the last few years. Not all students start with this sequence, as many are prevented from taking Chem 111 because of low (<20) math placement exam scores on the pre-calculus section of the test. Students wishing to apply to veterinary schools must also complete 1 semester of Calculus and as well as the required College writing.
- The Animal Science and Pre-Vet majors are tailored towards students who know what they want to do upon entering UMass. The inclusion of the Introduction to Animal Science and Animal Management courses sets the foundation for success in later classes, and is a valuable recruiting tool in that these classes give students animal handling exposure starting on their first day. Freshmen who start with these courses can

readily complete a structured animal health and biomedical curriculum within four years. However, it can be difficult to integrate internal and external transfers, especially if they enter in the spring semester. Transfers to the Animal Science major can catch up by taking the AnSci 103 class without taking AnSci101 first and then substituting an elective for AnSci 101. They also may take some courses out of their suggested sequence, although this may be more difficult because of course prerequisites.

Second year

ANIMLSCI 200 Animal Cellular & Molecular Biology
ANIMLSCI 220 Anatomy & Physiology
ANIMLSCI 260 Animal Care & Welfare
ANIMLSCI 392A Careers in Animal Science
CHEM 261/262/269 Organic Chemistry and lab
STAT 111 or STAT 240 or RESEC 212 Statistics

Animal Science majors, unlike Pre-Vet majors, only need one semester of Organic Chemistry. *Registration for Organic Chemistry has not been a problem in recent years but Organic Chemistry lab has been an ongoing issue. Most of our students are forced to wait for a year or two before they can register for the CHEM 269 lab, because registration is initially limited to seniors only, with the exception of Biochemistry and Chemical Engineering students. It would be preferable if students could take Chem 269 lab at the same time as the Chem 262 Organic Chemistry II lecture.* We used to include a grade in Chem 269 as part of the criteria to enter the the Pre-Vet major, but dropped it from the list because it would force students to defer the Pre-Vet election until the end of their junior year or the first semester of their senior year. Since students don't see the graduation requirements for their major or subplan in their Academic Requirement Report in SPIRE until they elect that major or subplan, this left Pre-vet students at a disadvantage.

Third year

ANIMLSCI 311 Animal Genetics
ANIMLSCI 332 Animal Nutrition
ANIMLSCI 372 Animal Diseases or ANIMLSCI 572 Infection & Immunity
BIOCHEM 420 or BIOCHEM 523/524 Biochemistry
MICBIO 310 Microbiology

By their third year, students who are in the BS-Animal Science major, Animal Management subplan (Table 2), must have started a four semester sequence of Animal Management classes in the species of their choice (sheep, beef cattle, goat, poultry, dairy calf, or research animals). They are required to take ANIMLSCI 390C Animal Business Management. Those in the Biotech subplan (Table 3) must have started a research experience in a laboratory or laboratories of their choice that will span 4 semesters, or 3 semesters of laboratory research plus ANIMLSCI 385 Biotech lab. Because UMass students need a minimum GPA of 3.4 to be competitive for admission to one U.S. veterinary medical college and because the average veterinary medical student graduates with an average of \$165,000 in debt, we anticipate increased numbers of students will choose the BS-Animal Science, Biotechnology subplan. Thus, it is important that we maintain and expand our biotech lab classes (AnSci 365 Fund. Vet. & Biomed. Lab, 385 Intro Biotech Lab, 390A Veterinary Microbiology Lab, 455/490R Research Animal Management I-II, and research lab experiences) to meet this anticipated demand for a career path alternative to veterinary medical college. These curricular offerings will address Massachusetts workforce development needs as well as increase senior survey satisfaction.

Fourth Year

ANSCI 390A Veterinary Microbiology Lab or MICBIO 265 Microbiology Lab

ANIMLSCI 421 Fundamentals of Reproduction or ANILSCI 521 Reproductive Physiology

ANIMLSCI 494GI Good Intentions IE or ANIMLSCI 494I Integrating Learning and Research IE (requires student to take honors thesis ANIMLSCI 499Y +499T)

NATSCI 397A Junior Writing

PHYSICS 131/132 (Pre-Vet)

- *Our students cannot usually take NATSCI 397A Junior Writing until their senior year, although the college has opened up more sections of NATSCI 397A and course accessibility has improved. The university decision that this course has to be taken in residence may negatively impact Junior Writing accessibility.*
- *We have recently developed ANIMLSCI 390A Veterinary Microbiology lab, because access to the 3 credit MICBIO 312 Microbiology lab was closed to our majors and the alternative MICBIO Microbiology lab was only one credit, which did not satisfy the number of credits required for some veterinary medical colleges.*
- *Ensuring that students are not blocked from graduating by the IE Gen Ed requirement has proved to be difficult, since this course is required to be taken in residence and both the major department and the department offering the course must approve the student using the course to fulfill the IE requirement. Multiple potential graduation blocks have arisen from the IE residence and major-restricted requirements, especially for those students doing Capstone experiences, students planning study abroad or domestic exchange, and transfer students taking unusual combinations of course in order to graduate in a timely manner. Solutions have been difficult to find. We are in the process of creating a second IE course to help reduce these conflicts.*
- Although not discussed here, the University Gen ed courses and elective courses are spread throughout the 4 years of the curriculum.

