



Board of Regents Meeting

Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska

Board of Regents Meeting

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June 25, 2021 Minutes 224



NOTICE OF MEETING

Notice is hereby given that the Board of Regents of the University of Nebraska will meet in a publicly convened session on Friday, August 13, 2021, at 9:00 a.m. in the board room of Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska.

An agenda of subjects to be considered at said meeting, kept on a continually current basis, is available for inspection in the office of the Corporation Secretary of the Board of Regents, Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska, or at <https://nebraska.edu/regents/agendas-minutes>

A copy of this notice will be delivered to the Lincoln Journal Star, the Omaha World-Herald, the Daily Nebraskan, the Gateway, the Antelope, the Kearney Hub, the Lincoln office of the Associated Press, members of the Board of Regents, and the President's Council of the University of Nebraska.

Dated: August 6, 2021

Philip Bakken
Corporation Secretary
Board of Regents
University of Nebraska

AGENDA
THE BOARD OF REGENTS
OF THE UNIVERSITY OF NEBRASKA
Varner Hall, 3835 Holdrege Street
Lincoln, NE 68583-0745
Friday, August 13, 2021
9:00 a.m.

- I. CALL TO ORDER
- II. ROLL CALL
- III. APPROVAL OF MINUTES AND RATIFICATION OF ACTIONS TAKEN ON JUNE 25, 2021
- IV. PRESENTATIONS
Legislative Update: Senator John Stinner, Appropriations Committee Chairman
- V. KUDOS
Richard Wardyn, University of Nebraska at Kearney
Jordan Malone, University of Nebraska-Lincoln
Lauren Lesiak, University of Nebraska Medical Center
Nik Stevenson, University of Nebraska at Omaha
- VI. PUBLIC COMMENT
The Standing Rules of the Board provide that any person who gives 24 hours' notice to the Corporation Secretary of the Board may speak to any item that is not on the agenda. In addition, any person may appear and address the Board of Regents on any item on the agenda for this meeting. Each person will be given up to five minutes to make his or her remarks. Public comment will be limited to a period of 30 minutes.
- VII. RESOLUTIONS
Resolution regarding Critical Race Theory, Addendum VII-1
- VIII. HEARINGS
Amend Section 2 of the Standing Rules of the Board of Regents of the University of Nebraska
- IX. PRESIDENT'S REMARKS
- X. UNIVERSITY CONSENT AGENDA
 - A. ACADEMIC AFFAIRS
 - B. BUSINESS AND FINANCE
University of Nebraska-Lincoln
 - 1. Approve the reappointment of Tom Henning and Dana Bradford as members of the "Class A" Directors of the NICDC Board of Directors for three-year terms effective July 1, 2021, Addendum X-B-1

XI. UNIVERSITY ADMINISTRATION AGENDA

A. ACADEMIC AFFAIRS

University of Nebraska-Lincoln

1. Approval to eliminate the Bachelor of Arts (BA) in Computer Science, Addendum XI-A-1
2. Approval to create the Bachelor of Science (BS) in Environmental Engineering, Addendum XI-A-2
3. Approval to create the Bachelor of Science (BS) in Statistics and Data Analytics, Addendum XI-A-3
4. Approval to create the Doctor of Philosophy (PhD) in Biomedical Engineering, Addendum XI-A-4
5. Approval to create the School of Computing, Addendum XI-A-5

University of Nebraska Medical Center

6. Approval to create the Master of Respiratory Care, Addendum XI-A-6
7. Approval to create the Genome Editing and Education Center-Nebraska, Addendum XI-A-7

University of Nebraska

8. Approval of Honorary Degree Award, Addendum XI-A-8

B. BUSINESS AND FINANCE

University of Nebraska

1. Approve agreement designating CDWG as strategic supplier of IT hardware for University of Nebraska system, Addendum XI-B-1

University of Nebraska-Lincoln

2. Approve revisions to the Kiewit Hall project and receive report from Business and Finance Committee regarding Intermediate Design Review, Addendum XI-B-2

C. EXECUTIVE

1. Approval of amendments to the Standing Rules of the Board of Regents, Addendum XI-C-1
2. Approve grant of performance-based merit pay to President Carter for FY2020-21, Addendum XI-C-2
3. Approval of President Carter's request to serve as a paid member of an outside Board of Directors, Addendum XI-C-3

D. REPORTS

1. Expedited Approval of French Graduate Certificate, Addendum XI-D-1
2. Expedited Approval of Machine Learning Graduate Certificate, Addendum XI-D-2
3. Expedited Approval of Sociology Graduate Certificate, Addendum XI-D-3
4. Expedited Approval of Teaching Spanish to Heritage/Bilingual Learners Graduate Certificate, Addendum XI-D-4
5. Approve the correct naming of The History of Teaching Tools Exhibit within the Wigton Heritage Center, Addendum XI-D-5
6. Bids and Contracts, Addendum XI-D-6
7. President's FY2020-21 Self-assessment, Addendum XI-D-7

XII. ADDITIONAL BUSINESS

Critical Race Theory Resolution

WHEREAS, all campuses and facilities of the University of Nebraska system are places for open reflection, discussion, study, research, and learning; and

WHEREAS, America is the best country in the world and anyone can achieve the American Dream here; and

WHEREAS, education, free speech, and sound learning are the keys to freedom and opportunity in this country; and

WHEREAS, we oppose discrimination in any form in the classroom, on campus, and in our communities, and we support the safety and wellbeing of all students, faculty, and staff; and

WHEREAS, Critical Race Theory does not promote inclusive and honest dialogue and education on campus; and

WHEREAS, Critical Race Theory seeks to silence opposing views and disparage important American ideals.

NOW, THEREFORE BE IT RESOLVED by the Board of Regents of the University of Nebraska, that the Regents of the University of Nebraska oppose Critical Race Theory being imposed in curriculum, training, and programming.

X. UNIVERSITY CONSENT AGENDA

A. ACADEMIC AFFAIRS

B. BUSINESS AFFAIRS

University of Nebraska-Lincoln

1. Approve the reappointment of Tom Henning and Dana Bradford as members of the “Class A” Directors of the NICDC Board of Directors for three-year terms effective July 1, 2021, Addendum X-B-1

TO: The Board of Regents Addendum X-B-1

Business and Finance Committee

MEETING DATE: August 13, 2021

SUBJECT: The reappointment of Tom Henning and Dana Bradford to the Nebraska Innovation Campus Development Corporation (NICDC) Board of Directors

RECOMMENDED ACTION: Approve the reappointment of Tom Henning and Dana Bradford as members of the “Class A” Directors of the NICDC Board of Directors for three-year terms effective July 1, 2021

PREVIOUS ACTION: June 26, 2020 – The Board of Regents approved the reappointment of Ronnie Green, Larry Miller, Bob Wilhelm, and Michael Yanney as members of the “Class C” Directors of the NICDC Board of Directors for three-year terms effective July 1, 2020.

November 20, 2014 – The Board of Regents approved staggered terms for the NICDC Board of Directors.

April 16, 2021 – The Board of Regents approved the Articles of Incorporation and Bylaws of the Nebraska Innovation Campus Development Corporation. The Board of Regents also approved the original appointments of the Board of Directors of the NICDC.

EXPLANATION: The management of the affairs of the NICDC shall be vested in a Board of Directors, whose operations in governing the Corporation shall be as set forth by statute and in the Corporation’s Bylaws. No Director shall have any right, title, or interest in or to any property held in the name of, or for the benefit of the Nebraska Innovation Campus Development Corporation.

The governance recommendations in the Business Plan for Innovation Campus included a nonprofit 501(c)3 entity to be created under the umbrella of the University Technology Development Corporation (UTDC). “This entity would have responsibility to assist the Board of Regents... in the acquisition, financing, improvement, and operation of the campus, research park, and other related properties including the design, development, construction, marketing, and leasing...”

The appointment of the NICDC Board of Directors is to be made by the Board of Regents of the University of Nebraska upon the recommendation of the UNL Chancellor and President.

If the action recommended is approved, then the classes and terms of the directors shall be as follows:

Class A Directors (term expires 6/30/2024)

Dana Bradford*

Tom Henning*

Class B Directors (term expires 6/30/2022)

Michael Boehm

Tonn Ostergard*

Matt Williams*

Class C Directors (term expires 6/30/2023)

Ronnie Green

Larry Miller*

Bob Wilhelm

Michael Yanney*

Ex-officio

Daniel Duncan

*Non-University directors

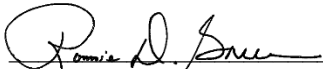
This item has been reviewed by the Business and Finance Committee.

SPONSOR:

William J. Nunez

Vice Chancellor for Business and Finance

RECOMMENDED:



Ronnie D. Green, Chancellor

University of Nebraska-Lincoln



Walter E. Carter, President

University of Nebraska

DATE:

July 16, 2021

XI. UNIVERSITY ADMINISTRATIVE AGENDA

A. ACADEMIC AFFAIRS

University of Nebraska-Lincoln

1. Approval to eliminate the Bachelor of Arts (BA) in Computer Science, Addendum XI-A-1
2. Approval to create the Bachelor of Science (BS) in Environmental Engineering, Addendum XI-A-2
3. Approval to create the Bachelor of Science (BS) in Statistics and Data Analytics, Addendum XI-A-3
4. Approval to create the Doctor of Philosophy (PhD) in Biomedical Engineering, Addendum XI-A-4
5. Approval to create the School of Computing, Addendum XI-A-5

University of Nebraska Medical Center

6. Approval to create the Master of Respiratory Care, Addendum XI-A-6
7. Approval to create the Genome Editing and Education Center-Nebraska, Addendum XI-A-7
8. Approval of Honorary Degree Award, Addendum XI-A-8

B. BUSINESS AND FINANCE

University of Nebraska

1. Approve agreement designating CDWG as strategic supplier of IT hardware for University of Nebraska system, Addendum XI-B-1

University of Nebraska-Lincoln

2. Approve revisions to the Kiewit Hall project and receive report from Business and Finance Committee regarding Intermediate Design Review, Addendum XI-B-2

C. EXECUTIVE

1. Approval of amendments to the Standing Rules of the Board of Regents, Addendum XI-C-1
2. Approve grant of performance-based merit pay to President Carter for FY2020-21, Addendum XI-C-2

3. Approval of President Carter's request to serve as a paid member of an outside Board of Directors, Addendum XI-C-3

TO: The Board of Regents Addendum XI-A-1
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Elimination of the Bachelor of Arts in Computer Science in the Department of Computer Science and Engineering in the College of Arts and Sciences at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to eliminate the Bachelor of Arts (BA) in Computer Science in the Department of Computer Science and Engineering in the College of Arts and Sciences at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTION: The Bachelor of Arts (BA) and Bachelor of Science (BS) degrees in Computer Science at UNL were established prior to modern records of Board approvals.

EXPLANATION: UNL Computer Science students have the choice of either a BA or a BS degree. The vast majority of students select a BS degree; the BA degree is rarely chosen. With the proposed creation of the School of Computing solely administered by the College of Engineering, the BA degree would not be an appropriate curricular option. Student and employer demand for computer science-related degrees continues to be high. UNL offers BS degrees in Computer Science, Computer Engineering, and Software Engineering; several minors and graduate degrees also available.

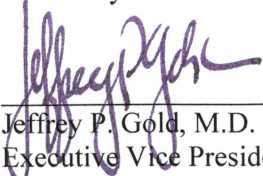
The two students currently enrolled in the BA degree, if they choose not to transfer to a BS degree, will be allowed to complete their degree following the BA curriculum.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

PROGRAM SAVINGS: \$0; no budgetary impact is expected due to the low number of students who have chosen this degree program.

SPONSORS: Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED: 

Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-A-2
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of a Bachelor of Science in Environmental Engineering in the Department of Civil and Environmental Engineering in the College of Engineering at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to create a Bachelor of Science (BS) in Environmental Engineering in the Department of Civil and Environmental Engineering in the College of Engineering at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTIONS: June 28, 2019 – The renaming of the Department of Civil Engineering to the Department of Civil and Environmental Engineering in the College of Engineering at UNL was reported to the Board.

November 3, 1995 – The Board approved the proposed Master of Science in Environmental Engineering at UNL.

EXPLANATION: The proposed UNL BS degree in Environmental Engineering will provide students with skills focused on applying engineering principles to protect human health from adverse environmental factors, protect the environment, and improve environmental quality. The proposed degree will prepare students to devise engineering solutions for topics ranging from water and air pollution control and treatment, drinking water supply, wastewater management, solid waste management, public health, water resources management, and sustainable design and industrial ecology. The degree will include the standard curricular components required to obtain discipline-specific professional engineering accreditation (ABET) and to prepare students for professional licensure in the discipline of Environmental Engineering.

The Executive Vice President and Provost has confirmed, like most engineering programs, that the curricular content to meet accreditation standards and the technical content-mastery required for professional licensure can't be met within a 120-credit hour program. The BS in Environmental Engineering will require 125 credit hours.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

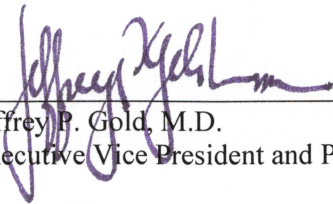
PROGRAM COST: \$119,600 for Year 1; \$1,161,761 over five years

SOURCE OF FUNDS: Tuition and fees

SPONSORS: Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED:



Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE:

July 16, 2021



April 23, 2021

Susan Fritz, Executive Vice President & Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583-0745

SUBJECT: BS Degree in Environmental Engineering

Dear Susan,

I am forwarding materials related to a proposal to create a new Bachelor of Science degree in Environmental Engineering to be administered by the Department of Civil and Environmental Engineering in the College of Engineering. The program will be available to students at both the Lincoln and Omaha campus locations.

This program will address a significant and growing workforce need in Nebraska and nationally. The core courses are already established, there are adequate existing resources, and a sufficient number of quality faculty are available. Any additional faculty positions necessary at various enrollment thresholds will be funded by the college and through increased enrollment growth. Accreditation Board for Engineering and Technology (ABET) professional standards require a 125-credit hour program; therefore, an exemption to the Board of Regent's 120-credit hour policy is requested.

This proposal has the full endorsement of the Academic Planning Committee and it has my approval. I am requesting you approve it and that it be reported to the Board of Regents at its next regular meeting.

Sincerely,

Ronnie D. Green, Ph.D.
Chancellor

- c: Kurt Geisinger, Chair, Academic Planning Committee
Elizabeth Spiller, Executive Vice Chancellor
Lance Perez, Dean, College of Engineering
Shannon L. Bartelt-Hunt, Voelte Keegan Chair, Civil Engineering
Mike Zeleny, Associate to the Chancellor
Renee Batman, Assistant Vice Chancellor, Academic Affairs
Suzi Tamerius, Project Coordinator, Academic Affairs
Karen Griffin, Coordinator, Faculty Governance

University of Nebraska-Lincoln

New Undergraduate Major or Degree

I. Descriptive Information

Name of Institution Proposing New Major or Degree
University of Nebraska-Lincoln
Name of Proposed Major or Degree
Environmental Engineering
Degree to be Awarded to Graduates of the Major
Bachelor of Science in Environmental Engineering
Other Majors or Degrees Offered in this Field by Institution
BS in Civil Engineering, MS in Civil Engineering, MS in Environmental Engineering, Ph.D. in Civil Engineering
CIP Code [IEA can help with CIP codes or browse here: http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55]
14.1401
Subject Code
ENVE
Administrative Units for the Major or Degree
Department of Civil and Environmental Engineering
Proposed Delivery Site
Lincoln and Omaha through College of Engineering
Program will be Offered [full program, not individual courses]
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
Date Approved by the Governing Board
<i>Pending</i>
Proposed Date the New Major or Degree will be Initiated
<i>Pending Coordinating Commission approval: Fall 2022</i>

II. Details

A. Purpose of the Proposed Major or Degree:

The purpose of the proposed major is to provide education in Environmental Engineering, which is a professionally licensed discipline of engineering. Environmental engineering is focused on the application of engineering principles for protection of human health from adverse environmental factors, protection of the environment, and improvement of environmental quality. The proposed degree will prepare students to devise engineering solutions for topics ranging from water and air pollution control and treatment, drinking water supply, wastewater management, solid waste management, public health, water resources management, and sustainable design and industrial ecology. The education will be provided to students in the College of Engineering in both Lincoln and Omaha through the University of Nebraska-Lincoln (UNL) Department of Civil and Environmental Engineering (CEE).

The proposed degree will expand the academic offerings in environmental engineering currently offered by the faculty of the Department of Civil and Environmental Engineering. This expansion is consistent with what has occurred within many UNL peer institutions and the Big Ten, as discussed in Section III.D. Currently, CEE offers Environmental Engineering coursework which is included as part of the required and elective courses for the B.S. in Civil Engineering and MS in Environmental Engineering. The program also will use coursework from the sciences, math, and other areas within Engineering. The Department of Civil and Environmental Engineering will continue to offer a B.S. in Civil Engineering that will focus on the professionally-licensed specialization of Civil Engineering, which includes structural engineering, geotechnical engineering, transportation engineering, and water resources/ environmental engineering. The B.S. in Civil Engineering is intended to provide broad exposure to all five of these subdiscipline areas. The B.S. in Environmental Engineering will focus on multiple topics within environmental engineering, such as water and water treatment, solid waste management, air pollution, industrial hygiene and sustainability. Many of our peer departments in the Big 10 and regional peer institutions offer B.S. degrees in both Civil Engineering and Environmental Engineering.

The B.S. in Environmental Engineering degree includes the standard curriculum components required to obtain discipline specific professional engineering accreditation (ABET) in Environmental Engineering and to prepare students for professional licensure in the discipline of Environmental Engineering. In the United States, the National Council of Examiners for Engineering and Surveying (NCEES) coordinates licensure standards for each jurisdiction. Generally, the licensure requirements include passing the Fundamentals of Engineering (FE) exam, graduating with an ABET (Accreditation Board for Engineering and Technology) accredited degree, passing the Principles and Practice of Engineering exam (PE exam), and obtaining four years of work experience under a licensed Professional Engineer (PE). The FE exam is typically taken during a student's last year, and the PE exam is typically taken during the first half decade after graduation. The student learning outcomes and specific coursework described in Section II.B are designed to provide education enabling graduates to obtain professional licensure and for the program to obtain ABET accreditation.

The proposed program requires a total of 125 credit hours. An exemption to the Board of Regent's 120-credit hour policy is requested for this new degree, as discussed in Section B. The 125 credit hours are needed to meet the UNL Achievement-Centered Education (ACE) requirements, professional accreditation requirements, and providing sufficient technical background for students to be successful on professional licensure exams. The proposed number of credit hours for the B.S. in Environmental Engineering is at the low end of credit hour requirements for other accredited engineering degrees in the UNL College of Engineering and by our regional comparators.

In addition, as discussed in Section III.D, there is a growing need and demand for Environmental Engineering, both nationally and in Nebraska. Anticipated workforce needs as quantified by data from the US Bureau of Labor Statistics' Occupational outlook handbook shows that Environmental Engineers have the fifth most common engineering discipline within the US, with a projected 5% job growth rate in the next decade. The Nebraska Bureau of Labor Statistics indicates that there are 460 environmental engineering jobs in the state of Nebraska and an additional 1,640 civil engineering jobs, a portion of which could be filled by individuals with a degree in environmental engineering. A market analysis provided to the UNL College of Engineering by Hanover Research found strong and growing student demand for the major, and that the labor market indicators paint an optimistic employment landscape for the graduates of the proposed program. The analysis stated that a non-existent competitive environment locally suggest that the proposed program will fill a market gap. Based on both the Hanover analysis and the experience of peer institutions, the proposed degree will increase the diversity within the College of Engineering.

B. Description of the Proposed Major or Degree:

The primary student learning outcomes of the proposed major or degree.

The program's educational outcomes of the University of Nebraska–Lincoln environmental engineering undergraduate program are to prepare our graduates so that, with a UNL B.S.in Environmental Engineering degree, a few years beyond graduation, alumni will:

- Be employed in environmental engineering or a closely-related field and successfully pursue professional licensure; or, graduates will be pursuing an advanced degree in environmental engineering, a closely related field or professional education in engineering, medicine, business, or law.
- Contribute to society and address societal and environmental needs through engagement in professional, community, or service organizations.
- Agree that the environmental engineering program prepared them for success in their careers in terms of knowledge and skillsets as embodied in the program and the Complete Engineer™ Initiative.

Student Learning Outcomes:

The following Student Learning Outcomes (SLOs) will be assessed in the evaluation of our B.S. in Environmental Engineering degree program. Our success in achieving these outcomes is periodically reviewed by our faculty, and by the Engineering Accreditation Commission of ABET as part of its accreditation process. We will advise Environmental Engineering students to think about these desirable outcomes and consider how through their choice of electives and co-curricular activities they can develop these abilities, and desired knowledge and understanding.

ABET General Student Learning Outcomes (SLOs):

Graduates of the environmental engineering program will have:

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
3. An ability to communicate effectively with a range of audiences.

4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
7. An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

In addition, there are specific student learning objectives to meet the Environmental Engineering Discipline-Specific ABET requirements and to prepare students to be successful in taking the Fundamentals of Engineering exam, which is the first step towards licensure as a professional environmental engineer. These outcomes include the need to apply knowledge of chemistry, biology, and an earth science to solve environmental engineering problems; apply the basic chemistry principles of stoichiometry, equilibrium, kinetics, and organic chemistry to solve environmental engineering problems, conduct environmental engineering laboratory experiments in two different focus areas (e.g., water, land, air); solve material balances for (a) non-reactive, single-unit processes, (b) non-reactive, multiple-unit processes, (c) reactive, single-unit processes, (d) reactive processes with separation and recycle, (e) non-reactive processes involving vapor-liquid equilibrium. These and other related student learning objectives related to ABET and the FE exam include knowledge of microbiology, sustainability, chemical fate and transport, drinking water treatment and supply, wastewater treatment and management, solid and hazardous waste engineering, and air pollution engineering.

Criteria for Professional Admission to the Environmental Engineering Degree Program

Pre-professionally admitted College of Engineering students majoring in environmental engineering must have their academic records reviewed for professional admission to the Environmental Engineering Degree Program during the fall, spring, or summer immediately following the term in which:

- At least 12 credits (one semester) have been completed after admission to the College of Engineering.
- At least 43 credits applicable to the degree have been earned.
- PHYS 211 General Physics I, MECH 223 Engineering Statics, ENVE 210 Material and Energy Balances for Environmental Engineers, and MECH 325 Mechanics of Elastic Bodies or MECH 373 Engineering Dynamics have been completed.

Additionally, the student can have no more than two declined professional admission requests to other engineering majors. It is likely a student may need to complete four full semesters of credits applying to the Program before these requirements are able to be completed.

Professional admission approval to the Environmental Engineering Degree Program also requires that all of the following Departmental-specific criteria must be met:

- Earn a C letter grade or better in PHYS 211, MECH 223, ENVE 210, and MECH 325 or MECH 373.
- Earn a cumulative grade point average of 2.4 or greater.
- Earn a C letter grade or better in ALL math, science, and engineering courses required for the Bachelor of Science in Environmental Engineering degree if the cumulative grade point average is less than 2.700.
- Students approved for professional admission to the Program are then allowed to take 400-level environmental engineering courses to complete their degree.

Students who are not admitted to the environmental engineering degree program on their second attempt are counseled through the UNL Explore Center and Engineering Student Services to identify an alternative major within the College of Engineering, or transfer to another UNL College.

COLLEGE ENTRANCE REQUIREMENTS

Core Course Requirements

- A minimum of 16 High School Units for Credit that must include the following courses:
 - 4 Units in Mathematics courses (equivalent to the listed below)
 - Algebra I
 - Algebra II
 - Geometry
 - Upper Level Math (something that builds on Geometry and Algebra II)
 - 4 Units of English courses
 - 3 Units of Natural Science with 1 Lab
 - 2 Units of Foreign Language
 - 3 Units of a Social Science/Studies
- The Core Course requirement is waived for transfer students with 24 or more hours of transfer work after graduating high school

Performance Requirement

- Domestic Freshmen:
 - 20 Composite ACT (or the equivalent SAT of a 1040)
 - OR Rank in the top 50%
 - OR a High School cumulative GPA of a 3.0
- Domestic Transfer:
 - 2.0 Post-Secondary Cumulative GPA (combined from all schools attended)
 - AND 2.0 Most recent term GPA
- International Freshmen:
 - 2.0 Cumulative Secondary School GPA
- International Transfer:
 - 2.0 Post-Secondary Cumulative GPA (combined from all schools attended)
 - AND 2.0 Most recent term GPA
- Readmit Students
 - Students who left in good standing will be admissible upon reapplication.
 - Students who were academically dismissed will be evaluated based upon a review of a readmit questionnaire and documentation.

Deficient Students

Any student with deficiencies in the above areas will be reviewed by an admissions review committee to determine admissibility despite any deficiencies.

English Proficiency Requirement

In order to gain admission into the University of Nebraska-Lincoln, all non-native English speakers must provide confirmation of English proficiency. The below scores grant English proficiency to UNL. While a student may gain admission to the University of Nebraska-Lincoln based upon these requirements, that does not assure admission into a college. Each college may choose to raise their college requirements above the university level.

The current, approved English proficiency requirements are:

- TOEFL Internet-Based: 70 (20 Writing Subscore)

- TOEFL Paper-Based: 523 composite
- IELTS: 6.0 composite (5.5 Writing Subscore)
- University of Nebraska–Lincoln English Language Test (ELT): 74
- ACT English Subscore: 20
- SAT Reading Subscore: 26
- Graduation from a high school in the United States
- Completion of 30 semester hours (or equivalent) of coursework at a college or community college in the United States
- Successful completion of the UNL Credit English for Academic Purposes Program with a semester GPA over a 3.0 or a semester GPA above a 2.0 with an approved test score

DOMESTIC FRESHMAN

Minimum Requirements

- Core: In addition to the Nebraska assured criteria, Engineering requires additional specific course requirements.
 - Math: 1 full unit of Trigonometry or Pre-Calculus or Calculus (Students must be calculus ready).
 - Natural Science: 1 full unit of Chemistry and 1 unit of Physics.
- Performance: Engineering requires that student performance be set at a 24 ACT or the equivalent SAT of 1180, or an ACT Math subscore of 24 or an SAT Math subscore of 580 or a 3.5 cumulative GPA.
- Additional mechanism: FT and F+ students with a 28 ACT or higher or 1310 SAT or higher may be admitted missing one full unit of either Trigonometry or Chemistry or Physics.

Freshman College Review

- Any domestic freshman student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln will be reviewed through College Review. Any freshman student who is not admitted through college review is placed in Pre-Engineering (PENG) with Explore.

DOMESTIC TRANSFER

Minimum Requirements

- Core: Engineering expects all transfer students to be calculus ready at time of admission. In order to determine this level, all transfer applicants who meet the performance criteria will be reviewed by the College Review team.
- Performance: In order to meet the performance requirement for Engineering, Transfer students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

Transfer College Review

- All domestic transfer students who have above a 2.5 cumulative GPA are reviewed through college review. This is to determine if the student is truly calculus ready. Any transfer with a cumulative GPA below 2.5 or who does not gain admission to Engineering through College Review will be placed into Explore as undeclared. PENG is not available to Transfer Applicants.

2+2 Programs

- The Department of Civil and Environmental Engineering has 2+2 program agreements with the University of Nebraska at Kearney and Wayne State College. Upon approval of this proposal for a B.S. in Environmental Engineering, these 2+2 program agreements will be updated to allow students in either of these programs to transfer to the B.S. in Environmental Engineering.

INTERNATIONAL FRESHMAN

Minimum Requirements

- Core: In addition to the Nebraska assured criteria, Engineering requires additional specific course requirements.
 - Math: 1 full unit of Trigonometry, Pre-Calculus or Calculus (Students must be calculus ready).
 - Natural Science: 1 full unit of Chemistry and 1 unit of Physics.
- Performance: Engineering requires that student performance for international freshmen applicants to be set at a 3.0 cumulative GPA

International Freshman College Review

- Any international freshman student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln will be reviewed through College Review. Any international freshman student who is not admitted through college review is placed in Pre-Engineering with Explore.

INTERNATIONAL TRANSFER

Minimum Requirements

- Core: Engineering expects all transfer students to be calculus ready at time of admission. In order to determine this level, all transfer applicants who meet the performance requirement will be reviewed by the College Review team.
- Performance: In order to meet the performance requirement for Engineering, Transfer students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

International Transfer College Review

- All international transfer students who have above a 2.5 cumulative GPA are reviewed by the College Review team. This is to determine if the student is truly calculus ready. Any transfer with a cumulative GPA below 2.5 or who does not gain admission to Engineering through the college review process will be placed into Explore as undeclared. PENG is not available to Transfer Applicants.

READMIT STUDENTS

Minimum Requirements

- Core: Engineering expects all Readmit students to be calculus ready at time of admission. In order to determine this level, all Readmit applicants who meet the performance requirement will be reviewed by the College Review team.
- Performance: In order to meet the performance requirement for Engineering, Readmit students must have the 2.0 most recent term GPA, but they must also have, at a minimum, a 2.5 cumulative post-secondary GPA.

Readmit College Review

- All readmit students who have above a 2.5 cumulative GPA are reviewed through college review. This is to determine if the student is truly calculus ready. Any readmit with a cumulative GPA below 2.5 or who does not gain admission to Engineering through College Review will be placed into Explore as undeclared. PENG is not available to Readmit Applicants.

ENGLISH PROFICIENCY

Non-Native English speakers can demonstrate proficiency through the same options as the University. However proficiency levels for new students are higher than the university requirements. Students demonstrating proficiency based upon test scores must provide scores at or above a minimum of:

- TOEFL Score of 80
- IELTS of 6.5
- Paper based TOEFL of 550
- ACT English Subscore of 22
- SAT Critical Reading Subscore of 480
- UNL ELT score of 80
- High School graduation from a USA High School
- Completion of 30+ academic transfer hours from a US College

The course requirements are provided in Table II.1.

Table II.1. Course Requirements for B.S. in Environmental Engineering. New classes are listed in bold.

CODE	Title	Credit Hrs
ENGR 10	Freshman Engineering Seminar	0
ENGR 20	Sophomore Engineering Seminar	0
ACE	Select one course from each of the ACE outcomes 5, 6, 7, 8, and 9 elective courses.	15
MATH 106 or Math 1950	Calculus I	5
MATH 208 or Math 1970	Calculus III	4
MATH 107 or Math 1960	Calculus II	4
Math 221 or Math 2350	Differential Equations	3
STAT 380 or STAT 3800	Statistics and Applications	3
CHEM 109, CHEM 113, or Chem 1180 or 1184	General Chemistry I (select one) General Chemistry I Fundamental Chemistry I General Chemistry and General Chemistry I Laboratory	4
CHEM 110, or CHEM 114, or CHME 1190 & CHEM 1195	Chemistry II (select one): General Chemistry II Fundamental Chemistry II General Chemistry II General Chemistry II Laboratory	3
Chem 251 & 253, Chem 261 & 264, or CHEM 2250 & Chem 2210	Organic Chemistry (select one) Organic Chemistry I and Organic Chemistry I laboratory Organic Chemistry and Organic Chemistry Laboratory Organic Chemistry Fundamentals of Organic Chemistry Laboratory	4
PHYS 211 or Phys 2110	General Physics I	4
LIFE 120 & 120L, or BIOL 2440	Biological Science (select one) Fundamentals of Biology I and Fundamentals of Biology I Lab The Biology of Microorganisms	4
GEOL 106, or GEOL 1170	Environmental Geology	3
JGEN 200, JGEN 300, or ENGL 3980	Technical Communications Technical Writing Across the Disciplines	3
COMM 286 or CMST 1110	Business and Professional Communication Public Speaking Fundamentals	3
CSCE 101, CSCE 155N, CSCE 155T,	Computer Skills (select one): Fundamentals of Computer Science Computer Science I: Engineering and Science Focus Computer Science I: Informatics Focus	3

CIST 1400, CYBR 2980	Introduction to Computer Science Special Topics in Cybersecurity (Python)	
MECH 223 or MECH 2230	Engineering Statics	3
MECH 325, MECH 3250, or MECH 373, MECH 3730	Select one: Mechanics of Elastic Bodies Engineering Dynamics	3

CODE	Title	Credit Hrs
BSEN 244, or MECH 200	Thermodynamics (select one) Thermodynamics of Living Systems Thermodynamics	3
ENVE 110	Introduction to Environmental Engineering	3
ENVE 210	Fundamentals of Environmental Engineering	3
CIVE 310	Fluid Mechanics	3
CIVE 321	Principles of Environmental Engineering	3
CIVE 321L	Environmental Engineering Laboratory	1
ENVE 322	Biological Principles of Environmental Engineering	2
CIVE 352	Introduction to Water Resources Engineering	3
CIVE 385	Professional Practice and Management in Civil Engineering	3
ENVE 410	Environmental Fate and Transport	3
CIVE 421	Environmental Engineering Process Design	3
ENVE 430	Sustainable Design in Environmental Engineering	3
CHME 489 or CIVE 424	Air Pollution, Assessment, and Control, or Solid Waste Management Engineering	3
CIVE 419 or CIVE 452	Flow Systems Design or Water Resources Development	3
CIVE 489	Senior Design Project	3
Technical Electives		6
Electives		6
	TOTAL	125

Technical Electives: At least six hours must be taken from the below list of courses.

- CIVE 334 Introduction to Geotechnical Engineering
- CIVE 378 Materials of Construction
- CIVE 419 Flow Systems Design
- CIVE 424 Solid and Hazardous Waste Management Engineering
- CIVE 425 Design of Water Treatment Facilities
- CIVE 426 Design of Wastewater Treatment and Disposal Facilities
- CIVE 429 Facility-Level Sustainability: Principles and Practice
- CIVE 430 Fundamentals of Water Quality Modeling
- CIVE 452 Water Resources Development
- CIVE 454 Hydraulic Engineering
- CIVE 455 Non-Point Pollution Control Engineering
- CIVE 456 Surface Water Hydrology
- CIVE 458 Groundwater Engineering
- CIVE 475 Water Quality Strategy
- CIVE 481 Computational Problem Solving in Civil Engineering
- CHME 489 Air Pollution, Assessment, and Control

Electives: Additional technical electives can be taken from the above list can be taken as electives, or electives can be taken from the below courses.

