

Graduate Faculty Senate
Meeting Minutes



October 25, 2022 1:30-3:00 PM

Member	Committee	Member	Committee
Lissa Behm-Morawitz (ex officio)	X	Wenjun Ma (Vet Med)	AA
David Beversdorf (Medicine)	Policy	Marcello Mogetta (A&S)	AA
Miriam Butler (Nurs)	Appeals	Azlin Mustapha (CAFNR)	Appeals
Sounak Chakraborty (A&S)		Stevie Neuman (Bus/Acc)	AA
Anita Cowan (Admin. Sup.)	X	Parker Owens (GPC Rep)	Policy
Chris Daniggelis (DGS at lg.)	Awards*	Richard Rueben (Law)	Policy
Matt Easter (CEHD)	Policy/Awards	Ashley Siebenaler (ex officio)	X
Maria Fidalgo (Eng.)	AA/Policy	Chi-Ren Shyu (Grad School/IDSI)	Policy*
Keith Greenwood (Jour.)	Policy/Appeals	Corinne Valdivia (CAFNR)	Awards
Damon Hall (CAFNR)	Awards/Appeals	Angie Zapata (CEHD)	AA*
Jeni Hart (ex officio)	X	Yuwen Zhang (Eng.)	Policy/Appeals
Brian Hensel (Medicine/HMI)	AA	Erin Robinson (Hlth. Prof)	GFC Rep /member at large
John Kerns (A&S)	Awards	Mich Calcutt (Vet Med)	

*Committee Chair

In attendance:

Jeni Hart, Anita Cowan, Miriam Butler, John Kerns, Maria Fidalgo, Erin Robinson, Chi-Ren Shyu, Lissa Behm-Morawitz, Brian Hensel, Parker Owens, David Beversdorf, Christopher Daniggelis, Yuwen Zhang, Stevanie Neuman, Mrcello Mogetta, Michael Calcutt, Damon Hall, Azlin Mustapha, Corinne Valdivia, Richard Reuben

1. Call to order
1:31
2. Acceptance of the agenda
Move to approve todays agenda - Erin Robinson
Seconded - Parker Owen
Agenda approved.
3. Approval of minutes from August 30, 2022 and September 27, 2022
September meeting minutes –
Motion to approve September meeting minutes – David Beversdorf
Seconded – Richard Reuben
Approved

August meeting minutes
Motion to approve August meeting minutes– Richard Reuben
Seconded -Brian Hensel
Approved.
4. Special Business of the Day –
 - a. Invited guest for New Program Proposal

- i. David Patterson, Animal Science -787: Graduate Certificate in Reproductive and Genomic Technologies for Livestock (iia)

Proposal presented to the senate – vote will be in November

There are only 12 specialists in the area of reproductive physiology, reproductive biology and the area of genetics and genomics. This is a joint proposal between the College of Agriculture specifically Animal Sciences and the College of Veterinary Medicine (who also sees a need for this advanced training). Expected funding is favorable to create a new hands on training. This will enhance the opportunities for those that complete the training relative to the certificate program. MU is only one of six land grant universities with colleges of Agriculture, Medicine, Veterinary Medicine in one location. When this proposal was put together it came about at the request of individuals in other states. Asking if there were ways to tap into our resources to gain access to information and/or training that is otherwise unavailable at many other institutions. There isn't any overlap relative to what is being provided at other land grant institutions across the country.

- ii. Douglas Moesel, Business Management – 794 Graduate Certificate in Entrepreneurship and Innovation Management

Proposal presented to the senate – vote will be in November

The Crosby MBA, which is the primary graduate vehicle in the Business School, recently changed about a year ago. It's seen some real promising enrollment increases since that time. We have a monetarized graduate program which means every Crosby MBA student has to complete at least one online certificate of twelve to fifteen credit hours. Part of the packaging of this certificate is to fit within that required certificate. So again, this would fit the needs of those certificate students as well. We have transitioned to fully online asynchronous courses at the graduate level. All these courses are part of their certificate.

5. Committee Reports:

- a. Academic Affairs – Prof. Angie Zapata, chair

Courses listed below are recommended for approval, with exception of highlighted courses.

SPC ED 8325 – at the time of the meeting, the department had sent the information needed back to the senate.

Pull for further clarification– TR BIOSC 8001
 TR BIOSC 8555
 TR BioSC 9001
 NAT R 8800 -

TR BIOSC 8001 – duplicate? – flexibility to shape seminar each semester. Ability to trial different options.

Moved to vote on all courses except those highlighted in green:

Motion to approve courses submitted by the Academic Affairs committee with the exception of the 4 courses highlighted in green - Angie Zapata

Seconded - Chi Ren Shyu

Approved unanimously.

i. **Course Approvals – changes to existing and new courses**

Highlighting indicates clarification has been requested from the initiator

Code	Title	Status	Initiator	Received
AN_SCI_7979	AN_SCI_7979: Poultry Production	Edited	straucht	10/14/2022
CL_L_S_8000	CL_L_S_8000: Current Trends in Clinical Laboratory Sciences	Added	amtbvk	10/14/2022
H_D_FS_8410	H_D_FS_8410: Infancy and Childhood	Added	lestera	10/14/2022
MUS_THRY_4221	MUS_THRY_4221: Analysis and Interpretation of Music	Edited	sims	10/14/2022
MUS_THRY_4284	MUS_THRY_4284: Analytic Approaches to Contemporary Music	Edited	sims	10/14/2022
NAT_R_8800	NAT_R_8800: Stakeholder Engagement in Environmental Management and Research	Added	halldam	10/14/2022
NURSE_8010	NURSE_8010: Family Dynamics and Intervention	Edited	ekhffk	10/14/2022
NURSE_9420	NURSE_9420: Qualitative Methods	Edited	ekhffk	10/14/2022
P_HLTH_8160	P_HLTH_8160: Introduction to Public Health and Food Safety	Added	bedfordm	10/10/2022
SPC_ED_8325	SPC_ED_8325: Language and Communication in Special Education	Added	goranl	10/10/2022
SPC_ED_8440	SPC_ED_8440: Advanced Behavior Management: Applied Behavior Analysis	Edited	colleyf	10/14/2022
TR_BIOSC_8001	TR_BIOSC_8001: Topics in Translational Biosciences	Added	smithchrista	10/14/2022
TR_BIOSC_8555	TR_BIOSC_8555: Professional Skills for Translational Biosciences I	Added	parrishar	10/14/2022
TR_BIOSC_9001	TR_BIOSC_9001: Topics in Translational Bioscience	Added	smithchrista	10/10/2022

ii. Program Approvals

- a. 787: Graduate Certificate in Reproductive and Genomic Technologies for Livestock – D. Patterson
- b. 794: Graduate Certificate in Entrepreneurship and Innovation Management – D. Moesel

iii. Program Change Proposals

Code	Title	Status	Initiator	Received
787	787: Graduate Certificate in Reproductive and Genomic Technologies for Livestock	Added	pattersond	9/12/2022
235	235: EdSp in Educational Leadership and Policy Analysis	Edited	kissaneb	10/4/2022
711	711: PhD in Music Education	Edited	sims	10/4/2022

237	237: EdSp in Educational Leadership and Policy Analysis with Emphasis in PK-12 Educational Leadership and Administration, Elementary and Secondary Principal, Certification	Edited	kissaneb	10/4/2022
794	794: Graduate Certificate in Entrepreneurship and Innovation Management	Added	moeseld	10/14/2022
624	624: MS in Natural Resources with Emphasis in Parks, Recreation, Sport and Tourism	Edited	foxn	10/14/2022

b. **Awards** – Prof. Chris Daniggelis, chair

The reminder about the awards has been sent out, with a deadline the first of November. Once the nominations have been processed, they will be available in canvas to review.

c. **Policy** – Prof. Chi-Ren Shyu, chair

We have 8 senators interested in the policy subcommittee. Dr. Hart has sent items for the committee to work through. A meeting will be set shortly for the Policy subcommittee to meet.

d. **Faculty Council Representative/Member at Large** – Prof. Erin Robinson

At the last Faculty council meeting they spent the majority of time discussing the new student feedback evaluation that the center for teaching for learning is working on. A draft has been developed and they are currently testing and receiving feedback. They have done a host of listening sessions with various departments across campus.

6. Report: Graduate Professional Council – Mr. Parker Owens, GPC Representative

No report

7. Report: Graduate School – Prof. Jeni Hart, Dean of Graduate School and Vice Provost for Graduate Studies.

The Faculty Council voted to approve ADC's (Alternative digital credentials), some institutions refer to these as micro credentials or badges. These are not certificates but are worth something and for the most part they are outside the academic process although it may involve a faculty member providing the alternative digital credential. We might give an ADC to students who complete a certain number of professional development sessions in the graduate school. It is possible the ADC could translate into credit bearing and would require an approval process. So the question is how many hours of ADC's should be allowed to transfer into a degree program?

Most of you are aware of the intention that both the undergrad and graduate education are to move to a tiered tuition model. The Deans of the schools and colleges have received a preliminary assessment of what tuition level they believe each academic program should be.

The Deans are supposed to provide the feedback by the end of this week to the provost office, and fiscal office to make sure that the credit recommendations are consistent with what they were anticipating. The Deans have

already met individually, with both the Provost and the CFO to talk about what they thought would be a good level. The graduate tuition, as it has been outlined to me, is that there will be three tuition levels. Level One would be the least expensive with level three being the most expensive. The majority of graduate programs are in tier one and two with a few in tier three. The online or distance programs have also been put into a tier, unless there is a reason for them to be at a market rate.

