Tier 3- Curriculum, Pedagogy, Space

a. Teaching, Learning, Scholarship for the programs offered in Animal Science and Dairy Science.

1) What effective approaches to teaching and learning are emerging in your field and related interdisciplinary areas?

In the fields of animal science and dairy science, there will be significant changes in teaching and learning approaches. It is generally accepted that diverse students have equally diverse learning styles and the faculty of animal science and dairy science must provide inclusive opportunities to accommodate these learning styles (How People Learn, Expanded Edition, 2000). Another significant emerging challenge will involve the manner in which digitally proficient learners are exposed to hands on learning, and the development of online learning opportunities with extensive experiential learning involvement involving our production facilities and labs.

Within the animal science and dairy science programs, focus areas will include:

- Hands-on learning experiences will continue to be paramount
- Increased Technology driven education that includes social media, hybrid courses, and online learning opportunities
- Increased Collaborations among faculty and students within and among departments and colleges will expand. Increased student opportunities to solve more complex multifocal problems with greater collaborative efforts across traditional “silos” typically found in a university setting.
• More Undergraduate research opportunities will allow students to develop applied problem solving skills

Pedagogies continue to evolve that incorporate new technologies; technology and education have a long tradition in curricula involving animals (Ketelhut and Niemi, 2007). Distance learning programs have been present at Cal Poly State University for years and new digital technologies are emerging within our programs. It is clear that at colleges of agriculture, the number of students taking at least a single online course is increasing and there is an enormous potential to capture value in education at this level. Thus, the incorporation of advanced technology in the classroom and the emergence of the digital education as whole must be addressed as effective teaching and learning approaches as identified in our tier 1 and 2 narrative.

Increasingly, higher education is being scrutinized for value by its stakeholders (Maxwell et. al., 2011) and hands-on experiential learning has emerged as a necessity of education, not a luxury. The animal science and dairy science programs continue to have these hands-on experiences as valued approaches to education and we are uniquely positioned to continue to lead. Based on our facilities, open spaces, and animal resources, the educators within our department continue to develop the experiential learning approaches to education that produce critical thinking skills that can be applied to solve real-world problems. It is critical that these resources improve to allow for the laboratories, enterprises, and senior projects that foster critical thinking skills.

Also in this narrative, collaboration and integration were identified as opportunities for enhancing teaching and learning approaches and this is inextricably linked to the teacher scholar model. The One Health concept presented in the narrative can serve as a model for interdisciplinary collaboration. This is quite congruent with the concept of the Faculty Learning Community (Cross, 1998) that continues to evolve in university education today. The hallmarks of these communities are the involvement of teachers, students, and administrative professionals with the common goal of solving a problem. These collaborations likely are particularly valuable to our disciplines due to the
complexity and high cost of our animal based programs. Integration of teaching and faculty research will provide the undergraduate with his/her own research experience. Again, these research experiences will be critical to the effective and emerging approaches to education within our disciplines. Because the programs within our departments are so diverse, the student has the opportunity to engage faculty on many levels. There is no doubt that research involves problem solving; our programs involve applied research which translates into graduates that, when given the opportunity, develop the skills to solve problems in the industry.

2) *How should Learn by Doing incorporate new learning needs, opportunities, and technologies (in your field etc.)*?

It is obvious that Cal Poly State University is known for Learn by Doing. Arguably it is CAFES that led the university along this path. Learn by Doing (LBD) must be incorporated into the four approaches to effective teaching and learning described above. In the first approach, hands-on experience, there should be little doubt regarding the incorporation of LBD. It is done very day, in every class within the animal science and dairy science programs. Instructors continue to use hands-on experience as the hallmark of the LBD education. Further, technology and LBD is incorporated into our curricula in the form of laboratory classes, enterprises, and senior projects. As these classes have an applied nature, the biggest challenge instructors and students face is keeping up with the world of high technology in agriculture. Again, because these programs are so diverse, the cost of updating technology merely to maintain the same level as industry is huge. It seems likely that we will need to rely on external sources, such as corporate partners, to allow our faculty and students access to the most current technology within agriculture. It was identified in our tier 1 and 2 narrative that higher education is facing a funding shift that now squarely places the majority of fiscal responsibility on the university instead of government sources. Therefore, it is likely that we will need to establish novel relationships with external partners if we are to maintain relevance in the increasingly technologically driven agriculture with respect to Learn by Doing in animal science and
diary science. It may be then that our teacher scholars should be afforded time at commercial entities to remain current on technological advances. This of course goes hand in hand with student participation at these same commercial entities.