- Any course offered by the college of engineering
- Any 200-, 300-, or 400-level course in Chemistry, Biology, Geoscience, Geology, or Physics
- MATH 314 or MATH 2050
- BSEN 206 Engineering Economics
- ARCH 107

The proposed program requires a total of 125 credit hours. An exemption to the Board of Regent's 120-credit hour policy is requested. This number of credit hours is needed to meet the UNL Achievement-Centered Education (ACE) requirements, ABET requirements, and to provide sufficient technical background for students to be successful on professional licensure exams. A list of classes in the proposed program of study with a justification for each class based on the previously noted requirements is included in the supporting documents. As noted in the marketing analysis provided to the College of Engineering by Hanover Research, the total credit hours required by the ten comparator universities ranged from 125 (Minnesota) to 132 (Iowa) hours. The number of credit hours required by the existing ABET-accredited degree programs within the UNL College of Engineering listed in Table II.2. The proposed number of credit hours for the B.S. in Environmental Engineering is at the low end of that required both in the UNL COE and by our regional comparators.

Table II.2. Credit Hours Required for Other ABET-Accredited B.S. Degrees in the UNL College of Engineering

Degree	Credit Hours
B.S. Agricultural Engineering	123
B.S. Computer Engineering (Omaha)	124
B.S. Electrical Engineering	124
B.S. Software Engineering	124
B.S. Environmental Engineering	125
B.S. Construction Engineering	125
B.S. Computer Engineering (Lincoln)	125
B.S. Biological Systems Engineering	127
B.S. Mechanical Engineering	128
B.S. Architectural Engineering	129
B.S. Civil Engineering	130
B.S. Chemical Engineering	131

Source: 2020-21 UNL Undergraduate Catalog

How and when advisors are assigned for students in the major or degree.

At the college level, an Engineering Student Services (ESS) advisor is assigned to a student during NSE/Orientation. ESS staff provide academic advising, support, and resources for all undergraduates in the CoE during the freshman and sophomore years (pre-professional status) or until professional admission to the program. Students are able to obtain a clear understanding of degree requirements and to plan their course of study with a college advisor, as well as receive academic and developmental coaching. ESS is located in the Engineering Library in Lincoln and in Room 107 in PKI.

At the department level, the ESS advisor (usually by the end of a student's sophomore year and following successful completion of professional admission requirements) provides the student with the name and contact information of a Civil Engineering faculty member who is assigned to act as their undergraduate advisor once their status has changed from pre-professional to professional. The

undergraduate advisor is responsible for evaluating the student's academic performance and approving selected courses for registration and communicates with the student on a regular basis.

National accreditation for such programs, and how this program meets the established standards.

The two key organizations related to accreditation and professional licensure related to Environmental Engineering are:

Accreditation Board for Engineering and Technology (ABET). ABET accredits post-secondary education programs, including those in Engineering.

National Council of Examiners for Engineering and Surveying (NCEES). The NCEES helps provide uniformity of licensure law and promote the mobility of licensure, including setting the requirements for an individual to be designated as a Model Law Engineer (MLE). NCEES represents engineering licensing boards from all 50 states, and other jurisdictions. Being designated a MLE expedites the process of obtaining licensure in each state/jurisdiction.

As documented by the American Academy of Environmental Engineers and Scientists (AAEES) and the US Bureau of Labor Statistics' Occupational Outlook Handbook, many Environmental Engineers obtain their Professional Engineers license. A Professional Engineer can oversee the work of other engineers, sign off on projects, and provide services directly to the public.

Generally, the licensure requirements include passing the Fundamentals of Engineering (FE) exam, graduating with an ABET-accredited degree, passing the Principles and Practice of Engineering exam (PE exam), and obtaining four years of work experience under a licensed Professional Engineer (PE). The FE exam is typically taken during a student's last year, and the PE exam is typically taken during the first half decade after graduation. The FE and PE exams are administered by NCEES and generally are required by all US jurisdictions to become a licensed professional engineer.

This proposed B.S. in Environmental Engineering will seek accreditation from ABET. All other Engineering programs at the University of Nebraska-Lincoln's College of Engineering have an ABET accredited degree. Note that ABET will accredit only one program (e.g., B.S. or M.S.) in a discipline at a University; the M.S. in Environmental Engineering has not sought accreditation since most participants either have completed an accredited B.S. degree in engineering or meet the NCEES Education Standard (documentation of equivalency to an ABET-accredited degree). Commentary concerning the EnvE-specific ABET provided by AAEES (the lead professional organization for accreditation of Environmental Engineering) is provided in the supplementary documentation.

ABET will consider a program for accreditation after the student has graduated. This program intends to apply for accreditation after the first student graduates. Boards in most jurisdictions, including the Nebraska State Board of Engineers and Architects, consider graduates for the two academic years previous to the ABET Accreditation site visit to be ABET-accredited for the purpose of licensure eligibility.

The student learning outcomes and specific coursework described in Section II.B are designed to provide education enabling graduates to successfully pass the FE and PE exams and for the program to obtain ABET accreditation. Six CEE faculty are licensed Professional Environmental Engineers. No other academic unit at UNL employs professionally licensed Environmental Engineers. Lists from NCEES of the examination topics for the FE and PE exams in Environmental Engineering, annotated with the UNL courses that address key topics are provided in the supplementary documentation.

The proposed program will be ABET-accredited, thus allowing a graduate to meet the MLE education requirement, and is organized so a graduate is prepared for the professional licensure examinations that must be passed to meet the MLE examination requirements. The other MLE requirement is gaining

professional work experience under the supervision of a licensed professional engineer. By obtaining MLE status, a graduate will be eligible for professional licensure in all US jurisdictions as noted in Appendix C.

An additional step beyond Professional Licensure is to become a board certified Environmental Engineer. The American Academy of Environmental Engineering and Scientists certified qualified licensed Professional Engineers through a certification process that includes being recommended by one's peers, passing an additional exam, and additional work experience after obtaining professional licensure. One CEE faculty member is a board certified Environmental Engineer.

Impact on Course Subject Codes

No new course subject codes need to be created. The ENVE course subject code already exists at the graduate level for the MS in Environmental Engineering and will be used at the undergraduate level for the proposed program.

III. Review Criteria

A. Centrality to UNL Role and Mission

As stated on the UNL Role and Mission webpage: "The University of Nebraska–Lincoln was chartered by the Legislature in 1869 and serves as both the land-grant and the comprehensive public university for the State of Nebraska." That page also states that "The university's graduates and its faculty and staff are major contributors to the economic and cultural development of the state."

The College of Engineering's Role and Mission webpage states that it: "...enthusiastically embraces its unique role as the singular intellectual and cultural resource for engineering instruction, research, and outreach within the state. It provides the people of Nebraska with comprehensive engineering academic programs to fulfill their highest aspirations and ambitions."

The proposed program is consistent with the University's 2025 Strategic plan by:

- Increasing student enrollment by attracting in-state, out-of-state, and international students,
- Increasing the diversity of the student body;
- Nurturing a field where strong two-way communications exist with stakeholder groups for research and learning collaborations; and
- Building upon an area of research strength within the College of Engineering.

As detailed in Section III.D, many peer institutions and other Big Ten Colleges of Engineering offer a B.S. in Environmental Engineering. Environmental Engineering is nationally one of the top five engineering disciplines in terms of number of engineers employed nationally and in terms of number of engineers licensed. The proposed degree program will address the gap in environmental engineering program delivery and by offering this degree enable the UNL College of Engineering to continue to provide the people of Nebraska with a comprehensive engineering academic program.

Consistent with the data provided in Section III.D, the proposed B.S. in Environmental Engineering will aid the College of Engineering's strategic plan to grow undergraduate student enrollment to 5,000 students and the College's Diversity and Inclusion plan to increase the percentage of women pursuing undergraduate degrees to 35% of the college's enrollment and students from underrepresented groups in STEM to 15% of the college's undergraduate student population.

Relationship of the proposal to the NU Five Year Strategy

As stated in the Five Year Strategy:

“...The framework consists of six key principles emphasizing access and affordability, quality academic programs, workforce and economic development, research growth, engagement, and accountability.” The proposed B.S. in Environmental Engineering degree addresses these goals as follows:

1. Access, Affordability and Attainment.

The proposed program will expand the disciplinary offerings of the College of Engineering to include a discipline offered by other comprehensive Colleges of Engineering and that is nationally one of the five largest in terms of professionals. The program will train students to address future impacts of our built infrastructure and environmental systems on the environment (and visa-versa) and on society should enhance enrollment and retention via presentation of curricular objectives, outcomes and degree benefits to potential students.

2. Culture, Diversity and Inclusion.

Diversity will be positively enhanced by the program. As noted in the Hanover Research marketing analysis (in the supporting documents), more than half of B.S. Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline. In addition, the Hanover Research analysis notes that Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of B.S. Environmental Engineering students that were not foreign students were affiliated with an underrepresented group (Hispanic, Asian, black, American Indian, native Hawaiian, etc.).

Faculty gender diversity will be positively affected by the proposed degree program, further enhancing program quality. A study of enrollment demographics from 2005 to 2013 published in Environmental Engineering Science Nationally found that women earn 39% of Ph.D. in Environmental Engineering, outpacing comparable fields. It is anticipated that this major will help attract more highly qualified women to the UNL College of Engineering.

3. Workforce Development.

The program will train engineering students to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa). This major will attract and retain talented Nebraska students by providing a degree program for which currently students leave Nebraska to obtain, and will address long-term interests and needs of the state (e.g. addressing important, and often overlooked, rural water and wastewater infrastructure and waste management needs). By adding to the College of Engineering a key discipline, it will help attract talent to the University of Nebraska and build a competitive workforce to help improve the sustainability of Nebraska, the United States, and world.

The proposed program will enhance the University of Nebraska’s competitiveness in research and scholarly activities, as well as their application, by focusing on areas of strategic importance and opportunity, specifically focusing on an area of research strength in the College of Engineering (Environmental Engineering) and an area of strategic importance to Nebraska (natural resources, especially water).

5. Partnerships.

This program will train engineering students to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa) will support economic growth via recruiting and graduating talented young women and men specializing in an engineering discipline strategically important to the state. The Environmental Engineering group in Civil and Environmental Engineering have a long history of active engagement and coordination with Nebraska citizens, businesses, and rural and urban communities.

B. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

1. Chapter 1: *Higher Education for Nebraska's Future*

Vision for Nebraska Higher Education. Nebraskans will reap many benefits from affordable, accessible, and high-quality higher education. Nebraska's people will value and support higher education institutions that are vital, vigorous, and visionary. Each higher education institution will fulfill its role and mission with distinction by being responsive to changing academic, workforce, societal, economic, and community development needs. Together, Nebraska's institutions will provide access to educational opportunities that meet the diverse needs of students and citizens while exercising careful and creative stewardship of available resources.

As noted in Section II.B, the proposed program will attract a diverse student body into a highly paid and high demand discipline. The proposed program will allow UNL COE to offer a comprehensive set of degrees to continue to attract students from Nebraska, the United States, and around the world. The graduates of the program will continue to improve public health and the environmental quality of the state, and the faculty will contribute to the viability of the state through research and development efforts.

2. Chapter 2: *Meeting the Educational Needs of Students*

Major Statewide Goal: Participation and Access. Nebraska institutions and policymakers will seek methods to increase participation and success in higher education and to ensure that access to higher education institutions' programs and services is not restricted by factors such as geographic location, economic status, age, culture, disability, color, national origin, or gender.

As noted in Section II.B, the proposed program will increase the participation of Nebraskans in higher education and will attract diversity into the UNL College of Engineering. As noted in the Hanover Research marketing analysis (in the supporting documents), more than half of B.S. in Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline. In addition, the Hanover Research analysis notes that Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of B.S. Environmental Engineering students that were not foreign students were affiliated with an underrepresented group (Hispanic, Asian, black, American Indian, native Hawaiian, etc.).

The proposed degree program that has fewer hours than most peer B.S. Environmental Engineering degree, to aid timely progression through postsecondary education into the workplace.

4. Chapter 3: Meeting The Needs of the State

Major Statewide Goal: Workforce Development. Higher education in Nebraska will be responsive to the workforce development and ongoing training needs of employers and industries to help sustain a knowledgeable, trained, and skilled workforce in both rural and urban areas of the state.

The proposed degree will attract and retain highly talented students interested in an engineering degree that trains them to address future impacts from our built infrastructure and environmental systems on the environment (and visa-versa), skills that will benefit and positively impact both urban and rural Nebraska communities. The degree will meet employer demand for students in this discipline. A marketing analysis performed by Hanover Research (in the supplemental documents) projects environmental engineer employment growth regionally will increase at least 10.4% over the next decade.

5. Chapter 4: Meeting Educational Needs Through Exemplary Institutions

Major Statewide Goal: Exemplary Institutions. Each Nebraska postsecondary institution will fulfill its role and mission in an exemplary manner and will compare favorably with peer institutions.

The proposed degree will more favorably align UNL in offering a comprehensive range of engineering degrees consistent with other Big Ten schools, and other peer institutions.

6. Chapter 5: Meeting Educational Needs Through Partnerships and Collaboration

Major Statewide Goal: Partnerships. Higher education institutions will work as partners with one another and with other entities whenever appropriate to share resources and deliver programs cooperatively to enhance learning opportunities for Nebraska residents.

The proposed degree will encourage additional partnerships with other institutions by providing a clear educational path for students who are interested in developing sustainable solutions for our society through built infrastructure and environmental systems.

C. Evidence of Need and Demand

1. Need:

The need for the proposed B.S. degree in Environmental Engineering will be discussed in context of information from the state, regional, and national perspective, using a data from Hanover Research, state professional associations, UNL Peer and Big Ten institutions, engineering licensure boards, and the US Government.

Marketing Analysis

In July of 2020, the UNL College of Engineering commissioned a market analysis for a B.S. in Environmental Engineering performed by Hanover Research. The market analysis is included in the supporting documents as a PDF. Key findings of the market analysis concerning workforce need are:

- Labor market indicators paint an optimistic employment landscape for graduates of the proposed program. Hanover projects environmental engineer employment growth regionally over the next decade at 10.4%.
- A non-existence competitive environmental locally and supportive saturation indicators nationally suggest that the proposed program will fill a market gap.

Workforce Need in Nebraska

Demand for graduates of UNL Civil Engineering B.S. in jobs related to environmental engineering is strong from employers including the federal agencies, state of Nebraska, municipalities, and engineering firms including HDR, Inc, Olsson Associates and Lamp Ryneason and Associates, among others.

Within Nebraska, there is an unmet demand for graduates with a background and interest in Environmental Engineering. One form of evidence is a recent decision of two professional organizations, the Nebraska Water Environment Association and Nebraska Section American Water Works Association, to start a student mentoring program in 2018 for undergraduate students interested in a career in Environmental Engineering. The program connects a student with a working professional, and includes three to five in-person professional events (facility tours, networking happy hours, etc.) each year where the student and working professional can jointly participate. The past two years, approximately 34 Nebraska professionals have volunteered to serve as a student mentor. The Nebraska Bureau of Labor Statistics indicates there are currently 460 environmental engineers in the state of Nebraska with a mean annual average salary of \$89,120. Employment growth is estimated at 5% nationally over the period of 2018-2028, and Nebraska Department of Labor estimates 7.79% growth in architecture and engineering professions over the same time period.

Big Ten and UNL Peer Institutions

Development of a B.S. degree in Environmental Engineering will provide additional opportunities to attract and retain Nebraska students to attend college in Nebraska, as students interested in this degree likely pursue their education at out-of-state institutions since this degree is not currently offered in Nebraska. Additionally, this degree is not offered at all of our regional and peer institutions, so expanding the degree offerings to include this degree will attract additional out of state students to Nebraska.

This degree, like other engineering disciplines, has grown out of other existing engineering disciplines. Around the US, Environmental Engineering most commonly has been taught in Civil Engineering. During the past two decades, some Big Ten institutions, as well as University of Nebraska-Lincoln's peer institutions, have added a separate degree focusing on Environmental Engineering to meet student and employer demand.

Regionally, B.S. in Environmental Engineering degrees have existed for over a decade in Colorado and South Dakota (South Dakota School of Mines), and have recently been initiated in Iowa and Kansas (Kansas State University). As listed in Table III.1, an ABET-accredited degree in Environmental Engineering now is offered by eight of the twelve other Big Ten Engineering Colleges. Seven of the ten UNL Peer Institutions (as listed by the University of Nebraska's Board of Regents) now offer an ABET-accredited degree in Environmental Engineering (Table III.2). Both in the Big Ten and among the peer group, about half the B.S. in Environmental Engineering programs have been added during the past decade. Thus, UNL will be at a recruiting disadvantage as compared to peer institutions if it does not have a B.S. in Environmental Engineering.

Table III.1. Frequency of Environmental Engineering degrees within the Big Ten.

Institution	Degree Name	Notes
University of Iowa	B.S. EnvE	
University of Illinois – Urbana		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering.
University of Maryland		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Michigan	B.S. EnvE	
Michigan State University	B.S. EnvE	
University of Minnesota - Twin Cities	B.S. EnvE	
Northwestern University	B.S. EnvE	
Ohio State University	B.S. EnvE	
Penn State University		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
Purdue University	B.S. Env. & Ecological Engr.	
Rutgers University	B.S. EnvE	
University of Wisconsin		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering

Table III.2. Frequency of Environmental Engineering degrees within UNL’s Peer Institutions.

Institution	Degree Name	Notes
Colorado State University	B.S. EnvE	
Iowa State University	B.S. EnvE	Degree was first offered in Fall 2021
Ohio State University	B.S. EnvE	
Purdue University	B.S. Env. & Ecological Engr.	
University of Colorado at Boulder	B.S. EnvE	
University of Iowa	B.S. EnvE	
University of Illinois – Urbana		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Kansas		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering
University of Minnesota - Twin Cities	B.S. EnvE	
University of Missouri - Columbia		Environmental Engineering is only offered as a concentration within the B.S. Civil Engineering

Licensure

The number of engineers licensed in Environmental Engineering is growing, and it is now the discipline with fourth highest number of PE exam takers and licenses issued. Table III.3 lists the number in the U.S. of test takers that passed PE exam during 2019 based on data from the NCEES website. Also, the table lists the annual average number of PE licenses issued by the Nebraska Board of Engineers and Architects (6/2/2020 data) for the 2015 to 2019 period. The Nebraska PE licensure data is a combination of individuals that passed the PE exam and requested licensure in Nebraska and individuals with a PE in another jurisdiction that were issued licensure in Nebraska through reciprocity.

The Environmental Engineering discipline was the fourth highest in the number of Professional Engineering Licenses issued between 2015 and 2019 in Nebraska, even though UNL only offers a MS and not a B.S. program in Environmental Engineering. Approximately half of the Environmental Engineering licenses issued in Nebraska were to individuals from other jurisdictions seeking the ability to perform

work in Nebraska. A degree in Environmental Engineering at UNL will increase the labor pool in the state, increase the number of Environmental Engineering PEs in Nebraska, and decrease the demand for hiring out-of-state Environmental Engineering PEs to perform projects.

Table III.3. Frequency of Professional Licensure by Discipline.

PE Exam ¹	National Number Passed 2019	Nebraska PE Licenses issued Annual Average of 2015-19
Civil Engineering	11,022	267.5
Mechanical Engineering	2,953	119
Electrical and Computer Engineering	1,854	81
Environmental Engineering	419	10.25
Chemical Engineering	353	7
Petroleum	143	0
Architectural Engineering	80	6.5
Agricultural and Biological Engineering	12	1.25
Software	8	0

1- Disciplines are not listed if a degree is not offered at UNL and fewer than 100 licensures are annually issued in the US.

National Workforce Need

Nationally, the workforce needs can be quantified by data from the US Bureau of Labor Statistics' Occupational Outlook Handbook. Table III.4 summarizes the data for existing UNL College of Engineering majors and minors. Environmental Engineering has the fifth highest workforce need, higher than Chemical, Agricultural, and Biomedical Engineering.

Table III.4. National Job Demand by Engineering Discipline.

Engr. Majors	No. Jobs, 2018	Job outlook (% growth 2018-28)	Employment Growth, 2018-28	2019 Median Pay (\$/yr)
Electrical	330,300	2	8,000	101,250
Civil	326,800	6	20,500	87,060
Mechanical	321,900	4	12,800	88,430
Computer	64,400	6	4,000	117,220
Environmental ¹	55,400	5	2,900	88,860
Chemical	33,900	6	2,100	108,770
Biomedical ¹	19,800	4	700	91,410
Agricultural	2,600	5	100	80,720

1- Currently a minor at UNL

Note: Other UNL COE Majors, Architectural Engineering, Construction Engineering, and Biological Systems Engineering, are not listed as separate disciplines by US Bureau of Labor Statistics.

Source: <https://www.bls.gov/ooh/architecture-and-engineering/home.htm>

This data shows that there is a regional and national demand for B.S. Environmental Engineering graduates. The graduates of this program will have a major impact on society and economic development by helping protect public health and environment, and by helping to improve the sustainability of our infrastructure and institutions.

3. Demand:

It is anticipated there will be a significant student demand for the proposed B.S. in Environmental Engineering. Data is provided based on Hanover Research, student interest at UNL, and enrollment trends from Big Ten and UNL Peer Institutions.

Marketing analysis

In July of 2020, the UNL College of Engineering commissioned a market analysis for a B.S. in Environmental Engineering performed by Hanover Research. The market analysis is included in the supporting documents as a PDF. Key findings of the market analysis concerning student demand for the degree are:

- Student demand for environmental engineering bachelor's programs is strong and growing, both regionally and nationally.
- Regionally, environmental engineering bachelor's completions in Environmental Engineering at comparator universities have grown by 15.5% between 2014 and 2018.
- More than half of B.S. Environmental Engineering students at peer institutions are women, which is the highest of any engineering discipline.
- B.S. Environmental Engineering programs regionally attract a significant proportion of underrepresented groups. Regional 2018 race/ethnicity data showed 23% of students that were not foreign students were affiliated with an underrepresented group (e.g., Hispanic, Asian, Black, American Indian, Native Hawaiian).
- International students are a strong proportion of B.S. Environmental Engineering students at comparator institutions.
- National Civil Engineering bachelor's programs show comparable growth to that of environmental engineering, supporting institutions choice to deliver both.
- A non-existence competitive environmental locally and supportive saturation indicators nationally suggest that the proposed program will fill a market gap.

UNL and Nebraska

At UNL, students are interested in Environmental Engineering. This is evidenced by the number of UNL students (from both the Lincoln and Omaha campuses) who signed up to participate in a mentoring program organized by the Nebraska Water Environment Association and the Nebraska Section American Water Works Association. In 2018-19, 20 UNL students signed up to participate in the program, and in 2019-20, 28 students signed up for the program. These students were primarily enrolled in the B.S. in Civil Engineering program, but also included students from other Engineering majors and several students from other majors who were considering changing majors. A chapter of the NWEA student organization was also formed in Omaha, showing interest in this area from both Omaha and Lincoln based students.

The degree of interest in Environmental Engineering among UNL students can also be found through the enrollment in CIVE 326 (Introduction to Environmental Engineering). CIVE 326 is a required class for the B.S. in Civil Engineering and an elective course for other engineering majors. The past three years the course has annually attracted 45 to 60 engineering students from other majors; 55% of these students expressed a very high interest in Environmental Engineering in a class pre-survey.

Dr. Bruce Dvorak, who serves as the graduate chair of the M.S. in Environmental Engineering program, annually receives fifteen to twenty emails from high school students interested in majoring in Environmental Engineering and seeking to determine if UNL has an undergraduate program in the topic. The majority of these students currently enroll in out-of-state institutions. Some students select a University based on the availability of the different majors the student is considering. UNL will be more

competitive in attracting students for which Environmental Engineering is one of their possible interests by offering the proposed degree.

It is estimated that the first year of the program the enrollment would be approximately 14 students since the enrollment would largely be based on internal transfers into the new major. We anticipate less than 5% of current B.S. CIVE students would transfer into the new B.S. EnvE major in the first year. Based on the enrollment growth data we collected from peer institutions, it is anticipated that enrollment will increase significantly after a full year of recruiting for the new major. It was conservatively estimated that the B.S. in Civil Engineering enrollment would grow 5% each year, and the B.S. in Environmental Engineering enrollment would be 19%, 22% and 25% of the B.S. Civil Engineering enrollment in years 3 through 5, respectively. Table III.5 provides projected enrollment for the first five years of the proposed B.S. in Environmental Engineering. We anticipate the B.S. EnvE program enrolling approximately 78.3% resident students and 21.7% non-resident students, which is the resident/nonresident ratio in the College of Engineering.

Table III.5. Projected Enrollment for the First Five Years of the B.S. Environmental Engineering

Year	Resident Enrollment	Non-resident Enrollment	Total Enrollment
1	11	3	14
2	53	15	68
3	75	21	96
4	92	25	117
5	110	30	140

Most classes for the proposed B.S. in Environmental Engineering taught by Civil and Environmental Engineering (CIVE and ENVE course codes) will be used by multiple majors. The majors using these classes are listed in Table III.6, with the last column lists majors other than the B.S. Environmental Engineering that use each course either as a required class, common elective (typically with 15+ students), or an elective (typically taken by a five to ten students from those majors). Because of the use of these classes by multiple majors, the minimum number of students required to make the proposed B.S. in Environmental Engineering program viable would be approximately 7 to 10 students per class year, which our enrollment projects support as of Year 2.

Table III.6. CIVE and ENVE Courses Used by B.S. in Environmental Engineering and Used by other Majors. New classes are listed in bold.

CODE	Title	Credit Hrs	Role in BS EnvE	Other Majors Using Course
ENVE 110	Introduction to Environmental Engineering	3	Required	Components of ENVE 110 will be taught jointly with CIVE 110.
ENVE 210	Fundamentals of Environmental Engineering	3	Required	
CIVE 310	Fluid Mechanics	3	Required	Reqd by BS CIVE, BS AGEN, BS CONE, BS BSEN, and MS AREN
CIVE 321	Principles of Environmental Engineering	3	Required	Reqd for BS CIVE, Common Elective for BS AGEN, BS BSEN, and BS CHME
CIVE 321L	Environmental Engineering Laboratory	1	Required	Reqd for BS CIVE
ENVE 322	Biological Principles of Environmental Engineering	2	Required	Elective for select students from BS BIOS

CIVE 352	Introduction to Water Resources Engineering	3	Required	Reqd for BS CIVE
CIVE 385	Professional Practice and Management in Civil Engineering	3	Required	Reqd for BS CIVE
ENVE 410	Environmental Fate and Transport	3	Required	Elective for BS CIVE
CIVE 421	Environmental Engineering Process Design	3	Required	Elective for BS CIVE and BS BSEN
ENVE 430	Sustainable Design in Environmental Engineering	3	Required	Elective for select students from BS CIVE
CIVE 424	Solid Waste Management Engineering	3	Fulfills a Requirement	Common Elective for BS CIVE and BS CHME
CIVE 419, or CIVE 452	Flow Systems Design or Water Resources Development	3	One Required, other can be a Technical Elective	Common Elective for BS CIVE Common Elective for BS CIVE
CIVE 489	Senior Design Project	3	Required	Reqd for BS CIVE
Technical Electives	Common Tech. Electives: CIVE 425 Design of Water Treatment Facilities CIVE 426 Design of Wastewater Treatment and Disposal Facilities CIVE 429 Facility-Level Sustainability: Principles and Practices	6 total	6 hours required (most commonly used will be CIVE 419, 424, 425, 426, 429 and/or 452)	Elective for BS CIVE Elective for BS CIVE Elective for BS CIVE, BS BSEN, BS CHME, BS ELEC, BS MECH

D. Avoidance of Unnecessary Duplication

This would be the only ABET-accredited program in Environmental Engineering in Nebraska. Additionally, there are no non-accredited environmental engineering degrees offered in the state of Nebraska. The B.S. degree in Environmental Engineering is not duplicative of the B.S. degree in Civil Engineering. The B.S. in Civil Engineering is a broad degree with exposure to structural engineering, transportation engineering, structural engineering, water resources engineering and environmental engineering. The B.S. in Environmental Engineering provides a focus on environmental engineering through additional coursework in the natural sciences combined with courses that focus on a wide range of areas within environmental engineering including water and wastewater treatment, air pollution, solid and hazardous waste management, industrial hygiene and sustainability.

E. Adequacy of Resources:

The proposed program will use existing faculty, advising, student support, classroom and lab space within the Department of Civil and Environmental Engineering in Lincoln and Omaha. A number of courses required for the degree are currently required or elective courses currently offered in the department and we have additional capacity in these classes to accommodate the additional students from the B.S. in Environmental Engineering. The College of Engineering annually allocates Graduate Teaching Assistant (GTA) resources based in part on departmental student credit hour (SCH) production. With the new degree and the resulting SCH production, additional GTA resources will be allocated to support the degree based on existing College of Engineering allocation policies. Adequate library

resources to support the program currently exist at the University of Nebraska-Lincoln and the University of Nebraska at Omaha. Existing instructional equipment and laboratory space exist within the College of Engineering and Civil and Environmental Engineering for the proposed program. A large portion of the coursework exists within the sciences, math, other engineering units, and from existing courses in the Department of Civil and Environmental Engineering. Five new classes, recently approved by the Department of Civil and Environmental Engineering, will be created for the proposed major and delivered on both the Lincoln and Omaha campuses. The capstone design series (CIVE 385 and 489) will be taught co-current with the Civil Engineering capstone design and will utilize the same instructor.

One professor of practice will be requested in Fiscal Year 2022 to support the new degree program implementation. In Dean Perez's memo, he has indicated his support and priority of this request, and future requests based on enrollment projections. If enrollments grow as projected, additional instructional resources would be added in year three (estimated enrollment of 96 students) and year five (estimated enrollment of 140 students) as additional sections of courses and labs for the program would be required. The instructional salary for FY 2022 would be supported through the College of Engineering's existing budget and future instructional salaries would be supported through enrollment growth revenue within the University's budget model.

CCPE Table One: Projected Expenses includes the estimated instructional salaries, which are estimated using a starting salary of \$92,000, plus 30% fringe benefits. The calculations factor in a 3% yearly adjustment for salary and benefit costs.

CCPE Table Two: Projected Revenue includes the estimated revenue based on enrollment for tuition, using the historical formula for resident and non-resident students in the College of Engineering, 78.3% resident and 21.7% nonresident.

IV. Appendices

- A. Letters of Support (attached)
- B. Licensure (available upon request)
- C. Curriculum Detail (available upon request)
- D. Hanover Market Analysis Research (available upon request)
- E. Catalog Copy (available upon request)

Appendix A

Letters of support:



January 15, 2021

Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Department of Civil and Environmental Engineering
University of Nebraska–Lincoln
Lincoln, NE 68588-0531

Re: Proposed B.S. Degree in Environmental Engineering in the
Department of Civil and Environmental Engineering

Dear Dr. Bartelt-Hunt:

The external advisory board for the Department of Civil and Environmental Engineering is pleased to provide this letter of support for the proposal prepared by the department to initiate a B.S. in Environmental Engineering. This proposed degree will complement the existing undergraduate degree in civil engineering offered in the department. Graduates with a B.S. in Environmental Engineering will contribute to the civil and environmental engineering workforce in the state of Nebraska and will find employment opportunities in local, state and federal government agencies as well as the private sector.

Sincerely,

Steve Goans, P.E. Acting Chair
Nebraska Department of Energy and Environment

Michael McIntosh, P.E.
Lamp Rynearson

Lindsey Connot, P.E. Vice Chair
Miller and Associates

Eric Obert, P.E.
JEO Consulting Group, Inc.

Scott Gilliland, P.E.
InfraStructure, LLC

Dr. Eric Seagren, P.E.
Michigan Technological University

Dale Jacobson, P.E.
DD Consulting, LLC

Dan Thiele, P.E.
Thiele Geotech, Inc.

Moe Jamshidi, P.E.
Nebraska Department of Transportation

Matthew Tondl, P.E.
HDR, Inc.

Dr. Heather Kirkvold, P.E.
James Madison University

Katie Underwood, P.E.
Olsson

Todd Wimmer
Union Pacific



Department of Civil and Environmental Engineering

W181 Nebraska Hall | P.O. Box 886105 | Lincoln, NE 68588-6105 | 402.472.2371 | F: 402.472.8934
1110 S. 67th St. | The Peter Kiewit Institute | Omaha, NE 68182-0178 | 402.554.2462 | F: 402.554.3288
cee.unl.edu

From: [Renee Batman](#)
To: [Renee Batman](#)
Subject: FW: Environmental Engineering BS Create
Date: Sunday, March 21, 2021 12:15:24 PM

From: Tiffany Heng-Moss <thengmoss2@unl.edu>
Sent: Saturday, March 20, 2021 7:13 AM
To: Renee Batman <rbatman2@unl.edu>
Cc: David Jones <david.jones@unl.edu>; Tiffany Heng-Moss <thengmoss2@unl.edu>; Michael Boehm <mboehm3@unl.edu>
Subject: Re: Environmental Engineering BS Create

Renee: David Jones and I support the proposal by the Department of Civil and Environmental Engineering to create a new undergraduate degree program in Environmental Engineering.