The University will present at the Board of Curators meeting in February to determine whether or not those tiers are going to be approved.

There is not a non-resident fee included, meaning that the hope is there will be one tuition cost for all graduate students in every tier. Whether they are domestic or not domestic, whether they are Missouri residents or not. There are a few programs that do have a heavy out of State population, and there were some concerns about what that might mean for them. They're tier is then at a higher rate to accommodate for that.

I did also want to circle back around to the quarter time and fifty percent tuition scholarship conversation, and I apologize for not being there at the last meeting. I know that there were some questions raised during that meeting. Because you may have had a chance to talk with folks in your own schools and colleges since we last met, I wanted to get one last round of feedback. What kind of conversations are you having, and what concerns are being raised around the possibility of moving in this direction. We're talking about a very small number of students who are going to be in quarter time only, but there are a few,

8. Resolutions

None

9. Adjournment

1:33pm

787: GRADUATE CERTIFICATE IN REPRODUCTIVE AND GENOMIC TECHNOLOGIES FOR LIVESTOCK

In Workflow

1. Form Check (whitneycm@missouri.edu)
2. AN_SCI Chair (wiegandb@missouri.edu)
3. CIP Code Rvw (eimersm@missouri.edu)
4. CAFNR CC Vote (lupoa@missouri.edu; choseo@missouri.edu; nilonc@missouri.edu; clarkea@missouri.edu; upahj@missouri.edu; tummonsj@missouri.edu; straucht@missouri.edu; freyermuths@missouri.edu; petersonca@missouri.edu; dfinke@missouri.edu; shannond@missouri.edu; yaor@missouri.edu; sveumm@missouri.edu)
5. CAFNR CC Chair (lupoa@missouri.edu)
6. CAFNR Dean (gartonb@missouri.edu)
7. Workflow Rvw (whitneycm@missouri.edu)
8. CAFNR Dean (gartonb@missouri.edu)
9. VET M Dean (cohn1@missouri.edu)
10. AAC-GFS Vote (zapatam@missouri.edu; fidalgom@missouri.edu; henselbk@health.missouri.edu; wma@missouri.edu; mogettam@missouri.edu; neumans@missouri.edu)
11. AAC-GFS Chair (zapatam@missouri.edu)
12. GFS Pres (butlermd@missouri.edu)
13. Grad Dean Rvw (hartjl@missouri.edu)
14. Provost (socaridesa@umsystem.edu; bearyj@missouri.edu)
15. UM (schaffin@umsystem.edu; zlkhd4@missouri.edu)
16. MDHE/CBHE (schaffin@umsystem.edu; zlkhd4@missouri.edu)
17. SAR (kochra@missouri.edu)
18. IR (urbank@missouri.edu)
19. OUR catalog (muregistrarcatalog@missouri.edu)

Approval Path

1. Tue, 20 Jul 2021 13:25:25 GMT
Carla Whitney (whitneycm): Approved for Form Check
2. Fri, 10 Dec 2021 19:33:15 GMT
Bryon Wiegand (wiegandb): Approved for AN_SCI Chair
3. Wed, 22 Dec 2021 21:45:33 GMT
Mardy Eimers (eimersm): Approved for CIP Code Rvw
4. Thu, 21 Apr 2022 13:31:37 GMT
9/13 votes cast.
Yes: 78% No:
22%
Donald Shannon (shannond): Approved for CAFNR CC Vote
5. Thu, 21 Apr 2022 21:02:47 GMT
Anthony Lupo (lupoa): Approved for CAFNR CC Chair
6. Mon, 25 Apr 2022 17:34:08 GMT
Bryan Garton (gartonb): Approved for CAFNR Dean
7. Mon, 25 Apr 2022 18:21:10 GMT
Carla Whitney (whitneycm): Approved for Workflow Rvw
8. Mon, 25 Apr 2022 18:48:31 GMT
Bryan Garton (gartonb): Approved for CAFNR Dean
9. Wed, 01 Jun 2022 19:16:04 GMT
Leah Cohn (cohn1): Approved for VET M Dean
10. Mon, 12 Sep 2022 18:37:05 GMT
4/7 votes cast.
Yes: 100% No:
0%
Brian Hensel (henselbk): Approved for AAC-GFS Vote
11. Mon, 12 Sep 2022 21:44:41 GMT
Maria Hampton (zapatam): Approved for AAC-GFS Chair

New Program Proposal

Date Submitted: Tue, 13 Jul 2021 02:11:45 GMT

Viewing: Graduate Certificate in Reproductive and Genomic Technologies for Livestock**Last edit: Tue, 13 Jul 2021 02:11:44 GMT**

Changes proposed by: pattersond

Contact Information:**Proposer User ID:**

pattersond

First Name:

David

Last Name:

Patterson

E-mail:

pattersond@missouri.edu

Phone:

573/882-7519

Department:

Animal Science

Primary Contact: The Primary Contact should be an individual who was integrally involved in the writing of this proposal, and will be able to answer questions regarding its content. Are you the Primary Contact for this proposal, or are you submitting this proposal on behalf of another individual/group?

I am the Primary Contact

Collaborating Writers: Are there any other individuals from MU who were integrally involved in the writing of this proposal?

Yes

Contact Information for Collaborating Writer(s): Enter the User ID(s) of the collaborating writer(s). Use the green plus sign to add rows as needed.

User ID	First Name	Last Name	Email	Phone	Department
payneca	Craig	Payne	payneca@missouri.edu	573/882-7848	Dean of Agriculture
lambersonw	William	Lamberson	lambersonw@misso	573/882-8234	Dean of Agriculture

Program Characteristics:**Campus:**

University of Missouri - Columbia

Type of Program:

Certificate

Specify program level:

Graduate

Program Title: List the exact name of the program. If a degree, include the abbreviation for the degree (i.e. BA, BS, MS, PhD). If a minor, graduate minor, certificate or graduate certificate, include this first in the program title. If an emphasis, first list the parent degree title (i.e. BA in Undergraduate Studies), followed by "with Emphasis in", followed by the emphasis title.

How it is listed here is what will display on the transcript (and diploma if a degree).

Program Title:

Graduate Certificate in Reproductive and Genomic Technologies for Livestock

College(s) or School(s) offering the program: Select the college or school offering the program. If more than one, use the green plus sign to add rows for listing additional colleges, and use the green arrows to list the primary unit at the top.

College

Unit(s) offering the program: Select the unit offering the program. If more than one, use the green plus sign to add rows for listing additional units, and use the green arrows to list the primary unit at the top. Only units currently offering programs are in the list. See the blue help bubble for instructions if unit is not listed.

Units (Departments, Divisions, etc.)

1 Animal Sciences

Eligible students:

Any person, open to non-degree seeking and degree-seeking students (free standing certificate program)

Total credits required for graduation/completion:

12

Mode of Program Delivery: Select the option below which best fits the program.

Blended Program – A portion of the program requirements must be completed online, and a portion must be completed face-to-face. Sometimes called a hybrid program.

Delivery Site(s): Select the option below which best describes the physical locations where the program will be delivered. This would include face-to-face sites or sites for receiving remote delivery. This would not include online delivery.

MU Campus

CIP Code: Use the "Find" link to search the government database for applicable CIP Code.

01.0999 - Animal Sciences, Other.

Term Start: Estimate the first term students will enroll.

Fall 2022

Term Graduate: Estimate the first term students will graduate.

Fall 2023

Program Director: Enter the User ID of the program director responsible for the student support services.

Program Director User ID:

pattersond

Program Director Name:

David Patterson

Academic Advisor(s): Enter the User ID(s) of the academic advisor(s) responsible for advising students in this program. Use the green plus sign to add rows as needed.

User ID	Name
pattersond	David Patterson
wneca	Craig Payne

Advisory Committee: Provide the information requested for the member(s) of the advisory committee for this program. Committee members may include representation from the professional, business or government sectors which the program is designed to serve. Use the green plus sign to add rows as needed.

Name	Title	Affiliation
Neal Martin	MS, DVM - Veterinary Practitioner	Alumnus
Brianne Bishop	MS, DVM - Veterinary Practitioner	Alumnus
Kent Haden	DVM - State Representative	Alumnus
Robert Youngquist	DVM - Emeritus Faculty Member	University of Missouri
Kirk Gray	MS, DVM - Veterinary Practitioner	Outside Graduate Faculty Member
Laurie Wallace	DVM - College of Veterinary Medicine Faculty	University of Missouri
Jason Osterstock	DVM, PhD, Vice President, Global Genetics	Zoetis, Inc.
Dan Busch	Beef Reproduction and Research Specialist,	Alumnus
Mike Deering	Executive Vice President, Missouri Cattlemen's	Alumnus

Participating Faculty: Enter the User ID(s) of the faculty member(s) participating in this academic program. Use the green plus sign to add rows as needed.

User ID	Name
ortegaobandom	Martha Ortega Obando
igub	Bhanu Telugu
payneca	Craig Payne
icks	Scott Pock
thomasjor	Jordan Thomas
ithmf	Michael Smith
deckerje	Jared Decker
ibersonw	William Lamberson
schnabelr	Robert Schnabel
sa	Sarah Low
pattersond	David Patterson
wndo	Douglas Brown

Additional Student Support Services: Describe any additional advising and support services that will be provided to students in this program.