The emergence of communication technology, social media and online courses represents another opportunity as well as challenge for our programs regarding Learn by Doing. According to our narrative, the demand and participation in online learning, digital learning, and hybrid learning environments is growing and we are not meeting this needs with respect to emerging approaches to teaching and learning. Regardless of Learn by Doing, we have basically no online learning or digital learning presence at this time. This is compounded then by the added complexity of incorporating LBD with distance learning. However, this may be an opportunity to again emerge as a leader in LBD, not in landscape of seasonally green grass, but in the digital landscape where grass is perpetually green. Metaphor aside, this side is open for our instructors to lead in LBD in the digital age. This will require significant resource allocation for faculty time and facilities. However, like most expeditions, the hardest step is the first. It is likely that the integration of online programs will begin within the traditional lecture style class where lectures can be recorded, provided online, discussions boards can be hosted etc. The most critical aspect of the digital integration of technology and LBD within our programs will be the incorporation of our hands-on experiences with animals. One can imagine a lecture based online type of format with a concomitant hands-on laboratory in some fashion; this is the hybrid course approach of the future.

3) How does the teacher scholar model fit (again in your field, etc.)?

As described in our Tier 1 and 2 narrative, collaboration and integration were identified as emerging trends in our disciplines. There is an obvious connection between the teacher scholar model and emerging teaching and learning within our programs; aspects of this model already exist. We have extensive applied research facilities, many of which
have been upgraded or even completely replaced. Our programs are ideally set up to foster teacher scholars as we maintain extensive animal resources that promote applied research. Because of our extensive facilities and animal resources, faculty afforded the time can develop applied scholarship alongside effective teaching. There is mutual benefit among students, faculty, and university regarding this model. Our faculty needs to be provided the opportunity to gain new expertise through research, grant writing, and continuing education. In turn this translates directly into undergraduate research opportunities, advancement of laboratories, enterprises, and senior projects. These classes are generally thought of as the hallmark of the LBD experience in animal science and dairy science that produces work ready graduates capable of thinking critically and problem solving. This model will require adjustment of teaching workload to provide the time needed to commit to these efforts.

As noted in our tier1 and 2 narrative, a significant challenge we face in animal and dairy science is the ability to recruit and retain qualified faculty and staff. This likely represents a large barrier to the incorporation of the teacher scholar model to our programs. We are developing excellent facilities that allow for applied research in our disciplines. To incorporate the teacher scholar model, we must find the human talent to fill our facilities, thereby exposing our students to the emerging teaching and learning approaches of the future.

b. **Learning Environments**—What learning environments should Cal Poly develop or modify to accommodate (1) new modes of teaching and learning, (2) Learn by Doing, and (3) the teacher-scholar model in the future? Please respond in terms of the qualitative characteristics of the facilities and other spaces (including technology) critical to your programs and students:

1) **Formal, scheduled or organized instruction,**

Learning environments in general will need to be modified and characterized by these changes to support emerging teaching and learning methods, Learn by Boing and Teacher Scholar model:
• Increase capacity for lecture and laboratory based scheduled learning
• Modernize technology available in lecture rooms, laboratory and animal production facilities to promote communication
• Establish unique learning environments dedicated to fostering collaboration among students, faculty, industry partners and administration thereby providing an holistic education
• Research facilities to be upgraded to permit use by all undergraduates in our programs