Tiffany

Tiffany Heng-Moss, Ph.D.
Dean
College of Agricultural Sciences and Natural Resources

University of Nebraska
103 Agricultural Hall
Lincoln, NE 68583
402.472.2201
thengmoss2@unl.edu
Pronouns: she/her/hers

#ThisIsCASNR

**WE ARE A COLLEGE COMMUNITY WHERE EVERYONE
CHALLENGES THEMSELVES, IS INCLUSIVE, ASKS BOLD
QUESTIONS, AND IS OPTIMISTIC ABOUT THE FUTURE!**

"If your actions inspire others to dream more, learn more, do more and become more, you are a leader." John Quincy Adams



January 14, 2021

Bruce Dvorak, Ph.D., P.E.
University of Nebraska-Lincoln
Nebraska Hall W181
900 N. 16th Street
Lincoln, NE 68588-0531

Dear Dr. Dvorak:

Recently we have become aware of the consideration of an additional program of study within the College of Engineering (COE). As a locally based company that relies on the university for a steady stream of talent (we currently employ 130 COE graduates), Olsson stands in support of a new ABET-accredited B.S. in Environmental Engineering.

The future of engineering is very bright. The needs are great, and opportunity abounds. For Olsson, one of the single largest challenges we face is the ability to hire enough quality talent to support the demand. With the establishment of a new undergraduate major, we see this as a pathway to create additional interest for individuals finding their life work - which in turn is good for Olsson!

The geographic spread of our projects, and thus our reach for talent, spans most of the central and southwestern United States. I can say unequivocally that the talent and work ethic that comes from graduates from the University of Nebraska is second to none. Often, they find success and assume leadership roles within our organization. As such, anything that can be done to keep up with the pace of our growth and the need to rebuild America's infrastructure is fully endorsed.

I would be delighted to sit down to discuss further and learn of other ways Olsson can help this initiative move along.

Sincerely,

A handwritten signature in black ink that reads "John S. Olsson". The signature is written in a cursive style.

John S. Olsson, P.E.

March 19, 2021

Dr. Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Department of Civil and Environmental Engineering
University of Nebraska-Lincoln
Lincoln, NE 68588-0531

Reference: Proposed B.S. Degree in Environmental Engineering in the
Department of Civil and Environmental Engineering

Dear Dr. Bartelt-Hunt:

Lamp Rynearson, Inc. is pleased to provide this letter of support for the proposal prepared by the department to initiate a B.S. in Environmental Engineering. This proposed degree will complement the existing undergraduate degree in civil engineering offered in the department. Graduates with a B.S. in Environmental Engineering will contribute to the civil and environmental engineering workforce in the state of Nebraska and will find employment opportunities in local, state, and federal government agencies as well as the private sector.

We are excited to see the University take this step and look forward to engaging with new Environmental Engineering graduates.

Sincerely,

LAMP RYNEARSON



Nancy Pridal, P.E., ENV SP
CEO/President



April 2, 2021

Shannon L. Bartelt-Hunt, Ph.D., P.E.
Professor and Chair
Donald R. Voelte Jr. and Nancy A. Keegan Chair of Engineering
Department of Civil and Environmental Engineering
College of Engineering, University of Nebraska–Lincoln
W181D Nebraska Hall, PO Box 880531
Lincoln, NE 68588-0531

Dear Dr. Bartelt-Hunt,

HDR is an employee-owned design firm of 10,500 employee owners in 220 offices in the US and 13 countries, specializing in engineering, architecture, environmental, and construction services. Approximately 1000 of our staff are located at HDR's global headquarters in Omaha. HDR employs Environmental Engineers to work on a wide range of projects, including drinking water and wastewater systems, stormwater management, solid waste disposal, water quality modeling, air quality management, and sustainability services.

UNL is a key producer of the engineering talent at HDR with UNL grads located at HDR offices around the country. We built our company on the locally produced talent and it continues to be a key source for us. HDR has long employed UNL Engineering graduates from all existing Engineering majors, including Civil Engineers with a focus on Environmental Engineering. We hope to continue to hire UNL Engineering graduates from all majors, including the proposed B.S. in Environmental Engineering. We see a need to increase the number of graduates in the region with expertise in Environmental Engineering and are excited about programs that will attract women and other underrepresented minorities into engineering. We strongly support the proposal for a new B.S. in Environmental Engineering at the University of Nebraska-Lincoln on both the Lincoln and Omaha campuses.

Sincerely,

Matthew Tondl, PE
Senior Vice President / Area Manager NE / IA
(UNL Civil Engineering Grad)

hdrinc.com

1917 S 67th Street, Omaha, NE 68106-2973
(402) 399-1000

**TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Environmental Engineering**

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty ¹	1.0	\$119,600	1.0	\$123,188	2.00	\$253,766	2.00	\$261,378	3.00	\$403,829	\$1,161,761
Professional											
Graduate Assistants											
Support Staff											
Benefits											
Subtotal	1.0	\$119,600	1.0	\$123,188	2.00	\$253,766	2.00	\$261,378	3.00	\$403,829	\$1,161,761
Operating											
Operating and Supplies											
Equipment											
Library/Information Resources											
Subtotal											\$0
Total Expenses		\$119,600		\$123,188		\$253,766		\$261,378		\$403,829	\$1,161,761

¹ Instructional salaries (1.0 FTE) requested in years 1, 3 and 5 are estimated at a salary of \$92,000 plus 30% fringe benefits. A 3% annual growth rate is assumed for salaries and benefits.

**TABLE 2: PROJECTED REVENUES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Environmental Engineering**

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	Reallocation of Existing Funds										
Required New Public Funds											
1. State Funds											
2. Local Tax Funds (community colleges)											
Tuition and Fees ¹		\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	\$6,854,995
Other Funding											
Total Revenue		\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	\$6,854,995

¹ Gross tuition projection based on projected enrollment in table below. The estimated course and lab fees per student over the course of their program is \$65.

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5	
	R	NR	R	NR	R	NR	R	NR	R	NR
Est. Tuition per student	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460	\$11,130	\$32,460
Est. Total Enrollment in Major	14		68		96		117		140	
Est. New Enrollment - Student Type	11	3	53	15	75	21	92	25	110	30
Est. New Tuition & Fees	\$122,007	\$98,613	\$592,606	\$478,980	\$836,620	\$676,207	\$1,019,630	\$824,127	\$1,220,071	\$986,135
Est. New Tuition & Fees	\$220,621		\$1,071,585		\$1,512,827		\$1,843,757		\$2,206,205	
Est. New Total Tuition & Fees	\$6,854,995									

TO: The Board of Regents Addendum XI-A-3
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of a Bachelor of Science in Statistics and Data Analytics in the Department of Statistics in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to create a Bachelor of Science (BS) in Statistics and Data Analytics in the Department of Statistics in the College of Agricultural Science and Natural Resources at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTIONS: March 5, 2005 – The renaming of the major in Mathematics and Statistics to the Major in Mathematics at UNL was reported to the Board.

June 7, 2003 – The Board approved the merger of the Division of Statistics within the Department of Mathematics and Statistics and the Department of Biometry to form the new Department of Statistics. The Department of Mathematics and Statistics was renamed the Department of Mathematics.

June 7, 2003 – The Board approved the consolidation of the Master of Science in Biometry and the statistics specialization of the Master of Science in Mathematics and Statistics into a single Master of Science in Statistics from the Department of Statistics.

June 7, 2003 – The Board approved moving the administrative responsibility for the Statistics PhD from the Department of Mathematics to the new Department of Statistics.

EXPLANATION: The proposed BS degree in Statistics and Data Analytics is designed for students who wish to pursue careers in statistics, machine learning, and data analytics. The State of Nebraska does not have, at any institution, an undergraduate degree dedicated to Statistics and Data Analytics. The proposed curriculum will interweave statistical thinking and computing with writing, data exploration, and data analysis. Students will be able to identify problems that can be informed by data, collect the data, analyze it appropriately, and communicate the results in a readily understandable manner. Upon graduation, students will be qualified for immediate employment at a variety of business and technology companies; they also will be prepared for graduate studies in Statistics, Biostatistics and related fields.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

PROGRAM COST: \$5,000 in Year 1; \$25,000 over five years

SOURCE OF FUNDS: Tuition and fees

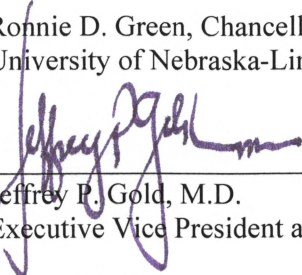
SPONSORS:

Michael J. Boehm
Vice President, Agriculture and Natural Resources, University of Nebraska
Harlan Vice Chancellor, Institute of Agriculture and Natural Resources,
University of Nebraska-Lincoln

Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED:



Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE:

July 16, 2021



April 29, 2021

Susan Fritz, Executive Vice President and Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583-0745

Dear EVPP Fritz,

I am forwarding materials related to a proposal to create a Bachelor of Science degree in Statistics and Data Analytics to be administered by the Department of Statistics in the College of Agricultural Sciences and Natural Resources.

This program will fill a gap in the university's undergraduate offerings and improve our competitive stance in the Big Ten and the higher education marketplace. The program is designed to meet the needs of students who are pursuing careers in statistics, machine learning, and data analytics to construct novel solutions to society's challenges.

The core courses are already established, there are adequate existing resources, and a sufficient number of quality faculty are available. This proposal has the full endorsement of the Academic Planning Committee and it has my approval. I am requesting you approve it and that it be reported to the Board of Regents at an upcoming meeting.

Sincerely,

Ronnie D. Green, Ph.D.
Chancellor

- c: Kurt Geisinger, Chair, Academic Planning Committee
- Mike Boehm, Vice Chancellor, IANR
- Tiffany Heng-Moss, Dean, College of Agricultural Sciences and Natural Resources
- Bertrand Clarke, Department Head, Statistics
- Mike Zeleny, Associate to the Chancellor and APC Secretary
- Renee Batman, Assistant Vice Chancellor, Academic Affairs
- Suzi Tamerius, Project Coordinator, Academic Affairs
- Karen Griffin, Coordinator of Faculty Governance, Academic Planning Committee
- David Jackson, Vice Provost
- Cathy Robertus, Executive Assistant to the EVPP

University of Nebraska-Lincoln

New Undergraduate Major or Degree

I. Descriptive Information

Name of Institution Proposing New Major or Degree
University of Nebraska-Lincoln
Name of Proposed Major or Degree
Statistics and Data Analytics
Degree to be Awarded to Graduates of the Major
Bachelor of Science in Statistics and Data Analytics
Other Majors or Degrees Offered in this Field by Institution
The University of Nebraska-Lincoln currently offers no undergraduate degree or major in Statistics and Data Analytics. The Department of Statistics already offers both a Masters and PhD in Statistics.
CIP Code <i>[IEA can help with CIP codes or browse here: http://nces.ed.gov/ipeds/cipcode/Default.aspx?v=55]</i>
27.0501
Subject Code
STAT (existing subject prefix code)
Administrative Units for the Major or Degree
Department of Statistics
Proposed Delivery Site
University of Nebraska-Lincoln
Program will be Offered <i>[full program, not individual courses]</i>
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
Date Approved by the Governing Board
Pending
Proposed Date the New Major or Degree will be Initiated
Upon approval by the Coordinating Commission.

II. Details

A. Purpose of the Proposed Major or Degree:

Data are ubiquitous and proficiency with data has become essential for both the routine functioning of society and for continued advances in many disciplines. While statistics and data analytics as a field go back to the early 1900s, the growth of the field accelerated in the early 90s, driven by the dramatic decrease in the cost of data collection and advances in computing. This acceleration shows no sign of slowing and UNL, alone in the Big 10, does not have an undergraduate degree in Statistics and Data Analytics. This proposal remedies that omission and positions UNL to be a leader in statistics and data analytics.

The proposed undergraduate degree program in statistics and data analytics is designed to serve the needs of students who wish to pursue careers in statistics, machine learning, and data analytics. The program is designed to produce students who can, working alone or as part of a team, identify a problem which can be informed by data, collect the data, analyze it appropriately, and communicate the results effectively. Upon graduation, students will be qualified for immediate employment at a variety of business and technology companies; they also will be prepared for graduate studies in statistics and related fields. Therefore, this degree program will prepare students for successful careers and create a pipeline for advanced degrees at UNL (Statistics) and UNMC (Biostatistics).

The state of Nebraska does not have, at any institution, an undergraduate degree dedicated to Statistics and Data Analytics. Unlike most existing undergraduate programs around the country, the program proposed here is an innovative synthesis of data analysis, statistical thinking, statistical computing, and technical communication skills. The core courses interweave statistical thinking and computing with writing and data exploration and analysis from the start, requiring students to present technical information in a readily understandable manner using visualizations, verbal discussion, and written reports.

B. Description of the Proposed Major or Degree:

Students in statistics learn how to use data to solve problems in a complex world. The degree program offers students the opportunity to formulate an answerable question, develop methodology for data analysis, collect data appropriately, extract evidence from that data, and use statistical reasoning to transform that evidence into information that can be used by enterprises, government, and other stakeholders. Graduates will be able to adapt to an ever-evolving data landscape and use their knowledge to construct novel solutions to challenges that are meaningful for society.

Learning Outcomes

Graduates of statistics and data analytics will be able to:

1. Identify the question to be answered, and design an appropriate data collection strategy.
2. Appropriately analyze data to solve complex problems.
3. Understand the underlying assumptions and theoretical properties of the analysis.
4. Use appropriate computing applications to pre-process, organize, visualize, and analyze data.
5. Demonstrate an understanding of how statistical procedures are computationally implemented, including awareness of when a procedure has failed and what to do about it.
6. Communicate statistical concepts and interpretation of data and results with collaborators in conversation, and through visual summaries and written reports.

Requirements for admission into the degree program and College of Agricultural Sciences and Natural Resources (CASNR) are consistent with general University admission requirements (one unit equals one high school year): 4 units of English, 4 units of mathematics, 3 units of natural sciences, 3 units of social studies, and 2 units of foreign language. Students must also meet performance requirements [ACT composite of 20 or higher OR combined SAT score of 1030 or higher OR a GPA of 3.0 or higher (on a 4.0 scale); transfer students must have a 2.0 (on a 4.0 scale) cumulative grade point average and 2.0 on the most recent term of attendance].

Core degree requirements (including CASNR requirements):

Removal of C-, D, and F Grades

Only the most recent letter grade received in a given course will be used in computing a student's cumulative grade point average if the student has completed the course more than once and previously received a grade or grades below C in that course.

The previous grade (or grades) will not be used in the computation of the cumulative grade point average, but it will remain a part of the academic record and will appear on any transcript.

A student can remove from his/her cumulative grade point average a course grade of C-, D+, D, D-, or F if the student repeats the same course at the University of Nebraska and receives a grade other than P (pass), I (incomplete), N (no pass), W (withdrew), or NR (no report). If a course is no longer being offered, it is not eligible for the revised grade point average computation process.

For complete procedures and regulations, see the Office of the University Registrar website at <https://registrar.unl.edu/academic-standards/course-repeats/>

Pass/No Pass

Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate.

GPA Requirements

A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation.

Transfer Credit Rules

To be considered for admission, a transfer student, Nebraska resident or nonresident, must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who have completed less than 12 credit hours of college study must submit either ACT or SAT scores.

Ordinarily, credits earned at an accredited college are accepted by the University. The College, however, will evaluate all hours submitted on an application for transfer and reserves the right to accept or reject any of them. Sixty (60) is the maximum number of hours the University will accept on transfer from a two-year college. Ninety (90) is the maximum number of hours the University will accept from a four-year college. Transfer credit in the degree program must be approved by the degree program advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the degree. At least nine hours in the major field, including the capstone course, must be completed at the University of Nebraska-Lincoln regardless of the number of hours transferred.

The College will accept no more than 10 semester hours of C-, D+, D, and D- grades from other schools. The C-, D+, D, and D- grades can only be applied to free electives. This policy does not apply to the transfer of grades from University of Nebraska at Omaha or University of Nebraska-Kearney to the University of Nebraska-Lincoln.

Course Requirements

The course requirements and student learning outcomes for a Bachelor of Science in Statistics and Data Analytics and degree program requirements are detailed in Appendix B. These courses have already been developed and approved by the college and campus curriculum committees.

Core Course Descriptions:

STAT 100 Career Explorations in Statistics – Credit Hours: 1

Introduction to the field of statistics, and exploration of careers available to those trained in statistics.

STAT 101 Introduction to Data – Credit Hours: 3

An introduction to statistics through exploratory data analysis and data visualization. Topics include data types, chart types, methods for working with and reducing data, simple regression, regression diagnostics. Focuses on how to communicate statistical information and how to critically consume statistical information presented in the media and popular press.

STAT 102 Principles of Statistical Analysis – Credit Hours: 3

Introduction to formal statistical inference and elementary probability for statistics majors. Explores the practical application of statistical techniques to meaningful scientific problems. Inference topics will be implemented using both simulation-based approaches and classical, theory-based methods.

STAT 151 Introduction to Statistical Computing – Credit Hours: 1

Introduction to programming for statistical analysis. Covers basic programming concepts necessary for statistics, good computing practice, and use of built-in functions to complete basic statistical analyses.

STAT 212 Principles of Study Design – Credit Hours: 4

Introduction to statistical aspects of study design. Both designed experiments and observational studies are covered. Sampling techniques, major experimental and treatment design structures, as well as power and sample size considerations.

STAT 251 Statistical Computing I: Data Wrangling – Credit Hours: 3

Techniques for processing, cleaning, and visualizing messy data. Topics include data reduction strategies, data transformations, combining multiple data sources, and special types of data (text, spatial, dates and times, hierarchical).

STAT 262 Probability for Statisticians – Credit Hours: 3

Probabilistic undergirding of statistical procedures including moments, common parametric families, marginal and conditional densities, sufficient statistics, modes of convergence, laws of large numbers and the central limit theorem and how they apply to estimators.

STAT 301 Mathematical Statistics and Modeling I – Credit Hours: 3

Essential statistical theory and methods for professional statistical practice. Broad statistical topics include estimation and hypothesis testing, elementary Bayesian concepts, multiple linear regression, linear mixed effects models, analysis of variance (ANOVA), logistic regression, Poisson regression, and nonparametric methods.

STAT 302 Mathematical Statistics and Modeling II – Credit Hours: 3

Essential statistical theory and methods for professional statistical practice. Topics include data transformation, multiple sources of error, elementary model selection, generalized linear mixed models, Bayesian models, and other theory and methods deemed appropriate as statistical science continues to evolve.

STAT 325 Statistical Collaboration I – Credit Hours: 3

Introduction to the role and purpose of statistical consulting and interdisciplinary collaboration. Covers processes for successful interdisciplinary collaboration, including asking good questions, dealing with difficult clients, communicating statistics to non-statisticians, working in teams, and determining solutions to answer the client's research question.

STAT 349 Technical Skills for Statisticians – Credit Hours: 3

Creation of research reports, business reports, and executive summaries. Presentation strategies, consequences of statistical modeling for real-world decision making, and countering common misconceptions and errors in statistical reasoning. Focus on real-world applications in research, business, and public service.

STAT 351 Statistical Computing II: Data Management and Visualization – Credit Hours: 3

Computational skills for management, visualization and analysis of large and complex data which are necessary for modern statistics. Includes a wide range of topics necessary for data analytics, including harvesting data from websites and common data structures, setting up and working with databases, and designing interactive data displays.

STAT 464 Model Selection and Prediction – Credit Hours: 3

Methods for selecting models applicable to real-world problems. Prediction as a modeling goal, models for prediction as opposed to inference. Methods for emerging data types, such streaming data, social network data, censored data, and others.

A brief overview of major requirements is shown below.

Table 1. Core degree requirements (including CASNR requirements) 96 credits

Topic area	Required Credits	ACE
College integrative course (SCIL 101)	3	8
Mathematics (MATH 106, 107, 208, 314)	16	3
Economics	3	6
Communications	6	1,2
Biology, Chemistry, Physics	8	4
Major Requirements	36	
STAT Electives	12	
Capstone Course	3	10
ACE Courses	9	5,7,9

For statistics electives, students will select at least 4 courses with a STAT prefix at the 300- or 400- level, excluding STAT 318, STAT 380, STAT 430, STAT 462, and STAT 463. They will select a capstone course from among STAT 425 (Statistical Collaboration II), STAT 451 (Development of Statistical Software), STAT 471 (Analysis of Messy Data), and STAT 499 (Undergraduate Thesis).

Example Four-Year Plan

Freshman Year			
Term 1	cr	Term 2	cr
SCIL 101 Science Literacy (ACE 8)	3	MATH 107 Calculus II	4
MATH 106 Calculus I (ACE 3)	5	LIFE 120/120L Fundamentals of Biology & Lab (ACE 4)	4
ENGL 150 Writing and Inquiry (ACE 1)	3	ALEC 102 Interpersonal Skills for Leadership (ACE 2)	3
STAT 100 Career Explorations in Stat	1	STAT 102 Principles of Statistical Analysis	3
STAT 101 Introduction to Data	3	STAT 151 Intro to Stat Computing	1
Total credit hours	15	Total credit hours	15

Sophomore Year				
Term 3	cr		Term 4	cr
MATH 208 Calculus III	4		MATH 314 Linear Algebra	3
CHEM 105 Chemistry in Context I	4		ACE 5 Humanities	3
AECN 141 Introduction to Economics of Ag (ACE 6)	3		ACE 7 Arts	3
STAT 212 Principles of Study Design	4		STAT 251 Statistical Computing I	3
			STAT 262 Probability	3
Total credit hours	15		Total credit hours	15

Junior Year				
Term 5	cr		Term 6	cr
ACE 9 Global Awareness	3		STAT 302 Math Stat & Modeling II	3
STAT 301 Math Stat & Modeling I	3		STAT 349 Technical Skills for Statisticians	3
STAT 325 Statistical Collaboration	3		STAT Elective	3
STAT Elective	3		STAT Elective	3
Focused/Free Elective	3		Focused/Free Elective	3
Total credit hours	15		Total credit hours	15

Senior Year				
Term 7	cr		Term 8	cr
STAT 464 Model Selection & Prediction	3		ACE 10 Capstone (Choose from STAT 425, STAT 471, STAT 451, STAT 499)	3
STAT 351 Statistical Computing II	3		Focused/Free Electives	12
STAT Elective	3			
Focused/Free Electives	6			
Total credit hours	15		Total credit hours	15

Four Year Credit Hour Total = 120

Advising and Internships

Students will be advised by both a faculty member and a professional advisor. The faculty member will work to mentor students on career and academic success, and the professional advisor will assist students with scheduling coursework and completing their degree in a timely fashion. The professional advisor will also work with students undergoing Academic Recovery. Although not a requirement of the degree program, students will be strongly encouraged to participate in internships. The faculty members and the professional advisor will work with students to help the students secure internships.

III. Review Criteria

A. Centrality to UNL Role and Mission

As a land-grant University, the University of Nebraska–Lincoln is charged with instruction, research, and outreach in agriculture and mechanic arts, not excluding other scientific or classical areas of study. The Institute of Agriculture and Natural Resources (IANR) was established through Nebraska legislative action for leadership in and service in agriculture, natural resources, and related fields of study. The College of Agriculture Sciences and Natural Resources (CASNR) is home to over 25 undergraduate degree programs providing instruction, research, and outreach in agriculture, natural sciences, and other related fields. Within CASNR, the Department of Statistics offers graduate programs at the MS and PhD levels.

Both CASNR and Statistics have a long and distinguished history of preparing talented, highly-trained, and motivated professionals who develop solutions, innovations, and discoveries changing the future of the world. A new degree program in Statistics and Data Analytics would continue the tradition of preparing students for rewarding careers in the multi-disciplinary fields of statistics and data analytics.

B. Relationship to NU 5-Year Strategic Priorities

The Statistics and Data Analytics major will meet the NU's 5-year strategic priorities. The new degree program will contribute to the strategic priorities in three critical ways. First, Statistics and Data Analytics major will increase the quality of the undergraduate learning pathway by engaging our students in systems thinking and increasing their confidence in data-based decision making. Second, the program will contribute to building a talented, competitive workforce and knowledge-based economy in Nebraska in partnership with the state, private sector and other educational institutions. Finally, graduates of this program will be able to engage with the citizens of Nebraska to help solve data-driven challenges to ensure the economic growth and vitality of Nebraska communities.

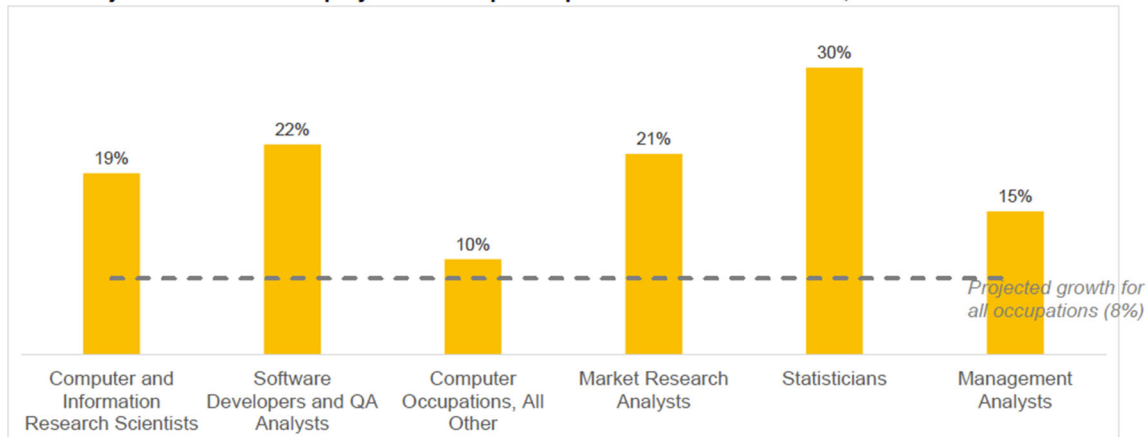
C. Evidence of Need and Demand

1. Need: Each day, people generate an increasing amount of data, as we add smart devices to our homes, new sensors to gather data from our power grids and highways, and advance scientific inquiry through data collection and analysis. As a result, statistics and data analytics are among the most in-demand skill sets in business settings, with a predicted increase in jobs of 30% between 2019-2029 (Appendix E, ADV Market Research & Consulting, Slide 5). Moreover, 69% of businesses report preferentially hiring those with analytics skills, such as statistics and data analytics, across a wide variety of positions¹.

¹ https://www.bhef.com/sites/default/files/bhef_2017_investing_in_dsa.pdf

Data science occupations projected to grow in the 2020s, especially statisticians

Projected Growth in Employment for Top Occupations for Data Scientists, 2019-2029



According to the Bureau of Labor Statistics, ‘Statistician’ is one of the fastest growing occupations in the US², and this is true in Nebraska as well. Overall, the number of jobs in Nebraska is expected to grow by 5.52% by 2028. However, over this timeframe, the job market for Statisticians in Nebraska is expected to increase more than 25%, with 72 ‘Statistician’ jobs added³. This does not include jobs added in related fields such as operations research and software application development, where similar increases are projected. Statistics and related fields (software development, operations research, etc.) account for 5 of the top 12 occupations with the highest expected job growth in Nebraska over the next 7 years, with 2214 jobs added across Statistics and related areas. NEworks estimates that for each 3 statistics positions posted, there are only 2 candidates.

An IBM report⁴ indicates that the demand for data and statistics skills is spread across industries such as finance, insurance, professional services, and IT. Applications for statistics in agricultural industries are increasing as well: farmers can now gather data on crop growth using drones, monitoring for nutrient deficiencies and pests; Fitbit-like devices are sold to monitor livestock health, location, and activity levels. All of these data-generating devices provide no utility without analysts who turn the streams of data into actionable, useful information. In a survey of data analytics and statistics postings on Glassdoor for the state of Nebraska, companies such as 3M, Humana, Thermo Fisher Scientific, ConAgra, and Sandhills Global are currently looking for statisticians and data analysts. Other companies attempt to develop data analytics skill sets in-house, because of the perception that data professionals gravitate towards the coasts and urban areas. Developing a local source of statistical talent will provide Nebraska companies with the opportunity to recruit Nebraska graduates.

2. Demand: Between 2010 and 2018, the number of statistics degrees issued in the United States increased almost five-fold⁵. The number of bachelor’s degrees in statistics awarded in 2019 was 3,745, which represents a 92% increase since 2015 (Appendix E, ADV Market Research & Consulting, Slide 4).

² <https://www.bls.gov/emp/tables/fastest-growing-occupations.htm>

³ <https://networks.nebraska.gov/gsipub/index.asp?docid=440>

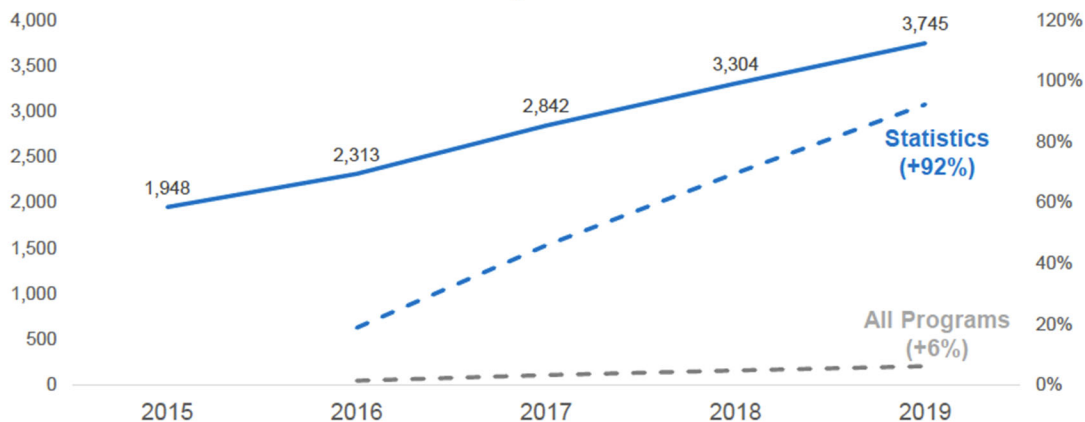
⁴ <https://www.ibm.com/downloads/cas/3RL3VXGA>

⁵ <https://ww2.amstat.org/misc/StatBiostatTable1987-Current.pdf>

Rapid growth in statistics programs

Bachelor's Degrees Awarded in Statistics – Nationally, All Institutions

Actual Number and Cumulative % Growth in Degrees Since 2015



While surveys of the population of potential or current students are unlikely to be productive in the current environment, we can look to the success of programs at similar midwestern universities. Iowa State is a comparable land-grant institution in a similar state for which undergraduate enrollment data by major is available. The statistics major in Iowa State consistently has enrollment of 75 and above since 2015. This growth is not unique to Iowa State. The Conference Board of Mathematical Sciences (CBMS) surveys mathematical sciences departments every five years, and found that in 2014-15 the estimated number of bachelor's degrees awarded by statistics departments was 1,847, compared with 838 bachelor's degrees awarded in 2009-10⁶. The CBMS survey will be conducted again in 2021, and is expected to show further growth in degrees awarded by statistics departments. Indeed, the overall number of bachelor's degrees more than doubled between 2014 and 2018⁷.

UNL graduates, resident or non-resident, are likely to stay in Nebraska after completing their degree. Therefore, we expect an undergraduate degree in Statistics and Data Analytics at UNL will not only attract students to the university, but will also increase the number of statistics professionals in the state. Moreover, the program will serve as a pipeline to established graduate programs in Statistics at UNL and Biostatistics at UNMC.

D. Adequacy of Resources:

The Institute of Agriculture and Natural Resources began investing in this growing area five years ago to support our tripartite mission of research, teaching and extension. The proposed program will use existing faculty, advising, student support, classroom and lab space within the Department of Statistics and the College of Agricultural Sciences and Natural Resources. Future instructional needs to support program growth will be supported through enrollment growth revenue within the University's new IBB model.

Adequate library resources to support the program currently exist at the University of Nebraska-Lincoln. Existing instructional equipment and informational resources exist within the College of Agricultural Sciences and Natural Resources for the proposed program.

⁶ http://www.ams.org/profession/data/cbms-survey/cbms2015_Chapter3.pdf

⁷ <https://ww2.amstat.org/misc/StatTable1987-Current.pdf>

General operating expenses for the new program are estimated to be \$25,000 over five years (\$5,000 each year). This will be funded through reallocation of existing resources within the department.

Projected Expenses:

	AY 2022-23	AY 2023-24	AY 2024-25	AY 2025-26	AY 2026-27	Total
General Operating	\$5000	\$5000	\$5000	\$5000	\$5000	\$25,000

Revenue projections are based on conservative student enrollment in the new program for a total of 75 new students by year five. Projected revenue is using the Fall 2019 proportion of resident vs. non-resident undergraduate students in CASNR (72.7% resident and 27.3% non-resident), and the 2020-21 tuition rates of \$259/credit hour for resident students and \$830/credit hour for non-resident students assuming 30 credits per year.

Projected Enrollment:

	2022-23	2023-24	2024-25	2025-26	2026-27
New Students	5	10	20	20	20
Total	5	15	35	55	70

Revenue Projections:

	AY 2022-23	AY 2023-24	AY 2024-25	AY 2025-26	AY 2026-27	Total
Tuition and Fees	\$55,980	\$185,070	\$443,250	\$684,300	\$869,370	\$2,237,970

E. Avoidance of Unnecessary Duplication

At this time, there are no undergraduate degrees in statistics and data analytics in Nebraska. The four related programs at NU institutions are tangential. At UNL, there is a Mathematics major with a Statistics and Data Science option offered by the Department of Mathematics, which requires three statistics courses (all offered by the Department of Statistics). There is also a UNL minor in Informatics, which requires one statistics course. At UNO, there is a Mathematics major with a Data Science concentration (two statistics courses required) or a Statistics concentration (three statistics courses required). At UNK there is a Data Analytics minor available, which requires one statistics course. Outside of the NU System, Creighton University offers a Data Science track in their Mathematics major (tuition \$42,618 per year), Doane University offers a Data Analytics minor (tuition \$37,080 per year), and Chadron State College offers a minor in Applied Statistics (four statistics courses required). None of these programs can provide the thorough and contemporary training in statistics and data analytics that a dedicated degree program can.

As a separate point, the American Statistical Association has published Curriculum Guidelines for Undergraduate Programs in Statistical Science⁸. These guidelines ensure that graduates are prepared for employment. We have constructed our program to align with these guidelines. The existing programs do not require adequate statistical coursework to ensure graduates would be successful candidates for statistical positions.