Advising and student support will be active and on-going. Students will be mentored based on their discipline of interest, and supported in establishing contacts and networking channels within the various allied industries.

Fit with University Mission and Other Academic Programs:

Alignment:

Alignment with Campus Strategic Plan: Explain how the program aligns with campus goals and priorities as stated in the Campus Strategic Plan (refer to blue help bubble), as well as college and department goals.

The proposed Graduate Certificate entitled "Reproductive and Genomic Technologies for Livestock" aligns with goals and priorities outlined in the Campus Strategic Plan, in addition to meeting the goals of the Division of Animal Sciences and College of Agriculture, Food, and Natural Resources.

> Student Success - The certificate program aims to address an existing information deficit by providing advanced reproductive and genomic training to animal science graduate students, post-baccalaureate students, veterinary students and professionals. Animal science graduates serve as extension specialists, AI and pharmaceutical industry representatives, industry consultants, or enter the production sector, serving as important sources of information for US beef producers. In addition, veterinarians are often cited as the key information source for US beef producers and are essential in facilitating adoption of various reproductive and genomic technologies. Veterinary students however have limited exposure to these disciplines during their education and are not adequately equipped to provide information or services related to reproduction and genomics early in their career. Without these additional

services, early career veterinarians may lose clients and slow the rate of technology adoption. This suggests that veterinarians must be trained to provide additional services beyond traditional health related services. Currently, no other institutions are offering a certificate program in bovine reproductive and genomic technology (Burning Glass Labor Insights, July 2019). Offerings in farm and ranch management, including one regional competitor are available but they do not meet the specialized needs of students and professionals aiming to provide value-added reproductive and genomic services.

>Research and Creative Works - The Animal Reproductive Biology at the University of Missouri is currently ranked first globally for research in Animal Reproduction, and in addition the Division of Animal Sciences maintains a highly ranked program in animal genetics and genomics. The demonstrated record of accomplishment in these two disciplines supports creation of a graduate certificate program that meets the needs outlined above.

- >Engagement and Outreach - MU is a national leader in outreach and engagement evidenced by the long standing success of the Missouri Show-Me-Select Replacement Heifer Program and the Division of Animal Sciences' success in securing funding from USDA- NIFA's integrated grant program areas.
- >Inclusive Excellence - Diversity, inclusion and equity are reflected in MU's Division of Animal Sciences not only by current and past students enrolled in the Division, but in addition evidenced by the diversity of our outstanding faculty.
- >Planning, Operations, and Stewardship - The Graduate Certificate outlined in this proposal supports the Land Grant Mission and demonstrates the Division of Animal Sciences' commitment to stakeholders in need of information that will be used to support their livelihoods and individuals they serve.

Duplication within the state:

Potential Duplications at MU or within UM: Does a similar program exist at MU or at another UM System school?

No

Market Analysis - Need/Demand:

Market Analysis – Need for Program:

Market Demand: Based on national, regional, state, or local market demand, justify the need for graduates of this program. Provide convincing data from sources such as MERIC or Bureau of Labor Statistics.

The graduate certificate program, "Reproductive and Genomic Technologies in Livestock" aims to address an existing information deficit by providing advanced reproductive and genomic training to animal science graduate students, post-baccalaureate students, veterinary students and professionals. Animal science graduates serve as extension specialists, AI and pharmaceutical industry representatives, industry consultants, or enter the production sector, serving as important sources of information for US beef producers. In addition, veterinarians are often cited as the key information source for US beef producers and are essential in facilitating adoption of various reproductive and genomic technologies. Veterinary students however have limited exposure to these disciplines during their education and are not adequately equipped to provide information or services related to reproduction and genomics early in their career. Without these additional services, early career veterinarians may lose clients and slow the rate of technology adoption. This suggests that veterinarians must be trained to provide additional services beyond traditional health related services (Hilton, 2018). Currently, no other institutions are offering a certificate program in bovine reproductive and genomic

technology (Burning Glass Labor Insights). Offerings in farm and ranch management, including one regional competitor are available but they do not meet the specialized needs of students and professionals aiming to provide value-added reproductive and genomic services.

Meeting Missouri's Needs: Explain how the program will help meet Missouri's academic, economic and societal needs.

The beef cattle industry is a mainstay of US agriculture. Cash receipts from cattle represent 19% of total farm receipts and 40% of livestock and product receipts. Cash receipts from cattle are spread broadly across the US in contrast to swine and dairy, which are concentrated into a small number of animal owners and states. Beef production in Missouri contributes \$2B annually to the state's economy, and Missouri ranks third in the nation in the total number of beef cows. Reproductive performance is the single most important economic trait in a beef cow herd with most reproductive loss occurring because heifers and cows fail to become pregnant. There remains considerable scope for improvement in beef cattle productivity. One of the overarching approaches to improve the efficiency and sustainability of beef cattle production is to maximize the number of productive offspring per breeding male and female, in conjunction with concomitant improvements in the genetic merit of the produced offspring. Recent and ongoing advances in reproductive and genomic research have created opportunities for beef producers to make rapid gains in production efficiencies.

These advances highlight the need for advanced course offerings that facilitate improvements in these discipline areas at the farm/ ranch level. Additionally, the Strategic Plan for the Missouri Cattlemen's Association highlights not only the need for improvements in these areas, but emphasizes the importance of efforts to enhance educational efforts in these two discipline areas.

Student Enrollment Projections: Estimate the total student enrollment in the program for the fall semester for the first five years.

Year	1	2	3	4	5
Total	10	20	30	40	50

Student Enrollment Projections - New to MU: Estimate the total enrollment of students new to MU in the fall semester for the first five years.

Year	1	2	3	4	5
Total	10	20	30	40	50

Market Analysis – Student Demand for Program:**Student Demand: Describe the evidence of sufficient student demand to support a viable program. The demand must be sufficient to project fiscal and academic viability within five years of the start of the program.**

As research has led to the development of more sophisticated and complex reproductive and genomic technologies that fewer people understand or perhaps even trust, the need for highly trained professionals is increasing. The limited adoption of existing and emerging reproductive technologies [e.g., reproductive tract scoring, estrous synchronization, fixed-time artificial insemination (AI), split-time AI, sex-sorted semen, reproductive ultrasound, fetal aging and sexing] by many beef enterprises will preclude these enterprises from reaching their economic potential and place them at a competitive disadvantage relative to enterprises that aggressively and successfully implement their use.

Although Extension is charged with the mission of transferring information to the agricultural industries, the US is ill equipped to transfer new and emerging technologies in reproduction and genomics to our nation's beef herds. Currently, only 12 of our nation's land grant institutions employ state extension beef specialists in reproduction, and there are only seven specialists in the area of beef cattle genetics/genomics. National educational programs that target both students and professionals will provide the infrastructure by which change can occur.

For these reasons, the certificate program aims to address this information deficit by providing advanced reproductive and genomic training to animal science graduate students, post-baccalaureate students, veterinary students and professionals. Animal science graduates serve as extension specialists, AI and pharmaceutical industry representatives, industry consultants, or enter the production sector, serving as important sources of information for US beef producers. In addition, veterinarians are often cited as the key information source for US beef producers and are essential in facilitating adoption of various reproductive and genomic technologies. Veterinary students however have limited exposure to these disciplines during their education and are not adequately equipped to provide information or services related to reproduction and genomics early in their career. Without these additional services, early career veterinarians may lose clients and slow the rate of technology adoption. This suggests that veterinarians must be trained to provide additional services beyond traditional health related services.

Currently, no other institutions are offering a certificate program in bovine reproductive and genomic technology (Burning Glass Labor Insights). Offerings in farm and ranch management, including one regional competitor are available but they do not meet the specialized needs of students and professionals aiming to provide value-added reproductive and genomic services. Opportunities for individuals with an animal science degree have changed markedly in allied industry (AI companies and genetics providers, pharmaceutical houses, and individual farms and ranches) with the advent of fixed-time artificial insemination, sex-sorted semen, and genomic technology. Although these collective advances in reproductive and genetic management of beef herds are now available, the industry lacks the training capacity to equip industry partners with the background and skills to effectively implement new technologies in the field. The F.B. Miller Internship in Reproductive Management at MU has been a model in providing Animal Science students: 1) with practical training in the development and execution of estrous synchronization and AI programs; 2) extensive hands-on experience in estrous synchronization, estrus detection, semen handling, and AI; in addition to training related to advances in genetic technologies and the way in which the two discipline areas (reproduction and genomics) are able to accelerate improvements in beef herds that successfully adopt their use. Participation in the internship by these students has fostered a greater appreciation of beef cattle reproductive and genetic management, created links for students with allied industries, and expanded career opportunities following

graduation. Many of these students are now gainfully employed in allied industries or have returned to farms and ranches expanding use of these technologies in the field.

In addition, veterinarians have long played an important role in the reproductive management of dairy herds across the US, however, in many cases, practitioners have had only limited involvement in the reproductive and genetic management of beef herds. The reasons for this vary, however there are numerous ways in which practitioners are now able to become more actively involved in the reproductive management of our nation's beef herds. The Missouri Show-Me-Select® Replacement Heifer Program changed the way that veterinarians assist beef producers with heifer development programs in areas related to reproductive health and management. Veterinarians involved with the Show-Me-Select® Program are more actively involved with participating farms, and have seen an increase in demand for more specialized services, including ultrasound for early pregnancy diagnosis, fetal aging and fetal sexing. In addition, some practitioners have begun offering expanded services that include estrous synchronization and artificial insemination (AI). As value-added programs gain momentum in the industry, the differentiation of AI-sired from natural-service sired calves, and determination of fetal sex will become more common and perhaps even expected. Practitioners will also be expected to have a working understanding of new and emerging genomic technologies to support their industry clients. These technologies accelerate the rate of genetic improvement within beef herds and change the way that beef producers embrace technology adoption.