In conclusion, the curriculum is now organized to prepare our students for their career of choice. First, it offers a strict sequence of academically demanding courses for those who want to gain admission to veterinary medical college or graduate schools. Second, because a large numbers of our students do not achieve the minimal GPA required to apply to veterinary schools, although they are still interested in working with animals, we have designed a major with subplans in Animal Management and Biotechnology that is designed to give students skills and expertise to be competitive in the job market. For the most part, the sequence of classes flows well, although persistent issues *are the limited spaces in the Organic Chemistry lab, the inability to take Junior Writing during the junior year, and the limited availability of laboratory teaching space. We hope that with the advent of laboratory fees, more space can be renovated to have increased availability of such spaces. The teaching facilities at Hadley Farm remain very poor, including deferred maintenance issues, and investments in teaching facilities and improving the barns will go a long way to attract more and better students.* The UMass Pre-Vet program is ranked in the top five of all Pre-Vet programs nationally; the Animal Science program is also highly nationally ranked. In any plans for the consolidation of biological sciences curricula, it will be important to preserve what makes the UMass Animal Science and pre-Vet programs so successful.

- Destination of Choice/Overall Effectiveness.

Data collected from the Student Experience Survey Data, confirms the satisfaction of the students with the Majors and concentrations, as detailed above. In terms of Access to classes in

the major, Career preparation and Writing preparation the department was above the mean for the college, although we were placed somewhat lower regarding Connections to the rest of the academics. The only consistent issue that could be gleaned from the Senior Survey Open-Ended responses and suggestions was the desire of “more hands animal and lab classes”. Since we have introduced several new courses to precisely address these issues, we have already undertaken corrective measures, which we discuss in detail throughout this document.

1b. Clarity of communication.

- Internal Review of department’s website

Fig. 1 Undergraduate program menu from www.vasci.edu.

Over the last few years the department has invested a lot of resources and became more aware of the need to improve communications with our undergraduates. Whereas the information is and has been available, many students, possibly due to information overload, are not aware and miss many of the incredible opportunities offered by the department and campus. Therefore, we have introduced several changes to make our students more aware of existing opportunities. Approximately 4 years ago we developed a new website, as the former version was outdated and difficult to update. Since then, we have hired an additional support person to manage the undergraduate program, and one of her most important jobs is to maintain and update the website. In our website, students can find detailed information about the recommended sequence of courses for each major along with a detailed handbook with a brief description of each of the courses taught in the department and pre-requisites. The undergraduate tab has other topic of general interests (see below) such as Internships, Clubs and Activities. It is worth noting that in addition to posting in the site upcoming trips and/or opportunities, our

Program Overview	
Animal Science Major	Student Profiles
Pre-Vet Major	Academic Advising
Honors Program	Clubs & Activities
Opportunities	Undergraduate Forms
Course Catalog	Student Handbook

administrative assistant send emails to the whole undergraduate body reminding them of events and deadlines. The handbook also offers a clear description of the expectation for each of the majors and offers a variety of suggestions regarding additional experiences to acquire in the summer and winter breaks to be competitive in the job market or for applications to veterinary schools.

Students receive additional academic advising and information about opportunities and career paths during advising sessions, which occur twice a year in synchrony with course registration. Each faculty member in the department has a number of advisees, and the numbers vary from 5 to 20 per tenure track faculty to 25 to 45 for lecturers. We strongly emphasize to each faculty member about the need to provide a meaningful advising experience to his or her advisees. To prepare our advisors, a faculty meeting prior to advising week is focused in updating faculty about requirements, changes in course numbers, new courses, etc. Furthermore, this year, following the lead of the college and the Student Success Collaborative (SSC) Platform, we tracked students whose performance was trending downward and were thus at risk, and communicated that to each of the respective advisors with suggestions how to motivate these students, make them aware of resources at the college and campus levels, and especially that we are concerned for their progress and willing to help. We don’t have feedback yet, as this was the first semester in which it was implemented. Lastly, for the last two years junior and senior students have organized a Peer-Mentoring program under the supervision of a faculty member. This program has been very successful and anywhere between 50 to 70% of our freshmen participates in this initiative. We encourage this informal exchange of information about courses,

opportunities in the department and campus, as some students find it easier to relate to peers than faculty. Also, the faculty sponsor has excellent rapport with students.

- Senior Survey Open-Ended Responses/suggestions

Overall students expressed satisfaction with the advising we provided both in terms of Academic Advising and Concern for their academic progress, as our mean numbers were comparable to those of the college. In the open-ended responses, an equal number of students complained about advising or indicated that advising was great, so we can learn very little from those responses.

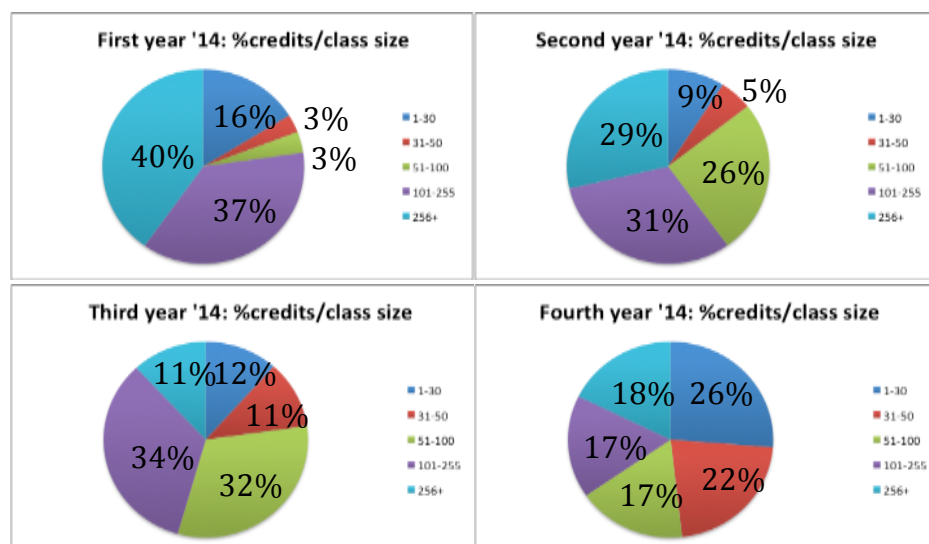
1c. Effective use of faculty time.