In addition, the proposed program is unique among peer institutions for its focus on the integration of statistical skills, communication and collaboration skills, and statistical computing skills. This distinguishes it from similar programs at other midwestern universities, which provide students with courses on statistics and programming, but do not integrate these with the “soft skills” essential for success in the workplace. In addition, while several universities in Nebraska offer master’s programs and graduate certificates in statistics and data analytics, students who wish to obtain a bachelor’s degree in statistics must go out of state. While data analytics programs are relatively common across the country, they still are not able to meet the expected demand for graduates with data analytics skills.

⁸ <https://www.amstat.org/asa/education/Curriculum-Guidelines-for-Undergraduate-Programs-in-Statistical-Science.aspx>

Finally, the Department of Statistics at UNL is the only unit in Nebraska that can provide a full complement of PhD level Statistics faculty for undergraduate education. This allows the Department to incorporate recent advances in the field into the undergraduate program rapidly, thereby permitting research experiences for undergraduates. The combination of thoughtfully chosen required statistics courses, complementary communication and computing skills, and PhD faculty with active research programs, will allow us to attract students that the existing programs cannot.

F. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

The Statistics and Data Analytics degree addresses the following statewide education goals:

“Nebraska colleges and universities will provide their graduates with the skills and knowledge needed to succeed as capable employees and responsible citizens.”

“Higher education in Nebraska will be responsive to the workforce development and ongoing training needs of employers and industries to sustain a knowledgeable, trained, and skilled workforce in both rural and urban areas of the State.”

“Higher education will serve the State by preparing individuals for productive, fulfilling lives and by developing and nurturing the citizens and future leaders of Nebraska.”

“Postsecondary education institutions will assess evolving needs and priorities in a timely manner and will be prepared to change and adopt new methods and technologies to address the evolving needs and priorities of the students and people of Nebraska.”

“Nebraska’s postsecondary institutions will be student-centered and will offer life-long learning opportunities that are responsive to student’s needs.”

“Postsecondary education institutions will provide appropriate support services to help all students reach their educational goals, regardless of where or how the instruction is delivered.”

The proposed degree would help reduce Nebraska and nationwide workforce shortages by educating and training a new generation of students to address the demand for data analytics and statistics skills across industries such as agriculture, medicine, finance, insurance, professional services, and IT.

IV. Appendices

- A. Letters of Support (attached)
- B. Catalog Copy (available upon request)
- C. Detailed Statistics and Data Analytics degree requirements (available upon request)
- D. Student Learning Outcomes & Associated Courses (available upon request)
- E. ADV Marketing Research & Consulting Report (available upon request)

Appendix A: Letters of Support

- UNL College of Arts and Sciences
- UNL College of Engineering
- UNL Department of Mathematics
- UNL Department of Computer Science and Engineering
- American Statistical Association
- Celerion
- Google
- North Carolina State University
- Penn State University

From: [Renee Batman](#)
To: [Suzi Tamerius](#)
Subject: FW: Statistics and Data Analytics - Support
Date: Monday, March 1, 2021 8:03:29 AM

From: Mark Button <mbutton2@unl.edu>
Sent: Sunday, February 28, 2021 2:02 PM
To: Tiffany Heng-Moss <thengmoss2@unl.edu>; Lance Perez <lcperetz@unl.edu>
Cc: Renee Batman <rbatman2@unl.edu>; Bertrand Clarke <bclarke3@unl.edu>; Erin Blankenship <erin.blankenship@unl.edu>
Subject: RE: Statistics and Data Analytics - Support

Dear Tiffany:

I support the Department of Statistic's proposal to create a Bachelor of Science in Statistics and Data Analytics.

Best wishes,
Mark

From: Tiffany Heng-Moss <thengmoss2@unl.edu>
Sent: Sunday, February 28, 2021 1:51 PM
To: Mark Button <mbutton2@unl.edu>; Lance Perez <lcperetz@unl.edu>
Cc: Renee Batman <rbatman2@unl.edu>; Bertrand Clarke <bclarke3@unl.edu>; Erin Blankenship <erin.blankenship@unl.edu>; Tiffany Heng-Moss <thengmoss2@unl.edu>
Subject: Statistics and Data Analytics - Support

Lance and Mark: Could you please respond to this email correspondence indicating your support for the Department of Statistic's proposal to create a Bachelor of Science in Statistics and Data Analytics? Thanks -Tiffany

Tiffany Heng-Moss, Ph.D.
Dean
College of Agricultural Sciences and Natural Resources

University of Nebraska
103 Agricultural Hall
Lincoln, NE 68583
402.472.2201
thengmoss2@unl.edu
Pronouns: she/her/hers

#ThisIsCASNR

**WE ARE A COLLEGE COMMUNITY WHERE EVERYONE
CHALLENGES THEMSELVES, IS INCLUSIVE, ASKS BOLD
QUESTIONS, AND IS OPTIMISTIC ABOUT THE FUTURE!**

"If your actions inspire others to dream more, learn more, do more and become more, you are a leader." John Quincy Adams

From: [Renee Batman](#)
To: [Suzi Tamerius](#)
Subject: FW: Statistics and Data Analytics - Support
Date: Wednesday, March 3, 2021 11:09:58 AM
Attachments: [image003.png](#)

From: Lance Perez <lcperetz@unl.edu>
Sent: Wednesday, March 3, 2021 11:08 AM
To: Mark Button <mbutton2@unl.edu>; Tiffany Heng-Moss <thengmoss2@unl.edu>
Cc: Renee Batman <rbatman2@unl.edu>; Bertrand Clarke <bclarke3@unl.edu>; Erin Blankenship <erin.blankenship@unl.edu>
Subject: Re: Statistics and Data Analytics - Support

Tiffany:

I am supportive of this proposal.

Lance



Lance C. Pérez, Ph.D.
Dean
Omar H. Heins Professor of Electrical and Computer Engineering

College of Engineering, University of Nebraska–Lincoln
114 Othmer Hall, P.O. Box 880642, Lincoln, NE 68588-0642
100 Peter Kiewit Institute, 1100 South 67th Street, Omaha, NE 68182-0176
402-472-5259 / 402-554-6009 / lcperetz@unl.edu
engineering.unl.edu | twitter.com/UNLLancePerez
COMMUNITY | IMPACT | INCLUSION

From: Mark Button <mbutton2@unl.edu>
Date: Sunday, February 28, 2021 at 2:01 PM
To: Tiffany Heng-Moss <thengmoss2@unl.edu>, Lance Perez <lcperetz@unl.edu>
Cc: Renee Batman <rbatman2@unl.edu>, Bertrand Clarke <bclarke3@unl.edu>, Erin Blankenship <erin.blankenship@unl.edu>
Subject: RE: Statistics and Data Analytics - Support

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Best wishes,
Mark

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Sent: Sunday, February 28, 2021 1:51 PM
To: Mark Button <mbutton2@unl.edu>; Lance Perez <lcperetz@unl.edu>
Cc: Renee Batman <rbatman2@unl.edu>; Bertrand Clarke <bclarke3@unl.edu>; Erin Blankenship <erin.blankenship@unl.edu>; Tiffany Heng-Moss <thengmoss2@unl.edu>
Subject: Statistics and Data Analytics - Support

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Tiffany Heng-Moss, Ph.D.
Dean
College of Agricultural Sciences and Natural Resources

University of Nebraska
103 Agricultural Hall
Lincoln, NE 68583
402.472.2201
thengmoss2@unl.edu
Pronouns: she/her/hers

April 23, 2020

Professor Bert Clarke
Chair, Department of Statistics
University of Nebraska- Lincoln

Dear Bert:

I've looked over your proposal for the new major in statistics. It looks like a very strong and well-designed program. In particular, I fully support the inclusion of the four mathematics courses (Math 106, 107, 208 and 314) in the core degree requirements.

Please let me know if you need any additional documentation regarding this. I look forward to seeing your degree program come to fruition.

Sincerely,



Tom Marley
Chair, Department of Mathematics
University of Nebraska-Lincoln

May 29, 2020

Prof. Bertrand Clarke
Department of Statistics

Dear Prof. Clarke,

I am writing to confirm the support of the Department of Computer Science and Engineering for your department's proposed Bachelor of Science program. Our discussions have identified several possible courses, both introductory and advanced, that may be of interest to students in your new program. We are happy to accommodate your students in the set of courses that make the most sense for your program and your students. We wish you success and look forward to working with you in the future.



Marilyn Wolf
Koch Professor of Engineering and Chair



February 3, 2021

Bertrand Clarke
Professor and Chair
Department of Statistics
University of Nebraska-Lincoln
340 Hardin Hall North Wing
Lincoln, NE 68583-0963

Dear Prof. Clarke,

Thank you for consulting me about your proposed new undergraduate major in Statistics and Data Analytics. As Executive Director of the American Statistical Association (ASA) I have had occasion to observe and review many undergraduate and graduate programs in statistics and data science. And in my previous role as a provost (at Washburn University, just a few hours from you in Kansas) I reviewed programs on campus and elsewhere in my role as an evaluator for the Higher Learning Commission.

Graduates from majors programs such as you propose are in high demand currently and the demand is expected to continue growing for at least 5-10 years. The webpage <https://www.bls.gov/ooh/math/mathematicians-and-statisticians.htm> provides some particulars. A web search will turn up many similar assessments. Research the ASA has done looking into degree data from IPEDS confirms that this is a fast-growing area.

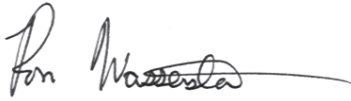
The specific proposal you have sent me is distinct in that it focuses on exploratory data analysis as a starting point for studying statistics and dwells heavily on the way statisticians and non-statisticians collaborate to mutual benefit. Having courses that continually combine theory and methods, computing, and applications rather than compartmentalizing these topics is also novel and well-matched to the emerging world of statistics and data analytics in which boundaries among quantitative people and those who need quantitative support are being eroded. The emphasis on messy data, prediction, and computing is also welcome as statisticians are confronted by more and more demanding problems earlier in their careers.

This program will prepare students for jobs in statistics and data analytics, or to go on to get graduate education in these fields. This is important for public universities, because these are good-paying technical jobs, so the university can show that it is providing direct benefit to the economy of Nebraska.

In short, I think you have a really modern program and that graduates from your program will be highly desired on the job market and for graduate study.

I strongly and without reservation support your efforts and your proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "Ron Wasserstein", with a long horizontal flourish extending to the right.

Ronald L. Wasserstein, Executive Director



May 6, 2020

Dr. Bertrand Clarke
Chair, Department of Statistics
340 Hardin Hall North
University of Nebraska
Lincoln, NE 68583-0963

Dear Dr. Clarke:

Celerion is a global leader in early clinical research services. As a Contract Research Organization, we assist pharmaceutical companies develop their drugs by offering a unique combination of medical expertise, clinical operations experience, and scientific expertise in drug development. One type of scientific expertise Celerion offers our clients is in the area of Biostatistics and SAS Programming. Celerion's team of Biostatisticians and SAS Programmers design, plan and conduct the statistical analyses of data from clinical trials in early clinical research.

Celerion is a global company, but our Global Headquarters are based in Lincoln, Nebraska. As our largest site, it is important to our company strategy to hire statistics and SAS programming talent to be located here in Lincoln, Nebraska. We have been very fortunate to be able to hire high quality, professional, and well-trained Statisticians and SAS programmers with advanced degrees from the University of Nebraska-Lincoln.

The need for more statisticians and data scientists at all levels is very evident in our industry. The competition for experienced statisticians or statisticians with advanced degrees is increasing. Celerion's most successful strategy for filling our ever-growing need for experienced statisticians has been to hire talented candidates early in their career and provide them the training, mentoring and guidance to grow into successful, well-established clinical trial Biostatisticians. The University of Nebraska-Lincoln's plan to provide an Undergraduate degree in statistics with a solid foundation in statistical methods as well as computation fits perfectly with Celerion's strategy. For this reason, I am delighted to provide my support in the creation of this undergraduate degree program.

Thank you for the opportunity to express my support. Should you need any additional details regarding Celerion or our interactions with the University of Nebraska-Lincoln Department of Statistics, please do not hesitate to contact me.

Sincerely,

A handwritten signature in blue ink, appearing to read "Michelle L. Combs", is written over the typed name.

Michelle L. Combs, PhD
Vice President, Data Management and Biometrics
Celerion

To: University of Nebraska-Lincoln
From: Tim Hesterberg

Google Inc.
601 N. 34th St.
Seattle, WA 98103

google.com

To whom it may concern:

I am writing in support of the proposed new University of Nebraska-Lincoln undergraduate major or degree in "Statistics and Data Analytics".

The program appears to me to be generally well designed. It may be a bit light on computing - it does include Stat 151, 251, 351, total of 7 credits, and other courses will include computing. But it is not clear to me that it includes enough programming (R and Python, and some SQL) and basic software engineering (source code control, testing). Someone with a data analytics degree should be able to do enough programming to wrangle data (this is covered) and pull data from unstructured sources. (*)

(*) I wrote the above based on the program description. I subsequently reviewed the syllabi for Stat 151, 251, 351 and 451. These do include R and Python, source code control, databases including SQL, testing, text data, complex data, pulling data from websites, and image data. So the program does include the areas I highlighted.

Conversely, the lack of formal computer science courses does not concern me. Many CS courses are not appropriate for a bachelor's degree in data analytics. One that is appropriate, "artificial intelligence", is frankly usually little more than a fancy name for what computer scientists call machine learning and statisticians call regression and classification, and that is represented appropriately in this major.

I like the emphasis on communication. Modern work in industry almost always involves work in teams, and effective communication is critical. The four primary hiring criteria for data analytics at Google are:

- * Statistics
- * Computing
- * Data Intuition (can you work with data and discover what it says)
- * Communication

and they are weighted equally.

I will call out three courses for special mention:

- * Stat 325 - Statistical Collaboration - this is good preparation for communication and teamwork.
- * Stat 212 - Principles of Study Design - understanding how to design data collection to avoid bias is a critical skill, where software engineers and people with data analytics degrees that are light on statistics are often lacking.
- * Stat 301-302, in particular the Bayesian components - this is important for two reasons. One, it provides students with a quantitative approach to a critical thinking skill, how to combine prior

information with new evidence from data. Second, Bayesian methods are particularly useful in modern study design in high tech fields, where data is collected over time and estimates continually updated.

At Google we would love to hire more people with a good background in experimental and sample design. And more generally, we have a hard time hiring enough people with good statistics backgrounds.

There is a huge demand for data analytics. This program would put graduates in a good position to be competitive for data analytics jobs, to succeed in the workplace, and to provide good value to their employers and society.

The traditional path to a career in statistics was to major in mathematics as an undergraduate, then do graduate study in statistics. But mathematics is now less critical due to increased use of statistical methods that substitute compute simulation for theory, and we are beginning to see more good programs in statistics and data analytics at lower levels. This program would be a welcome addition. It is weaker in CS and stronger in statistics than other programs, but that would balance other programs that lean the other direction. And graduates would be prepared to work in teams, with colleagues with complementary skills.

Let me add a personal note. I grew up in rural Minnesota, and worked summers on Grandpa's farm in Iowa. I'm concerned about the future of agriculture - due to climate change, and because the current golden age of easy no-till agriculture enabled by Roundup-ready crops won't last, as more weeds become resistant. Nebraska in particular may be hit hard by the combination of climate change and depletion of the Ogallala Aquifer. Continued food production and rural prosperity will need a lot of research to adapt to changing conditions, and new ways of farming - e.g. development of higher-yield perennial crops, and weed control without traditional plowing, disking and cultivation. Data analytics will play a critical role in this work.

About me - I currently work at Google, worked previously at a statistical software company, a gas/electric utility, and in academia. My short (humorous) bio is at <https://research.google/people/TimHesterberg>, and a resume is at <http://www.timhesterberg.net/home/HesterbergResume.pdf>

Sincerely yours,



Tim Hesterberg
Senior Data Scientist, Google

February 3, 2021

Bertrand Clarke
Professor, Department Chair
Department of Statistics
University of Nebraska - Lincoln
Lincoln, NE 68588

Dear Professor Clarke:

I welcome the opportunity to write in support of your proposed undergraduate major in Statistics and Data Analytics. At NC State we have had an undergraduate major in Statistics since before I joined the department in 1986. In the last 35 years I have seen the size of our program ebb and flow for much of its existence, but the last ten years has witnessed phenomenal interest and growth in both our undergraduate major and minor programs.

In response to the increased demand from students for quantitative and computational training especially as relates to big-data applications, many universities and colleges with little or no experience or faculty expertise in the relevant areas are adding programs in data analytics, or data science, or informatics, etc. Thus it is a welcome relief to see the addition of a well-conceived program from a department with a long history of excellence in graduate training in Statistics, and possessing the faculty qualified to ensure its success.

Your proposed program provides the same level of training as ours with similar mathematics and computer science requirements, and a similar number of required credits in statistics proper. So, I expect that the training received by your future students will be as thorough and rigorous as the training in Statistics that has served our students so well for so long.

Where your proposed program differs from ours is its orientation. Ours is focused on statistical theory and methodology with attention to applications. Yours is focused on the practice of statistics and data analytics, as well as collaboration with other scientists. As such, on the surface your program looks to be somewhat more applied. However, judging from your course descriptions, you require the same volume of theory and methodology that we do. If there is a difference, you seem to require a wider scope of methodology and less theory, whereas we currently require more theory and a slightly narrower scope of methodology. The difference in orientation is also borne out in the way that your proposed program includes courses specifically dedicated to collaboration and communication within the discipline. Both programs included advised credits, which allow the students to customize the degree to fit their particular educational goals.

I think it is noteworthy that even though there are differences between our current program

and your proposed program, those differences will fade with time because we are in the process of developing courses for a minor in data science/analytics that will give our students the option of courses that will provide them the wider scope of modern methodology that you have designed into your proposed program. In that sense, your program anticipates future directions to which we too are responding.

NC State students are attracted to our undergraduate major because of the favorable prospects for lucrative employment upon graduation, coupled with the option of continuing their academic training in graduate school. Because your proposed program is similar to ours in that it will provide solid training in core theory and methodology, yet with a modern emphasis on the practice of statistics and data analytics, and collaboration and communication, I expect that the undergraduates at UNL will find it very attractive for the same reasons our undergraduate program continues to grow—the future of statistics and data analytics is bright.

Sincerely,

A handwritten signature in cursive script that reads "L. A. Stefanski".

Leonard A. Stefanski
Department Head
R. A. Fisher Distinguished Professor
of Statistics



May 29, 2020

To Whom It May Concern:

I am writing this letter in strong support of the proposed Statistics and Data Analytics major at the University of Nebraska at Lincoln (UNL). At the Department of Statistics at Penn State I have served as Department Head since 2018 and Director of Undergraduate Studies between 2012 and 2016. This academic year we had 256 students in our BS program in statistics, 42 students in our interdisciplinary statistical modeling data science major, and 135 students minoring in statistics. The demand for these majors continues to grow both due to the heavy demand for their skills as well as because of the growing excitement and interest surrounding the closely related subjects of statistics, data science, and machine learning. I therefore understand well the tremendous value of the undergraduate program being proposed at UNL. The proposal for the new Bachelor of Science in Statistics and Data Analytics is very well thought out and contains both the vision as well as the requisite detailed planning in order to be successful. There is no question that it is prudent to move forward with approving this major as soon as possible.

By now it has become a cliché that we live in a data-rich age. The demand from the private and public sectors for graduates who are skilled at statistics, data analysis, or machine learning has been very high for a number of years, and will continue to grow. These graduates are highly sought after by business companies of all kinds, engineering firms, start-up companies, as well as in the health and pharmaceutical sectors, and in many branches of government. These graduates are at the forefront of innovation in business, in science and technology, and healthcare, to name just a few examples of how statistics and data analytics play an important role in some of the most important and rapidly evolving sectors of the economy. Demand far outstrips the number of qualified graduates. There is also an enormous amount of excitement among students to study statistics and data analytics, starting from high school, thanks to the ubiquity and importance of statistics and data science, along with the very closely related terms “analytics” and “informatics”, in business, science, and sports, as well as in our popular press and culture. At Penn State, for instance, not only has the growth in numbers been rapid and sustained over the past decade, but we are seeing that many of the top students are increasingly attracted to majoring in statistics and data analytics, sometimes as the sole major, sometimes as a double major.

Twenty first century statisticians and data scientists need training in the following areas: (1) statistical thinking: how to think about observations, uncertainty, sampling design, statistical modeling, the mathematical and statistical rigor and depth to carry out a complex data analysis using modern statistical methods; (2) computing/data wrangling: how to process and work with complicated, messy, and potentially massive data sets and carry out sophisticated and complex statistical analyses by writing and developing

computationally expedient algorithms, and (3) communication: how to interact with people from a wide variety of domains to understand the problem that needs to be solved, how to translate that problem into the language of statistics, and then communicate those ideas broadly and obtain practical conclusions. Under the section titled Details as well as from the description of their curriculum and course plans, particularly the example four-year plan for a student, the proposal makes it abundantly clear that the new UNL program will provide the students with precisely this set of crucial skills; the plan includes courses and learning outcomes that address each of the areas I list above. Their courses and topics listed for each of the courses has a lot of similarities with our program. It is good to see, for instance, that UNL's proposal includes courses that build both statistical and computing skills. In the proposal there are courses specifically on data wrangling and computing, as well as technical communication; courses in the former category have only been added to Penn State's program over the past 4 years while on the latter front we are still working on more ways to incorporate communication into our major.

In summary, it is apparent that there is a very strong case for why UNL should have such a major as soon as possible. As the flagship university of the state, it is imperative to have a major that addresses fundamental societal/economic needs. The Department of Statistics is also the best place to train students in this field and the collaborative nature of the discipline in general, and the faculty in this department in particular, put it in an ideal place to train students to be collaborative and to pick up the set of skills they need to succeed. This program will attract many strong students to UNL and will be of great value to those who are already there or planning to attend. It will also benefit the economy, both locally in Nebraska as well as nationally. As is apparent from state universities across the country, particularly similar landgrant institutions like Iowa State, Ohio State, and Penn State, there is enough demand that as soon as the major is created it will immediately attract many students. The Department of Statistics at UNL already has a well formulated plan and vision, as well as the necessary expertise (faculty and graduate students) to rapidly implement their plan for a high quality degree program.

Please do not hesitate to contact me if you have any further questions.

Sincerely,



Murali Haran
Professor and Head
Department of Statistics
Pennsylvania State University
email:mharan@stat.psu.edu
814-863-8126

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Statistics and Data Analytics

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty											
Professional											
Graduate Assistants											
Support Staff											
Benefits											
Subtotal	0.0	\$0	0.0	\$0	0.00	\$0	0.00	\$0	0.00	\$0	\$0
Operating											
General Operating ¹		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000	\$25,000
Equipment											
Library/Information Resources											
Subtotal											\$25,000
Total Expenses		\$5,000		\$5,000		\$5,000		\$5,000		\$5,000	\$25,000

¹ Support for recruiting materials, web page development, recruiter travel, and development of advising materials. We anticipate these costs to be consistent through the first 5-years of the program.

TABLE 2: PROJECTED REVENUES - NEW INSTRUCTIONAL PROGRAM
UNL BS in Statistics and Data Analytics

	(FY2022) Year 1	(FY2023) Year 2	(FY2024) Year 3	(FY2025) Year 4	(FY2026) Year 5	Total
	Reallocation of Existing Funds					
Required New Public Funds						
1. State Funds						
2. Local Tax Funds (community colleges)						
Tuition and Fees ¹	\$55,980	\$185,070	\$443,250	\$684,300	\$869,370	\$2,237,970
Other Funding						
Total Revenue	\$55,980	\$185,070	\$443,250	\$684,300	\$869,370	\$2,237,970

¹ Tuition calculations based on 2020-21 tuition estimates (\$259/credit hour for resident students; \$830/credit hour for non-resident students) assuming 30 credit hours per student per academic year. Projected student enrollment: 2022-23 (5 new students), 2023-24 (10 new students; 15 total), 2024-25 (20-students; 35 total), 2025-26 (20 new students; 55 total), and 2026-27 (20 new students; 70 total). Projected revenue is using the Fall 2019 proportion of resident vs. non-resident undergraduate students in CASNR (72.7% resident and 27.3% non-resident).

TO: The Board of Regents Addendum XI-A-4
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of a Doctor of Philosophy degree in Biomedical Engineering in the College of Engineering at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to create a Doctor of Philosophy (PhD) degree in Biomedical Engineering in the College of Engineering at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTION: April 13, 2012 – The Board approved the disaggregation of seven department-based tracks of the unified PhD in Engineering at UNL into stand-alone PhD degree programs: Architectural Engineering; Biological Engineering; Chemical and Biomolecular Engineering; Civil Engineering; Computer Engineering; Electrical Engineering; and Mechanical Engineering and Applied Mechanics.
May 18, 1973 – The Board approved initiating a unified interdepartmental PhD program in Engineering.

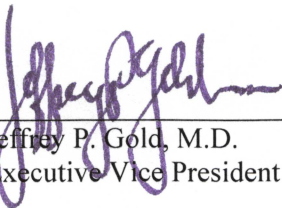
EXPLANATION: UNL currently offers a Biomedical Engineering specialization for its general PhD in Engineering degree; 25 students are enrolled in the specialization. As with the programs disaggregated from the PhD in Engineering in 2011, the discipline of Biomedical Engineering has developed, matured, and grown nationally and the need for Biomedical Engineering PhDs also is growing. The interdisciplinary field focuses on employing engineering techniques to improve human health by incorporating both engineering and biomedical knowledge and techniques. Student demand, faculty, and resources are in place to support the stand-alone program. The proposed PhD will promote greater visibility, resulting in more effective recruitment of prospective students and faculty, as well as placement of PhD graduates. The proposed degree will help Nebraska meet its goals for workforce development and the program’s research efforts will support improving human health throughout the world.
This proposal has been approved by the Council of Academic Officers and the Executive Graduate Council. This proposal also has been reviewed by the Academic Affairs Committee.

PROGRAM COST: \$0 (No new faculty or resources are needed to operate this program.)

SOURCE OF FUNDS: N/A

SPONSORS: Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer
Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED:



Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE:

July 16, 2021



January 28, 2021

Susan Fritz, Executive Vice President and Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583-0745

Dear EVP Fritz,

I am forwarding to you materials related to a proposal to establish the Biomedical Engineering PhD program to be administered by the College of Engineering. Over the past decade the Biomedical Engineering field of study has grown nationally and the need for Biomedical Engineering PhDs has also grown. The College of Engineering has made significant institutional investments in faculty and resources to offer a standalone PhD program to meet student demand. The core courses are already established, there are adequate existing resources, and a sufficient number of quality faculty are available.

This proposal has the full endorsement of the Academic Planning Committee and it has my approval. I am requesting you approve it and that it be reported to the Board of Regents at an upcoming meeting.

Sincerely,

Ronnie D. Green, Ph.D.
Chancellor

- c: Kurt Geisinger, Chair, Academic Planning Committee
- Elizabeth Spiller, Executive Vice Chancellor
- Lance Perez, Dean, College of Engineering
- Mike Zeleny, Associate to the Chancellor and APC Secretary
- Renee Batman, Assistant Vice Chancellor, Academic Affairs
- Suzi Tamerius, Project Coordinator, Academic Affairs
- Karen Griffin, APC File

University of Nebraska-Lincoln

New Graduate Major or Degree

I. Descriptive Information

Name of Institution Proposing New Major or Degree
University of Nebraska-Lincoln
Name of Proposed Major or Degree
Biomedical Engineering
Degree to be Awarded to Graduates of the Major
PhD
Other Majors or Degrees Offered in this Field by Institution
None
CIP Code <i>[IEA can help with CIP codes or browse here: http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55]</i>
14.0501, Biomedical/Medical Engineering
Subject Code
14.0501, Biomedical/Medical Engineering
Administrative Units for the Major or Degree
College of Engineering
Proposed Delivery Site
College of Engineering, Lincoln and Omaha sites
Program will be Offered <i>[full program, not individual courses]</i>
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
Date Approved by the Governing Board
Pending
Proposed Date the New Major or Degree will be Initiated
When approved by the Coordinating Commission.

II. Details

A. Purpose of the Proposed Major or Degree:

The PhD program currently in the College of Engineering (CoE) was established in 1973 under what was termed a Unified PhD. The original program included five fields of study, termed specializations, including mechanical engineering, civil engineering, and electrical engineering. Eventually, additional fields of study were created, including one in Biomedical Engineering (BME), whose specialization began in 2002. In 2011, the College of Engineering requested and was granted approval to develop seven stand-alone programs which related directly to the names of departments in the College. At that time, the Biomedical Engineering field of study was deemed

not ready to be a stand-alone Doctor of Philosophy degree program; therefore, Biomedical Engineering continues to be offered as a Specialization within the PhD in Engineering degree.

Since the specialization was approved the field of Biomedical Engineering has developed, matured, and grown nationally and the need for Biomedical Engineering PhDs. is also growing. As a result, for the program to be fully competitive necessitates a stand-alone PhD. The College recognized that national growth in the field necessitated strategic investments to support program growth and success. As a result, since 2012 the College has hired a cadre of faculty with background and expertise in biomedical engineering, and these faculty require a suitable academic home for their graduate students. This critical mass of faculty has successfully attracted graduate students who are seeking a fully established degree and the specialization has graduated 25 PhD students who have successfully moved on to academia and industry careers. In addition, there are currently 25 PhD students enrolled in the specialization. The number of applications to the specialization and enrolled students continue to grow, and we expect the growth will continue for some time and certainly increase should the stand-alone program be approved. The support network of inter-department graduate advisors has grown substantially. The number of graduate classes with a primary theme of biomedical engineering has also rapidly grown.

In sum, the College of Engineering is ready to continue its work from 2011 to establish Biomedical Engineering as a stand-alone PhD program. The student demand, faculty and resources are in place to support the stand-alone program. By doing so, the program will promote greater visibility, resulting in more effective recruitment of prospective students and faculty, as well as placement of PhD graduates. It is also an appropriate step given Nebraska's goals for workforce development across the state and criticality of the field of biomedical engineering in the world.

The existing doctoral major in Engineering, which has established specializations in Computer Engineering, Construction Engineering and Management, and Materials Engineering, will remain.

Purpose

The Handbook of Biomedical Engineering¹ describes the field itself nicely:

"With almost continual technological innovation driving medical care, engineering professionals have become intimately involved in many medical ventures. As a result, the discipline of biomedical engineering has emerged as an integrating medium for two dynamic professions, medicine and engineering. In the process, biomedical engineers have become actively involved in the design, development, and utilization of materials, devices, and techniques for clinical research, as well as the diagnosis and treatment of patients . . ."

"Biomedical engineers apply electrical, mechanical, chemical, optical, and other engineering principles to understand, modify, or control human systems, as well as design and manufacture products that can monitor physiologic functions and assist in the diagnosis and treatment of patients....Biomedical Engineering is a rapidly growing field that encompasses a wide variety of activities, including:

- Application of engineering system analysis (physiologic modeling, simulation, and control) to biologic problems;
- Detection, measurement, and monitoring of physiologic signals (i.e. biosensors and biomedical instrumentation);
- Diagnostic interpretation via signal-processing techniques of bioelectric data;

¹ Biomedical Engineering Handbook, J. D. Bronzino, ed, CRC Press, Boca Raton, Florida, 1995.

- Therapeutic and rehabilitation procedures and devices (rehabilitation engineering);
- Devices for replacement or augmentation of bodily functions (artificial organs);
- Computer analysis of patient-related data and clinical decision-making (i.e., medical informatics and artificial intelligence);
- Medical imaging, i.e., the graphic display of anatomic detail or physiologic function; and
- The creation of new biologic products (i.e., biotechnology and tissue engineering)."

"Typical pursuits of biomedical engineers, therefore, include:

- Research in new materials for implanted artificial organs;
- Development of new diagnostic instruments for blood analysis;
- Computer modeling of the function of the human heart;
- Writing software for analysis of medical research data;
- Analysis of medical device hazards for safety and efficacy;
- Development of new diagnostic imaging systems;
- Design of telemetry systems for patient monitoring;
- Design of biomedical sensors for measurement of human physiologic systems variables;
- Development of expert systems for diagnosis of diseases;
- Design of closed-loop control systems for drug administration;
- Modeling of the physiologic systems of the human body;
- Design of instrumentation for sports medicine;
- Development of new dental materials;
- Design of communication aids for the handicapped;
- Study of pulmonary fluid dynamics;
- Study of the biomechanics of the human body; and
- Development of material to be used as replacement for human skin."

The field is highly interdisciplinary, and the major emphasis is on employing engineering techniques to improve human health, by understanding both the engineering needs and the medical needs for the specific problem.

According to the American Society for Engineering Education², graduate biomedical engineering program enrollments in the U.S. have risen from approximately 6,800 students in 2006 to roughly 10,000 in 2015. While there are at least 78 programs nationwide offering a PhD in Biomedical Engineering, there are relatively few in the Midwest. North Dakota, South Dakota, Kansas, Colorado, New Mexico, Wyoming, Montana, and Missouri do not have programs leading to a PhD in Biomedical Engineering, although the University of Oklahoma started one in the year 2000, University of Iowa has had such a program since 1986, and University of Minnesota's program started in 1972. Colorado State has an interdisciplinary studies specialization in Biomedical Engineering started in 1999.

The employment opportunities for biomedical engineers are strong. In 2011, the Bureau of Labor (BoL) Statistic's list of fastest growing occupations listed Biomedical Engineering as number one. The report, explained in a New York Times article, indicated a perceived 72% growth in BME positions (or 12,000 new jobs) by 2012. This information is in line with a similar report from the BoL in 2009, which noted

² American Society for Engineering Education, <https://www.asee.org/papers-and-publications/publications/college-profiles/15EngineeringbytheNumbersPart1.pdf>

the aging of the population, and a growing focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries. Median annual earnings of biomedical engineers were \$88,550 in the 2018 report, up from \$82,550 in 2011.