Collectively, enrollment in the certificate program from the various audiences listed above provide a robust sampling of the potential for this program. No other programs, similar to the one outlined in this proposal, are currently available to provide training in these areas, but in addition, few if any other institutions have the critical mass to support such an undertaking.

Financial Projections:

Resources: Describe the resources necessary to launch and support the program, including estimates of instructional costs, student advising, support staff, space, library resources, equipment, etc:

Human and facilities resources are currently in place and available to launch and support this program. Tuition Fees are currently set as follows: Resident - \$394.90 per credit hour; Non-Resident - \$920.40 per credit hour (\$394.90 tuition + \$686.20 non-resident fee). Practicum fees will be assessed at a rate of \$500.00 per credit hour.

New Revenue: Describe the new revenue to be generated from program enrollment by students NEW TO MU, including any new or additional fees to be collected:

Given the fact the Graduate Certificate program would be a new offering from the Division of Animal Sciences, student enrollment in the program would reflect a flow of new dollars to the institution. Tuition Fees are currently set as follows: Resident - \$394.90 per credit hour; Non-Resident - \$920.40 per credit hour (\$394.90 tuition + \$686.20 non-resident fee). Practicum fees will be assessed at a rate of \$500.00 per credit hour.

Business and Marketing Plan - Recruiting and Retaining Students:

Marketing Strategy: How will the program be marketed to attract new students to it?

The graduate certificate program, Reproductive and Genomic Technologies for Livestock, is designed to support creation of a new operational model to transfer complex technologies in reproduction and genomics to U.S. livestock producers. The graduate certificate program will support the unmet need for advanced training in these disciplines for students and industry professionals. The program will be an avenue for students from the University of Missouri and beyond to receive training that is otherwise unavailable.

The certificate can stand-alone or may be earned as part of an approved animal science or veterinary training program. For example: A student enrolled in an accredited College of Veterinary Medicine could earn a graduate certificate as part of their elective curriculum, in addition to graduate students in Animal Science programs at other Universities.

The certificate program will be administered through the Division of Animal Sciences with an initial focus on beef cattle. The intent is to provide further training and expertise in the area of beef cattle reproduction and genomics for animal science graduate students, post-baccalaureate students, veterinary students and professionals. This certificate program will be supported through the National Center for Applied Reproduction and Genomics (NCARG). The center is a USDA-funded initiative stemming from a partnership between the MU College of Agriculture, Food, and Natural Resources and the MU College of Veterinary Medicine. The primary mission

of NCARG is to accelerate the adoption of profitable reproductive and genomic technologies in the livestock industry. NCARG is uniquely positioned to support execution of the graduate certificate program given its nationwide mission and scope, expertise of participating faculty and professionals, and support from professional veterinary organizations, including the American Veterinary Medical Association (AVMA), Academy of Veterinary Consultants (AVC), and the American Association of Bovine Practitioners (AABP), as well as a wide range of industry partners.

Projected program growth: Project how the program will grow over time and how marketing will change as the program grows.

Currently graduate certificate programs of this kind are not available. Given the number of Animal Science departments and Colleges of Veterinary Medicine across the U.S., we anticipate significant interest and ongoing growth of the program over time.

Retaining Students: Describe the plans to retain students through graduation.

We do not envision problems in retaining students through completion of the Certificate program. Opportunities for individuals with an animal science degree have changed markedly in allied industry (AI companies, pharmaceutical houses, and individual farms and ranches) with the advent of fixed-time artificial insemination, sex-sorted semen, and genomic technology. Although these collective advances in reproductive and genetic management of beef herds are now available, the industry lacks the training capacity to equip industry partners with the background and skills to effectively implement new technologies in the field. For these reasons, the program is anticipated to see continued growth over time.

Achieving Enrollment Outcomes: Describe the plans to ensure program enrollment outcomes are achieved.

Efforts to ensure program enrollment outcomes are achieved will occur in a number of ways. The certificate program will be advertised through the website for the National Center for Applied Reproduction and Genomics, in addition to other social media outlets. Plans include advertising the certificate program through the American Society of Animal Science, in addition to American Association of Bovine Practitioners, Academy for Veterinary Consultants, the American Embryo Transfer Society, all of the major U.S. beef breed associations, the major pharmaceutical houses, and the major artificial insemination (genetics providers) companies headquartered in the U.S.

Exit Strategy: Provide information regarding the steps the department/academic unit will take if the program underperforms expectations. At what point would the academic unit believe the program needs to be put on hiatus or discontinued?

In the event the program underperforms, a working plan will be developed and implemented in an attempt to increase enrollment. However, in the event these efforts are not successful, a collective decision would be made among participating faculty and administration to discontinue the program until a more viable working alternative is developed.

Program Goals and Objectives:

Program Goals and Objectives: Briefly describe the goals and objectives of the program.

The graduate certificate program, Reproductive and Genomic Technologies for Livestock, is designed to support creation of a new operational model to transfer complex technologies in reproduction and genomics to U.S. livestock producers. The graduate certificate program will support the unmet need for advanced training in these disciplines for students and industry professionals. The program will be an avenue for students from the University of Missouri and beyond to receive training that is otherwise unavailable. The certificate program aims to address this information deficit by providing advanced reproductive and genomic training to animal science graduate students, post-baccalaureate students, veterinary students and professionals. Animal science graduates serve as extension specialists, AI and pharmaceutical industry representatives, industry consultants, or enter the production sector, serving as important sources of information for US beef producers.

Overall Description of Student Learning Objectives: Provide any overall descriptive information regarding the student learning objectives for this program.

As research has led to the development of more sophisticated and complex reproductive and genomic technologies that fewer people understand or perhaps even trust, the need for highly trained professionals is increasing. The limited adoption of existing and emerging reproductive technologies [e.g., reproductive tract scoring, estrous synchronization, fixed-time artificial insemination (AI), split-time AI, sex-sorted semen, reproductive ultrasound, fetal

aging and sexing] by many beef enterprises will preclude these enterprises from reaching their economic potential and place them at a competitive disadvantage relative to enterprises that aggressively and successfully implement their use.

Listing of Student Learning Objectives: Include clearly stated student learning objectives for the program, indicating what students will know (concepts, terminology, methods, history, etc) and what students will be able to do when they complete the program. These should be broad enough to encompass all of the knowledge acquired during the course of study yet specific enough, using active verbs, to communicate clearly to students, parents and other stakeholders what students will know and be able to do. Most programs identify 6-10 student learning objectives. Refer to the blue help bubble for examples or additional assistance.

Provide a minimum of six student learning objectives in the table below. Use the green plus sign to add rows as needed.

Student Learning Objectives	
-----------------------------	--

- | | |
|---|---|
| 1 | Understand the physiological principles and fundamentals of bovine reproduction.
Develop a working understanding of the various applications of reproductive technologies. |
| 3 | Develop a working understanding of applied livestock genetics. |

- | | |
|---|--|
| 4 | Develop an understanding and appreciation for genomics and how the technology may be used to accelerate genetic change. |
| 5 | Develop an understanding of ways in which reproductive and genomic technologies may be |
| 6 | Acquire skills related to various reproductive procedures including: prebreeding evaluations of heifers, pregnancy diagnoses including fetal aging and sexing, in vitro fertilization and embryo transfer, advanced genomic applications, and next-generation breeding technologies.
used to more effectively market livestock. |

Program Curriculum:

Program Structure

General description: Provide a general description of the structure of the curriculum plan, such as the overall number of credit hours required, general areas of study, planned academic activities, etc. If the program has an online option, explain if instruction is delivered in an asynchronous format, a synchronous format, or both.

To complete this certificate program, students must complete 12 course hours from the listing below. Coursework can be completed in 36 weeks, and must be completed within 5 years after the student is accepted into the program. No grade lower than a C will be accepted toward certificate completion. Practicum courses will consist of online and in-person instruction whereas all other courses will be on-line exclusively. The online nature of these courses facilitates completion of many of the requirements for the certificate program to be completed off campus making the program more attractive to a broader audience, including students attending minority-serving institutions and working professionals.

Program Requirements: Describe all requirements for the program. This content will be displayed in the Program Requirements area of the online University Catalog.

Program Requirements:

Course work list, noting required versus elective courses and minimum credit hours needed

To complete this certificate program, students must complete 12 course hours from the listing below. Coursework can be completed in 36 weeks, and must be completed within 5 years after the student is accepted into the program. No grade lower than a C will be accepted toward certificate completion. Practicum courses will consist of online and in-person instruction whereas all other courses will be on-line exclusively. The online nature of these courses facilitates completion of many of the requirements for the certificate program to be completed off campus making the program more attractive to a broader audience, including students attending minority-serving institutions and working professionals.