- Faculty Contact and Engagement

All faculty in our department advise students. New students meet with advisors during NSO or transfer periods, then are assigned to their permanent faculty advisors so that the advisor has an opportunity to build rapport with the advisee and become familiar with their case. This relationship enables advisors to serve as an advocate for the student with the university and to be a resource for the reference letters needed to further support students in their career goals and scholarship applications. Students must meet with their faculty advisor twice a year during the week before registration opens, to talk for 20-30 minutes about their plans and have the registration hold removed. In order to make each student's advising experience more uniform, the Undergraduate Program Director distributes advising notes to advisors twice a year and briefs the chair and advisors on issues discussed at the CNS CUA and Curriculum Committee meetings at monthly faculty meetings. In addition, a Pre-Vet advisor is available to answer questions about strategies to optimize veterinary medical school applications, veterinary medical school prerequisites, choices of veterinary medical colleges, interviews, and essay feedback.

Our faculty also engage our students in high faculty:student ratio laboratory courses and sections, laboratory research experiences, honors colloquia Animal Science RAP seminar and animal management courses.

- Class Size - Cumulative Class Size Experience by Major by Year Level of Cohort

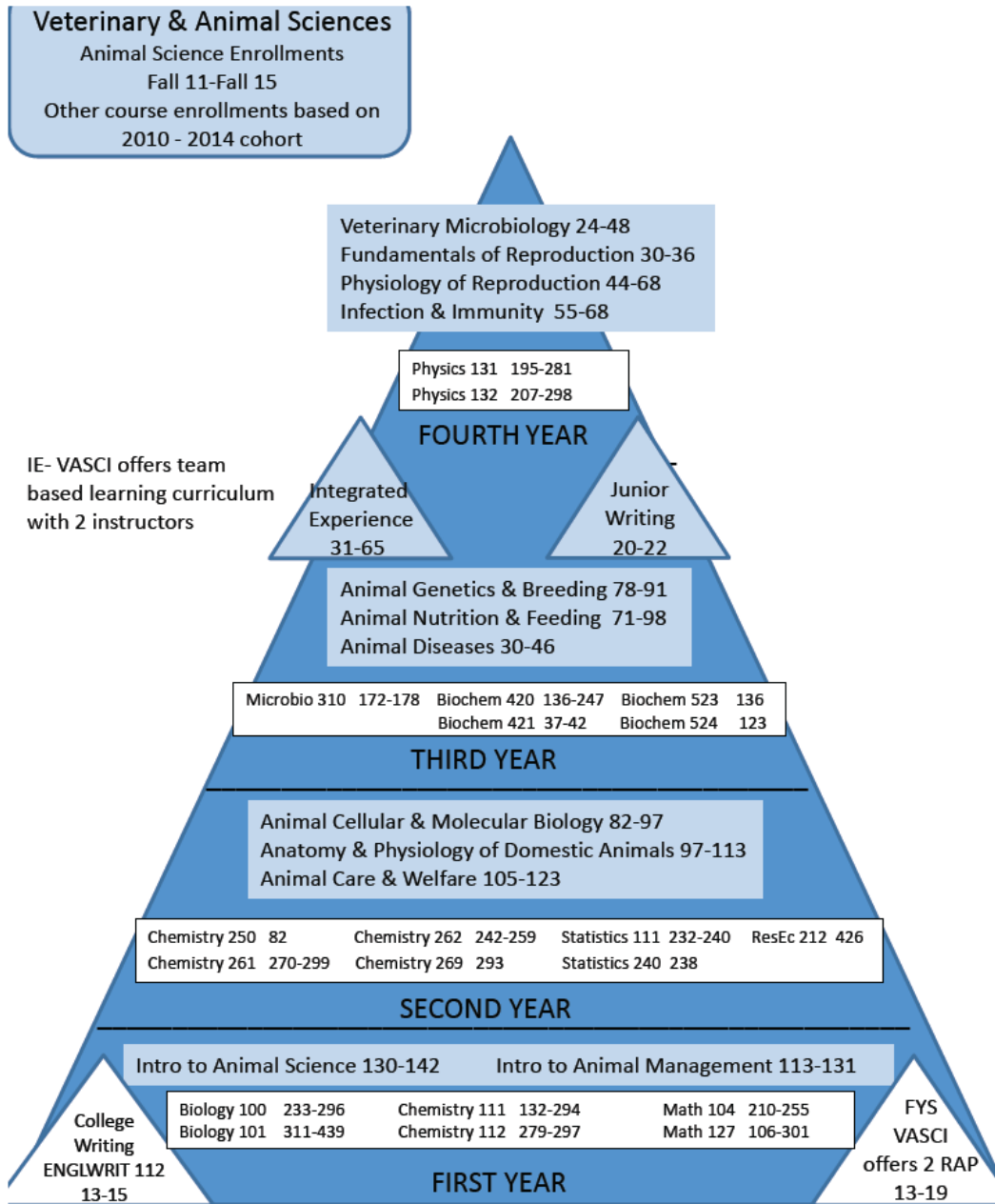


entering Fall 2010 and graduating Spring 2014. Fig. 2 Percent credits derived from class size ranges of 1-30 (dark blue), 31-50 (red), 51-100 (green), 101-255 (purple), and greater

than 256 (light blue).