The undergraduate Biomedical Engineering option within the Biological Systems Engineering major currently enrolls roughly 130 students. Of the students who graduate within the Biomedical Engineering option, approximately two-thirds go on to attend graduate school or medical school. Many attend graduate school at other universities since we do not have a PhD in Biomedical Engineering.

It is difficult to predict the enrollment in a new program such as the PhD in the field of biomedical engineering. We would expect that the program would be comparable in size to the other Engineering PhD fields within a few years. In Spring 2019 there were 345 students enrolled in UNL Engineering PhD programs, across 13 fields. Hence, if the program enrolled 26 students it would be an average-sized PhD program. However, we anticipate that this field will not simply be average, but in fact will grow rapidly after its creation.

The University of Nebraska system has a research-active Medical Center (UNMC), and the University of Nebraska-Lincoln has the only engineering research programs in the state of Nebraska, but neither has a stand-alone graduate program in Biomedical Engineering. We are seeking to add a Biomedical Engineering PhD program. This will focus attention on the activities in Biomedical Engineering in the state, will reduce the current barriers to biomedical engineering learning, and will provide the necessary framework to foster research and collaboration between engineers and the medical community.

Creation of a stand-alone Biomedical Engineering PhD program, administratively supported by the College of Engineering Dean's Office, is a natural next step in the continued growth of graduate education and research in this area. The College currently offers a PhD in Engineering with specialization in Biomedical Engineering which is successfully administered by the Dean's office. The Dean's office supports other interdisciplinary graduate programs, such as the Master of Engineering Management and the Complex Biosystems PhD.

Extensive resources have been dedicated to the effort with noted increases in collaborative externally funded research successes. The College of Engineering has made a concerted effort to hire faculty into multiple Departments whose teaching and research expertise and activities closely align with Biomedical Engineering, with nearly 15 tenure/tenure-track faculty hired at various ranks since 2014. Research collaborations between College of Engineering faculty and colleagues at UNMC and the University of Nebraska at Omaha (UNO) continue to increase, with faculty from all seven departments in the college recently or currently involved in externally funded research and graduate student advisement with one or both campuses.

At present, students who wish to enter the graduate program for the PhD in Engineering must identify one of several existing fields – Architectural Engineering, Biological Engineering, Chemical and Biomolecular Engineering, Civil Engineering, Computer Engineering, Mechanical Engineering, and Electrical Engineering. Fitting a biomedical engineering learning and research program into one of these molds is usually an awkward force-fit. For example, many of the courses essential for a degree in Engineering Mechanics are not vital for the study of Biomedical Engineering, while many of the courses essential to the study of Biomedical Engineering are not within the scope of the Engineering Mechanics program. Even in fields where the supervisory committee has substantial latitude in choosing the coursework, the qualifying exam for these disciplinary fields often relies heavily on discipline-specific knowledge that may not subsequently be useful in the biomedical area under study. For the truly

interdisciplinary needs of biomedical engineering learning and research, a more flexible interdisciplinary field-with more appropriate admissions and program requirements is essential.

Furthermore, by creating a stand-alone PhD in Biomedical Engineering, we formally take advantage of the synergism UNMC and UNO can provide in the future growth of the program. UNMC and UNO faculty are close to the state's research hospital facilities, and are often clinicians themselves, and can facilitate contact with human patients – which is always the target of biomedical engineering research. College of Engineering graduate partnerships with UNMC and UNO are thus natural in biomedical engineering and work to the benefit of the graduate student. These partnerships not only encompass joint research funding successes discussed above, but also include adjunct and/or courtesy faculty appointments that allow UNMC faculty to advise UNL College of Engineering graduate students. Facilities also are shared when necessary. Inclusion of UNMC and UNO faculty on Biomedical Engineering PhD graduate student supervisory committees will support existing collaborations and expand those activities to include continual review and enhancement of program curricula. Guest lectures from UNMC and UNO faculty in UNL graduate classes, and vice versa, have been beneficial for students as they provide a more comprehensive view of biomedical engineering topics. With creation of a stand-alone Biomedical Engineering PhD, such education collaborations could be formalized in a way that would permit, for example, co-taught graduate courses with each faculty member receiving teaching credit from their respective institution.

Structure

Synergistic Activities with UNMC and UNO

Improved human health is a shared research and education goal between Biomedical Engineering and many other departments at UNMC and UNO. It is natural, beneficial and desirable for UNL's Biomedical Engineering PhD program to leverage the different skill sets, knowledge bases and areas of expertise present at UNMC and UNO and for UNMC and UNO to reciprocate. For example, the Biomedical Engineering PhD program requires at least nine hours of graduate-level biology coursework with objectives in human health. Many courses offered at UNMC and UNO can augment biological science courses available at UNL. Several students in the current Biomedical Engineering Specialization of the Unified Engineering PhD program have taken courses at UNMC. An abbreviated list of courses currently available at UNMC and UNO for which many Biomedical Engineering PhD students would have the necessary biological science prerequisites are shown in Table 1. It also should be stated that graduate engineering courses at UNL are not limited to graduate engineering students and many graduate students in health-related disciplines offered at UNMC and UNO meet prerequisite requirements. Prerequisites for these courses vary and can include math, calculus-based physics, and engineering design. Examples of graduate biomedical engineering courses available at UNL that fall into this category are listed in Table 2. In addition, some courses under the UNO Master of Science in Biomechanics program and the PhD in Exercise Science would be candidates for potential cross-listing with the BME PhD program.

Further evidence of the collaboration between UNL and UNMC/UNO, and of the potential for strong cross-institutional collaboration, could be achieved by cross-listing courses in these tables under the College of Engineering's "BIME" prefix for biomedical engineering courses. They would be suitable for inclusion in a student's Program of Studies. As more students take these courses, it would be natural for research relationships between faculty instructors and the advisor of the student taking the class to develop.

TABLE 1: SAMPLE COURSES SUITABLE FOR BME PH.D. BIOLOGY REQUIREMENT

Course Number	Course Name
BMB 815	Metabolism
BMI 810	Introduction to Biomedical Informatics
BMB 915	Proteins and Nucleic Acid
CIP 806	Graduate Physiology
CIP 916	Cardiopulmonary Function in Health & Disease
GCBA 823	Fundamentals in Genetics and Genomics
GCBA 825	Human Histology
IPMM 916	Cardiopulmonary Function in Health & Disease
IPBS 801	Fundamentals of Biomolecules
IPBS 802	Molecular Cell Biology
IPBS 803	Fundamentals of Receptors & Cell Signaling
NSC 922	Molecular & Cellular Neuroscience
PAMM 857	Introductory Immunology
PHSC 910	Pharmacokinetics and Biopharmaceutics

TABLE 2: SAMPLE GRADUATE BME COURSES SUITABLE FOR OTHER DISCIPLINES

Course Number	Course Name
BSEN 812	Rehabilitation Engineering
BSEN 814	Medical Imaging Systems
BSEN 816	Introduction to Biomaterials
BSEN 818	Tissue Engineering
CHME 871	Stem Cell Engineering and Regenerative Medicine
CHME 876	Micro/Nano Systems for Engineering and Life Sciences
CHME 877	Molecular Bioengineering
MECH 836	Introduction to Continuum Biomechanics
MECH 837	Biomedical Device Design
MECH 838	Mechanics of Biomaterials
ECEN 850	Bioinformatics
ECEN 853	Computational and Systems Biology

BME Program Differentiators

It is recognized that a joint PhD program exists in Exercise Science involving UNO Biomechanics and their School of Health and Kinesiology. Some of UNL's biomedical engineering courses are listed as program electives. UNL BME Faculty enjoy a close collaborative relationship with the UNO Biomechanics program as several faculty have collaborated on research projects and on graduate committees. What differentiates the Bioengineering PhD from the Exercise Science PhD is the existence of prerequisites that, as stated above, can include math, calculus-based physics, and engineering design. UNO's Exercise Science PhD degree does not require specific prerequisites.

Another important differentiator is that engineering is a licensed profession in the U.S. Every state has a Professional Engineering Board that issues and administers licenses. Licensed professional engineers are required to provide design services for any project regulated under the Nebraska Engineers and Architects Regulation Act. Two members of the BME PhD Graduate Committee hold a professional engineering license (P.E.), and our program will be active in encouraging other associated faculty

members to do so. There is no equivalent licensure or curricular requirements for biomechanics professions.

Graduate Program Organization

Graduate Committee

The Committee consists of six faculty members appointed by participating Graduate Faculty. One of the members, appointed by the Dean of Graduate Studies, shall serve as Committee Chair. The Graduate Committee reviews applications and approves admission to the graduate program. The Committee also administers program policies and responds to student concerns. The Graduate Committee Chair leads the activities of the committee, signs student forms, and works with the Dean of Engineering and the Associate Dean for Graduate Programs.

Participating Graduate Faculty

Graduate Faculty in the BME PhD Program meet the definition of Graduate Faculty at <https://catalog.unl.edu/graduate-professional/graduate/faculty/>. The initial graduate faculty will consist of the Graduate Committee appointed by participating Graduate Faculty as described above. The Graduate Catalog describes the procedure for adding (nominating) graduate faculty to the interdepartmental area. Table 3 lists certain criteria for membership to the Graduate Faculty as written in the Graduate Catalog, and examples (not exclusive) of how these criteria may be met.

TABLE 3: GRADUATE FACULTY MEMBERSHIP CRITERIA

Graduate Catalog Criteria	Examples of meeting the criteria for biomedical engineering
"Hold the terminal degree normally accepted for academic employment in the discipline or its clear equivalent as determined by the Graduate Committee of the nominee's ... interdepartmental area"	<ul style="list-style-type: none"> • A PhD in Biomedical Engineering • A PhD in another field of engineering where the dissertation work focused in human health
"Be actively involved in scholarly activity and/or graduate teaching as part of his or her regular duties"	<ul style="list-style-type: none"> • Recently served as a Graduate Committee member for a student in the UNL CoE Biomedical Engineering PhD program • Active attendee of the UNL CoE Biomedical Engineering Seminar • Have recently taught a graduate level class with a biomedical engineering focus
"Have demonstrated clear evidence of continuing scholarly activity at the national level and potential in the discipline, beyond teaching"	<ul style="list-style-type: none"> • Have recent funding from a national funding agency for which the project has a human health focus • Documented past, current and/or future research activities (e.g. publications, theses/dissertations by advisees, proposal submissions) in the past ten years that can be tied to Biomedical Engineering

The Graduate Faculty review and discuss current best practices and continuous improvement in biomedical engineering graduate education. The Graduate Faculty may change program requirements (including prerequisites, admission policies, and core curriculum) by a two-thirds majority vote.

Advisor

Each graduate student must have a major advisor who is a member of the Graduate Faculty. If the major advisor is not a faculty member with a regular appointment in the College of Engineering, s/he must have a co-advisor who is a faculty member with a regular appointment in the College of Engineering. Major advisors advise students regarding course work and general academic requirements and guide students through their chosen research program. A student's major advisor will serve as the chair of the student's Supervisory Committee.

Supervisory Committee

The primary function of the Supervisory Committee is to assist the student in developing a program of study that is compatible with the goals of the student. In addition, the Supervisory Committee will also monitor the progress of the student and provide counsel if problems arise during the program. The Supervisory Committee ultimately functions to ensure that the student has reached a satisfactory level of academic and research achievement. This committee is responsible for conducting comprehensive and final examinations prior to conferring the PhD degree.

Program of Study

The BME doctoral program follows and meets all of the requirements set forth for a Doctor of Philosophy (PhD) degree by the Office of Graduate Studies. Ninety credit hours beyond the Bachelor of Science (B.S.) degree are required. Any graduate coursework completed at another university may be considered for credit towards the PhD degree. A program of studies must be developed and approved by the student's Supervisory Committee and the Dean of Graduate Studies before a doctoral student has accumulated 45 credit hours, including credit hours from an M.S. degree.

Admission

The steps for admission of a student into the BME Graduate Program are:

1. Student completes application in ADMIT (CollegeNET). The graduate chair is automatically notified when an application is complete.
2. After the deadline date (February 15), the graduate chair will assign two Graduate Committee members to review each applicant's file whose status is "complete".
3. Reviewers complete checklist in ADMIT. Each student will receive one of three possible initial recommendations:
 - a. Admit (for students who meet admission criteria and have secured funding)
 - b. Admit subject to funding (for students who meet admission criteria but have not secured funding)
 - c. Not admit (for students who do not meet admission criteria)
4. The Graduate Committee will consider all applicants, making a final recommendation on each.
5. After the committee reviews applicants, the graduate chair sends to all faculty with BME graduate faculty status a list of potential students who are recommended for admission and who are not already matched to faculty.
6. Students are notified of decision of Graduate Committee (change of status in ADMIT).
7. If a faculty member agrees to advise the graduate student:
 - a. The faculty member notifies the graduate chair that they agree to advise the student, and that they are offering an assistantship (or the student is self-funded)
 - b. The faculty advisor (or his/her designee) sends a letter of assistantship offer to the applicant, cc'ing the graduate chair.
 - c. Once signed, the faculty advisor forwards a copy to the graduate chair.

- d. The student is admitted to the BME PhD program. Any deficiencies are noted in the letter of admission coming from Graduate Studies.
8. Letters are sent out by the Graduate Committee to students admitted, not admitted, and admitted subject to funding.

Graduate students are admitted into the Biomedical Engineering PhD Program, but are often given assistantships administered by a university department. An offer of an assistantship from a department should include specific language requiring adherence to a graduate program's requirements. Suggested language:

- “[As part of accepting this assistantship,] you must be admitted into a degree program and adhere to that program's requirements”

Prerequisites/Deficiency Procedures

- All students, whether or not they have a master's degree, must have a B.S. in engineering, or show strong academic competency in the quantitative and physical sciences.
- All students must show basic academic competency in the life sciences.
- Specific prerequisites:
 - Engineering / Physical Sciences:
 - Math through differential equations
 - Two semesters of (preferably calculus-based) physics
 - Three courses of advanced (junior-level or higher) engineering courses
 - Life Sciences
 - One course in biology with laboratory or in physiology with laboratory
 - One additional course in the biological sciences
- If a student does not meet the above requirements, they may be admitted under a provisional status with a requirement to satisfy a list of deficiency courses, which will be presented at the time of their admission. Such deficiencies will be determined so as to prepare the student for success both in their graduate program and in their career as a biomedical engineer.
 - The deficiency courses will be noted in the student's admission letter from Graduate Studies.
 - The provisional status will be removed when the deficiency courses are completed.
 - Deficiency courses will not count towards the requirements for the graduate degree.
 - The deficiency courses must be completed before the student's comprehensive examination.
 - The Graduate Committee will review students with provisional status annually to check progress on deficiency courses.
 - The Graduate Committee chair is responsible for checking the program of studies before signing to ensure deficiency courses have been completed before the comprehensive examination.

Core Curriculum

The PhD degree in Biomedical Engineering requires a core curriculum of 42 credit hours, including the following:

- Statistics and Experimental Design (3 credit hours)
- Human Biology (9 credit hours)
 - The BME Graduate Committee will maintain, and annually review, a list of graduate courses that the graduate faculty have approved as acceptable “human biology” courses.
 - Courses may include relevant biological science offerings at UNO and UNMC.

- Engineering/Science Electives (30 credit hours)
 - 30 credit hours of electives, to include at least 12 credit hours of graduate-level engineering electives.
 - The BME Graduate Committee will maintain, and annually review, a list of graduate courses that the graduate faculty have approved as acceptable engineering courses.
 - Acceptable “science electives” are at the discretion of the supervisory committee, provided they are graduate-level courses.
 - Courses offered by UNO and UNMC also will be considered if they contain sufficient engineering and/or science content.

Appointment of Supervisory Committee

At the time of a student’s admission to the BME doctoral program, an advisor for the student is assigned by the BME Graduate Committee Chair. Upon recommendation of the BME Graduate Committee, the Dean of Graduate Studies appoints, for each student, a Supervisory Committee. The Committee will be chaired by the student’s advisor, who is a Graduate Faculty member, and will consist of at least four Graduate Faculty Members or Associates. The Supervisory Committee must be appointed before a doctoral student has accumulated 45 credit hours using the Appointment of Supervisory Committee form.

The different members of the Supervisory Committee have designated roles as follows:

- Chair: The advisor of the student chairs the Committee. The Chair may not serve as an outside representative and must be a Graduate Faculty member with an appointment in the College of Engineering. Appointed Adjunct faculty and courtesy faculty affiliated with the College of Engineering may not serve as the Chair, but may co-chair the Committee.
- Member: Members of the Committee vote on admission to candidacy, extension requests, and the outcome of the dissertation defense.
- Reader: Two members of the Committee are designated as Readers. The Chair and the Readers review the dissertation draft to determine if the dissertation is ready to defend.
- Outside Member: At least one Committee member external to the BME Graduate Faculty, who is a member of the Graduate Faculty, must be included. When the student is pursuing a minor, a Graduate Faculty member from the minor department must be on the Supervisory Committee. The Supervisory Committee member from the minor department may serve as the outside representative. The Outside Representative may also serve as a Reader.
- Special Member: Faculty external to the University of Nebraska system may serve as a fifth member of the Committee. The Special Member may serve as a reader, but not as outside representative.

PhD Comprehensive Examination

PhD students are required to complete a comprehensive examination that consists of a written and possibly oral (at the discretion of the Supervisory Committee) examination, as detailed in <https://catalog.unl.edu/graduate-professional/graduate/degrees/doctoral/>.

For the comprehensive examination, the style and format are at the discretion of the supervisory committee. A typical format is:

- Written exam: The student writes a research proposal. Research proposals follow the format for project narratives used by the NIH, NSF, or other national funding agency, as determined by the Supervisory Committee. It is not necessary to include the budget, conflict of interest, current and pending support, or other forms. The major advisor should be involved in the planning and development of the project but should not edit or rewrite the document prior

to submission to the Supervisory Committee. Thus, this document should be an accurate representation of the student's writing and reasoning abilities.

- The student orally defends the written proposal in the form of a seminar to the Supervisory Committee. The Committee will then examine the student on the research proposal. Areas to be evaluated include the student's knowledge of the science and methods to be used in the project, the student's ability to express his/her ideas orally, and the student's ability to answer questions related to the proposed project.

PhD Dissertation

All PhD students must write a dissertation. Specifics concerning the organization and preparation of the document are published in the Graduate Studies Catalog. Additional information on form and style can be obtained from the "Guidelines for Preparing your Thesis or Dissertation" available from the UNL Office of Graduate Studies. Due dates for the relevant academic year can also be obtained from the Office of Graduate Studies website: <http://www.unl.edu/gradstudies/current/degrees>.

Direct-to-PhD Option

Students having a Bachelor of Science degree can apply directly to the PhD program. Only exceptional applicants will be considered. It is expected that the exceptional applicants have outstanding grades and GRE scores, prior research experience, and superior letters of reference. When students are considering applying directly for the PhD program, we recommend they upload their research articles, reports, abstracts, conference proceedings, awards, recognitions, and so forth in their application package.

Assistantships

Many BME graduate students receive a research assistantship (RA). These RAs are awarded on a very competitive basis. With these awards comes the expectation that the student will be fully committed to their academic program. This means graduate students are expected to work during academic holidays such as spring break, semester break, and so on in the same manner as University support staff (i.e., whenever the University is open). The University offers no vacation benefit for graduate students. Therefore, time off must be negotiated with the major advisor. Assistantship awards are renewable based on satisfactory performance by the student (see Annual Reviews and Expected Student Performance).

Research Areas

Graduate students are expected to pursue an academic area and conduct research consistent with the interests of the major advisor. Research projects enable students to pursue their thesis/dissertation objectives and to satisfy the research objectives of the major advisor. The expected result is a thesis or dissertation for the student, the completion of grant objectives for the major advisor, and manuscripts published in scientific journals.

In addition to conducting their thesis/dissertation research, all RAs are not to exceed 19.6 hours per week for a maximum 0.49 FTE assistantship and are expected to assist their major advisor with special projects, to train other students, and to perform other relevant academic duties.

Tuition Benefits and Registration Requirements

All graduate students receiving an assistantship qualify for tuition waivers. Students should consult the Graduate Studies Catalog for current guidelines on requirements for eligibility. Students holding assistantships may not exceed established registration limitations. During regular academic semesters, students holding full assistantships (0.49 FTE) must register for a minimum of nine credits and a maximum of 10 credits, while students with 0.33 FTE assistantships may enroll for a maximum of 12 credits. Students who do not hold an assistantship may enroll for up to 15 credits per semester.

Summer Registration

Students do not have to be registered during the summer. If a graduate student has a qualifying assistantship that includes a summer tuition waiver, the student may choose to register in the summer terms (for a total of four credit hours--two credit hours in the first session, which lasts eight weeks, and two credit hours in the third session, which lasts five weeks; or two credits in each of the second and third sessions, which each last five weeks) but is not required to do so. When students do not enroll, they have limited access to such university facilities as the health center and campus recreation. International students should visit with the International Student Scholar Office to determine how summer enrollment affects the status of their visa. For additional information, see the "Guidelines for Good Practice in Graduate Education" on the Office of Graduate Studies website.

Expected Student Performance

Graduate students are expected to make satisfactory progress in course work and research activities at all times. The Graduate College has the following scholarship requirements that must be satisfied to receive graduate credit:

1. A minimum grade of B is required in all 800-level courses within the core curriculum.
2. A minimum grade of C or P (pass) is required for 800-level courses in the student's minor, collateral, or supporting areas of work.
3. A minimum grade of C or P (pass) is required for 900-level courses, or 800-level courses without 400-level counterparts, within the core curriculum.

In the event that the student's academic and/or research performance has been unsatisfactory, the major advisor will notify the student and Supervisory Committee and make recommendations for further action. Students who receive an unsatisfactory progress report may be permitted to continue, but their assistantship will not be renewed if their performance continues to be unsatisfactory during the next semester. Students who were originally admitted on a provisional basis and who receive an unsatisfactory rating will not be permitted to continue in the graduate program.

III. Review Criteria

A. Centrality to UNL Role and Mission

The proposed Biomedical Engineering PhD Program is consistent with the role and mission of the University of Nebraska - Lincoln as the sole provider of graduate engineering programs in this state: "The University of Nebraska provides extensive, comprehensive postsecondary education to Nebraska citizens through its four campuses: University of Nebraska-Lincoln, University of Nebraska at Omaha, University of Nebraska at Kearney, and University of Nebraska Medical Center.

This proposed degree will directly assist the College of Engineering and the University of Nebraska-Lincoln in meeting targets to grow our graduate student populations.

B. Relationship of the proposal to the NU Strategic Framework

The proposed Biomedical Engineering PhD program is consistent with the NU strategic framework: "The University of Nebraska, through its four campuses, strives to be the best public university in the country—as measured by the impact we have on our people and our state, and through them, the world."

This proposed degree is also aligned with the University of Nebraska-Lincoln College of Engineering's goals to transform to better serve the State's engineering workforce and

technology-based economic development needs. This proposed degree will directly benefit Nebraska engineering industries.

C. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

According to the Comprehensive State-Wide Plan for Postsecondary Education (July 2016), "UNL is the primary doctoral degree granting public institution in the state for fields outside the health professions." Given that UNL's College of Engineering is the sole engineering postsecondary degree granting institution in the state, the proposed Biomedical Engineering PhD program is consistent with this statement.

The proposed Biomedical Engineering PhD program meets the goals of the Comprehensive Statewide Plan for Postsecondary Education (the Statewide Plan). It meets the needs of students for high-quality educational programs that help them reach their career goals. Students in this program will be educated in advanced aspects of biomedical engineering that are in particular demand in Nebraska and across the Country.

A. Evidence of Need and Demand

1. Need:

According to the American Society for Engineering Education, graduate biomedical engineering program enrollments in the U.S. have risen from approximately 6,800 students in 2006 to roughly 10,000 in 2015. There are at least 78 programs nationwide offering a PhD in Biomedical Engineering; there are relatively few in the Midwest. North Dakota, South Dakota, Kansas, Colorado, New Mexico, Wyoming, Montana, and Missouri do not have programs leading to a PhD in Biomedical Engineering, although the University of Oklahoma started one in the year 2000, University of Iowa has had such a program since 1986, and University of Minnesota's program started in 1972. Colorado State has an interdisciplinary studies specialization in Biomedical Engineering started in 1999.

The employment opportunities for biomedical engineers seem strong. In 2011, the Bureau of Labor Statistics list of fastest growing occupations listed Biomedical Engineering as number one. The report, explained in a New York Times article, indicated a perceived 72% growth in BME positions (or 12,000 new jobs) by 2012. This information is in line with a similar report from the BoL in 2009, which noted the aging of the population, and a growing focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries. Median annual earnings of biomedical engineers were \$88,550 in the 2018 report, up from \$82,550 in 2011.

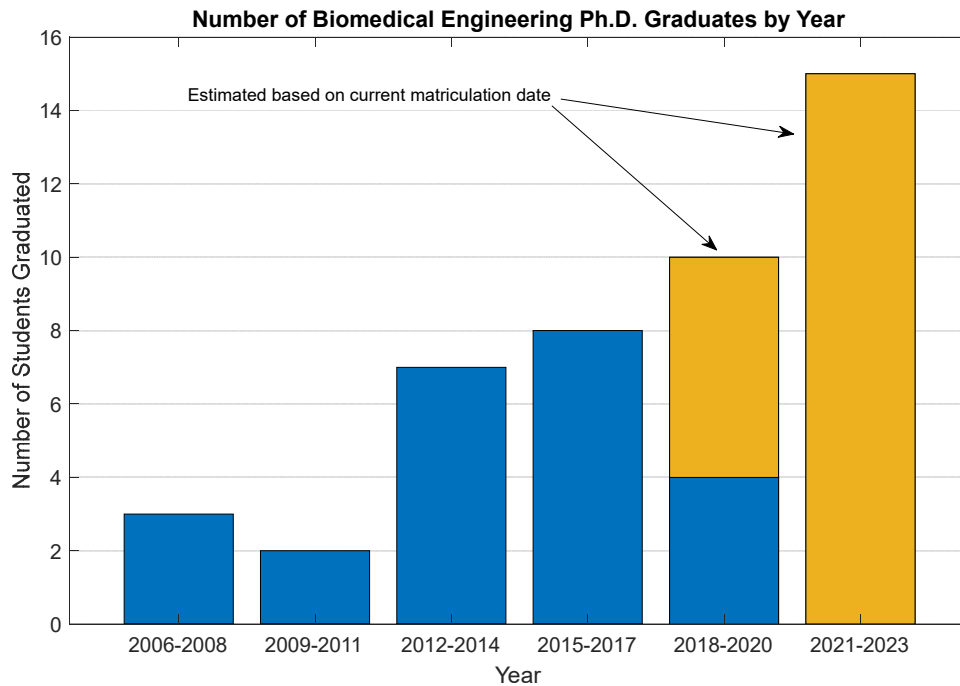
2. Demand:

As stated earlier, the undergraduate Biomedical Engineering option within the Biological Systems Engineering department currently enrolls roughly 130 students. Of the students who graduate within the Biomedical Engineering emphasis, approximately two-thirds go on to attend graduate school or medical school. Many attend graduate school at other universities since we do not have a PhD in Biomedical Engineering.

The Biomedical Engineering specialization in the Unified PhD in Engineering has now graduated 25 PhD students who have successfully moved on to academia and industry careers (Table 4). In addition, there are currently 25 PhD students enrolled in the specialization. The number of

applications to the specialization and enrolled students continues to grow, and we expect this growth to continue for some time.

TABLE 4: BIOMEDICAL ENGINEERING GRADUATION DATA



D. Avoidance of Unnecessary Duplication

The Biomedical Engineering PhD program currently offered at the University of Nebraska-Lincoln is a specialization in the Unified PhD program and this program will supplant that. It does not duplicate Biomechanics at UNO, which does not offer a PhD, only a M.S., and constitutes study of the forces that act on a body and the effects they produce. Biomedical Engineering focuses on solving medical problems using engineering skills. There are no PhD programs at UNMC whose foci demonstrate some level of duplication. Also, potential licensure of engineers in the State of Nebraska ensures avoidance of unnecessary duplication.

While there are at least 78 programs nationwide offering a PhD in Biomedical Engineering, there are relatively few in the Midwest. North Dakota, South Dakota, Kansas, Colorado, New Mexico, Wyoming, Montana, and Missouri do not have programs leading to a PhD in Biomedical Engineering, although the University of Oklahoma started one in the year 2000, University of Iowa has had such a program since 1986, and University of Minnesota's program started in 1972. Colorado State has an interdisciplinary studies specialization in Biomedical Engineering started in 1999.

E. Adequacy of Resources:

1. Faculty/Staff

As stated earlier, the University of Nebraska has made significant institutional investment in faculty who would support the Biomedical Engineering PhD program. The resources necessary to offer the proposed additional degree are already in place. No additional budgetary resources will be required to implement the proposed degree.

All the courses that will be required by the proposed degree are already being offered. This additional degree offering may increase enrollment in these classes, but not to a level that new sections will need to be offered for the planning period encompassed by this proposal.

The College of Engineering has an Associate Dean for Graduate and International Programs (Daniel Linzell) and two staff members (Graduate Program Director Kayla Person and Administrative Associate Cameron Adams) who currently support the specialization and would support the proposed program. A survey of graduate faculty interested in engaging with the program from UNL, UNO and UNMC elicited 33 names as listed in Table 5. Faculty program support would be via the Graduate Committee as discussed in Section II.

TABLE 5: BIOMEDICAL ENGINEERING GRADUATE FACULTY

Faculty Name	Department/Campus
Andrew Dudley	Genetics, Cell Biology and Anatomy/UNMC
Alexey Kamenskiy	College of Education/UNO
Angie Pannier	Biological Systems Engineering/UNL
Ben Terry	Mechanical and Materials Engineering/UNL
Bonita Sharif	Computer Science and Engineering/UNL
Carl Nelson	Mechanical and Materials Engineering/UNL
Deepak Keshwani	Biological Systems Engineering/UNL
Erica Ryherd	Durham School of Architectural Engineering and Construction/UNL
Fadi Alsaleem	Durham School of Architectural Engineering and Construction/UNL
Forrest Kievit	Biological Systems Engineering/UNL
Greg Bashford	Biological Systems Engineering/UNL
Hani Haider	Orthopedic Surgery and Rehabilitation/UNMC
Hasan Otu	Computer Science and Engineering/UNL
Jennifer Keshwani	Biological Systems Engineering/UNL
Josephine Lau	Durham School of Architectural Engineering and Construction/UNL
Juan Cui	Computer Science and Engineering/UNL
Jung Yul Lim	Mechanical and Materials Engineering/UNL
Khalid Sayood	Electrical and Computing Engineering/UNL
Mark Beatty	Department of Adult Restorative Dentistry/UNMC
Massimiliano Pierobon	Computer Science and Engineering/UNL
Michael P Sealy	Mechanical and Materials Engineering/UNL
Nicole Iverson	Biological Systems Engineering/UNL
Nick Stergiou	College of Education/UNO
Rebecca Wachs	Biological Systems Engineering/UNL
Ruiguo Yang	Mechanical and Materials Engineering/UNL
Ryan Pedrigi	Mechanical and Materials Engineering/UNL
Sangjin Ryu	Mechanical and Materials Engineering/UNL
Shane Farritor	Mechanical and Materials Engineering/UNL
Shudipto Dishari	Chemical and Biomolecular Engineering/UNL
Sri Kidambi	Chemical and Biomolecular Engineering/UNL
Yuguo Lei	Chemical and Biomolecular Engineering/UNL
Yinying Wang	Special Education and Communication Disorders/UNL

2. Library/Information Resources

Current library resources are adequate to support this proposed degree program. No additional instructional equipment or informational resource needs are anticipated.

3. Physical Facilities and Equipment

Classrooms on the Lincoln campus are located in Scott Engineering Center, Hardin Hall, Nebraska Hall and Othmer Hall. Classrooms are distributed throughout the buildings and range in size from 20 to 110 seats. On the Scott campus in Omaha, classrooms are located in the Peter Kiewit Institute and Scott Technology Center and range in size from 20 to 64 seats.

Each faculty member listed in Table 5 maintains physical laboratory spaces in Lincoln and Omaha that can be used for laboratory-based graduate courses and for research.

4. Instructional Equipment and Informational Resources

Associated equipment typically available in classrooms includes LCD projectors, projector screens, PCs, white boards, document camera units, connection for portable computers, tables and chairs, overhead projectors, and laptop computers. Each classroom is equipped with a wireless network, including Internet access.

The Lincoln and Omaha engineering campuses are connected via video conferencing equipment. There are currently six distance education classrooms on the Lincoln campus and three on the Omaha campus. These classrooms are supported and maintained by the CoE Learning Spaces Project Manager with additional support provided by the IT staff and student workers.

5. Budget Projections

Currently, we do not expect additional funds will be required to support this program, as we can deliver the program with existing faculty, staff, and courses (CCPE Table 1).

Revenue projections are based on attracting 10 new students to UNL in total to the program to join the existing 25 current students in the PhD Biomedical Engineering specialization in the Unified PhD program who would move to the stand-alone PhD program once approved. The total enrollment capacity of the Biomedical Engineering PhD program is 35 students, without additional faculty and resources.

CCPE Table 2 shows gross tuition revenue for the 10 new students which is predicted to be in place by Year 2 of the program, in 2022-23. The total gross tuition revenue associated with 10 new students, using the College of Engineering historic distribution of resident and non-resident graduate students would be \$685,788.

Understandably, doctoral students in this type of program will likely be on graduate assistantships with the benefit of full tuition waivers. The College plans to support the tuition waiver benefit up to \$15,000 per new student from externally funded research. We are conservatively assuming no revenue increases, either based on tuition rates or increased research activity, will occur during the first five years of the program. This means that with an anticipated new enrollment of 10 PhD students per year, the program will generate \$600,000 in funded tuition waivers (remission) over the next five years (Table 6).