All required*

ANSCI_7904: Physiological Principles and Fundamentals of Bovine Reproduction (2 credits, F & S) ANSCI_7914: Applications of Reproductive Technologies (2 credits, F; prerequisite 7904)
ANSCI_7903: Applied Livestock Genetics (2 credits, S)
ANSCI_7913: Introduction to Genomics (1 credit, S; prerequisite 7903)
ANSCI_7905: Marketing & Advocating Reproductive and Genomic Services (1 credit, F)

Select four (4):

- 1) ANSCI_7/8XXX: Estrus Synchronization & AI Practicum (1 credit, F & S; prerequisite 7914)
- 2) ANSCI_7/8XXX: Prebreeding Evaluation of Heifers & Bulls Practicum (1 credit, F & S; prerequisite 7914)
- 3) ANSCI_7/8XXX: Pregnancy Diagnosis Practicum (1 credit, F & S; prerequisite 7914)
- 4) ANSCI_8XXX: In-Vitro Fertilization and Embryo Transfer Practicum (1 credit, F & S)
- 5) ANSCI_8XXX: Advanced Genomic Applications (1 credit, S; prerequisite 7913)
- 6) ANSCI_8XXX: Next-generation Breeding Technologies (1 credit, prerequisite 7914) (Course numbers are placeholders until final approval.)

Sample plan of study:

FALL 2022

ANSCI_7904: Physiological Principles and Fundamentals of Bovine Reproduction (2 credits, F & S) ANSCI_7914: Applications of Reproductive Technologies (2 credits, F; prerequisite 7904)
ANSCI_7905: Marketing & Advocating Reproductive and Genomic Services (1 credit, F)

SPRING 2023

ANSCI_7903: Applied Livestock Genetics (2 credits, S)
ANSCI_7913: Introduction to Genomics (1 credit, S; prerequisite 7903)
ANSCI_7/8XXX: Estrus Synchronization & AI Practicum (1 credit, F & S; prerequisite 7914)

FALL 2023

ANSCI_7/8XXX: Pregnancy Diagnosis Practicum (1 credit, F & S; prerequisite 7914) ANSCI_8XXX: In-Vitro Fertilization and Embryo Transfer Practicum (1 credit, F & S) ANSCI_8XXX: Advanced Genomic Applications (1 credit, S; prerequisite 7913)

Courses outside your School/College: Outside of general education requirements or electives, indicate all of the schools and colleges from which you are including one or more of their courses as a required course for your program.

Agriculture, Food & Natural
Resources Veterinary
Medicine

Additional Faculty: For each level of expertise, provide the number of additional faculty that will be needed to deliver the program. If none, indicate 0.

Level	Number
Tenure Track	0
Non-Tenure Track	0
Post-Doc Fellows	0
Grad Tchng/Research Asst	2
Adjunct	5

Accreditation:

Plans to apply: Do you plan to apply for program specific accreditation?

No

Provide brief explanation:

At this point no plans are made to seek any form of specific accreditation per requests from the Division of Animal Sciences Academic Affairs and Graduate Committees.

Gainful Employment:

Certificate web site:

National Center for Applied Reproduction and Genomics (in development)

Tuition for program: Based on current tuition rates, calculate the total tuition for completing this program within normal time.

\$5240

Associated fees: Based on current fee rates, calculate the total fees for completing this program within normal time.

\$500

Books and supplies: Based on current costs, calculate the total typical costs for books and supplies for completing this program within normal time.

\$500

Related occupational titles and codes: As part of the federal disclosure, MU is required to report prospective occupations for certificate holders. Titles can be found in the US Department of Labor's database, O*Net Online at <http://www.onetonline.org>. Click Find Occupations. Type a keyword into the search box. Click go. Scan the list for feasible titles. Click on a title to review its summary. If it matches the certificate, copy the job title, occupational code, and URL into the table below.

Provide at least 10 occupations. Use the green plus sign to add rows as needed.

Job Title	Occupational Code	URL for Summary Page
Farm Labor Contractors	13-1074.00	Agribusiness Systems
Farmers, Ranchers, and Other Agricultural Managers	11-9013.00	Agribusiness Systems
Animal Breeders	45-2021.00	Animal Systems
Animal Caretakers	39-2021.00	Animal Systems
Animal Scientists	19-1011.00	Animal Systems
Veterinarians	29-1131.00	Veterinary
Veterinary Technologists and Technicians	29-2056.00	Veterinary
Agricultural Technicians	19-4012.00	Veterinary
Veterinary Assistants and Laboratory Animal	31-9096.00	Veterinary
Animals		
Farmworkers, Farm, Ranch, and Aquacultural	45-2093.00	Agribusiness Systems

Car

Catalog Information:

Information provided in this section is used to automatically populate program information in the online university catalog when published each year in June.

Program Description: In one short but thorough paragraph, describe the program. This official description will be included in the online university catalog and other initiatives supporting student success. The description should include the following three elements: 1) general description of the academic subject area, explaining the area, how it is relevant today, and interest areas that would draw a person to the program; 2) highlights of the program, including descriptions of core and advanced areas of study, special activities within the program such as internships, hands-on learning, research, field operations, study abroad, mentoring, shadowing, etc; 3) careers and opportunities associated with the program, discussing typical professions and work settings, additional educational opportunities, and top prospects in employment.

The graduate certificate program, Reproductive and Genomic Technologies for Livestock, is designed to support creation of a new operational model to transfer complex technologies in reproduction and genomics to U.S. livestock producers. The graduate certificate program will support the unmet need for advanced training in these disciplines for students and industry professionals. The program will be an avenue for students from the University of Missouri and beyond to receive training that is otherwise unavailable. The certificate can stand-alone or may be earned as part of an approved animal science or veterinary training program. For example: A student enrolled in an accredited College of Veterinary Medicine could earn a graduate certificate as part of their elective curriculum, in addition to graduate students in Animal Science programs at other Universities. The certificate program will be administered through the Division of Animal Sciences with an initial focus on beef cattle. The intent is to provide further training and expertise in the area of beef cattle reproduction and genomics for animal science graduate students, post-baccalaureate students, veterinary students and professionals. This certificate program will be supported through the National Center for Applied Reproduction and Genomics (NCARG). The center is a USDA-funded initiative stemming from a partnership between the MU College of Agriculture, Food, and Natural Resources and the MU College of Veterinary Medicine. The primary mission of NCARG is to accelerate the adoption of profitable reproductive and genomic technologies in the livestock industry.

Key: 787

1. Form Check (whitneycm@missouri.edu)
2. MANGMT Chair (anthonyross@missouri.edu)
3. CIP Code Rvw (eimersm@missouri.edu)
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13. SAR (kochra@missouri.edu)
14. IR (urbank@missouri.edu)
15. OUR catalog (muregistrarcatalog@missouri.edu)

Approval Path

1. Fri, 06 May 2022 13:40:17 GMT
Lori Hartman (hartmanl): Approved for Form Check
2. Fri, 06 May 2022 16:39:49 GMT
Anthony Ross (anthonyross): Approved for MANGMT Chair
3. Mon, 09 May 2022 21:46:02 GMT
Mardy Eimers (eimersm): Approved for CIP Code Rvw
4. Tue, 10 May 2022 00:31:43 GMT
Joyce Albright (albrightj): Approved for BUS Dean Grad
5. Mon, 16 May 2022 18:44:01 GMT
Carla Whitney (whitneycm): Approved for Workflow Rvw
6. Tue, 11 Oct 2022 15:35:58 GMT

4/6 votes cast.

Yes: 100% No:

0%

Maria Fidalgo (fidalgom): Approved for AAC-GFS Vote

7. Fri, 14 Oct 2022 15:54:53 GMT

Maria Hampton (zapatam): Approved for AAC-GFS Chair

New Program Proposal

Date Submitted: Sat, 30 Apr 2022 00:55:50 GMT

Viewing: Graduate Certificate in Entrepreneurship and Innovation Management Last edit: Fri, 06 May 2022 13:39:53 GMT

Changes proposed by: moeseld

Contact Information:

Proposer User ID:

moeseld

First

Name:

Douglas

Last

Name:

Moesel

E-mail:

moesel@missouri.edu

Phone:
573/489-7165

Department:
Management

Primary Contact: The Primary Contact should be an individual who was integrally involved in the writing of this proposal, and will be able to answer questions regarding its content. Are you the Primary Contact for this proposal, or are you submitting this proposal on behalf of another individual/group?

I am the Primary Contact

Collaborating Writers: Are there any other individuals from MU who were integrally involved in the writing of this proposal?

No

Program Characteristics:

Campus:
University of Missouri - Columbia

Type of Program:
Certificate

Specify program level:
Graduate

Program Title: List the exact name of the program. If a degree, include the abbreviation for the degree (i.e. BA, BS, MS, PhD). If a minor, graduate minor, certificate or graduate certificate, include this first in the program title. If an emphasis, first list the parent degree title (i.e. BA in Undergraduate Studies), followed by "with Emphasis in", followed by the emphasis title.

How it is listed here is what will display on the transcript (and diploma if a degree).

Program Title:
Graduate Certificate in Entrepreneurship and Innovation Management

College(s) or School(s) offering the program: Select the college or school offering the program. If more than one, use the green plus sign to add rows for listing additional colleges, and use the green arrows to list the primary unit at the top.

College

1 Business

Unit(s) offering the program: Select the unit offering the program. If more than one, use the green plus sign to add rows for listing additional units, and use the green arrows to list the primary unit at the top. Only units currently offering programs are in the list. See the blue help bubble for instructions if unit is not listed.