The experience of the BS-Animal Science and Pre-Vet majors who entered UMass in the Fall of 2010 and graduated in Spring of 2014 shows that the 77% of the credits in the first year are derived from classes with enrollments greater than 100 (light blue and purple). This decreases to 60% in the second year, 45% in the third year, and 35% in the fourth year. The smallest class size, with 1-30 students enrolled, ranges from 9-16% of credits for the first three years, increasing to 26% in the fourth year.

Fig. 3 Class sizes for BS-Animal Science and BS-Pre-Veterinary Science, mapped onto the “aspirational triangle”. Animal Science animal management, career seminar, honors colloquium, research, and practicum courses are not included (see Table 1 for full listing).



Figures 2 and 3 show that the experience of BS-Animal Science and BS-Pre-Veterinary Science majors fits the aspirational triangle of majority smaller classes by the fourth year, as classes 50 and under make up 48% of the credits taken by fourth year students. Fig. 3 shows that the courses with greater than 200 enrollments are administered by other departments. It is also likely that the 18% of course credits from classes with more than 256 students enrolled in the fourth year (dark blue, Fig. 2) is derived from General Education courses, because the large enrollment Physics classes are not required by, and not usually taken by, BS-Animal Science majors who don't need them for professional or graduate school admission. Animal Science animal management, business, animal health team-based learning, career seminar, honors colloquium, research, teaching and practicum courses that are not shown in Fig. 3 also compensate for large enrollment classes in the third and fourth year. It is of note that the Office for Institutional Research does not include courses ending in x96 or x98 in their calculations, which includes our small enrollment experience research, teaching, and practica classes.

- Course Capacity and Enrollments

Courses in the BS-Animal Science (subplans Animal Management and Biotechnology) and BS-Pre-Veterinary Science curricula are generally at capacity (Table 1). With the new Animal Science subplans, effective for the students who entered in the Fall of 2014 and after, we anticipate that there will be more demand on courses that have previously been electives and we may have to expand courses that are at currently at capacity. For example, we added another 24-student section of AnSci 390A Veterinary Microbiology in response to demand from our majors, for a total of 48 seats. Not all students who wished to enroll were able to, indicating that there is demand in excess of 48 seats for this course. However, adding more sections of lab courses requires suitable lab space, which is in short supply on campus currently.

Several Animal Science courses have structural limitations that limit our ability to enroll students from other majors, e.g. AnSci 101 sometimes requires bus transport, which is not elastic, and the animal management courses are limited by the animals available. However, lecture courses such as AnSci 200 Cellular and Molecular Biology and AnSci 311 Genetics could be expanded to help meet the demand of other majors, especially if other majors accepted them as meeting a major requirement.

AnSci courses (Table 1) with low enrollments are generally lab courses or animal management courses that require low enrollments for pedagogical reasons. In some cases, low enrollments arise from the course being new and not adequately advertised, which can be corrected in future semesters. Since many of these courses will fulfill major requirements for the new Animal Management and Biotechnology subplans, now only in their second year of implementation, we anticipate that their enrollment will increase as students become better cognizant of the new requirements.

Besides the courses listed below, we have added AnSci 490W Wildlife Reproduction and AnSci 298D Service Dog Training for Spring 2016, courses which have both generated considerable excitement in our student population. We have encountered challenges with students having time conflicts for the main IE requirement class, and plan on converting AnSci 390L Problem-based Learning/Advances in Animal Health to a 3 credit IE alternative to the AnSci 494GI Good Intentions IE.

Table 1 Course Capacity and Enrollments

	Credits	Small class experience	Enrollment (F14/S15)	Min.-Max. (F2011-F2015)
AnSci 101 (F14) Intro to Animal Science	4	4 Lab sections ~40	140	130-150
AnSci 103 (S15)	4	4 Lab sections ~30	113	113-131
AnSci 191AnSci1 RAP-FYS			26	
AnSci 196 Research experience	1-6	Discovery-based lab tutorial	8	1-8
AnSci 220 (F14)	4	4 Lab sections ~30	103	97-113
AnSci 200 Animal Cell & Mol Bio (S15)	4	2 Discussion sections ~50	97	82-97
AnSci 231 Sheep Management I	2		37	14-37
AnSci 251 Sheep Management II	2		20	4-31
AnSci 232 Belted Galloway Management I	2		25	11-37
AnSci 252 Belted Galloway Management II (S15)	2		23	7-27
AnSci 233 Goat Management I	2		38	27-41
AnSci 253 Goat Management II (S15)	2		45	19-45
AnSci 234 Poultry Management I	2		21	14-25
AnSci 254 Poultry Management II (S15)	2		12	10-16
AnSci 260 Animal Care and Welfare (F14)	4	3 Discussion sections ~40	119	105-123
AnSci 296 Research experience	1-6	Discovery-based lab tutorial	18	10-18
AnSci 296T Intro to Teaching in Animal Science	2		27	9-28
AnSci 297B A.I Certification (S15)	1	Trip to Penn., certificate	23	23-30
AnSci 297DC (F14)	2	Outreach at	16	14-16

		local farm		
AnSci 297D Dairy Calf Management (S15)	2	Outreach at local farm	12	11-14
AnSci 297L Livestock Classic	1		25	25-54
AnSci 297P Livestock Classic Management	2		11	7-11
AnSci 298 Practicum	1-18	Internship	9	5-9
AnSci 311 Genetics (F14)	3		81	78-91
AnSci 332 Nutrition (F14)	4	Lab	71	71-98
AnSci 365 Fund. Vet. & Biomed. Lab (F14)	4	Lab	13	5-16
AnSci 372 Animal Diseases	3		39	30-46
AnSci 385 Intro Biotech Lab (S15)	4	Lab	2	2-4 (max enrollment 4 as part of MICBIO 385)
AnSci 390A Veterinary Microbiology (S15)	2	2 lab sections of 24 each	48	24-48
AnSci 390C Animal Business Management (S15)	3		16	16-24
AnSci 390L Problem-based Learning/Advances in Animal Health (F15)	2		4	first offered F15
AnSci 392A Careers in Animal Science (S15)	1		46	29-46
AnSci 396 Research experience	1-6	Discovery-based lab tutorial	25	10-25
AnSci 396T Advanced Teaching in Animal Science	2		5	3-16
AnSci 398 Practicum	1-18	Internship	4	1-4
AnSci 421 Fund. Of Reproduction (F14)	3	Lab	30	30-36
AnSci 445A Equine Reproduction (S15)	1	Lab	20	6-20