Table 6: TUITION WAIVERS SUPPORTED BY EXTERNAL GRANTS

	FY(22) Year 1	(FY23) Year 2	(FY24) Year 3	(FY25) Year 4	(FY26) Year 5	Total
Tuition Waivers (Remission) Offset ¹	\$0	\$150,000	\$150,000	\$150,000	\$150,000	\$600,000
Total Revenue	\$0	\$150,000	\$150,000	\$150,000	\$150,000	\$600,000

¹Tuition only. Estimated annual tuition waivers (remission) offset through external research funding of \$15,000/student. Estimating 10 enrolled students beginning in FY23.

IV. Appendices

- A. Abstract of Proposal
- B. Letters of Support
- C. Faculty CVs (available upon request)

Appendix A: Abstract of Proposal

Biomedical engineering (BME) is one of the most rapidly expanding areas of engineering education, research, and job growth in the U.S. UNL has the only engineering graduate and research programs in the state of Nebraska and successful BME undergraduate academic and graduate research activities. CoE faculty and graduate students actively and successfully collaborate with UNMC researchers at the Medical Center and with UNOs Biomechanics Department in this area.

We are seeking to add a stand-alone Biomedical Engineering PhD program to replace the specialization within the Unified Engineering PhD. This will provide a focal point for BME activities in the state, will reduce the current barriers to BME learning, and will provide the necessary framework to grow research and collaboration between engineers and the medical community.

We envision that formation of a BME PhD program in the College of Engineering that engages a vibrant coalition of engineers, scientists, clinicians and students in Nebraska will prominently place UNL on the landscape of BME graduate education and research institutions in the U.S. The program would use an interdisciplinary approach to develop skills employing engineering techniques to improve human health via understanding engineering and medical needs associated with important problems.

We see the day when the best students in the country will want to receive a PhD in BME through UNL, and, subsequently, when our doctoral program rivals those from the best institutions in the U.S. Our vision is that “Nebraska Biomedical Engineering improves the quality of human life,” which was developed with the idea that leadership from UNL CoE and healthy collaborations with faculty from UNL, UNMC and UNO, when coupled with joint research projects involving UNMC, UNO, Creighton, Madonna, Bryan LGH, and companies such as Stanley Security Solutions and LICOR, will make us the center of BME education and research in the region. It is our belief that we can compete with leading national programs in the region such as Rice, Washington University, and the Universities of Iowa and Minnesota.

Coupled with the educational mission is a desire to complete preventative, acute and long-term health care research. We envision that the program will: (i) be known as a program of excellence in BME education; (ii) be nationally recognized for BME research; (iii) reflect the interdisciplinary nature of BME in our graduate teaching, research and outreach programs; and (iv) foster economic development and improve human health through technology transfer of new biomedical engineering developments.

Coupled with leveraging rapid growth in BME nationally, the proposed program will also leverage a successful and growing undergraduate BME track in Biological Systems Engineering, successful faculty and recent hires across the NU system whose expertise and success would directly enhance and benefit from the PhD program and existing, successful collaborations between UNL CoE, other UNL Colleges, UNMC and UNO to fulfill the vision and mission. We would expect it would be one of the larger PhD programs in CoE within a few years.

The proposed program is supported by a number of junior and faculty. The faculty are housed in multiple colleges at UNL and UNMC and Biomechanics Department at UNO.

Appendix B: Letters of Support



January 21, 2021

University of Nebraska-Lincoln
Academic Planning Committee

To Whom It May Concern –

We are writing this letter to express our support for the proposed standalone doctoral program in Biomedical Engineering and for our faculty who are participating in the program. Creation of a standalone doctoral program is essential to ensure that the College's and University's biomedical engineering efforts continue to thrive.

Faculty contributions to this graduate program, which has existed as a Specialization of the Engineering PhD program for two decades, are incorporated in annual evaluations the same way contributions to departmental programs are. The program itself does not have an evaluative role.

Sincerely,

Jerry L. Hudgins

Jerry L. Hudgins, Ph.D.
Chair and Professor
Department of Electrical and Computer Engineering

David Jones

David Jones, Ph.D.
Department Head and Professor
Department of Biological Systems Engineering

Hossein Nouredдини

Hossein Nouredдини, Ph.D.
Chair and Professor
Department of Chemical and Biomolecular Engineering



Jay Puckett, Ph.D.
Director and Charles W. & Margre H. Durham Distinguished
Professor of Engineering & Technology
Durham School of Architectural Engineering and Construction



Jeffrey Shield, Ph.D.
Chair and Robert W. Brightfelt Professor
Department of Mechanical and Materials Engineering



Marilyn Wolf, Ph.D.
Chair and Koch Professor of Engineering
Department of Computer Science and Engineering

DATE: January 31, 2020

FROM: Daniel Linzell, Associate Dean for Graduate and International Programs



TO: Tim Carr, Associate Vice Chancellor and Dean of Graduate Education

SUBJ: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Lance Perez, Greg Bashford

I am writing to inform you the proposal referenced above was unanimously supported by College of Engineering Graduate Chairs at their 1/31/2020 meeting. I also support the proposal on behalf of the College of Engineering.

Enclosures: BME Ph.D. proposal

January 9, 2020

DATE: February 3,
2020

FROM: Ron Nelson, Ph.D., Interim Chair of the Department of Special Education and
Communication Disorders

TO: Tim Carr, Associate Vice Chancellor and Dean of Graduate
Education

SUBJ: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Daniel Linzell, Lance Perez, Greg Bashford

I am writing to inform you that I support the proposal on behalf of Department of Special
Education and Communication Disorders.

February 10, 2020

TO: Tim Carr, Associate Vice Chancellor and Dean of Graduate Education

SUBJECT: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Dan Linzell, Lance Perez, Greg Bashford

Dear Dr. Carr,

I am writing to inform you that I support the proposal on behalf of Dr. Andrew Dudley.

Sincerely,

A handwritten signature in blue ink that reads "Vimla Band". The signature is written in a cursive style and is underlined with a single horizontal line.

Vimla Band, PhD
Ardith and Anna Von Housen Professor and Chair
Department of Genetics, Cell Biology and Anatomy
Associate Director of Center for Breast Cancer Research
UNMC-Eppley Cancer Center
University of Nebraska Medical Center
Phone: (402) 559-8565
Email: vband@unmc.edu

TO: Tim Carr, Associate Vice Chancellor and Dean of Graduate Education

FROM: Dr. Steven E. Haas, DMD, JD, MBA
Interim Department Chair, Adult Restorative Dentistry

DATE: February 3, 2020

RE: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Daniel Linzell, Lance Perez, Greg Bashford

I am writing to inform you that I support the proposal on behalf of Mark Beatty, DDS, MSE, MSD, MS.

A handwritten signature in black ink, appearing to read "Steven E. Haas DMD, JD, MBA". The signature is stylized and cursive.

DATE: February 4, 2020

FROM: David W. Mercer, M.D.; McLaughlin Professor and Chairman, Department of Surgery
University of Nebraska Medical Center

TO: Timothy Carr, Ph.D.; Associate Vice Chancellor and Dean of Graduate Education
University of Nebraska – Lincoln

SUBJ: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Daniel Linzell, Ph.D.; Lance C. Pérez, Ph.D.; Greg Bashford, Ph.D.

Dear Dr. Carr,

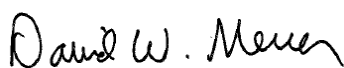
It is my pleasure to inform you and the rest of your team that I am in full support of Alexey Kamenskiy, Ph.D., who has expressed an interest in being part of the Graduate Faculty affiliated with your program.

As Chairman of the Department of Surgery at the University of Nebraska Medical Center (UNMC), we had the good fortune to work closely with Dr. Alexey Kamenskiy when we recruited him from the University of Nebraska – Lincoln (UNL) to work alongside Jason MacTaggart, M.D. That relationship was incredibly fruitful and led to funding of several NIH grant proposals. He rapidly rose through the ranks in the College of Medicine, being promoted to Associate Professor in 2017, and was granted tenure in July of 2019. Dr. Kamenskiy had adjunct appointments in the Department of Mechanical & Material Engineering at UNL and in the Department of Biomechanics at the University of Nebraska – Omaha (UNO). He was recruited to UNO in August of 2019, but continues to have a faculty appointment here and maintains a working relationship with Dr. MacTaggart.

It is noteworthy that Dr. Kamenskiy developed a new graduate course that is offered at UNO and UNL, Vascular Mechanobiology, which was developed in the spring of 2016 and represents a 3 credit hour graduate-level course. In addition, Dr. Kamenskiy has mentored more than 20 medical students, 7 undergraduate students, and 8 graduate students from the U.S. and abroad. He was also the advisor for several Ph.D. students, postdoctoral students, and general surgery residents within the Department of Surgery at UNMC. Working with Dr. MacTaggart, Dr. Kamenskiy obtained over \$5 million dollars in extramural funding and obtained over \$700 thousand dollars as a Co-PI. Prior to leaving, he had filed over 10 patents and received a number of awards for his work. These include, but are not limited to, Recognition of Service Award (2017), the New Investigator Award (2015), and the Most Promising Invention (2013-2014) at UNMC. He is well published and is recognized nationally and internationally in his research area.

In summary, I highly recommend Dr. Alexey Kamenskiy to become part of the Graduate Faculty affiliated with the Biomedical Engineering Program. If there are any questions regarding this outstanding individual, do not hesitate to call.

Sincerely yours,



David W. Mercer, M.D.
McLaughlin Professor and Chairman

February 4, 2020

FROM: Dr. Nick Stergiou
University of Nebraska at Omaha
Biomechanics Research Building, 214
Omaha NE, 68182

TO: Tim Carr, Associate Vice Chancellor and Dean of Graduate Education

RE: Biomedical Engineering (BME) Ph.D. Program Proposal

CC: Daniel Linzell, Lance Perez, Greg Bashford

I am writing to inform you that I support the proposal on behalf of the Biomedical Engineering (BME) Ph.D. program proposal.

Sincerely,



Prof. Dr. N. Stergiou (Nick)

Assistant Dean and Director of the Division of Biomechanics and Research Development, University of Nebraska at Omaha
Distinguished Community Research Professor and Founding Chair, Department of Biomechanics, University of Nebraska at Omaha
Director, Center for Research in Human Movement Variability (MOVCENTR), University of Nebraska at Omaha
Professor, Department of Environmental Agricultural and Occupational Health, University of Nebraska Medical Center
President-Elect, American Society of Biomechanics



ORTHOPAEDIC ACADEMIC FACULTY

ADULT RECONSTRUCTION SURGERY

Kevin L. Garvin, M.D., Chairman
Curtis W. Hartman, M.D.
Beau J. Kildow, M.D.
Beau S. Konigsberg, M.D.

ADULT SPINE SURGERY

Chris A. Cornett, M.D., Vice Chair of Clinical Services
Scott A. Vincent, M.D.

BIOMECHANICS & ADVANCED SURGICAL TECHNOLOGIES LABORATORY

Hani Haider, Ph.D., Director

FOOT & ANKLE SURGERY

Alexander B. Sawatzke, M.D.

HAND, WRIST & MICROVASCULAR SURGERY

Daniel E. Firestone, M.D.
Joseph A. Morgan, M.D.
Philipp N. Streubel, M.D.

MUSCULOSKELETAL ONCOLOGY

Sean V. McGarry, M.D.

ORTHOPAEDIC TRAUMATOLOGY &

LOWER EXTREMITY

Sara M. Putnam, M.D.
Matthew A. Mormino, M.D., Program Director
and Vice Chair of Education
Justin C. Siebler, M.D.

PEDIATRIC ORTHOPAEDIC & SPINE SURGERY

Paul W. Esposito, M.D.
Matthew A. Halanski, M.D., Vice Chair of Research
Brian P. Hasley, M.D.
Ryan J. Koehler, M.D.
Nicholas J. Nahm, M.D.
Susan A. Scherl, M.D.
Maegen J. Wallace, M.D.
Walter W. Huurman, M.D., Professor Emeritus

SPORTS MEDICINE &

ARTHROSCOPIC SURGERY

Katie L. Freeman, M.D.
Matthew A. Tao, M.D.

SHOULDER & ELBOW SURGERY

Philipp N. Streubel, M.D.
Matthew J. Teusink, M.D.

ADJUNCT FACULTY

Kenneth W. Bayles, Ph.D.
Julia A. Bridge, M.D.
Paul D. Fey, Ph.D.
Angela L. Hewlett, M.D.
Steven H. Hinrichs, M.D.
Tammy L. Kielian, Ph.D.
Mark E. Rupp, M.D.
Elizabeth Wellsandt, Ph.D.

ADMINISTRATIVE DIRECTOR

Julie A. Zetterman, M.B.A.

Date: February 10, 2020

To: Tim Carr, Associate Vice Chancellor and Dean of Graduate Education

From: Kevin L. Garvin, M.D. *Kevin L. Garvin*
L. Thomas Hood, M.D., Professor

Subject: Hani Haider, Ph.D., Professor
Biomedical Engineering (BME) Ph.D. Program Proposal

I am writing in support of the proposed renewal of the Biomedical Ph.D. Program. One of our faculty, Dr. Hani Haider, is an engineer and was among the founders who conceived of this course years ago and worked with the University of Nebraska-Omaha to create it. Since then, the course has done well, and serves the collaborative work needed for teaching and innovation research work across our university.

In March of 2000, we were fortunate to attract Dr. Haider as Director of our Orthopaedic Biomechanics and Advanced Surgical Technologies Laboratory. Dr. Haider is an extremely talented researcher and has brought great enthusiasm to our research team and has maintained that enthusiasm with a high level of productivity. Dr. Haider's outstanding research and scholarly activity, especially in the areas of orthopaedic implant technology and biomechanics has brought prestige to the Department of Orthopaedic Surgery and to the University of Nebraska. The Biomedical Engineering PhD program is a good conduit to supply fresh potential research talent for our lab, and others across UNMC and other campuses.

It is therefore with great pleasure that I continue to support Dr. Haider's and our Department participation in the University of Nebraska's Biomedical Engineering Ph.D. program.

CC: Daniel Linzell, Lance Perez, Greg Bashford

TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM

UNL PhD in Biomedical Engineering

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty											
Professional											
Graduate Assistants											
Support Staff											
Subtotal	0.0	\$0	0.0	\$0	0.0	\$0	0.0	\$0	0.0	\$0	\$0
Operating											
General Operating		\$0		\$0		\$0		\$0		\$0	\$0
Equipment											
New or renovated space											
Library/Information Resources											
Subtotal		\$0		\$0		\$0		\$0		\$0	\$0
Total Expenses		\$0		\$0		\$0		\$0		\$0	\$0

TABLE 2: PROJECTED REVENUES - NEW INSTRUCTIONAL PROGRAM

UNL PhD Biomedical Engineering

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	Reallocation of Existing Funds										
Required New Public Funds											
1. State Funds											
2. Local Tax Funds (community colleges)											
Tuition and Fees ¹	\$0		\$171,447		\$171,447		\$171,447		\$171,447		\$685,788
Other Funding											
Total Revenue	\$0		\$171,447		\$171,447		\$171,447		\$171,447		\$685,788

¹ Gross tuition only. Estimating 10 new enrolled students each year beginning in FY23, 40.9% resident and 59.1% non-resident (using the College of Engineering historic percentage of resident and non-resident graduate students).

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5	
	R	NR	R	NR	R	NR	R	NR	R	NR
Student Type										
Est. Tuition per student	\$8,496	\$23,130	\$8,496	\$23,130	\$8,496	\$23,130	\$8,496	\$23,130	\$8,496	\$23,130
Est. Total Enrollment in Major	25		25		25		25		25	
Est. Total New Students in Major	0		10		10		10		10	
Est. New Enrollment - Student Type	0	0	4	6	4	6	4	6	4	6
Est. New Tuition & Fees	\$0	\$0	\$34,749	\$136,698	\$34,749	\$136,698	\$34,749	\$136,698	\$34,749	\$136,698
Est. New Tuition & Fees	\$0		\$171,447		\$171,447		\$171,447		\$171,447	
Est. New Total Tuition & Fees	\$685,788									

TO: The Board of Regents Addendum XI-A-5
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of the School of Computing in the College of Engineering by renaming the existing Department of Computer Science and Engineering currently shared between the College of Arts and Sciences and the College of Engineering at the University of Nebraska-Lincoln

RECOMMENDED ACTION: Approval to create the School of Computing in the College of Engineering by renaming the existing Department of Computer Science and Engineering (CSE) currently shared between the College of Arts and Sciences and the College of Engineering at the University of Nebraska-Lincoln (UNL)

PREVIOUS ACTION: March 12, 1988 – The Board approved a proposed new Department of Computer Science and Engineering at UNL.

EXPLANATION: Enrollment in the UNL Department of Computer Science and Engineering is growing — up 83% over the past five years to nearly 1,000 undergraduate and graduate students. UNL estimates that the unit will reach 2,500 full-time students by 2030. To better serve students, the UNL College of Engineering proposes to create a School of Computing by renaming the existing Department of Computer Science and Engineering. The Department is currently housed jointly between two colleges, the College of Arts and Science and the College of Engineering. The proposed School of Computing will have an administrative home solely in the College of Engineering, which will enhance administrative efficiency. The proposed School will offer UNL’s existing signature undergraduate and graduate programs in Software Engineering, Computer Engineering and Computer Science. The constellation of specializations and skills brought together in the School of Computing will allow faculty to pursue new opportunities to engage in cross-disciplinary education and collaborative research with students and other faculty across the University.

There are no changes to the program statuses with the Accrediting Board for Engineering and Technology (ABET). Programs in CSE currently accredited by ABET will remain so when housed in the School of Computing.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

PROGRAM COST: \$0 (No net-new costs)

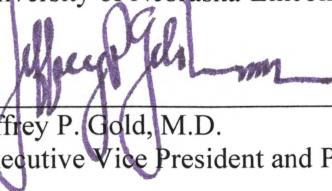
SOURCE OF FUNDS: Budgets for the Department of Computer Science and Engineering within the College of Engineering and the College of Arts & Sciences will be used to fund the proposed School of Computing

SPONSORS:

Elizabeth Spiller
Executive Vice Chancellor and Chief Academic Officer

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

RECOMMENDED:



Jeffrey P. Gold, M.D.
Executive Vice President and Provost

DATE:

July 16, 2021



April 23, 2021

Susan Fritz, Executive Vice President & Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583-0745

SUBJECT: School of Computing

Dear Susan,

I am forwarding materials related to a proposal to transform the Department of Computer Science and Engineering, currently shared between the College of Arts and Sciences and the College of Engineering, to a School of Computing to be administered by the College of Engineering. The programs within the existing department will continue in the school configuration, with the exception of the BA degree in Computer Science. A proposal regarding the BA Computer Science degree deletion is also included in the attached proposal.

There is a significant and growing need for both computing majors and non-computing majors who have strong computing skills, as evidenced by an 83% enrollment increase over the past 5 years. Furthermore, the interdisciplinary nature of the School will enhance collaborations in teaching and research.

This proposal has the full endorsement of the Academic Planning Committee and it has my approval. I am requesting you approve it and that it be reported to the Board of Regents at its next regular meeting.

Sincerely,

Ronnie D. Green, Ph.D.
Chancellor

- c: Kurt Geisinger, Chair, Academic Planning Committee
- Elizabeth Spiller, Executive Vice Chancellor
- Lance Perez, Dean, College of Engineering
- Mark Button, Dean, College of Arts & Sciences
- Marilyn Wolf, Elmer Koch Professor and Chair, Computer Science & Engineering
- Mike Zeleny, Associate to the Chancellor
- Renee Batman, Assistant Vice Chancellor, Academic Affairs
- Suzi Tamerius, Project Coordinator, Academic Affairs
- Karen Griffin, Coordinator, Faculty Governance

University of Nebraska-Lincoln

New Academic Unit

Academic units include colleges, departments, and schools
For Centers, Bureaus and Institutes use Centers form

I. Descriptive Information

Name of Institution Proposing New Academic Unit
University of Nebraska-Lincoln
Name of Proposed Academic Unit
School of Computing (SoC)
Administrative Unit(s) for the new Academic Unit [e.g. college, division, etc.]
College of Engineering (CoE)
Academic Programs to be Housed in the new Academic Unit
B.S. in Computer Science B.S. in Computer Engineering B.S. in Software Engineering Minor in Computer Science Minor in Software Development Minor in Robotics Engineering Minor in Computational Biology and Bioinformatics (joint with CASNR and CAS) Minor in Informatics (currently under development) M.S. in Computer Science Ph.D. in Computer Science Ph.D. in Engineering with Specialization in Computer Engineering Joint program - Ph.D. in Computer Science and Mathematics
Proposed Date the New Unit will be Initiated
When approved by the Coordinating Commission.
Date Approved by the Governing Board
<i>Pending</i>

Summary: The College of Engineering (CoE) at the University of Nebraska-Lincoln proposes to create a School of Computing (SoC) by renaming the existing Department of Computer Science and Engineering (CSE). UNL's Department of Computer Science and Engineering is currently housed jointly between two colleges, the College of Arts and Science (CAS) and the College of Engineering. The proposed School of Computing and all associated degree programs, including those currently housed in the College of Arts and Sciences will be solely housed in the College of Engineering. There are no changes to the program statuses with the Accrediting Board for Engineering and Technology (ABET). Programs in CSE currently accredited by ABET will remain so when housed in the School of Computing. Upon creation of the School of Computing, the Department of Computer Science and Engineering will be eliminated.

II. Details

A. Purpose of the Proposed Unit:

Computing is an essential tool of the 21st century. Knowledge of computing is important as a practical skill in virtually every discipline. Given that computing systems are intertwined into our societal systems—finance, critical infrastructure, health—a basic understanding of computing concepts is important for all citizens. Computing is used throughout the physical and social sciences, humanities, and engineering. According to the [2019 Bureau of Labor and Statistics OES survey](#), the projected growth rate for software developers continues to be strong—21% through 2028—which is much faster than average. In addition, demand for non-computing majors with strong computing skills is increasing as employers are now seeking graduates in the arts, agriculture, engineering, business, journalism, medicine, and other areas who can leverage advances in big data, applied machine learning, virtual reality, augmented reality, and other technologies in unique ways to solve major challenges. A School of Computing would provide support for a wide range of collaborations as well as providing a strong foundation in core concepts.

Enrollment in the UNL Department of Computer Science and Engineering is also growing — up 83% over the past five years to nearly 1,000 undergraduate and graduate students. We estimate that we will reach 2,500 full-time students in 2030. The School of Computing enrollment goal taken relative to UNL total enrollment is consistent with that seen by other computing programs.¹

In response to the high need for both computing majors and non-computing majors who have strong computing skills, the Department of Computer Science and Engineering and the University of Nebraska propose to form a School of Computing (SoC) from the existing Department of Computer Science and Engineering at UNL. The proposed School of Computing will have an administrative home solely in the College of Engineering, which will enhance administrative efficiency, and will continue to offer and enhance its existing signature undergraduate and graduate programs in Software Engineering, Computer Engineering and Computer Science.

The current Department of Computer Science and Engineering houses strengths in several key areas of computing: software engineering, networking and communications, Internet-of-Things (IoT), robotics. The formation of a School of Computing will enhance the faculty's ability to embody the breadth and depth of this rich field; the interdisciplinary nature of the School will similarly enhance its ability to engage with a large range of collaborations in teaching and research.

The constellation of specializations and skills brought together in the School of Computing will allow the School to pursue new opportunities to engage in cross-disciplinary education and research with students and faculty across the University. Elevating the field of computing and creating a School will give the school the capacity to collaborate more broadly across the campus. Graduates from these interdisciplinary programs will be prepared for an information age in which computing technologies—artificial intelligence, real-time distributed computing, data analytics, bioinformatics, robotics, data visualization, wet computing, and many others—play a critical supporting role in nearly every field and discipline. The School will help to provide all students with fundamental knowledge in computing and skills to apply that knowledge to real-world problems. In addition, the increased breadth of the School will enable this interdisciplinarity and broader collaborations while strengthening its existing collaborations with the College of Engineering and the College of Arts and Sciences.

¹ National Academies of Sciences, Engineering, and Medicine. 2018. *Assessing and Responding to the Growth of Computer Science Undergraduate Enrollments*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/24926>.

The creation of a School of Computing at UNL will increase our competitiveness with other institutions, including recruitment and retention of students and faculty. Institutions that have created Schools of Computing include Arizona State University, University of Utah, University of Pittsburgh, Montana State University, Grand Valley State University, Florida International University, University of South Alabama, and the University of Southern Mississippi. Institutions that are more science and technology focused than UNL, including Carnegie Mellon University, Georgia Tech and MIT, have created Colleges of Computing. If UNL, as a comprehensive doctoral granting institution, is to compete in the area of computing and meet the computing workforce needs of the state, the expanded breadth and visibility provided by a school is necessary.

The following Big Ten schools have recently formed or expanded a School of Computing:

- Indiana University's Luddy School of Informatics, Computing, and Engineering (Launched as a School of Informatics in 2000 and expanded in 2018 to add Computing Science, Computer Engineering and other programs)
- U. of Wisconsin's School of Computer, Data & Information Sciences (Launched in September 2019)

By forming a School of Computing at UNL, we will be consistent with the trend in the Big Ten that recognizes the pervasiveness of computing across campus.

Creation of the School of Computing will benefit the state of Nebraska and the University of Nebraska in several ways:

- 1) Elevate the discipline of computing at UNL in a way that is consistent with national and international developments and maintain the competitiveness of UNL in computing disciplines.
- 2) Create stronger collaborations and syntheses within the unit's programs and across the university.
- 3) Enable the unit to meet local, state, and national workforce needs. The Bureau of Labor Statistics projects that employment of computer and information technology will grow 13 percent from 2016 to 2026, and the growth rate for software developers is projected to be 21% through 2018. This growth translates to over half a million new jobs. In 2018, the median annual wage for computer and information technology occupations was \$86,320, which was higher than the median annual wage for all occupations of \$38,640.
- 4) Enable the unit to respond to emerging applications of computing to support intelligent transportation, computational based decision making, large scale data analytics, social network connectivity, and various forms of emerging media.
- 5) Support new degree programs that reflect the increasing breadth of the field of computing, including areas such as artificial intelligence and data science.

Through the formation of a School of Computing, the University of Nebraska will raise its international profile and reputation by recruiting and retaining exceptional faculty and students to meet the growing workforce demands in the state of Nebraska in computing related fields. The school also will the University to prepare graduates to apply computing technologies in novel ways to leverage computing to solve key business and societal problems such as finance, health, logistics, and communication.

B. Description of the Proposed Unit:

Academic Programs: The School of Computing in the College of Engineering at the University of Nebraska-Lincoln will initially offer three existing undergraduate B.S. programs, Computer Science (CS), Computer Engineering (CE), and Software Engineering (SE), four minors (including a Minor in Computational Biology and Bioinformatics that is jointly offered with CASNR and CAS) and four graduate

programs (including a joint program - Ph.D. in Computer Science and Mathematics). As the field of computing continues to evolve and become more pervasive, the School of Computing will enhance its existing programs and expand its programs to include dynamic interdisciplinary initiatives and research programs with units across the University, with local and national industry partners, and with community stakeholders. Programs in the School of Computing will continue to provide students with a rigorous and innovative curriculum while providing novel interdisciplinary opportunities to prepare graduates to meet the demands of a wide range of disciplines in industry and research, both now and in the future.

Program Strength and Disciplinary Focus: Our rigorous computing programs prepare students with core computing foundations. Each program has high-quality research and education in the traditional computing foundations, while exposing students and faculty to multiple practical and research approaches and providing synergies in scholarship and teaching only achievable through interdisciplinary activities. The School of Computing will continue this work. It will contribute interdisciplinary research activities addressing emerging challenges and will provide real-world, qualitative and quantitative education to our students. New programs will focus on extending computing education to students who desire a computing background while pursuing a non-computing major.

Scholarship: The School of Computing will leverage the unique strengths of each of its programs to address the computing needs across all disciplines at UNL and across multiple industries within Nebraska, the US, and the world. While the lack of computing-capable workforce has been a long-standing issue in Nebraska, and the US in general, this problem is exacerbated by the need to provide a workforce capable of developing emerging applications of computing including:

- Deployment of autonomous and unmanned aerial vehicles (UAVs) for military, private and commercial applications.
- Medical advancements including genomics, telemedicine, intelligent diagnosis and early warning, 3-D imaging, maintaining health and wellness through smart mobile devices.
- Advanced human-computer interfaces via Virtual Reality (VR), Augmented Reality (AR), and Gestural technology.
- Real-time analysis and operation of complex real-world systems: healthy and energy-efficient buildings, intelligent manufacturing, agriculture and food systems.
- Large scale data achieving and processing in various Digital Humanities projects that include Geographic Information Science (GIS), remote sensing, environmental factors, text and image processing, and natural language processing.
- Enterprise-grade artificial intelligence (AI) to aid decision-making processes.

Table 1: Current strengths of programs within the proposed School of Computing			
PROGRAM	COMPUTER SCIENCE	COMPUTER ENGINEERING (JOINTLY OFFERED BY SOC AND ECE)	SOFTWARE ENGINEERING
DISCIPLINARY FOCUS	Focus on broad introduction to fundamentals of computer science.	Focus on design and construction of computer systems through the application of computer science and electrical engineering fundamentals.	Focus on design and implementation of large-scale software systems through the application of rigorous engineering principles and processes.
DEGREES OFFERED	B.S., M.S., Ph.D.	B.S., Ph.D.	B.S.
FACULTY	33 Tenure/Tenure Track lines, nine Professors of Practice, three Lecturers and one Research Faculty.		
UNDERGRADUATE STUDENTS (AY 18-19)	559 Computer Science majors	183 Computer Engineering majors	163 Software Engineering majors
FOCUS AREAS WITHIN THE UNDERGRADUATE MAJOR	Artificial Intelligence, Foundations, Informatics, Networking & High-performance computing	Embedded Systems and Robotics, Signal Processing and Communications, VLSI Design, High-Performance Computing	--
GRADUATE STUDENTS (AY 18-19)	43 M.S. (8 of which have CE specialization) and 54 Ph.D. Computer Science students	16 Ph.D. Computer Engineering students	--
FOCUS AREAS WITHIN THE GRADUATE PROGRAM	Bioinformatics, Computer Engineering, Computer Science, Mathematics	--	--
EDUCATION ABROAD (UNDERGRADUATES)	Faculty led program in Jordan Opportunities provided through the College and University		
INTERNSHIP OPPORTUNITIES (UNDERGRADUATES)	Local, national, and international companies State and federal agencies Non-profit organizations		
NATIONALLY COMPETITIVE STUDENT AWARDS	Multiple NSF Graduate Fellowships, one DoJ Fellowship, one Goldwater Fellowship		
FACULTY RESEARCH EXPERTISE	Robotics, Systems, Software Engineering, Artificial Intelligence, Communication Networks, Embedded Systems, Signal Processing, Control Theories, Algorithmic and Foundations, Computer Science Education, Image Processing, Programming Languages		
EXISTING RESEARCH AND TEACHING PARTNERSHIPS	Collaborations include many departments in most colleges at UNL, STRATCOM, local, national, and international companies, DoD, NSF, DoE, NIH, USDA, AFOSR, ARL, DARPA, Department of Education, LPS		

Undergraduate Education: The School of Computing will continue to offer a B.S. in Computer Science, B.S. in Computer Engineering, and B.S. in Software Engineering. The new School of Computing will consolidate these three degrees under one college home, the College of Engineering. The Software Engineering program will not be affected by the transition to the School of Computing. The Computer Engineering degree is currently housed in the College of Engineering and is jointly administered by the Department of Computer Science and Engineering and the Department of Electrical and Computer Engineering.

The School of Computing will also continue to offer the following minors currently offered by the Department of Computer Science and Engineering: Computer Science, Software Development, Robotics Engineering, and Computational Biology and Bioinformatics (jointly offered through the College of Arts & Sciences, CASNR, and the College of Engineering). The following two minors currently offered through the College of Arts & Sciences (Computer Science and Software Development) will have their college administrative home changed to the College of Engineering as part of the transition to a School of Computing. The Robotics Engineering minor currently is being administered by the College of Engineering.

The evolution of the Department of Computer Science and Engineering into a School of Computing reflects the increased breadth of computing disciplines and will enable the academic unit to create new interdisciplinary courses, certificates, and programs. Students will be able to choose from a diverse set of computing courses offered by the School and intended to help students prepare to solve real-world problems using data analytics, applied machine learning, virtual reality, augmented reality, bioinformatics, robotics, data visualization and other technologies in unique ways. A common capstone course sequence will encourage undergraduates to engage in real-world projects and research from the broad, interdisciplinary perspective embraced by the School.

The connotation of a School of Computing versus a Department of Computer Science and Engineering describes a more inclusive concept of computing in general. This is critical for UNL because of the goal to provide all students with fundamental knowledge in computing and skills to apply that knowledge to real-world problems. Given the universal reach of computing in modern society, every student needs to know some basics of computing and many students will benefit from in-depth study of one or more aspects of computing.

The School of Computing will provide computing competency and critical thinking capability to our students, an important NU strategic goal. School-wide integrative courses built into degree requirements for undergraduate and graduate students will bring students and faculty together. In addition, bringing these programs together in the new School of Computing will allow all of our faculty and students from across the University to benefit from our broad expertise.

Graduate Education: The School will continue to offer a Ph.D. in Computer Science (with an optional specialization in Bioinformatics), a Ph.D. in Engineering with a specialization in Computer Engineering, and an M.S. in Computer Science (with optional specializations in Bioinformatics or Computer Engineering). The M.S. in Computer Science and Ph.D. in Computer Science will have their college administrative home changed to the College of Engineering as part of the transition to a School of Computing. No graduate program changes are planned as part of the transition to the School of Computing.

In addition to the graduate programs listed above, the School of Computing will continue to offer a joint Ph.D. program with Computer Science and Mathematics, and will continue to work with the Department

of Electrical and Computer Engineering to establish a stand-alone, joint Ph.D. program in Computer Engineering.