Adequately scheduled classroom based, formal instruction is essential to our programs. This is a traditional learning environment that reaches a large number of students and establishes the initial connection of our instructors with students. We are currently faced with a lack of adequate appropriately sized lecture space; this space needs to be expanded to accommodate increased enrollment in our highly sought after programs. While we identified a potential downturn trend in enrollment in animal based programs across the country, our programs currently experience the opposite trend. The existing lecture space generally has poor technology, as the most advanced technology in these spaces is the projector so called smart room. We need to expand our current learning environments for scheduled instruction and upgrade the outdated technology. As we continue to upgrade our labs and production units, an increased focus on communication technology will be important. For instance, during the upcoming poultry facility remodel, the placement of cellular phone accessible video surveillance capabilities will be added to allow students enrolled in poultry courses to observe animal behavior at in time, day or night. Our current facilities will need to be modified to incorporate online, hybrid, and social media into our teaching and learning approaches.

We have extensive teaching facilities for our laboratory based courses and enterprises, however, many of these facilities do not have adequate classrooms associated with them. These facilities continue to be upgraded regarding advanced technology; most of the technology is geared towards application not instruction. To enhance Learn by Doing at these facilities, technology geared towards instruction and communication must be
incorporated into upgrades and modernization, including adequate classroom space at the units.

2) Informal student learning outside the classroom or laboratory,

As we identified in our first narrative, funding of higher education by government is decreasing. Further, students that are capable of thinking critically and can solve problems are desirable to employers. Increased informal learning opportunities must be incorporated into our formal education programs.

The opportunities may be characterized by:

- Expanded internships
- Increased volunteer experience
- International study and living programs
- Outreach and service programs
- Work-study programs

There are several opportunities that are worth evaluation and assessment for value. The most obvious is the internship. Internships have been an invaluable means by which direct experience can be gained. These experiences need to be evaluated for merit and congruency with our program objectives, but it is likely that they can serve the student to a greater degree than the current standard. Volunteer, outreach, and service opportunities have long been valued by many organizations and employers. The classic Peace Corp experience so popular among students should be evaluated as a means of enhancing the education of our students. Lastly we should evaluate the informal experience of living away from campus and home, perhaps another state or country for a period of time, and the acknowledgment that this may be the ultimate in Learn by Doing----Learn by Living.

We also identified a change in demographics among our students leading to a more diverse student body. This change in demographic dictates our learning environments
will need to accommodate this diversity. Learning environments then must facilitate communication across cultures and geographical barriers. We need to expand the boundaries of what we consider a traditional learning environment and understand that the world is the greatest Learn by Doing classroom. With proper supervision, faculty participation, and international outreach, the animal science and dairy science programs will promote the global perspective in students and faculty that we envision as essential to Student Success.

3) The Teacher Scholar Model
A critical aspect of our learning environments is the animal production units, the dedicated research laboratories, and our open spaces. To foster innovation through scholarship, our facilities must be supported, modernized and expanded. To meet the university directive regarding the Teacher scholar, faculty must be permitted the space, adequately equipped, and maintained to perform such scholarship, and the time to pursue research endeavors. Our programs are fortunate in that we have benefited from leadership with the vision to realize our need for modern facilities and therefore the process began long ago to support modern facilities. We need to continue this vision to include all our facilities moving forward.

As we indicated in the emerging teaching and learning approaches, collaborations among faculty and students will be one mark of a successfully implemented enrollment plan. By enabling these collaborations, the teacher scholar model is directly encouraged; as Learn by Doing is part of our culture, it is expected that, as a natural progression, undergraduate research opportunities will increase.

The outcome of this effort to develop our enrollment plan is of course student success. Successful animal science and dairy science students will be able to

- Demonstrate expertise and the use of technology in their respective discipline.
- Demonstrate effective oral and written communication skills.
o Make choices based on an understanding of personal and professional ethics and respect for diversity of people and ideas.

o Recognize leadership principles and skills.

o Evaluate and solve problems using critical thinking.

o Demonstrate an appreciation for sustainability and global perspectives.

These program-learning objectives continue to be the standard we strive for in producing graduates equipped to enter the work force as productive contributors to our combined future.