AnSci 454 Dairy Herd Management (S15)	4	Lab	5	
AnSci 455 Research Animal Management I (F14)	3	Lab	15	15-23
AnSci 490R Research Animal Management II (S15)	3	Lab	5	First offered S15
AnSci 494GI Good Intentions (S15)	3	Team-based	63	31-65
AnSci 494TI integrating Learning & Research (Honors, S15)	1 (+ 6 cr 499+499T)		6	6-9
AnSci 496 Research experience (F14)	1-6	Discovery-based lab tutorial	13	6-12
AnSci 497A Equine Diseases & Health Management (S15)	3		11	5-16
AnSci 497L Winter Traveling Dairy (S15)	1		12	1-12
AnSci 499Y/499T Honors thesis	6		9	4-12
AnSci 521 Physiology of Reproduction (S15)	4	3 Lab sections ~25	68	44-68
AnSci 572 Infection and Immunity (S15)	3		68	55-68
AnSci 581 Cancer Biology (F15)	3		15	15
AnSci 596	1-6	Laboratory research	4	2-5
AnSci 697K Advanced Immunology	3		28	17-28
AnSci 792 Seminar Animal Biotechnology and Biomedical Science	1		20	9-20
AnSci794A Journal Club- Immunology	1		28	10-28
AnSci 795A Journal Club- Cell, Genes	1		16	7-18

and Development				
AnSci H200 Honors Colloquium AnSci 200	1	Lab	14	7-14
AnSci H260 Honors Colloquium AnSci 260	1		5	
AnSci H332 Honors Colloquium AnSci 332	1		10	2-12
AnSci H521 Honors Colloquium AnSci 521	1		7	5-8

Response 2

Learning Goals and Experiences

- Updated Student Learning Objectives for Veterinary and Animal Sciences
 - Scientific awareness: Broad training in basic biological and physical sciences.
 - Analytical skills: The sciences demand quantitative skills supported by requirements in mathematics and statistics.
 - Animal biology: Required coursework within the Department focusing on understanding the foundations of cellular communication and organization to create tissues to perform specific functions. The courses also build practical skills in understanding the physiological and behavioral requirements of various species of animals and building practical decision-making skills regarding how to feed, how to breed and manage animals to assure their well being and productivity.
 - Food animal production and biotechnology: In addition to the focus on assuring health and welfare of animals, we develop an understanding of the use of animals in food production. The growing use of animals in biotechnology to produce pharmaceutical products is addressed throughout upper-level coursework in genetics, immunology, reproduction and nutrition providing an emphasis on health-related technologies.
 - Critical and ethical thinking/problem solving: In addition to standard knowledge (fact-based), students are expected to develop abilities to gather information needed to address broad questions.
 - Communication: Strengths in written and verbal communication are fundamental to being able to contribute to one's profession.

Direct Assessment tools

- Analytical skills and oral and written communication skills are assessed by faculty in our courses and at the annual Science Day and Farm Day, in which students deliver 12 minute oral presentations or present posters on their independent study research. These assessments have led to the elucidation of standards for these presentations, specifically that quantitative data is preferred and it must be analyzed using statistical tests for significance.

Indirect Assessment tools

- Surveys of students interested in our major who attend Fall and Spring open houses as to their projected career plans revealed that 80-90% plan on attending veterinary medical school. However, only 20-25% of our seniors apply for admission to veterinary medical school. The difference in the two numbers has led us to focus on students who need to be trained in marketable skills in biotechnology, business, veterinary medicine and animal management.
- Exit surveys of our graduating seniors so that we can gather suggestions for improvement, make correlations between GPA/GRE and veterinary/medical school or graduate school admissions, and maintain a database of our students' career plans for future contacts for our Careers in Animal Science course and other career advising.
- Destination of Choice/Student Outcomes
 - Self-Reported Learning and High Impact Practices

In this survey we found that our department is well positioned in terms of “How much you feel you have learned in this course”, where we are above the campus and college means. The department also compares favorably in all other categories, except “Solving Complex real-world problems”. In addition, our students reported much higher rates of Practicum and Research Experience than the means for the campus and comparable to rates by other departments in the college.
 - Post-UMA Employments and Education

Only over 50% of our students report that they will seek a job post-graduation, which is below the mean of the campus that is close to 70%. These numbers however are explained by the high percentage of our students who will pursue graduate degrees, which is well above the mean for the campus. Many of our students also seek voluntary experiences, and this is most likely associated with the need to obtain animal and research experiences to pursue veterinary schools or graduate schools. Our students who report having a job upon graduation have salaries that are slightly below the campus mean, but these numbers are deceiving, as many departments do not post numbers for this category.
- Changes in practices and curriculum based on feedback.
 - We have charged a faculty member, Dr. Susan Marston, with developing a comprehensive list of internships and learning-experience opportunities for our students. It is imperative that those students not planning to attend graduate school acquire skills to compete in the marketplace following graduation. We have organized the opportunities in three major themes: 1-Veterinary clinics, 2-Biotechnology, Pharma and research opportunities; 3-Farm positions. We have also been working closely with Rick Robar, CNS, who serves as a liaison between biotech companies in the state and alumni who are employed in those companies. In addition, we offer a 1 credit Careers in Animal Science course, where students are exposed to speakers from different branches of animal-related activities that share their real-life careers experiences. This course is now offered in the sophomore year to give students more time to explore career options prior to graduation.