School Organization, Administration and Staffing: The School will be led by a Director, a member of the SoC faculty. Standing committees will include Undergraduate Affairs, Graduate Affairs, Tenure and Promotion, and Diversity and Inclusion; other committees may be established under the SoC Bylaws.

The current chair of the Department of Computer Science and Engineering will be the founding Director of the School of Computing. Raikes School faculty who have their tenure home or professor of practice appointment home in CSE will be moved with the School of Computing.

Administrative support will be provided by current CSE business and grant support staff in partnership with the COE Dean's Office business staff and current CSE support staff.

C. Summary of Academic Program Changes

Proposed Undergraduate Program Changes: Table 2, shown below, includes a list of the undergraduate programs currently offered by CSE, and the proposed changes that are as part of the transition to the School of Computing.

Table 2: Undergraduate Programs Currently Offered by the Department of Computer Science and Engineering

Program Name	Current College Administrative Home	Proposed Changes
Computer Science (B.S.)	<ul style="list-style-type: none"> Engineering 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC Program changes to align with other SoC majors and COE norms, but no changes to learning outcomes or content.
Computer Science (B.A.)	<ul style="list-style-type: none"> Arts & Sciences 	<ul style="list-style-type: none"> Delete program due to lack of demand²
Computer Engineering (B.S.)	<ul style="list-style-type: none"> Engineering 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC No program changes
Software Engineering (B.S.)	<ul style="list-style-type: none"> Engineering 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC No program changes
Computer Science Minor	<ul style="list-style-type: none"> Arts & Sciences 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC Change college administrative home from CAS to COE Program change to align with other SoC majors reflect COE norms (Allowable P/NP credit hours changed from zero to three)
Software Development Minor	<ul style="list-style-type: none"> Arts & Sciences 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC Change college administrative home from CAS to COE Program change to align with other SoC majors and reflect COE norms (Allowable P/NP credit hours changed from zero to three)
Robotics Engineering Minor	<ul style="list-style-type: none"> Engineering 	<ul style="list-style-type: none"> Change department administrative home from CSE to the SoC No program changes

² Students rarely chose a B.A. in Computer Science over a B.S. The last student who chose this option (last enrolled Spring 2019) selected this option because the student already had a B.S. degree and CAS does not allow multiple B.S. degrees.

III. Review Criteria

A. Centrality to UNL Role and Mission

The individual programs that are currently offered by the Department of Computer Science and Engineering and proposed to be offered by the School of Computing have all made important contributions to the University of Nebraska system mission of teaching, research, and service, and have provided leadership through quality education and the generation of knowledge. In addition, all of the programs have strong connections to institutions throughout the state of Nebraska. The State faces a major workforce crisis in the area of computing; thousands of jobs have been unfilled due to the lack of employees with the necessary computing skills. A mission of the School of Computing is to address this crisis by providing the essential preparation for students across multiple majors to have computing competency. This is in addition to our mission to foster the School of Computing to national excellence in research and teaching. Consistent with the UNL mission, we will train students from Nebraska, the nation, and beyond, preparing them for a globally connected world.

B. Relationship of the proposal to the NU Five-Year Strategy

Access, affordability, and attainment: The School of Computing will provide high quality, affordable undergraduate and graduate programs that do not exist at other universities in Nebraska. In particular, our interdisciplinary approach to computing issues and our diverse course offerings in applied machine learning, artificial intelligence, robotics and Internet-of-Things, data analytics, data visualization, virtual reality and other areas of applied computing make computing accessible to every student on campus and will attract students to UNL who otherwise might leave the state.

Workforce development: Demand for graduates with computing competencies is strong. UNL students graduating with undergraduate and graduate degrees in Computer Science, Computer Engineering, and Software Engineering have found employment with state and federal agencies, non-profit organizations, and the private sector. As our programs become integrated and our students develop expertise across disciplines, we expect demand for our students to increase. Moreover, as our interdisciplinary courses and research are fully developed in the School of Computing, we expect that demand for students with computing skillsets will climb. For example, according to the U.S. Department of Labor Occupational Outlook Handbook, the growth rate for software developers is projected to be 21% through 2028 - this is much faster than the average growth rate for all occupations. As the gap between the number of job openings and the number of graduates with a computing background continues to widen (at both the undergraduate and graduate levels), graduates of the School of Computing and graduates from across the University who pursue an integrated program of study that includes computing courses will be especially competitive in the job market.

Culture, Diversity, and Inclusion: The School of Computing will foster a culture of inclusion and welcoming inclusion. Providing access to all is both a moral imperative and an economic necessity – we will not be able to meet the huge demand for a computing-skilled workforce without engaging every member of our society.

Partnerships: The School of Computing faculty and students will continue to be actively engaged in outreach activities, partnerships, and internships across Nebraska, and also nationally and internationally. Examples of ongoing programs that will be expanded with the formation of the School include:

- Student internships with local companies including Hudl, Sandhills Publishing, Don't Panic Lab, Union Pacific, FireSpring, SpreeTail, Kiewit, Talent +, Virtual Incision, Mutual of Omaha, and many others.
- Research partnerships with UNMC and Madonna Rehabilitation Hospital.

- Partnerships through our Senior Design projects with LPS, NDOT, Nebraska State Museum, Nebraska Forest Services, CompanyCam, Erudite, Madonna Rehabilitation Hospital, NET, WEX Health, and The Nebraska Environmental Trust.
- Outreach activities that include preparing LPS and OPS middle and high school teachers to teach programming concepts to their students, offering classes through Girl Scouts and as part of the Lincoln Bright Lights program, providing low-cost software development solutions to non-profit organizations in the city and state through a partnership with the Lincoln Community Foundation.

Efficiency and Effectiveness: The School of Computing will be administered cost-effectively and will consistently work to maximize both efficient use of resources and student achievement.

- Assessment of educational programs: The School of Computing will thoughtfully participate in campus assessment activities including ACE assessment, Biennial Undergraduate Program Assessment, and Academic Program Reviews, as required by UNL policy. The School will also continue to maintain ABET accreditation for its Computer Science and Computer Engineering programs and will pursue accreditation for its Software Engineering program. These assessments ensure that we are working to continuously improve instruction and student experience.
- Efficient resource use: By serving as a nexus for computing at UNL, efficiencies of scale and administrative savings will be realized and reinvested in the academic programs.
- Alumni support and fund raising: The School of Computing will continue to garner generous donations from our alumni and local companies to support student research, travel, and tuition. The formation of the School will create excitement for both our current and new donors, and provide opportunities to welcome even more active supporters.
- External support: Currently, CSE has a research expenditure of \$5.4 million. The expected growth in faculty size and synergies among faculty across departments and colleges who share common interests in interdisciplinary research will lead to additional external funding for School of Computing research.

C. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

The Comprehensive Statewide Plan for Post-Secondary Education lists five over-arching goals: meeting the needs of students, meeting the needs of the State, meeting needs by building exemplary institutions, meeting needs through partnerships and collaboration, and facilities planning to meet educational needs (<https://ccpe.nebraska.gov/sites/ccpe.nebraska.gov/files/COMP%20PLAN-updated%20October%202018.pdf>). The School of Computing will contribute directly to the first four of these goals.

Meeting the educational needs of students: The School of Computing will be student-centered and will create an inclusive environment, thus fostering student success. Students will graduate from our program with interdisciplinary experiences, critical thinking skills, and quantitative skills. This combination will make students highly competitive in the 21st-century global market place.

Meeting the needs of the state: The Nebraska economy is deeply intertwined with the global economy, and for this reason, it is critical that UNL provide educational experiences that prepare students to understand global issues. The School of Computing coursework, interdisciplinary experiences, internships, and co-curricular programming all contribute to better technical and cultural competencies and global awareness.

Meeting needs by building exemplary institutions: Exemplary institutions are made up of exemplary academic units training students for the global economy. The Department of Computer Science and

Engineering has a strong history of exemplary research and teaching, and with its transition to the School of Computing, will continue in its mission to prepare students for an increasingly connected world. The School of Computing will continue the Department's exceptional academic and research programs, seek out and establish new interdisciplinary research and teaching opportunities with units across the University system and with organizations outside UNL, deploy flexible academic programs and courses that enable student-learning in the new environment of social distancing, establish new opportunities for internships and international field experiences, hire exceptional faculty, recruit diverse top-ranked students from around the world, and continue to assess and improve its programs and practices to ensure it maintains its status as an exemplary academic unit.

Meeting needs through partnerships and collaboration: Opportunities for experiential learning activities such as internships with local agencies, non-profit organizations, and with state and federal agencies will increase in the School of Computing as the number of students enrolled in computing programs grows. Research partnerships with local and national organizations will also grow through course capstone projects and through collaboration with faculty and graduate students.

D. Evidence of Need and Demand

The new structure provided by the School of Computing will better serve the needs of the University and the state. The School of Computing will serve as a home for core computing disciplines and outreach to other disciplines that make use of computing. As a result, the School will be able to better provide a balanced set of academic programs to serve all students interested in computing. The School will also serve as a home to research in computing that benefits the core computing disciplines and enriches application areas and leads to economic development. The enhanced prominence of the School of Computing will better serve shareholders in the state and attract new students.

E. Avoidance of Unnecessary Duplication

The School of Computing will provide a simplified structure for computing at the University of Nebraska, thereby avoiding duplication. The improved efficiency provided by the School of Computing will allow the School to focus on academic and research excellence.

F. Adequacy of Resources: No cost changes are required to create the School of Computing. The CSE Chair will become the School of Computing Director.

IV. APPENDIX

A. Support Letters

A. Letters of Support

1. The Boeing Company
2. Chief Industries
3. Communication Systems Solutions
4. Don't Panic Labs
5. Hudl
6. Kiewit Corporation
7. Mutual of Omaha
8. Sandhills Global
9. Stephen Cooper, Executive Director, Jeffrey S. Raikes School of Computer Science and Management



Greg Hyslop, D.Sc.
Chief Engineer,
Senior Vice President
Engineering, Test & Technology

The Boeing Company
P.O. Box 3707
Seattle, WA 98124-0788

December 7, 2020

Lance Perez
Dean, College of Engineering
University of Nebraska
Lincoln, Nebraska

Dear Dean Perez,

I am writing to voice my support for the formation of the School of Computing within the College of Engineering at Nebraska. This is the right move at the right time for the College of Engineering and the State of Nebraska. The areas of computer science, computer engineering, software engineering and data science are, and will continue to be, critical to industries in Nebraska and across the globe.

It's been said that "data is the new oil." This means that data collected from multiple sources and analyzed with modern techniques is now a competitive discriminator for businesses. The competitive race extends to capabilities within products and being able to respond to customers faster than a competitor, and this is being done primarily through software. Companies across Nebraska, and companies like Boeing, will look to the School of Computing to produce future leaders who are on the leading edge of these disciplines.

At Boeing we operate on the foundation of safety, quality and integrity and I see those values at work in the College of Engineering and the creation of the School of Computing. Your commitment to attracting and retaining top faculty will ensure the success for the School and pay dividends for its graduates and their employers for generations to come. As an alumnus of the University of Nebraska, I offer my complete support for this endeavor and have full confidence in your leadership and commitment to its success.

Greg Hyslop, D.Sc.



3942 West Old Highway 30
P.O. Box 2078
Grand Island, Nebraska 68802-2078
Phone 308/389-7200 - Fax 308/389-7221

EXECUTIVE OFFICE

December 7, 2020

RE: The University of Nebraska-Lincoln School of Computing

To Whom It May Concern:

I am writing to show my support for The University of Nebraska-Lincoln changing its Computer Science and Engineering Department into a "School of Computing".

A School of Computing would be an excellent addition to current avenues that support the needs of industry, government, educators, and the community. Introducing the importance of computing to students is a step in the right direction towards building the workforce of the future.

We appreciate the university moving in this direction to support the employment needs of businesses across Nebraska and the nation.

Sincerely,

A handwritten signature in blue ink that reads "DJ Eihusen". The signature is written in a cursive, flowing style.

DJ Eihusen
Chairman of the Board/CEO/President



**Communication
SYSTEMS SOLUTIONS**

To: UNL Academic Planning Committee
From: Perry Howell, President, Communication Systems Solutions (UNL BSEE 1994, MSEE 1996)
Subject: School of Computing, College of Engineering
Date: 12/5/2020

To whom it may concern:

I'm writing this letter in support of the initiative to create a College of Computing, within the College of Engineering under the leadership of Dean Lance Perez. Dr. Perez has shown a profound level of leadership throughout his career at UNL, his vision for the School of Computing continues that leadership.

I firmly believe that creating the School of Computing and the consolidation of Computing under the College of Engineering has been a long time coming. Make no mistake about it, I'm a huge fan of the work the CSE faculty is doing and have had the pleasure to interact with several faculty members. This includes presenting material to the incoming Freshman CSE class. That said, it seems obvious that consolidating ALL of this under the College of Engineering would allow the University of Nebraska to compete in the Big 10 and the world at a much higher level.

Communication Systems Solutions hires EE's, CSE's and CSEE's, BSME's, manufacturing engineers, supply chain management, business administration and all the staff required to support the design and manufacturing of electronic components and products. We have 34 employees today, every degreed person in this company is a UNL graduate. It means a great deal to me to see the University of Nebraska in general and the College of Engineering in particular, grow and prosper. To put its own stamp on the world, to find and advance new frontiers. The College of Computing, within the College of Engineering, would help continue global leadership at the University of Nebraska.

My understanding is that Dr. Marilyn Wolf will chair the new endeavor. This is an excellent choice. Dr. Wolf's background and achievements uniquely position her to lead the School of Computing and support the growth of the College of Engineering and the University of Nebraska.

Go Big Red!!!



December 8, 2020

Lance Perez, PhD
Dean, UNL College of Engineering
114 Othmer Hall
Lincoln, NE 68588-0642

Dear Dean Perez:

Don't Panic Labs is a software company that builds technologies that tackle complex problems in a variety of industries and problem domains. Part of our mission is to create opportunities for young people to help build and work for software technology startups here in Lincoln and across Nebraska. In order for us to be successful, we need to bring on college graduates who not only fit culturally in our organization but who also possess the skills and experience that will allow them to hit the ground running. It is simply not feasible for small companies like ours to invest in young people right out of college unless they have enough context and experience to be able to contribute fairly quickly. If we can solve this problem and begin attracting even more talented students and producing more software engineers with the educational background and experience that is aligned with what the tech community needs, then we will undoubtedly see a significant growth in the tech-sector of our economy both in Lincoln and Nebraska.

This is why I am so excited to hear about the formation of the School of Computing at UNL and the significant investment that is being made in computing education. I honestly think this is not only a game-changer for our local community, but has the potential to differentiate UNL from other programs across this country. A School of Computing is clear recognition of the significant role that software now plays in our personal lives as well as every industry. I am looking forward to seeing how you are able to leverage this new school to enhance the computing skills of software engineers and of other engineering programs at UNL, as well as the other colleges. Finally, I'd like to congratulate you on hiring Dr. Marilyn Wolf to lead the CSE department and this new school. I have gotten to know Dr Wolf over the last 18 months and I truly believe she is the right person, with the right vision, to lead this transition and be a positive force for transforming the way we educate software engineers and computing professionals.

I am looking forward to partnering with the School of Computing, sharing our experiences, and creating opportunities for collaboration. Please don't be afraid to ask if there is anything Don't Panic Labs can do to help.

Sincerely,

A handwritten signature in blue ink, appearing to read "Doug Durham".

Doug Durham
CEO and Co-Founder

Subject: Support for School of Computing | Brian Kaiser @ Hudl

Date: Sunday, December 6, 2020 at 12:39:59 PM Central Standard Time

From: Brian Kaiser

To: Lance Perez

Dean Perez,

I am writing you to express my explicit support for a unified School of Computing. As a CE grad, and now as an employer in Lincoln, I have always been surprised by lack of unification in our comp sci/comp eng strategy. A unified School of Computing will help UNL attract the most talented students and faculty. We have a real opportunity to create something world class – but we need to be aligned on the importance and we need support from the university system as a whole. The creation of this program is a great step in the right direction – but it is just a step – we need to stay strong on the path. The need for computing across industries is not going to decrease over the next 15 years – it is the new bedrock. As always please let me know if I can provide and assistance as you undertake this journey.

Best,

Brian Kaiser

CTO | Hudl

[913.515.3300](tel:913.515.3300)



RICHARD A. LANOHA
President and Chief Executive Officer

December 7, 2020

Dean Lance Perez
College of Engineering
University of Nebraska-Lincoln
114 Othmer Hall
820 N. 16th Street
Lincoln, NE 68588-0642

Dear Dean Perez:

I am writing on behalf of Kiewit Corporation to communicate our support for the proposal to integrate the School of Computing with the College of Engineering at the University of Nebraska-Lincoln. As one of North America's largest construction and engineering firms – and a long-time, proud Nebraska-based company – Kiewit has appreciated our close relationship with the university. That starts with the many University of Nebraska alumni who Kiewit has employed during our long history. I am one of those alumni, and understand the importance of a well-rounded, excellent education for students as they start and build their careers.

As a company that actively recruits from many of the most reputable engineering universities in North America, we have a direct view into the programs that educate the students we hire – and what differentiates the good from the great. An increasingly important differentiator has been those schools that have successfully integrated innovative technology and computing curriculum into their core engineering and construction management programs. Not only does this better prepare students for the fast-evolving technology and process changes in our industry, but it develops more innovative, adaptive thinkers who can capably turn ideas into results.

We also see the value of this proposal in enhancing the reputation and capabilities of the university. It should generate strong interdisciplinary programs, expand valuable research and attract more students and impressive faculty to the University of Nebraska system. A stronger University of Nebraska is a win for our company, but also the state and region.

Dean Lance Perez
December 7, 2020
Page 2

Kiewit's recent contribution to the University of Nebraska-Lincoln – and our commitment to you and university leadership to partner on new, important internship and scholarship programs – should confirm our faith in, and support of, the future of the College of Engineering and proposals such as this one. Bold, smart steps to think differently and improve the student experience is exactly what is needed.

Thank you for your continued efforts. We look forward to seeing the developments of this important proposal.

Sincerely,

A handwritten signature in black ink, appearing to read "Rick Lanoha". The signature is fluid and cursive, with the first name "Rick" being more prominent and the last name "Lanoha" following in a similar style.

Rick Lanoha
President and Chief Executive Officer
Kiewit Corporation

RL:psp

December 8, 2020

Dr. Lance Pérez
Dean
College of Engineering
University of Nebraska-Lincoln

Dear Lance,

I am writing to express my strong support for the proposed College of Engineering School of Computing. Focusing the Computer Science, Data Science and Software Engineering degree programs in the School of Computing is a strategically sound move that will benefit key stakeholders in Nebraska, including the industry and students. The industry is clearly seeking more and better prepared graduates in these critical technology degree fields. Students should expect a well-aligned, coherent choice of degree pathways that will prepare them for a high-opportunity technology career.

Companies like Mutual of Omaha are focusing on delivering products and services to customers and distribution partners through cutting-edge technology. Specifically, we are seeking graduates who have the requisite educational foundation to develop sophisticated software solutions, derive business value from data and data-driven models, and innovate technology-empowered business ideas. It goes without saying that technology enables companies to innovate and develop competitive differentiation in the marketplace. I am excited for the possibilities the School of Computing program offers industry to enable advancement.

Mutual of Omaha hires nationally and thus has a general awareness of other higher education technology programs like the proposed School of Computing. It is not surprising that out-of-state universities are investing significantly in innovative technology degree programs. Making this investment in our University and the College of Engineering is a wise decision and will promote the ongoing relevance to the state of Nebraska.

I appreciate the opportunity to express my support for the proposed College of Engineering School of Computing. If you have any questions, I am happy to provide additional input.

Sincerely,



Mike Lechtenberger
Chief Information Officer
Mutual of Omaha



Sandhills Global

I am writing in support of the School of Computing at the University of Nebraska-Lincoln. I feel the goals and vision of the School of Computing align closely with the needs we have at Sandhills Global.

As a growing technology company we have an ever increasing need for well-rounded, highly-skilled software engineers and technologists.

Sandhills Global seeks to provide challenging and rewarding career opportunities for the best and brightest of UNL's students. Attracting talented students from around the world and keeping them here to grow the tech-sector economy in Nebraska is a shared goal of both UNL and Sandhills Publishing.

The School of Computing would provide a strong foundation in preparing students to become valuable members of our organization. I am optimistic about the potential of the new School of Computing and foresee continued growth within our organization in partnership with the University of Nebraska-Lincoln.

Sincerely,

Scott McKinney
Chief Information Officer | Sandhills Publishing
402-304-0484



March 12, 2021

Dear Sir or Madam,

The Jeffrey S. Raikes School of Computer Science and Management (Raikes School) wishes to express its strong support for the creation of a School of Computing (SoC). The Raikes School is an interdisciplinary program focused on design thinking, model thinking and innovation. We combine academic courses in computing, business, data science, communication and leadership as we seek to prepare our graduates to become leaders in the tech and business worlds. It is essential that we have strong partners in both computing and in business at the University of Nebraska-Lincoln.

When I first started as the director of the Raikes School 5+ years ago, I thought it somewhat strange that our chief partners were the Department of Computer Science and Engineering and the College of Business Administration. There was an obvious imbalance between our two key partners being a department and a college. Allowing the Department of Computer Science and Engineering to grow into the SoC decreases this imbalance, elevating the role of computing for the Raikes School and, indeed, for the University more broadly. And allowing the Department to grow into a School will show the world the importance/centrality of computing at the University and will make it easier to attract and retain top-flight teachers and researchers in computing, faculty who will be able to accomplish amazing things with our Raikes School students (and with all of the students who are incorporating computing into their academic experiences at the University). I also expect that an SoC will enhance improved relationships with the tech industry throughout Nebraska, an industry starved for the intellectual contributions and graduates an SoC can produce.

Regards,

A handwritten signature in black ink, appearing to read "Steph Cooper", is set against a background of a faint, light gray circuit board pattern.

Chancellor's Professor
Executive Director, Jeffrey S. Raikes School of Computer Science and Management
Associate Professor, Computer Science and Engineering Department

TABLE 1: PROJECTED EXPENSES - NEW ORGANIZATIONAL UNIT
UNL School of Computing

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty											\$0
Non-teaching staff: Professional											\$0
Graduate Assistants											\$0
Non-teaching staff: Support											\$0
Subtotal		\$0		\$0		\$0		\$0		\$0	\$0
Operating											
General Operating											\$0
Equipment											\$0
New or Renovated Space											\$0
Library/Information Resources											\$0
Other											\$0
Subtotal		\$0		\$0		\$0		\$0		\$0	\$0
Total Expenses		\$0		\$0		\$0		\$0		\$0	\$0

NOTE: Existing resources allocated to the Department of Computer Science and Engineering will fund the proposed School of Computing.

TABLE 2: PROJECTED REVENUES - NEW ORGANIZATIONAL UNIT
UNL School of Computing

	(FY2022) Year 1	(FY2023) Year 2	(FY2024) Year 3	(FY2025) Year 4	(FY2026) Year 5	Total
	Reallocation of Existing Funds					
Required New Public Funds						\$0
Tuition and Fees						\$0
Other Funding						\$0
Total Revenue	\$0	\$0	\$0	\$0	\$0	\$0

NOTE: Existing resources allocated to the Department of Computer Science and Engineering will fund the proposed School of Computing.

TO: The Board of Regents Addendum XI-A-6
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Creation of the Master of Respiratory Care in the College of Allied Health Professions at the University of Nebraska Medical Center

RECOMMENDED ACTION: Approval to create the Master of Respiratory Care (MRT) in the College of Allied Health Professions at the University of Nebraska Medical Center (UNMC)

PREVIOUS ACTIONS: April 17, 2020 – The Board approved the creation of the Master of Diagnostic Cytology in the College of Allied Health Professions at UNMC.

August 11, 2017 – The Board approved the creation of the Masters in Genetic Counseling in the College of Allied Health Professions at UNMC.

January 29, 2016 – The Board approved the creation of the Master of Medical Nutrition in the College of Allied Health Professions at UNMC.

January 16, 1999 – The Board approved the creation of the Masters of Perfusion Science in the School of Allied Health Professions at UNMC.

January 18, 1992 – The Board approved the change of the Physician Assistant program from a Baccalaureate to a first professional Master's degree program at UNMC.

EXPLANATION: The College of Allied Health Professions (CAHP) at the University of Nebraska Medical Center (UNMC) proposes to establish a new entry-level health professions Master of Respiratory Care (MRC) degree. Respiratory therapy is an allied health profession dedicated to evaluating and treating persons with heart and lung diseases. Respiratory therapists initiate, monitor, modify, and discontinue mechanical ventilator support for patients receiving this care. In addition, respiratory therapists perform diagnostic studies (e.g., arterial blood gases, pulmonary function testing, exercise testing, sleep apnea testing), provide patient education, and provide long-term care for patients with chronic illness. Students with an MRC degree will have advanced skill sets, benefiting Nebraska's health facilities and patients. The proposed MRC curriculum is designed to meet new accreditation standards from the Commission on Accreditation for Respiratory Care.

This proposal has been approved by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

PROGRAM COST: \$111,177 for Year 1; \$3,086,735 over five years

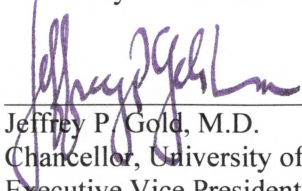
SOURCE OF FUNDS: College/campus auxiliary funds for the first three years, and tuition and fees beginning in Year 3.

SPONSORS:

H. Dele Davies
Senior Vice Chancellor for Academic Affairs

Jeffrey P. Gold, Chancellor
University of Nebraska Medical Center

RECOMMENDED:



Jeffrey P. Gold, M.D.
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

DATE:

July 16, 2021



April 9, 2021

Susan Fritz, Executive Vice President and Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583

Dear Provost Fritz:

We are forwarding you the materials relating to the creation of a Masters in Respiratory Care program, administered by the College of Allied Health Professions. Respiratory therapy is an allied health profession dedicated to the evaluation and treatment of persons with heart and lung diseases. Respiratory therapists are key members of health profession teams focused on the ongoing management of patients with acute pulmonary disease. There is already high demand for these health care professionals, and the need will continue to grow as a result of the Covid-19 pandemic. Given the long-term respiratory-related sequela of patients recovering from moderate to severe forms of the disease, it is likely respiratory therapy service demand will remain above pre-pandemic levels.

This proposal has been reviewed by us, and it has our approval. We are requesting your review and approval, that of the Chief Academic Officers, and that it be reported to the Board of Regents at an upcoming meeting.

Sincerely,

A handwritten signature in black ink, appearing to read 'H. Dele Davies'.

H. Dele Davies, MD, MS, MHCM
Senior Vice Chancellor

A handwritten signature in black ink, appearing to read 'Jeffrey P. Gold'.

Jeffrey P. Gold, M.D.
Chancellor

Enc: Proposal MS Respiratory Care

University of Nebraska Medical Center

New Major or Degree

I. Descriptive Information

Name of Institution Proposing New Major or Degree
University of Nebraska Medical Center
Name of Proposed Major
Respiratory Therapy
Degree to be Awarded to Graduates of the Major
Master of Respiratory Care (MRC)
Other Majors or Degrees Offered in this Field by Institution
None
CIP Code [browse here: http://nces.ed.gov/ipeds/cipcode/Default.aspx?y=55]
51.0908
Subject Code
Administrative Units for the Major or Degree
College of Allied Health Professions (CAHP)
Proposed Delivery Site
University of Nebraska Medical Center (UNMC) Omaha campus (with possible future expansion to the Health Science Education Complex in Kearney)
Program will be Offered [full program, not individual courses]
<input checked="" type="checkbox"/> On-campus only <input type="checkbox"/> Distance only <input type="checkbox"/> Both (on-campus and distance)
Date Approved by the Governing Board
Pending
Proposed Date the New Major or Degree will be Initiated
Upon approval by the Coordinating Commission.

II. Details

A. Purpose of the Proposed Major or Degree

The College of Allied Health Professions (CAHP) at the University of Nebraska Medical Center (UNMC) proposes to establish a new entry-level health professions education program in respiratory therapy. Respiratory therapy is an allied health profession dedicated to the evaluation and treatment of persons with heart and lung diseases. Respiratory therapists are key members of health profession teams focused on the ongoing management of patients with acute pulmonary disease such as acute respiratory tract infections, pneumonia, pulmonary edema, acute respiratory distress syndrome (ARDS), and other causes of respiratory failure, as well as chronic lung disease, such as asthma, chronic lower respiratory disease (formerly chronic obstructive pulmonary disease), cystic fibrosis, and pulmonary fibrosis.

Respiratory therapists perform their duties in a number of care delivery venues, spending considerable time in acute settings providing care for patients in critical care units (CCU). Respiratory therapists initiate, monitor, modify, and discontinue mechanical ventilator support for patients receiving this care in a CCU.

In addition, respiratory therapists perform diagnostic studies (e.g., arterial blood gases, pulmonary function testing, exercise testing, sleep apnea testing), provide patient education (e.g., smoking cessation, asthma education, CLRD management and rehabilitation), and provide long-term care for patients with chronic illness.

B. Description of the Proposed Major or Degree

The CAHP proposes to develop an entry-to-practice Master of Respiratory Care degree program open to students who complete pre-requisite coursework but who have no prior competence in respiratory therapy. The program of study would require students to complete either a bachelor's degree or a minimum of three-years and 90-credit hours at an undergraduate accredited university, prior to applying to the program at UNMC. The undergraduate course of study would include specifically identified pre-requisites courses. The UNMC professional curriculum will consist of an 82-credit hour program delivered over 5 semesters (21 months) awarding a Master of Respiratory Care degree (hereafter MRC). Students entering the professional component of the curriculum following three-years (90 credits) of undergraduate preparation, will also be awarded a Bachelor's degree in Medical Sciences from UNMC.

The accreditation agency for respiratory therapy programs, the Commission on Accreditation for Respiratory Care (CoARC), requires new program applicants to identify a "base program" for initial accreditation. A base program is defined as the "primary, degree-granting respiratory care program established by the sponsor."^{1, p. 23} Sponsors can offer *only* one base program, defined as either "entry-level," "degree advancement," or "advanced practice." In accordance with CoARC nomenclature, the CAHP proposes to develop an "entry-level" base program awarding a master's degree. Currently, only eight universities in the US offer master's degree programs in the field of respiratory therapy² (see Table 1) with only five of these programs designated as "entry-level."

Table 1. Universities with CoARC Accredited Master's Degree Programs

INSTITUTION	STATE	DEGREE	CATEGORY
Georgia State University	GA	MS Degree	Entry into the Profession
Rush University Medical Center	IL	MS Degree	Entry into the Profession
Bellarmine University	KY	MS Degree	Entry into the Profession
UNC Charlotte	NC	MS Degree	Degree Advancement
CHI St. Alexius Health/University of Mary	ND	MS Degree	Entry into the Profession
University of Texas Health Science Center	TX	MS Degree	Entry into the Profession
Boise State University	ID	MS Degree	Degree Advancement
The Ohio State University	OH	MS Degree	Advanced Practice Respiratory Therapy

C. Rationale for Developing a Master's Degree Program

The decision to propose the development of an entry-level master's degree was based on the following factors:

1. *Evolution of the Profession of Respiratory Therapy*

Throughout most of the history of the respiratory therapy profession, entry-level education has occurred at the associate-degree level. Even today, 82 percent of entry-level programs remain at the associate degree level.³ However, like so many allied health professions that have over time advanced their entry-level degree requirement secondary to expanding knowledge and roles, in 2018 the Commission on Accreditation for Respiratory Care (CoARC) changed the accreditation standard to require all *new* entry-level programs in respiratory therapy education to award a "baccalaureate or graduate degree."⁴

The professional organization for respiratory therapy, the American Association for Respiratory Care (AARC) supported this change in accreditation, indicating in a 2019 statement⁵ that all respiratory therapists should hold the *minimum* of a bachelor's degree by 2030 (emphasis added).

The 2019 AARC statement followed their 2015 position statement in which they noted,⁶

...training and education for entry-to-practice as a respiratory therapist should be provided within programs awarding a bachelor's or master's degree in respiratory care (or equivalent degree titles) and all newly accredited respiratory care educational programs must award, as a minimum, the bachelor's degree in respiratory care (or equivalent degree title).

2. *Consultant's Recommendation*

In 2019, the CAHP invited a national expert in respiratory therapy education, David Shelledy*, PhD, RRT, FAARC, FASAHP, to UNMC to conduct a two-day independent review of the CAHP and its clinical partners (Nebraska Medicine and Children's Hospital and Medical Center) to examine the feasibility of UNMC initiating a respiratory care educational program, and identify strengths and areas for further development.

Among many recommendations, Dr. Shelledy indicated the CAHP was well poised to develop an entry-to-practice master's degree program, stating, "The University of Nebraska Medical Center (UNMC) provides sophisticated, state-of-the-art care to patients with acute and chronic illness. Nebraska Medicine provides a unique venue for training advanced level respiratory therapists and a respiratory therapist training program within the College of Allied Health Professions (CAHP) could rapidly develop into a nationally recognized program of excellence." His complete report is included in Appendix A. In summary he indicated, "UNMC has the infrastructure, clinical facilities, and medical personnel to develop and support an *excellent entry-to-practice master's degree respiratory care educational program* to prepare outstanding respiratory therapists with a focus on clinical services delivery" (emphasis added). Dr. Shelledy's expertise and assessment, including his projection of the likely continued evolution of the profession, were key determinants in shaping this proposal.

3. *Strong Support from the Profession and Nebraska Medicine*

In addition to the recommendation from Dr. Shelledy, the CAHP has also communicated with the Coalition for Baccalaureate and Graduate Respiratory Therapy Education (CoBRGTE). The CoBRGTE is a national organization consisting of 65 member colleges, universities, and health systems with a mission to advance respiratory care education by advocating for the development and establishment of baccalaureate and graduate-level education for respiratory therapists (<http://www.cobgrte.org/>). Among several strategic goals, the CoBRGTE seeks to "transform the profession by advancing quality academic programs, professional knowledge, and faculty resources," and "increase the number of graduates from baccalaureate and graduate respiratory care educational programs."