Units (Departments, Divisions, etc.)

1 Management

Eligible students:
Any person, open to non-degree seeking and degree-seeking students (free standing certificate program)

Total credits required for graduation/completion:
12

Mode of Program Delivery: Select the option below which best fits the program.

E-Learning Program – 100% of the program requirements are completed online. May have proctored exams for courses.

CIP Code: Use the "Find" link to search the government database for applicable CIP Code.

52.0701 - Entrepreneurship/Entrepreneurial Studies.

Term Start: Estimate the first term students will enroll.

Fall 2023

Term Graduate: Estimate the first term students will graduate.

Spring 2024

for success as global citizens, business leaders, scholars, innovators and entrepreneurs."

Trulaske College of Business Six Strategic Priorities include: "infusing an entrepreneurial mindset ... (and) Applying business principles to education opens new opportunities for innovative ideas, industry partnerships and collaborations across campus."

The MU Management Department Website begins with: "The Management Department prepares students to be leaders in innovative, entrepreneurial and technology settings that includes large established firms, small and medium sized growth businesses, and entrepreneurial startups."

Department Strategic Priority:

MU Department of Management houses both the Center for Entrepreneurship and Innovation and the department undergraduate minor in Entrepreneurship and Innovation Management. Both serve the entire MU campus.

Duplication within the state:

Potential Duplications at MU or within UM: Does a similar program exist at MU or at another UM System school?

Yes

Similar MU/UM Program Name: List the name and campus of the similar program.

- 1) Graduate Certificate in "Entrepreneurship and Technological Innovation" in Business and Information Technology Department at MS&T.
- 2) "Graduate Certificate in Entrepreneurship" in College of Business and College of Education at UMSL
- 3) "Graduate Certificate in Life Science Innovation and Entrepreneurship" in College of Business, College of Engineering, and Medical School at MU
- 4) "Master of Science Program in Real Estate Entrepreneurship" in Bloch School of Management.

Rationale: Describe the areas of duplication, the rationale for proposing a program similar to one at MU/UM, and any potential impact on the related program.

- 1) MS&T Graduate Certificate also requires 12 CH including two required classes and choice of two elective courses from a list of 8 other courses. The existing certificate has more of a marketing and global focus (international marketing is a required course and digital marketing and customer focus and satisfaction are two elective courses) in comparison to the greater focus on management in the proposed certificate. The elective courses in the existing certificate are also geared more toward mobile and digital technologies, reflecting core strengths of Missouri S&T, whereas the current proposal is more geared toward specific innovation and consulting activities in the management of key sectors (like commercialization of life science research, consulting with local small business entrepreneurs, etc.), reflecting key strengths of MU. The existing certificate segregates project management into a separate certificate while the proposed certificate includes agile project management as a key skill embedded in the management of entrepreneurship and innovation. It is not clear which of the courses in the existing certificate program are offered as fully online, asynchronous courses whereas all the courses in the proposed certificate are. It is possible that this proposed certificate might attract some of the same applicants that might be attracted to the existing certificate program. The existing program is more likely to attract those with an engineering background whereas the proposed certificate is more likely to attract those with a business background or non-technical background.
- 2) UMSL Graduate Certificate requires 12 CH including choice of two of four "required" courses. Two of the four courses are taken in Education rather than in Business but these courses can be avoided by taking the other two "Required courses." There are three tracks of which the "social track" is the most dissimilar to the proposed MU Graduate Certificate and the "technology track" and the "general track" show more similarity. There is no clear designation on the school website as to whether any of these courses in the certificate can be taken as fully online classes at present as is proposed with the new certificate. There might be some loss of enrollment for the existing certificate to the degree that individuals are attracted to the convenience of online learning, especially where they wish to maintain their full-time job while completing the certificate.
- 3) MU Graduate Certificate in Life Science Innovation and Entrepreneurship also requires 12 CH. There is one course that overlaps across these two certificates, MANGMT 8200. Students taking the existing certificate are typically life science professionals or are transitioning to that specialization. Students taking the proposed certificate are likely to have less background knowledge of life science technologies and are likely to have a stronger business management focus. It is possible that the proposed certificate might slightly lower the number of business students pursuing the existing interdisciplinary certificate (these numbers have generally been 5 or less each year) because the proposed certificate allows them to explore the innovation and entrepreneurship options in the life sciences without delving as heavily into the technological aspects of this segment. A technology specialist in the life sciences would still benefit more from the existing certificate.
- 4) UMKC Masters of Science degree has "Real estate" in the title of all seven core courses and its purpose appears to be to focus on entrepreneurship and innovation strategies specific to the broad industry of real estate. It appears to have more of a focus on the finance function (the traditional domain of real estate courses in business) as opposed to the management function. One highlight of the degree program brochure says that students can "select courses offered in flexible, blended format" but it is not clear if this includes fully online, asynchronous instruction modes. The degree requires 30 CH rather than the 12 Ch required in this proposed certificate. Minimal impact of the proposed certificate is expected on the enrollment of this existing degree program because the proposed certificate has no specialized real estate focus and should be less attractive for a student seeking such focus.

Market Analysis - Need/Demand:**Market Analysis – Need for Program:**

Market Demand: Based on national, regional, state, or local market demand, justify the need for graduates of this program. Provide convincing data from sources such as MERIC or Bureau of Labor Statistics.

U.S. News codes 38 of the 486 (7.8%) graduate business schools that it ranks as having known entrepreneurship specializations in its 2022 rankings including only Washington University St.

Louis and St. Louis University in the state of Missouri. The entrepreneurship specialization list includes 33 of U.S. News' top 100 best business schools. These totals substantially understate the prevalence of such programs.

Missouri University of Science and Technology is not coded as having an entrepreneurship specialization but drilling down into the

U.S. News profile entry for the university a "department/concentration" (category of sub-specialization) of entrepreneurship is listed for the school. Likewise the same is true with Missouri State University, University of Missouri Kansas City, Rockhurst University, and Southeast Missouri State. It appears that the College of Business at University of Missouri St. Louis inadvertently did not code

entrepreneurship as a concentration in their data form for U.S. News even though they have an interdisciplinary graduate certificate with the College of Education in entrepreneurship. Also the University of Missouri Columbia has an existing interdisciplinary graduate certificate in Life Science Innovation and Entrepreneurship that is not listed on their profile entry. Thus in Missouri 9 of the 13 (69%) graduate business programs listed in U.S. News have some form of entrepreneurship concentration rather than 2 of 13 (15%) as originally suggested by the specialization coding. If Missouri is representative; this suggests that graduate programs with certificates or concentrations in entrepreneurship are quite prevalent across the country, especially at the larger universities.

Of the 13 specializations in business coded by U.S. News, the entrepreneurship specialization ranked fourth in popularity, trailing only business analytics (46), accounting (41), and finance (40) with its 38 explicitly coded schools. Clearly entrepreneurship is among the most popular graduate business concentrations offered both nationally and statewide- presumably fueled by strong demand from business students but also by students from other disciplines that are allowed access to these programs.

These course concentrations help prepare students for: new product and new project development roles and other innovation management roles at large corporations including innovation portfolio managers, innovation management advisory roles with consulting organizations including the advisory services branches of the big four accounting firms, management and assistant management roles at incubators and accelerators, analyst positions at private equity firms, managers of angel investment groups, and a wide variety of business venture management options across a broad array of industries including both urban and rural startup options. These roles are instrumental to economic development at the local, state, regional, and national levels by increasing employment levels and growing respective tax bases.

Meeting Missouri's Needs: Explain how the program will help meet Missouri's academic, economic and societal needs.

Statistics from the U.S. Census Public Use Microdata indicate that annual income for the average Missourian was \$25,500 for 2000 while average income for Missouri's entrepreneurs was \$40,270 (MERIC "Latino Entrepreneurs in Missouri"). This suggests that the average entrepreneur in the state earned 58% more than the average Missourian at that time. It should be noted that immediate pay levels for entrepreneurs in startups are likely to be lower in the first couple of years after the startup relative to comparable full-time work for other ventures as the entrepreneur signals commitment to the venture's equity investment by accepting lower payment (sweat equity). However, as the venture attains legitimacy and grows its customer base and passes the breakeven point, compensation in later years is expected to be much higher for the entrepreneur who retains a fair level of equity in the venture.

Missouri's academy benefits by producing alumni with greater philanthropic giving potential to its universities. Missouri's economy benefits by having greater employment increase and a higher tax revenue base. Missouri's social capital increases because of entrepreneurial and innovative problem solving that better addresses the previously unmet needs of the citizens of the state both in urban and rural areas.

Although data is mixed, Missouri appears to have some need to improve its entrepreneurial potential. From 2010-2013, the University of Nebraska Lincoln's Bureau of Business Research published a State Entrepreneurship Index each year ranking states by their current entrepreneurial potential. Missouri was ranked 21 in 2010, 25 in 2011, and 36 in 2013. By 2013 Missouri trailed 6 of 8 adjacent states- exceeding only Arkansas and Kansas. Although this University of Nebraska measure appeared quite volatile from year to year, Missouri seems to have been consistently slipping in relative entrepreneurial activity over the 2010-2013 time period. This would likely result in decreased business growth and decreased tax base for the state over time. Post 2013 data on this measure that would allow a more recent comparison appears to be unavailable.