- Faculty and departmental curriculum committee discussions about expectations (i.e. what material students should have learned previously) and how courses build upon each other are ongoing in faculty meetings and by email. We constantly update courses and requirements and have placed pre-requisites earlier in the major so students are aware of the fundamental knowledge that is required to advance in the major.
- Meetings with admission counselors from veterinary schools and former students who are veterinarians to discuss our curriculum and advising support for students applying to veterinary schools.
- Increased support for students interested in Animal Management by investing in the management and genetics of our herds (i.e. Sheep, Goat, Cattle, and Poultry). Further, we have recently created a partnership with a local farm, where our students are responsible for the calf operation of the farm during the academic year. This initiative has been a great success and students are keen to participate. Financial support through scholarships for students to attend shows and conventions that deal with animal husbandry. Development of new courses such as course Animal Business Management to give students the fundamentals to understand the financial component of running a farm or animal-related enterprise.
- Train students in our laboratories year round, and encourage students to apply for summer research fellowships at biotechnology companies and at universities. We are planning to develop a Certificate in Biotechnology. We already offer 5 courses whose content is related to techniques required in the industry, from molecular and microbiological techniques to the management of research animal colonies. We plan to implement this possibility in the next 2 years.
- Diversity- We have used the SSC program to identify students who appear to be heading on a downward academic trajectory, based on a previous semester's term GPA of less than 2.700 and a cumulative GPA of less than 2.999. This information was sent out as an alert to the students' advisors, along with a notation if the student was ALANA and/or first generation college student. Advisors were given information on resources available (i.e. seeking help from professors and TAs, tutoring in the library, CMASS, and Charlana Simmons, CNS Director of Student Success/Diversity)
- Internationalization- Our departmental IE course, AnSci 494GI Good Intentions, is international in scope, as the module are based on case studies of animal health problems of global concern. In addition, we maintain contacts with the University of Edinburgh veterinary medical school. In order to better support our students' aspirations to study abroad while keeping up with major requirements, we plan to set up course equivalencies for our courses with Dr. Jean-Pierre Scheerlinck, Center for Animal Biotechnology, University of Melbourne, Australia. This would be ideal for our students because the Veterinary Biomedical and Animal Management courses at the University of Melbourne are very similar to ours, and because Australia is a very popular destination among our students.
- **Response 3**
- **Curricular Revision Action Plans**
- Response 3a. Without additional support.
- The issues of accessibility identified in response 1.1 are not something we can address, as they are mostly related to classes not offered by the department. However, we have

identified certain gaps in the curriculum we have been trying to solve by developing more targeted courses. First, we have developed a “Business Animal Management” course, as our students could not gain access to similar classes offered in SOM. This topic was deemed very important, as farms are small or large businesses and students need this knowledge if they eventually run their own farms or are hired to manage farms. Second, in one of the surveys, our students expressed dissatisfaction with their preparation for “Solving Complex real-world problems”. To that end, we have developed a new course based on problem solving of routine cases observed in veterinary clinics entitled “Advanced Animal Health and Management” where students are made to work through clinical cases and come up with the diagnosis and treatment. This is the first semester the class is offered and the enrollment was limited, but we plan to expand it next fall. Besides working in teams, students must read the literature to request tests to arrive to a diagnosis as well as to make recommendations for treatments. Third, we are in the second year of offering a “Veterinary Microbiology Lab”. This arose from the need of some of our students applying to veterinary schools needing a 2-credit microbiology lab, which at the time the Microbiology department was not offering. It has been a big success and all our seat available for this course are now taken. Forth, we have been teaching a very successful class, research animal management, AnSci 455, which teaches all the regulations required to house and manage research animal colonies. Many of our graduates have gone on to important management positions in Animal Care in places such as Novartis and New England Medical Center. Besides, there is a great demand for this type of training in the state, given the large number of pharmaceutical companies. Thus, we have added a second semester to AnSci 455, during which students gain experience using our own animal colonies, including managing mice, rats, fish and frogs. This is an excellent opportunity that makes use of existing resources and train students for immediate employment. Additional resources could be used to visit other state of the facilities that are not available on campus.

- Response 3b. With additional resources. We have identified a few additional gaps that to implement corrective measures for would require some investment. First, it is imperative better laboratory space is made available to the college and departments. In our particular case, we don't have any designated laboratory space and must negotiate every semester with other departments to teach our courses that require modern laboratories space. Besides being time consuming, this process creates unpredictability in the program, as for some courses meeting times are changed year after year. Thus, our students would greatly benefit for good quality and stable laboratory space. An area we have identified as a gap of training for our students, and for most students in the life sciences, that would benefit from more laboratory space is the teaching of “sterile cell culture technique”. We plan to modify a course already in existence, AnSci 385, which is also Micro 385, to emphasize it. Almost any research laboratory in the life sciences today, whether at a research institution or at a Biotech company, uses this technique to probe any type of scientific question. Thus, students completing such a course and with expertise in this subject would be highly employable. However, these types of courses require spaces equipped with incubators, hoods, and a whole host of complementary equipment, reagents and consumables. An additional area of improvement identified by students, see Senior-Survey Open-Ended Responses, is the need for better hands-on animal experience. While we have the animals and barns, we don't have the teaching facilities in the Farm. A classroom and a studio/lab space would go a long way to make the many classes that take place in the barns more enjoyable and better teaching experiences. For example, presently there are no rooms in the farms where microscopes can be used and stored, or for surgical procedures and necropsies to be conducted safely and aseptically, and available Wi-Fi and computer terminals to enter data

collected on site. Whereas it is understandable that not all requests can be granted at once, a list of priorities should be initiated and subsequently implemented and long-term solutions found so that the overall learning experience of our undergraduates is improved.

**Table 2 COURSE CHECKLIST FOR ANIMAL SCIENCE MAJOR,
ANIMAL MANAGEMENT SUBPLAN (started with new students
Fall 2014)**

University Gen Ed Requirements	
College Writing (Fall or Spring)	ENGWLP 112
Arts/Literature (AL or AT)	4 credits
Historical Studies (HS)	4 credits
Social/Behavioral Sciences (SB)	4 credits
Plus one additional course in (SI)	ANIMLSCI 260
Diversity "U" (can be combined with Gen Eds above, i.e. HSU)	
Diversity "G" (can be combined with Gen Eds above, i.e. HSG)	
Integrative experience (IE, min. 3 credits)	ANIMLSCI 494I or honors option ANIMLSCI 499Y+499T+ ANIMLSCI 494TI
Basic Science & Math Requirements	
Intro Biology I	BIOL 151
Intro Biology II (req. minimum C in BIOL 151)	BIOL 152
Biology lab	BIOL 153
General Chemistry I + lab (req. min. 20 in part A of math placement exam, or Math 101/102, or Math 104)	CHEM 111
General Chemistry II +lab (req. min. C- in Chem 111)	CHEM 112
Organic Chemistry (req. min. C- in Chem 112)	CHEM 261 or 250
Biochemistry (Fall, Prereq 250 or 261 or 265, min. C-)	BIOCHM 420
Statistics (Math R2 requirement)	STAT 111 or 240 or RES EC 212
Microbiology (Prereq. CHEM 261 or current enrollment)	MICBIO 310
Animal Science Core	
Introduction to Animal Science (Fall)	ANIML SCI 101
Introduction to Animal Management (Spring)	ANIML SCI 103
Animal Cellular and Molecular Bio (Spring, req. Bio 151 min. C, Chem 111 min. C-)	ANIML SCI 200
Anatomy/Physiology (Fall)	ANIML SCI 220
Animal Care & Welfare (Fall, Gen Ed SI)	ANIML SCI 260
Careers in Animal Science (Spring)	ANIMLSCI 392A
Animal Genetics & Breeding (Fall, req. Bio 151 min. C, BIOL 152 min. C, and ANIMLSCI 200, BIOL 285, or BIOCHEM 275 min. C-)	ANIML SCI 311
Animal Nutrition & Feeding (Fall, req ANSCI103 or 220)	ANIML SCI 332
Animal Business Management (Spring, req. ANIMLSCI 103)	ANIMLSCI 390C
Jr Year Writing (Fall or Spring)	NATSCI 397A
Animal Diseases (Spring, Prereq. ANIMLSCI 200, BIOL 285, or BIOCHEM 275)	ANIML SCI 372 (or ANSCI 572)
Fundamentals of Reproduction (Fall, req. ANSCI 220)	ANIML SCI 421 (Spring ANSCI 521)
Choose 1 laboratory: ANIMLSCI 365 Fundamentals in Veterinary and Biomedical Laboratory Techniques 4 credits (Fall)	ANIMLSCI 365 or

<p>ANIMLSCI 385 Introduction to Biotechnology Laboratory 3 credits (Spring)</p> <p>ANIMLSCI 390A Microbiology lab 2 credits (Spring)</p> <p>BIOCHEM 421 Biochem lab 2 credits (Fall)</p>	<p>ANIMLSCI 385 or</p> <p>ANIMLSCI 390A or</p> <p>BIOCHEM 421</p>
<p>Choose 2 2-semester species management courses:</p> <p>ANIMLSCI 298E/ANIMLSCI 297E Dorset Sheep Management I+II</p> <p>ANIMLSCI 232/ANIMLSCI 252 Belted Galloway Management I+II</p> <p>ANIMLSCI 298S/ANIMLSCI 297S Boer Goat Management I+II</p> <p>ANIMLSCI 234/ANIMLSCI 254 Poultry Management I+II</p> <p>ANIMLSCI 297DC/ANIMLSCI 297D Dairy Calf Management</p> <p>ANIMLSCI 455/ANIMLSCI 490R Research Animal Management I+II</p>	
<p>Choose 2:</p> <p>ANIMLSCI 390L Advanced Animal Health & Management</p> <p>ANIMLSCI 445A Equine Reproduction (Spr) + ANIMLSCI 497A ST-Equine Diseases & Health Management (Fall)</p> <p>ANIMLSCI 454 Dairy Herd Management</p> <p>ANIMLSCI 297L Livestock Classic 1 credit + ANIMLSCI 297P Livestock Classic Management & Coaching 2 credits</p>	