The Kauffman Foundation annually monitors both early stage entrepreneurship activity and new employer business activity across the United States with data currently stretching from as early as 1996 to as recent as 2020. The foundation provides four component measures of each area by state tracked over time.

With respect to early stage startup activity, Kauffman's measure of rate of new startup activity (percent of population that starts a new business) for Missouri ranged from 0.21% to 0.29% from 1998-2010. In six of those years Missouri was lower than all 8 surrounding states and in five other years Missouri only exceeded one of the eight surrounding states. The state's rank ranged from 30 to 46 during this period. However, from 2011-2020 Missouri's value ranged from 0.28% to 0.37%. They were exceeded only by one surrounding state in 7 of those years and by two surrounding states in 2 years. The state's rank ranged from 12 to 28 during this period. The state's peak value of 0.37% was achieved in both 2019 and 2020. Thus the state has dramatically improved on this measure in the decade after 2009.

A second measure of early stage startup activity is the opportunity share of new entrepreneurs (percent of entrepreneurs who started a new business by choice rather than by necessity). From 1998-2004 Missouri was in the top 20 on this metric in all but one year (1998) with values ranging from 81% to 92%. From 2005 to 2012 the values dropped- ranging from 71%-79% with Missouri ranking 35 or below in five of those eight years. Since 2013 values have ranged from 77%-88% and rankings have ranged from 11 to 45. The measure peaked at 92% in 2001 and was at 79% in 2020. Among the surrounding states only Illinois was below Missouri in 2020.

A third measure of early startup activity is the average number of jobs created by the new venture in its first year. From 1998-2008 Missouri averaged between 5.3 and 6.2 jobs created per startup. In nine of these 11 years the state ranked 26th to 40th (except 2003 and 2006). From 2009-2016 Missouri's values dropped to 3.7 to 4.8 (except 2013 at 5.3). Ranks ranged from 18th to 31st (except 9th in 2013). From 2017-2020 Missouri's values rose again to 5.1 to 5.6 with rankings ranging from 12th to 19th. The measure peaked in 2006 at 6.2 and was at 5.1 in 2020 when Oklahoma was the only adjacent state that was higher.

A fourth indicator is new employer survival rate showing the percent of new employers that are still active in business after one year. Missouri has traditionally enjoyed medium (three to five surrounding states above) to high status (less than three surrounding states above) on this measure from 1997 to 2016 including a high spike as recently as 2017 (higher than all surrounding states). However, after 1996, Missouri avoided being lower than six or more of the surrounding states until 2016. From 2018-2020 Missouri has been lower than seven or all eight surrounding states with a state value ranging from 70.1- 76.0% in those three years. The prior low value had been 76.3% in the 1996-2017 period.

In summary, the Kauffman Foundation's four measures of early entrepreneurial activity show that Missouri's position relative to its eight surrounding states is volatile over time and across measures. Most recently, new employer survival rate and the opportunity

share of new entrepreneurs are especially troubling for the state whereas the rate of new startup activity and the average number of jobs created by the new venture in its first year are especially promising.

As part of New Business Employer Activity, Kauffman tracks four other dimensions annually. The rate of new employer business actualization tracks the percent of firms making their first payroll within 8 quarters of business application. Like the national average drop of 35% from 2005 to 2008, Missouri's rate dipped from 23.39 to 15.15 (35%) during the same period. During this time Missouri was usually intermediate relative to surrounding states (except in 2006 when none of the seven states with available data were higher). Between 2009 and 2017, values for the state ranged from 15.9% to 12.9% (generally trending downward) and were relatively high with only none to two states with available data in the surrounding states exceeding it. From 2018 to 2020 values for the state trended downward further from 12.1% to 10.3% with three surrounding states exceeding it each year.

The second New Business Employer Activity measure, rate of new employer businesses per 100 population, shows an identical strong downward trend from 2005 to 2008 (39% decrease).

Missouri decreased from 0.18 to 0.11 during this period. Since 2008 Missouri has remained essentially flat ranging from 0.10 to .012. During that time Missouri was either higher than all 8 surrounding states for which data were available or was tied with either Oklahoma, Nebraska, or Illinois. In 2019, the most recent year available, Missouri trailed four surrounding states with a value of 0.11.

The third New Business Employer Activity measure, new employer business velocity has been trending upward nationally the last 12 years. This measures the average time it takes in quarters of a year to become an employer-based business (make payroll) for firms reaching this within the first 8 quarters. Lower is considered better. This value has increased nationally from 1.43 quarters in 2005 to

2.01 quarters in 2016. Missouri has increased from 1.15 in 2005 to 1.57 in 2016. Although five of the 8 surrounding states were lower and therefore better than Missouri in 2005, in the ensuing eleven years only in two years did a single surrounding state beat Missouri. In the other nine years Missouri was best among the eight surrounding states.

The fourth New Business Activity measure, employer business newness, has been flat nationally since 2010. It is the proportion of new employers relative to all employers. Starting in 2006 the national average fell from 9.79% to 6.36% in 2010. It then rose slightly to 6.63% in 2016 and accelerated slightly to 7.01 in 2017. Missouri mirrored the rapid decline from 9.65% in 2006 to 5.97% in 2010, and the flat period from 6.64% in 2011 to 6.31% in 2017. This did accelerate slightly in 2018 to 6.9%. Missouri was highest of the 8 surrounding states in 2006 and 2007 and then again from 2011 to 2018. One (2010) and two (2009) states were higher in two other years. Only in 2008 did four surrounding states outperform Missouri. Of the eight Kauffman measures Missouri has performed most strongly on this measure.

In summary, the Kauffman Foundation's four measures of new business employer activity suggest that Missouri has generally performed at medium to high levels relative to the eight surrounding states. Also a comparison of early entrepreneurial activity measures and new business employer activity measures suggests that Missouri has tended to perform better on the latter rather than the former measures. In general Missouri tends to be slightly above average across all measures over time relative to its eight surrounding states. While Missouri has generally not performed poorly on available entrepreneurship measures, there is clearly additional room for improvement within the region of the state and its eight surrounding neighbor states.

Student Enrollment Projections: Estimate the total student enrollment in the program for the fall semester for the first five years.

Year	1	2	3	4	5
Total	10	15	20	25	30

Student Enrollment Projections - New to MU: Estimate the total enrollment of students new to MU in the fall semester for the first five years.

Year	1	2	3	4	5
Total	9	13	17	21	25

Market Analysis – Student Demand for Program:

Student Demand: Describe the evidence of sufficient student demand to support a viable program. The demand must be sufficient to project fiscal and academic viability within five years of the start of the program.

The Graduate Programs Office of the Trulaske College of Business recently conducted a poll of graduate students to determine the receptivity of students to a graduate business certificate based on entrepreneurship and innovation management. The survey was sent to all 224 current masters degree students enrolled in the Trulaske College of Business or the School of Accounting on September 9, 2021. A follow-up message was also sent some days later. 26 students (11.6%) responded with interest. The number of graduate students in these programs is expected to rise to 300 by Fall 2023. This would suggest a level of demand of about 35

students of those 300 over time. The projections included represent an assumption of modest build-up to 35 students over six years.

Data on specialized graduate entrepreneurship program enrollment across universities is often not broken by certificate or by specialized M.S. degrees. However, as noted earlier, entrepreneurship is the fourth most popular specialization offered by graduate business schools according to U.S. News.

Financial Projections:

Resources: Describe the resources necessary to launch and support the program, including estimates of instructional costs, student advising, support staff, space, library resources, equipment, etc:

All of the graduate certificate programs open to MS- Business and Crosby MBA students are administered by the Graduate Program Office in the Trulaske College of Business. All available approved certificates are promoted broadly to all new students as they apply for entry into their degree programs.

New Revenue: Describe the new revenue to be generated from program enrollment by students NEW TO MU, including any new or additional fees to be collected:

New Revenue (\$936,666 over 5 years):

Management Graduate Course

Tuition: \$782.10/CH Business

Course Fee: \$121.20/CH

IT Fee: \$15/CH

Total per CH=\$918.30

12 credit hours x \$918.30 =

\$11,019.60 per student

Year 1: \$11,019.60 x 9 =

\$99,176.40

Year 2: \$11,019.60 x

13 = \$143,254.40

Year 3:

\$11,019.60 x 17

= \$187,333.20

Year 4:

\$11,019.60 x 21 =

\$231,411.60

Year 5:

\$11,019.60 x 25

= \$275,490.00

TOTAL: \$936,666 revenue over 5 years (assuming no tuition increases)

Business and Marketing Plan - Recruiting and Retaining Students:

Marketing Strategy: How will the program be marketed to attract new students to it?

As the certificate is expected to help serve as an effective recruiting tool for both our Crosby MBA program (newly redesigned to be delivered in online asynchronous format) and our M.S. in Business degree program (designed from the outset to be online and asynchronous), the certificate will be featured prominently in brochures, posters, fliers, websites, etc., that advertise these degrees.

The certificate will also be heavily promoted to graduate students in other disciplines across the MU campus as an opportunity to enrich the marketability of their current degree program regardless of their industry preference for their career. All approved graduates certificates for which College of Business graduate students all eligible as part of their degree programs are advertised together as a group so this specific certificate will not require extra advertising beyond what is done for all graduate certificate programs within the college.

Projected program growth: Project how the program will grow over time and how marketing will change as the program grows.

Heavy initial advertising will be needed to get the base of the student certificate population up to sustainable enrollment levels in order for each individual course to consistently make its enrollment minimums by the end of the second year of the program. After that advertising will begin to focus on actual student career opportunity outcomes that they attribute to the certificate experience (testimonials, placements, etc.) and direct word of mouth from current and former certificate students to prospective students.

Retaining Students: Describe the plans to retain students through graduation.

We believe that students will find the content personally engaging because of the customizability

of the contexts to which they can apply the principles taught. Students who appear to be struggling in courses related to the certificate will be offered opportunities to engage in entrepreneurship and innovation related student and university competitions and to virtually interact with entrepreneurial and innovative personnel in context areas where they appear to have the strongest interests.

Achieving Enrollment Outcomes: Describe the plans to ensure program enrollment outcomes are achieved.

The graduate business programs of the Trulaske College of Business are currently in the midst of a very rapid increase in enrollment beyond pre-Covid levels. This is due, in part, to the increased convenience for working professionals of a fully online, asynchronous format that allows them to continue working their regular jobs while completing their graduate business degree. This increase in graduate business student population is expected to increase for at least the next two years and to bring the Crosby MBA program to historically high levels. All students in both the Crosby MBA program and the M.S. in Business program are expected to take one to two graduate certificates as part of their degree programs (a modular format) in lieu of taking a varied assortment of elective courses. The continued expected growth in enrollment of these two programs combined with the overall popularity of entrepreneurship and innovation programs generally should ensure solid growth in this certificate program as it launches and becomes firmly established.

Exit Strategy: Provide information regarding the steps the department/academic unit will take if the program underperforms expectations. At what point would the academic unit believe the program needs to be put on hiatus or discontinued?

If the certificate program proves unable to sustain minimum graduate enrollment levels of 15-20 per course (or fewer graduate students in combined graduate and undergraduate hybrid courses) after the first two years then the lowest enrollment courses listed will need to be discontinued. If two courses have to be discontinued then the certificate will lose a large portion of its flexibility (four courses to be taken from a list of just four remaining courses). One option will be to replace one or more such discontinued courses with courses that prove to be more popular. There are two other current tenure track assistant professor faculty in entrepreneurship that could develop one or more new graduate courses in the future as potential replacement courses. If fewer than four courses are able to sustain minimal enrollment expectations by the second course offering then the certificate would need to be discontinued.

for lack of available courses. New students would no longer be admitted to the certificate and existing students would be given a reasonable period of time to complete the certificate that they began (with one or two relevant course substitutions if needed).

Program Goals and Objectives:

Program Goals and Objectives: Briefly describe the goals and objectives of the program.

The program is designed to introduce students to a broad range of knowledge about managing entrepreneurship and innovation processes both in established and new ventures. It is also designed to deepen student knowledge and retention through actual implementation of these principles of entrepreneurship and innovation with real clients and with exploration of personal business ideas. Students have a variety of choices in determining the nature of the industry and the type of firm in which to implement these principles in order to more fully engage their personal interests.

Overall Description of Student Learning Objectives: Provide any overall descriptive information regarding the student learning objectives for this program.

Each of the learning objectives addresses a key skill set associated with effective management of entrepreneurial and innovative projects and organizations. Each of these can be considered to be an important element of "entrepreneurial mindset."

Listing of Student Learning Objectives: Include clearly stated student learning objectives for the program, indicating what students will know (concepts, terminology, methods, history, etc) and what students will be able to do when they complete the program. These should be broad enough to encompass all of the knowledge acquired during the course of study yet specific enough, using active verbs, to communicate clearly to students, parents and other stakeholders what students will know and be able to do. Most programs identify 6-10 student learning objectives. Refer to the blue help bubble for examples or additional assistance.

Provide a minimum of six student learning objectives in the table below. Use the green plus sign to add rows as needed.

Student Learning Objectives	
1	Comparatively assess benefits and disadvantages of various financing sources for funding
2	Understand how to effectively implement various key organizational roles to advance the corporate entrepreneurship and innovation process in large to medium sized firms
3	Effectively consult with entrepreneurial and innovative clients on how to better manage their
4	Discern between attractive and timely new business opportunities and less attractive and ill-timed new business opportunities and clearly articulate these differences.
	practices in developing new technologies, products, and services
5	Build a compelling business case for an entrepreneurial or innovative venture through multiple
6	Design and effectively implement agile project management plans to guide development of new technologies, products, and services, including innovation portfolio plans.
7	Guide clients in the effective development and implementation of new entrepreneurial and innovative business models.

Program Curriculum:

Program Structure

General description: Provide a general description of the structure of the curriculum plan, such as the overall number of credit hours required, general areas of study, planned academic activities, etc. If the program has an online option, explain if instruction is delivered in an asynchronous format, a synchronous format, or both.

The certificate requires 12 credit hours to be selected from seven available three-credit-hour courses. Students can select any two courses from a set of four principles courses, one course from a set of application to client courses, and one additional course from either of the first two categories. All courses are delivered online and asynchronously.

Program Requirements: Describe all requirements for the program. This content will be displayed in the Program Requirements area of the online University Catalog.

Program Requirements:

Degree Requirements

Students are required to take 12 credit hours of electives chosen from seven courses in two groups.

Principles Courses (Choose at least 6 credit hours)

6

MANGMT 7730	New Business Planning and Management
MANGMT 7760	Demystifying the Management of Venture Financings, IPOs, and Direct Listings

MANGMT 7770	Corporate Entrepreneurship	
MANGMT 8510	Project Management	
Application Courses (Choose at least 3 credit hours)		3
MANGMT 7740	Facilitation of Entrepreneurship and Innovation	
MANGMT 7761	Design Thinking for Business Innovation	
MANGMT 8200	Commercialization of Life Science Innovations	
Free Choice (Choose last 3 credit hours from either of two categories above)		3
Total Credits		12

Additional Faculty: For each level of expertise, provide the number of additional faculty that will be needed to deliver the program. If none, indicate 0.

Level	Number
Tenure Track	0
Non-Tenure Track	0
Post-Doc Fellows	0
Grad Tchng/Research Asst	0
Adjunct	0

Accreditation:

Plans to apply: Do you plan to apply for program specific accreditation?

No

Provide brief explanation:

This is a graduate certificate rather than a graduate degree program.

Gainful Employment:

Certificate web site:

<http://business.missouri.edu>

Tuition for program: Based on current tuition rates, calculate the total tuition for completing this program within normal time.

\$9385

Associated fees: Based on current fee rates, calculate the total fees for completing this program within normal time.

\$1634

Books and supplies: Based on current costs, calculate the total typical costs for books and supplies for completing this program within normal time.

\$600

Related occupational titles and codes: As part of the federal disclosure, MU is required to report prospective occupations for certificate holders. Titles can be found in the US Department of Labor's database, O*Net Online at <http://www.onetonline.org>. Click Find Occupations. Type a keyword into the search box. Click go. Scan the list for feasible titles. Click on a title to review its summary. If it matches the certificate, copy the job title, occupational code, and URL into the table below.

Provide at least 10 occupations. Use the green plus sign to add rows as needed.

Job Title	Occupational Code	URL for Summary Page
Chief Executives	11-1011.00	https://www.onetonline.org/link/summary/11-1011.00
General and Operations Managers	11-1021.00	https://www.onetonline.org/link/summary/11-1021.00
Management Analysts	13-1111.00	https://www.onetonline.org/link/summary/13-1111.00
Business Intelligence Analysts	15-2051.01	https://www.onetonline.org/link/summary/15-2051.01

Project Management Specialists	13-1082.00	https://www.onetonline.org/link/summary/13-1082.00
Commercial and Industrial Designers	27-1021.00	https://www.onetonline.org/link/summary/27-1021.00
Marketing Managers	11-2021.00	https://www.onetonline.org/link/summary/11-2021.00
Sales Managers	11-2022.00	https://www.onetonline.org/link/summary/11-2022.00
Financial and Investment Analysts	13-2051.00	https://www.onetonline.org/link/summary/13-2051.00
Medical and Health Services Managers	11-9111.00	https://www.onetonline.org/link/summary/11-9111.00

Catalog Information:

Information provided in this section is used to automatically populate program information in the online university catalog when published each year in June.

Program Description: In one short but thorough paragraph, describe the program. This official description will be included in the online university catalog and other initiatives supporting student success. The description should include the following three elements: 1) general description of the academic subject area, explaining the area, how it is relevant today, and interest areas that would draw a person to the program; 2) highlights of the program, including descriptions of core and advanced areas of study, special activities within the program such as internships, hands-on learning, research, field operations, study abroad, mentoring, shadowing, etc; 3) careers and opportunities associated with the program, discussing typical professions and work settings, additional educational opportunities, and top prospects in employment.

This certificate focuses on how to be an agent of change in business by managing entrepreneurial and innovative activities in established and emerging organizations. Entrepreneurship and innovation processes are crucial to economic improvement and social change across all industries and organizations. Students will learn basic management principles that are known from academic research and will implement these principles via actual experience with their own new venture ideas or with those of live clients. The certificate will prepare students to: launch their own business in an industry of their preference, consult with clients across a range of business and industry contexts, and/or to be a innovative change agent in an established business organization. Emphasis is on the general manager's perspective of balancing revenues and expenses to effectively create profitability for the organization.

Reviewer Comments:

Lori Hartman (hartmanlo) (Fri, 06 May 2022 13:37:06 GMT): Edited format of list of courses in Program Requirements into Course List table.

Key: 794