**Table 3 COURSE CHECKLIST FOR ANIMAL SCIENCE MAJOR,
BIOTECHNOLOGY SUBPLAN (started with new students Fall
2014)**

University Gen Ed Requirements	
College Writing (Fall or Spring)	ENGWLP 112
Arts/Literature (AL or AT)	4 credits
Historical Studies (HS)	4 credits
Social/Behavioral Sciences (SB)	4 credits
Plus one additional course in (SI)	ANIMLSCI 260
Diversity "U" (can be combined with Gen Eds above, i.e. HSU)	
Diversity "G" (can be combined with Gen Eds above, i.e. HSG)	
Integrative experience (IE, min. 3 credits)	ANIMLSCI 494I or honors option ANIMLSCI 499Y+499T+ ANIMLSCI 494TI
Basic Science & Math Requirements	
Intro Biology I	BIOL 151
Intro Biology II (req. minimum C in BIOL 151)	BIOL 152
Biology lab	BIOL 153
General Chemistry I + lab (req. min. 20 in part A of math placement exam, or Math 101/102, or Math 104)	CHEM 111
General Chemistry II +lab (req. min. C- in Chem 112)	CHEM 112
Organic Chemistry (req. Chem 112 min. C-)	CHEM 261 or 250
Biochemistry (req 250 or 261 or 265, min. C-)	BIOCHM 420
Statistics (Math R2 requirement)	STAT 111 or 240 or RES EC 212
Microbiology (Prereq. CHEM 261 or 250 or current enrollment)	MICBIO 310
Animal Science Core	
Introduction to Animal Science (Fall, can be substituted by higher-level elective by external or internal transfer students)	ANIML SCI 101
Introduction to Animal Management (Spring, req. ANIMLSCI 101 min. C)	ANIML SCI 103
Animal Cellular and Molecular Bio (Spring, req. Bio 151 min. C, Chem 111 min. C-; ANIMLSCI 220 min. C-)	ANIML SCI 200
Anatomy/Physiology (Fall, req BIOL 151 min. C)	ANIML SCI 220
Animal Care & Welfare (Fall, Gen Ed SI)	ANIML SCI 260
Careers in Animal Science (Spring)	ANIMLSCI 392A
Animal Genetics & Breeding (Fall, req. ANIMLSCI 200, BIOL 285, or BIOCHEM 275, min. C-)	ANIML SCI 311
Animal Nutrition & Feeding (Fall, req ANSCI103 or 220)	ANIML SCI 332
Jr Year Writing (Fall or Spring)	NATSCI 397A
Animal Diseases (Spring, req. ANSCI 200, BIOL 285 or BIOCHEM 275)	ANIML SCI 372 (or ANSCI 572)

Fundamentals of Reproduction (Fall, req. ANSCI 220)	ANIML SCI 421 (Spring ANSCI 521)
Fundamentals in Veterinary and Biotechnology Laboratory Techniques (Fall)	ANIMLSCI 365
Veterinary Microbiology Lab (Spring)	ANIMLSCI 390A
Research Animal Management I (Fall)	ANIMLSCI 455
Research Animal Management II Spring	ANIMLSCI 490R
12 credits in laboratory research (needs Biotech in title) or 9 credits in laboratory research + 3 credits ANIMLSCI 385	

Table 4 COURSE CHECKLIST FOR PRE-VETERINARY MAJOR

University Gen Ed Requirements	
College Writing (Fall or Spring)	ENGWLP 112
Arts/Literature (AL or AT)	
Historical Studies (HS)	
Social/Behavioral Sciences (SB)	
Plus one additional course in (AL, AT, HS, SB, SI or I) ANIML SCI 260 fulfills SI	ANSCI 260
Integrative Experience (IE)	ANSCI 494 GI or for honors students 499YT + ANSCI 494 TI OR NATSCI 494I
Diversity "U"	
Diversity "G"	
Basic Science & Math Requirements	
Introductory Biology I	BIOL 151*
Introductory Biology II (req. minimum C in BIOL 151)	BIOL 152*
Biology Lab	BIOL 153*
General Chemistry I	CHEM 111*
General Chemistry II (req Chem 111, min. C-)	CHEM 112*
Organic Chemistry (req. Chem 112, min. C-)	CHEM 261*
Organic Chemistry (req Chem 261, min. C-)	CHEM 262
Organic Chemistry lab	CHEM 269
Biochemistry (req 250 or 261 or 265, min. C-)	BIOCHEM 420 or BIOCHEM 523 (fall only, allows full year of Biochem)
Math R1 (either MATH101/102 or MATH104 or Test-out, min. 20 on Part A of math placement exam)	
Statistics (Math R2 requirement)	STAT 111, 240 or RESEC 212
Calculus	MATH 127*
Microbiology (Prereq. CHEM 261 or 250 or current enrollment)	MICBIO 310
Microbiology Lab	ANSCI 390A or MICBIO 265
Intro Physics I and Lab	PHYSIC 131
Intro Physics II and Lab	PHYSIC 132
Animal Science Core	
Introduction to Animal Science (Fall, can be substituted by higher-level elective by external or internal transfer students)	ANIML SCI 101
Introduction to Animal Management (Spring) Prereq. ANIMLSCI 101, min. C	ANIML SCI 103*
Animal Cellular and Molecular Bio (Spring, req. Bio 151 min. C, Chem 111 min. C-; ANIMLSCI 220 min. C-)	ANIML SCI 200*
Anatomy/Physiology (Fall, req BIOL 151 min. C)	ANIML SCI 220*
Animal Care & Welfare (Fall, Gen Ed SI)	ANIML SCI 260
Junior writing (Fall or Spring)	NATSCI 397A
Animal Genetics & Breeding (Fall, req. ANIMLSCI 200, BIOL 285, or BIOCHEM 275, min. C-)	ANIML SCI 311
Animal Nutrition & Feeding (Fall, req ANSCI 103 or 220)	ANIML SCI 332

Infection and Immunity (Spring, req. ANSCI 200, BIOL 285 or BIOCHEM 275)	ANIML SCI 572
Reproductive Physiology (Spring, req. AnSci 220)	ANIML SCI 521

NOTE: *Ten science and math courses used to calculate Pre-Vet major eligibility. Credit-weighted GPA must be greater than or equal to 2.700 (=B-) in order to graduate as a Pre-Vet major. Students with 10-course GPAs less than 2.700 can graduate as Animal Science majors.