A letter of support from the CoBRGTE President (C. Kane) and Executive Director (T. Barnes) for UNMC to develop a master's degree program is included in Appendix C. Among many notable insights, Drs. Kane and Barnes cite the value of preparing a respiratory therapy workforce that not only possess the advanced knowledge and skills for effective patient management, but can also serve as educators, researchers, managers, and clinical specialists in support of the US healthcare system. Similar sentiments were also identified by several individuals from UNMC's clinical partner, Nebraska Medicine (Appendix C), including the need to have graduate-level educated respiratory therapists to deliver the highest-quality, safe care in an increasingly complex environment.

**Dr. Shelledy began his career as a respiratory therapist; a career now spanning almost 50 years as clinician, educator and administrator, including serving as Dean of the School of Health Professions, University of Texas Health Science Center at San Antonio, and Dean of the College of Health Sciences at Rush University in Chicago. At both of these universities, he was instrumental in leading the development of entry-level master degree programs in respiratory therapy.*

4. *CoARC Outcomes*

Admittedly, as noted in the most recent CoARC 2020 Report on Accreditation in Respiratory Care Education³ master's level programs accounted for only 1% of total respiratory therapy education programs in 2019. However, the report also cited several very favorable outcome measures for master's level programs (as well as programs housed at academic health science/medical centers) as compared to associate or baccalaureate level programs. These outcomes included the highest percentage increase (42%) in applications compared to 2018 (applications to associate degree programs decreased 4.9% and 2.6% for baccalaureate programs), the highest percentage increase in new enrollments (43.5%) compared to 2018 (new enrollments decreased 2.8% for associate degree programs and 3.6% for baccalaureate degree programs), the highest retention rate (97%), and the highest mean employment placement rate (97%). The job

placement rate was also the highest by programs housed at academic health science/medical centers (95%). Master's degree programs also had the highest mean pass rate for the *Registered Respiratory Therapist* (RRT) certification examination (95%), as did programs housed at academic health science/medical centers (88%).

5. *Degree Content and Workload*

Pertaining to curricular requirements, CoARC accreditation standard² 4.02 indicates that the curriculum must include "preparation for practice as a Registered Respiratory Therapist with exposure to a broad variety of practice settings... and patient populations..." (e.g., professional competencies). The standard goes on to indicate that programs offering a bachelor's (the minimum degree requirement for new programs) or master's degree, *must* also include content related to "leadership development in management, education, research, AND/OR to advanced clinical practice..." (emphasis added). The sample curriculum in Appendix B⁷ is generally commensurate with other similar health profession education programs currently housed in the CAHP and consequently completion of the proposed MRC curriculum would be commensurate with the awarding of a master's degree.

In addition, the CAHP already has several approved courses at the graduate/professional level that could be used as curriculum for leadership, management, education, and research in the MRC curriculum. With respect to advanced clinical practice, expertise in respiratory care at Nebraska Medicine and Children's Hospital and Medical Center would support the development of advanced clinical practice courses in adult and pediatric critical care to prepare graduates to sit for the adult critical care specialist, and neonatal/pediatric specialist certification examinations administered by the National Board for Respiratory Care (NBRC). This would be a value-added opportunity for graduates to more quickly obtain these specialty certifications. The NBRC is the national organization that also administers the Registered Respiratory Therapy (RRT) certification examination.

6. *Existing Structure of the CAHP*

The CAHP currently houses five other entry-level master degree health profession education programs in the Department of Medical Sciences (diagnostic cytology, genetic counseling, medical nutrition, perfusion science, physician assistant studies), which is also the department where the proposed MRC degree would be housed. A future respiratory therapy program will benefit from this organizational arrangement as it will facilitate the integration of respiratory therapy students with other health profession students in the department, affording the opportunity for shared faculty and existing coursework, and promoting interprofessional education.

7. *CAHP Role and Responsibility*

The mission and obligation of the CAHP is to offer allied health profession education programs that both provide opportunities for students from Nebraska to pursue careers in the allied health professions, and graduate the highest quality allied health workforce to meet the healthcare delivery needs of the citizens of Nebraska, the region and the country. To fulfill this mission, the CAHP programs are, and must continue to be at the "cutting edge" of both health professions education pedagogy, and the evolution of the allied health professions. For example, in 2004, UNMC became one of the first public institutions to offer the Doctor of Physical Therapy (DPT) degree, now the required, standard degree offered by all US accredited physical therapy education programs. Based on the extensive feasibility study undertaken to prepare this proposal, the CAHP and UNMC believe the most appropriate degree to ensure both the success of the proposed program, and the respiratory therapy profession is the master's entry-level degree.

D. Accreditation, Curriculum Development, and Admissions Processes

As noted above, all entry-level programs in respiratory care, regardless of degree offered, are accredited by the Commission on Accreditation for Respiratory Care (CoARC). The CAHP is very familiar with specialized (programmatic) accreditation agencies as it currently works in partnership with eight different agencies responsible for the accreditation of its various programs. All CAHP health profession education programs are fully accredited (or in the case of new programs, provisionally accredited), and all of the CAHP programs have had continuous accreditation from these various agencies since the inception of the respective program. The CAHP will follow all CoARC policies and procedures¹ and adhere to all CoARC accreditation standards⁴ to ensure initial, full, and ongoing accreditation for this proposed program.

Student learning outcomes will be guided by CoARC accreditation standards. The distribution of courses and their credit hours will be developed by the Program Director and faculty of the Respiratory Therapy Program following approval of

this proposal and recruitment and hiring of program personnel. A *sample* curriculum⁷ from a similar program to the one being proposed by the CAHP is included in Appendix B (credit hours may vary).

In summary, the consultant recommended,

The curriculum should include advanced coursework in the areas of patient assessment; protocol development and administration; care plan development, initiation, delivery, modification, and evaluation; critical care and mechanical ventilatory support (adult, pediatric, neonatal and specialty); and cardiopulmonary diagnostics. While the primary focus of the program should be on the preparation of outstanding clinical (bedside) advanced level respiratory therapists, courses and units of instruction should also be included in the areas of leadership, research and education.

All courses will require development in accordance with CoARC standards and the approved CAHP format for course and syllabus development, and will be reviewed and approved by the CAHP's Curriculum Committee in accordance with existing CAHP policies and procedures.

To be considered for admission, applicants will be required to have completed a minimum of 90 credit hours at an accredited undergraduate institution, to include general pre-health professions pre-requisites (specific requirements TBD) in the biological sciences, chemistry, and mathematics. As is true of all CAHP health profession education programs, enrollment is projected to be limited and competitive. The Respiratory Therapy Program administration, faculty, and other CAHP faculty and/or Nebraska Medicine personnel will comprise the admissions committee for the program, will evaluate each qualified applicant, and make final selections for admission, in accordance with the program and CAHP goals and objectives. The CAHP employs holistic review practices for admission to all of its health profession education programs.

The CAHP has an Office of Enrollment Management and Student Affairs (EMSA), with personnel involved in the marketing and recruitment functions for all of the CAHP health profession programs. This office is managed by a Director of Enrollment Management and Student Affairs (M. Winnicki). The Assistant Dean for Student Affairs (A. Donnelly) oversees the EMSA Office, which is also responsible for student wellness, executing logistics for all admission processes including applicant transcript reviews, and planning for annual CAHP convocation and commencement related activities. The same enrollment management and student affairs services currently provided to the students in all of the health profession education programs in the CAHP will be afforded to the Respiratory Therapy Program and its students.

III. Review Criteria

A. Centrality to UNMC Role and Mission

As noted above, one of the core missions of UNMC is to improve the health of Nebraskans through premier educational programs with the intent of graduating the best-educated health professionals and scientists. The CAHP participates in this mission by preparing a highly qualified allied health workforce to serve Nebraska and the region in each of the fourteen health profession education programs housed in the college.

The UNMC Strategic Goals and Strategies have recently been updated for 2022-2025. The development of a health professions program in respiratory therapy is congruent with many of these goals and objectives. Specifically, Goal 1, "Establish UNMC and its educational programs as the most learner-centered university in health professions and interprofessional education," and Goal 3, "Establish UNMC and our clinical partners as an academic health system providing the highest-quality care that is recognized for outstanding patient outcomes and a compassionate and patient-centered care experience."

The development of a new respiratory therapy program awarding an entry-level Master of Respiratory Care degree addresses many of the objectives listed in the new Strategic Plan, including the following objectives:

- 1.1. Provide an innovative, competency-based and individualized curriculum.
- 1.4. Actively recruit those faculty needed to expand UNMC's current & future programs.
- 1.5. Expand use of Interprofessional Experiential Center for Enduring Learning (iEXCEL)

- 1.6. Prepare UNMC health profession learners to assume leadership roles.
- 3.1. Build relationships with our clinical partners to improve patient health outcomes.
- 3.2. Utilize interprofessional practice to provide optimal patient care environments.
- 3.5. Assure timely access to UNMC clinical care services.
- 3.7. Accelerate planning of the UNMC/Nebraska Medicine Project NExT.
- 3.10. Strengthen incentives to recruit and retain clinical faculty of diverse backgrounds.

B. Relationship of the proposal to the NU Strategic Framework

The development of a respiratory therapist education program is also congruent with elements of the five-year strategic plan put forward by President Carter on behalf of the University of Nebraska system in August 2020.⁸ Notably, the development of a respiratory therapy program would provide workforce development opportunities for both those students interested in pursuing this career and for communities in need of these professionals. The current holistic admissions model (including marketing, recruitment and admissions) utilized by the CAHP, will contribute to a diverse workforce of respiratory therapists and provide opportunity for students who may not have previously been aware of this profession or career option.

C. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

Providing a Master of Respiratory Care degree is consistent with the vision and major statewide goals outlined in the *Comprehensive Statewide Plan for Postsecondary Education (hereafter "Plan")*.⁹ The vision for postsecondary education in Nebraska is that "Nebraskans will reap many benefits from affordable, accessible, and high-quality postsecondary education." And that, "each postsecondary institution will fulfill its role and mission with distinction by being responsive to changing academic, workforce, societal, economic, cultural, and community development needs."⁹ p. 1-1

The creation of a respiratory therapy program awarding the *only* master degree entry-level program in respiratory care in the State of Nebraska, contributes to the fulfillment of this vision as it pertains to UNMC's responsibility for health professions education. The development of a respiratory therapy program at UNMC would have a direct impact on the following major statewide goals outlined in the *Plan*:

- Nebraska's institutions and policymakers will increase participation and success in postsecondary education, particularly for low-income and underrepresented populations, and ensure that all Nebraskans are able to access and successfully complete postsecondary education appropriate to their individual needs and abilities, unrestricted by age, culture, disabilities, religion, race, ethnicity, gender, sexual orientation, gender identity, nationality, socioeconomic status, or geographic location.
- Nebraska's postsecondary institutions will be student-centered, create inclusive environments that foster student success, and offer lifelong learning opportunities that are responsive to students' and workforce needs.
- Nebraska colleges and universities will foster critical thinking skills and provide their graduates with the knowledge and workplace skills needed to be successful employees, innovative entrepreneurs, and responsible citizens on a global stage.
- Nebraska will close the historical educational attainment gaps between majority and underrepresented populations and be among the leading states in overall educational attainment.
- Postsecondary education in Nebraska will be responsive to the workforce development and ongoing training needs of employers and industries to build and sustain a knowledgeable, trained, and skilled workforce in both rural and urban areas of the state.
- Postsecondary institutions will contribute to the health and prosperity of the people and to the vitality of the state through research and development efforts, technology transfer and technical assistance, and by attracting external funds to support these activities.

- Postsecondary education will serve the state by preparing individuals for productive, fulfilling lives and by developing and nurturing the citizens and future leaders of Nebraska.
- Each Nebraska institution will fulfill its role and mission in an exemplary manner and will compare favorably with peer institutions.
- Postsecondary education in Nebraska will be effective in meeting the needs of students and the state, will be efficient in its expenditure of the state’s resources, and will be accountable for developing, sustaining, and demonstrating exemplary teaching, learning, research, and public service.
- Nebraska will promote a physical environment at each of its public postsecondary institutions that is supportive of role and mission; is well utilized and effectively accommodates space needs; is safe, accessible, cost effective, and well maintained; and is flexible to adapt to future changes in programs and technologies.

D. Evidence of Need and Demand

According to the Department of Labor, Bureau of Labor Statistics¹⁰ the national demand for respiratory therapists is expected to increase by 19% during the ten-years from 2019-2029. This projected rate of growth is characterized by the Bureau of Labor Statistics as “much faster than average,” with the average combined projected growth rate for *all* professions projected to be 4%.

In addition to percentage increase in employment demand, average annual openings (a combination of new demand and demand resulting from retirements), are projected to be 10,600 across the United States, with 830 average annual openings in Nebraska and its 6 contiguous states (see Table 2). The age of the respiratory therapy workforce in Nebraska may have an impact on average annual openings for respiratory therapists in Nebraska.

A recent workforce study conducted by the University of Nebraska Medical Center Area Health Education Center (AHEC) Program¹¹ found that of the total respiratory therapist workforce in the State of Nebraska, almost one-quarter (24%) of respiratory therapists were over the age of 56 years. Of these, 9.6% were between the ages of 61-65 years, and 3.1% were over the age of 65 years.

Table 2. Projected Percentage Increase in US and Regional Demand for Respiratory Therapists 2018-2028¹²

Area	Base	Projected Need Total	Change (#)	Change (%)	Average Annual Openings
United States	134,000	162,000	28,000	20.9	10,600
Nebraska	1,220	1,320	100	8.2*	80
Colorado	2,140	2,970	830	38.8	220
Iowa	960	1,180	220	22.9	80
Kansas	1,320	1,580	260	19.7	100
Missouri	3,350	4,310	960	28.7	300
South Dakota	340	430	90	26.5	30
Wyoming	210	260	50	23.8	20
Total Regional	9,540	12,050	2,510		830

*A 2018 Nebraska Workforce Report supported by the Nebraska Hospital Association¹³ indicated a 13.5% projected increase for respiratory therapists in Nebraska for the decade 2014-2024.

The COVID-19 pandemic has dramatically increased the need for respiratory therapists in the Omaha community and at UNMC’s clinical partner, Nebraska Medicine. Currently, Nebraska Medicine (including Bellevue Medical Center) employs approximately 150 respiratory therapists across multiple departments. Additionally, Children’s Hospital and Medical Center employs approximately 80 respiratory therapists. Vacancy rates at Nebraska Medicine are consistently in the

10%-20% range, with turnover at approximately 10%-15%. As a result, Nebraska Medicine and other Omaha metro health systems have implemented employment strategies such as offering incentive pay, sign-on bonuses or educational support, requiring mandatory overtime, or utilizing contract services. Filling vacancies is a more acute problem for departments or health systems that require respiratory therapists with specialized experience and training (e.g., Children's Hospital and Medical Center that requires pediatric and newborn experience, or the Nebraska Medicine Department of Pulmonary, Sleep, and Surgical Services).

Given the high demand, high volume, high acuity environment of a tertiary/quaternary academic medical center, to maintain respiratory care services, on average Nebraska Medicine relies on 5-10 respiratory therapists on contract at any given time. Even an intermittent reliance on contract support can be especially costly. Generally, the cost of a contract respiratory therapist ranges from \$60-\$68/hour. During the peak of the pandemic the rate jumped to \$110-140/hour. For general comparative purposes, the 2019 national median annual salary for respiratory therapists was \$61,330. Based on this median salary and a benefits factor of 25%, the annualized cost for a 1.0 FTE respiratory therapist would be approximately \$77,000 (approximately \$37/hour.)

While it might be anticipated that the acute need for respiratory therapy services will diminish as the U.S. begins to emerge from the pandemic, the long-term respiratory-related sequela of patients recovering from moderate to severe forms of the disease will likely keep respiratory therapy care demand above pre-pandemic levels. In addition, according to the CDC National Center for Health Statistics,¹⁴ and the American Lung Association,¹⁵ even *before* the pandemic (2018) chronic lower respiratory diseases (formerly known as chronic obstructive pulmonary disease) as a category was the fourth leading cause of death in all ages in the U.S., behind heart disease, cancer, and accidents and unintentional injuries (thus, the third leading cause of *disease-related* death).

The 2018 prevalence of CLRD was 6.3% in Nebraska and ranged from a low of 4.6% (South Dakota) to a high of 9.1% (Missouri) in the six contiguous states. In real numbers, over one million (1,067,500) individuals in Nebraska and its six contiguous states were living with chronic lower respiratory diseases in 2018.

E. Avoidance of Unnecessary Duplication

As noted in Table 1, there are eight respiratory care master-level programs in the U.S., only five of which are entry-to-practice. There are no other programs in respiratory therapy within the University of Nebraska system, and no other master's degree programs in respiratory care of any type in the State of Nebraska. According to the CoARC website¹⁶ there are three entries into the profession associate degree programs in respiratory care in Nebraska (Southeast and Metropolitan Community Colleges, and Nebraska Methodist College). There is also one bachelor's level degree advancement program (Nebraska Methodist College).

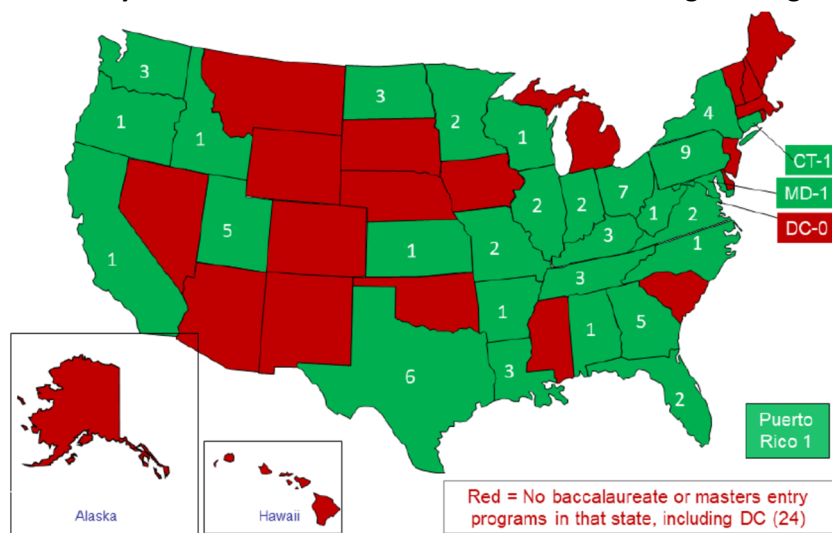
There are a total of 32 entry-to-practice respiratory care programs in Nebraska and the contiguous states (see Table 3). Only two of those programs are at the bachelor degree level, and none are at the master's degree level (see Figure 1). There were just over 1,000 applicants to these programs in 2019, with an overall acceptance rate of just over 50 percent (50.7%). The programs graduated 430 total graduates in 2019, representing approximately 52 percent of the projected average annual openings in the region (see Table 2).

The CAHP has for many years offered online degree-advancement programs in clinical perfusion, medical laboratory science, physician assistant studies, and radiography. While these degree programs do not increase the number of personnel in these respective fields, they do afford current practitioners the opportunity to maintain employment in their communities while acquiring advanced knowledge. Given the CAHP's experience and success in offering degree advancement programs, and considering that no master's degree programs are currently offered in Nebraska or the contiguous states, following the accreditation and implementation of the base entry-to-practice master's degree, the CAHP will seek subsequent accreditation for a master's degree advancement program.

Table 3. 2019 CoARC Data for Entry Respiratory Care Programs for Nebraska and Contiguous States³

State	Entry RC Programs (n) & Type	Applications	New Enrollees	Graduates
Colorado	4 Associate	262	111	103
Iowa	6 Associate	212	70	52
Kansas	8 Associate; 1 Baccalaureate	237	121	82
Missouri	6 Associate; 1 Baccalaureate	170	119	132
Nebraska	3 Associate	76	58	41
South Dakota	2 Associate	32	16	8
Wyoming	1 Associate	12	13	12
Totals	32	1,001	508	430

Figure 1. CoARC Accredited Entry into Practice Baccalaureate and Graduate Degree Programs (n=75 as of 12/31/20)³



F. Adequacy of Resources

Faculty and Staff Resources

The budget for the proposed program (see Tables 3 and 4), including FTE devoted to personnel, is based on a projected enrollment of 24 students per year for a total ongoing enrollment of 48 students upon full implementation. CoARC accreditation standards require all programs have FTE devoted to “key program personnel,”^{4, pp.11-12} which include at a minimum, a 1.0 FTE program director, and a 1.0 FTE director of clinical education. CoARC accreditation standards also require an appointed medical director, although the medical director is not required to have a full-time appointment. A medical director for the program must be a licensed physician board certified in a “specialty relevant to respiratory care.” The medical director will be provided in-kind from Nebraska Medicine.

In addition to these formally titled roles, two additional 1.0 FTE instructional faculty will be hired to teach in the program. Lastly, CoARC accreditation standards require, “sufficient administrative and clerical support staff to enable the program to meet its goals and objectives...”^{4, p. 21} The CAHP currently organizes administrative personnel in one of four offices, designed to provide comprehensive services to all students and faculty within the CAHP. These offices include academic affairs, business affairs, enrollment management and student affairs, and research affairs. Existing personnel in these offices will be available to provide administrative support for the Respiratory Therapy Program. Clerical support within the CAHP is provided via a shared service model. An additional 1.0 FTE for dedicated administrative support will be budgeted for support of the Respiratory Therapy Program.

The development of the curricular design and content will be the responsibility of the Respiratory Therapy Program faculty, however as noted above, the CAHP currently has several approved courses at the graduate/professional level related to content on leadership, management, education, and research, as well as professional (competency-based) courses in existing programs (e.g., Clinical Perfusion, Physician Assistant) that could meet the knowledge and competency needs of students in the Respiratory Therapy Program.

Physical Resources

UNMC and the CAHP will identify and renovate as necessary, space on the UNMC Omaha campus to house the respiratory therapy program, including office space for the program director, director of clinical education, and faculty, as well as student work area/small group meeting space. These areas will have internet access, conference room space and equipment for distance learning, conference calls, and video conferencing. Resources are also presently available in Bennett Hall, Wittson Hall, the Michael F. Sorrell Center for Health Sciences Education, and Nebraska Medicine that will be accessible to the respiratory therapy program. New and existing offices and conference rooms will be conducive to work associated with planning, scholarly activities, and student counseling.

Didactic classes will be held in the state-of-the-art classrooms and laboratories in Bennett Hall, or the Michael F. Sorrell Center for Health Science Education on the Omaha campus. These facilities also provide ample student interaction space. The CAHP has research laboratories, classrooms, and graduate student offices in the Center for Healthy Living, as well as laboratory space in Wittson Hall and Bennett Hall on the UNMC Omaha campus.

Instructional Equipment and Information/ Technological Resources

In recent years, the CAHP has made significant investments in technology to support the growing demand for distance education, to facilitate curriculum revision, including “flipped classroom” and hybrid delivery models, and to provide students opportunities for hands-on learning through simulation training. Audio visual (AV) and information technology (IT) components in excess of \$875,000 have been purchased and installed in Bennett Hall, Wittson Hall, and the Michael F. Sorrell Center for Health Science Education.

The UNMC Office of Academic Affairs houses the E-Gallery, an ever-expanding library of e-Learning modules, available to students anytime and anywhere. In addition, with the opening of the Davis Global Center in October 2020, the new Respiratory Therapy Program students will have access to considerable instructional resources using simulation, and virtual and augmented reality for learning and acquiring complex clinical competencies. In addition, the budget for the development of the program includes the purchase of specialized equipment required for hands-on laboratory education.

As an Academic Health Sciences Center, UNMC offers many educational opportunities and advantages for students. Students have access to the Leon S. McGoogan Health Sciences Library, one of the nation’s premier health science libraries. The Leon S. McGoogan Health Sciences Library serves the information needs of all UNMC students, faculty, and staff. In addition to resources physically located on the Omaha campus, the library has over 5,500 full-text, online journals and over 150 on-line textbooks. All UNMC students have complete access to the library and other online resources. The Leon S. McGoogan Health Sciences Library also provides services to students including how to search for literature, locate articles and books, search the internet, note copyright restrictions, cite sources, and avoid plagiarism, as well as writing assistance.

Clinical Education Resources

As is true of all health profession education programs, the availability of clinical placements will be key to the success of the program. The CAHP has a long history of partnerships with state, regional, and national health care systems and providers, whose clinical sites support the clinical training of allied health students. The CAHP has strong relationship with its clinical partners Nebraska Medicine and Children’s Hospital and Medical Center, which will form the foundation for clinical education experiences for students in the Respiratory Therapy Program.

While the primary clinical partners for the program will be the respiratory therapy services at Nebraska Medicine and Children’s Hospital and Medical Center, the CAHP also has as existing network of over 400 affiliation agreements with healthcare facilities and providers, most external to UNMC. Of these agreements, over 300 are “blanket” agreements which support clinical education for students from multiple health professions programs (143 of which are with healthcare institutions in Nebraska). Many of these sites are located in rural communities throughout Nebraska. Given that an essential mission of the CAHP is to educate the highest-quality allied health workforce to serve the State of Nebraska, it is anticipated that respiratory therapy students will also participate in clinical education experiences at many community and regional hospitals throughout Nebraska.

CoARC accreditation standards require the hiring a 1.0 FTE Clinical Education Director, whose primary role will be to develop a network of clinical education placements for the program. Additionally, CoARC accreditation standards require the appointment of a Program Advisory Committee (PAC). The PAC provides general oversight and guidance for the program, and membership on the PAC is voluntary. Members will be solicited from community stakeholders, largely Nebraska Medicine and Children’s Hospital and Medical Center (see Appendix C for letters of support from these institutions).

G. Budget

The expense and revenue projections for the Respiratory Therapy Program are modeled in the attached tables. The program will require an investment of approximately \$1.2M over a three-year implementation phase, with a first cohort projected to matriculate in the fall of academic year 2023-24. Funds from CAHP/Campus auxiliary activities are available to meet this need (see Appendix D). The revenue projection is modeled on enrollment of a cohort of 20 students in year one (16 resident and 4 non-resident) and cohorts of 24 students thereafter (18 resident and six non-resident students). Tuition will be “flat rate” based on a per-credit hour cost similar to the Masters of Perfusion Studies degree currently offered by the CAHP. The program is projected to generate revenue in excess of expenses in FY 2025, resulting in recovery of the initial investment in FY 2037. Ongoing annual revenue in excess of expenses is projected to be approximately \$126K thereafter.

The projected expense budget includes one-time expenses for equipment and technology acquisition, potential building renovations and faculty recruitment. These expenses are projected over the first three-years after program approval. On-going expenses include faculty and staff salaries and benefits, and routine operating expenses for faculty development, general supplies, accreditation fees, program marketing, etc. All expenses are inflated at 2.5% per year.

Tuition projections are based on the current resident and non-resident tuition for the Clinical Perfusion Master’s degree program, inflated at 2.5% after the current tuition freeze expires. The projected resident per credit hour rate is \$367 and the non-resident rate is \$965, for the 82-credit hour program. Congruent with all CAHP programs, the Master of Respiratory Care will be billed in a flat rate model of \$30,337 for the first resident cohort and \$79,781 for the first non-resident cohort. On average, the CAHP remissions rate is 9% for resident students and 42% for non-resident students enrolled in similar master’s degree programs.

IV. Conclusion

The College of Allied Health Professions (CAHP) at the University of Nebraska Medical Center (UNMC) proposes to establish the first in Nebraska entry-to-practice master of respiratory care degree program, allowing students to complete their bachelor’s degree and obtain a master of respiratory care degree in five-years.

The program would help to meet a projected 19% increase in national demand for respiratory therapists, including 830 annual openings for respiratory therapists in Nebraska and its six contiguous states. The development of the program is congruent with many of the strategic goals and objectives of the UNMC and University of Nebraska Strategic Plans, as well as the Comprehensive Statewide Plan of the Nebraska Coordinating Commission for Postsecondary Education. Budget modeling indicates that in approximately year six of the program and thereafter, the program would be a self-sustaining revenue center for UNMC and the CAHP.

As noted by the consultant who assisted in conducting the feasibility study that informed this proposal,

The University of Nebraska Medical Center (UNMC) provides sophisticated, state-of-the-art care to patients with acute and chronic illness. Nebraska Medicine provides a unique venue for training advanced level respiratory therapists and a respiratory therapist training program within the College of Allied Health Professions (CAHP) could rapidly develop into a nationally recognized program of excellence.

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**Appendix A
Consultant Report**

University Nebraska Medical Center
College of Allied Health Professions

*Feasibility of the Establishment of a Respiratory Care Educational Program at
the University Nebraska Medical Center*

Report of Consultation Visit
David C. Shelledy, PhD, RRT, FAARC, FASAHP
February 11 and 12th, 2020

Executive Summary

Respiratory care is the allied health discipline focused on the evaluation, treatment, and care of patients with heart and lung disorders. Respiratory therapists work across multiple healthcare venues including acute care hospitals, long-term care facilities, sleep disorder centers, physician offices, skilled nursing facilities and rehabilitation centers. Patients commonly requiring respiratory care include those patients with acute pulmonary disease (acute respiratory tract infection, pneumonia, pulmonary edema, acute respiratory distress syndrome [ARDS], and other causes of respiratory failure) and those with chronic lung disease (COPD, asthma, cystic fibrosis, pulmonary fibrosis). Respiratory therapists are the primary allied health personnel responsible for the institution, adjustment, monitoring, and care of patients receiving mechanical ventilatory support, including invasive mechanical ventilation. Within the hospital environment, respiratory therapists devote a great deal of their time caring for critically ill patients receiving intensive care. Respiratory therapists also perform diagnostic studies (e.g., arterial blood gases, pulmonary function testing, exercise testing, sleep laboratory), providing patient education (e.g., smoking cessation, asthma education, COPD chronic care and rehabilitation), as well as providing long-term care for patients with chronic illness.

Respiratory therapists (RTs) are trained at colleges and universities and respiratory care educational programs require specialized accreditation. The National Board for Respiratory Care administers the examinations for respiratory therapist credentialing and provides the credentialing system used for state licensure. Credentials awarded include the registered respiratory therapist (RRT) credential and specialization credentials in adult critical care, neonatal and pediatric critical care, pulmonary function testing, and sleep studies. The U.S. Bureau of Labor Statistics estimates a need for an additional 10,600 respiratory therapists per year for the period 2018-2028.

In the past, the majority of respiratory therapy education programs awarded an associate degree. Effective in 2018, all new respiratory therapist educational programs must offer a bachelors or master's degree and the American Association for Respiratory Care has stated that all respiratory therapists should hold minimum of a baccalaureate degree by the year 2030.

The University of Nebraska Medical Center (UNMC) provides sophisticated, state-of-the-art care to patients with acute and chronic illness. Nebraska Medicine provides a unique venue for training advanced level respiratory therapists and a respiratory therapist training program within the College of Allied Health Professions (CAHP) could rapidly develop into a nationally recognized program of excellence.

Given the high level of care provided by UNMC and Nebraska Medicine, it is recommended that the CAHP initiate a new entry-to-practice respiratory therapist educational program awarding the master of respiratory care degree upon completion. This program should focus on preparing outstanding respiratory care clinicians able to care for the difficult and complex patients seen by the medical center. The curriculum should include advanced coursework in the areas of patient assessment; protocol development and administration; care plan development, initiation, delivery, modification, and evaluation; critical care and mechanical ventilatory support (adult, pediatric, neonatal and specialty); and cardiopulmonary diagnostics. While the primary focus of the program should be on the preparation of outstanding clinical (bedside) advanced level respiratory therapists, courses and units of instruction should also be included in the areas of leadership, research and education.

Introduction

Respiratory Care has been defined as the healthcare discipline that specializes in the promotion of optimum cardiopulmonary function and health. Respiratory therapists employ scientific principles to identify, treat and prevent acute or chronic dysfunction of the cardiopulmonary system. Respiratory therapists are employed across all healthcare delivery venues including acute care hospitals, subacute care, skilled nursing facilities, long-term acute care facilities, physicians' offices and clinics, rehabilitation facilities and homecare. Respiratory therapists also provide diagnostic services in pulmonary function laboratories and sleep disorder centers. They are involved in research, and may find employment at universities, research institutes and with industry, medical equipment companies and suppliers, and governmental agencies. Respiratory therapists are also employed as faculty members within respiratory care educational programs located at colleges and universities. Specialty areas within respiratory care include adult critical care, pediatric and neonatal critical care, cardiopulmonary rehabilitation, cardiopulmonary diagnostics (e.g., pulmonary function testing, sleep studies, cardiopulmonary exercise testing, metabolic testing), patient transport (e.g., emergency and critical care air transport), and home care.

Respiratory therapists are trained and educated at colleges and universities accredited by the Commission on Accreditation for Respiratory Care (see: www.CoARC.com). Effective January 1, 2018 all new entry-to-practice respiratory care educational programs must award either the baccalaureate or graduate (e.g. master's) degree upon completion of the program. Associate degree programs that applied for accreditation or were accredited prior to January 1, 2018 may continue to award graduates the associate degree as long as they continue to remain accredited by the CoARC. Currently there are approximately 344 associate degree programs, 71 baccalaureate degree programs and 15 master's degree respiratory care programs (10 post-professional master's and 5 entry-to-practice masters) in the U.S (Appendix C).

Purpose of the Consultation

The purpose of this consultation was to determine the feasibility of the establishment of a baccalaureate and/or master's degree program in respiratory care within the College of Allied Health Professions at the University Nebraska Medical Center. Specifically, this report details findings related to the following activities:

1. Survey demand, need, support, and facilities with respect to the establishment of a respiratory care educational program.
2. Meet with key stakeholders to determine interest and support in establishment of a respiratory care educational program.
3. Determine viability and initial startup needs for a new program in respiratory care.

Additional background information related to the development of new respiratory care educational programs should be considered. Although many associate degree programs remain in operation, current accreditation standards require that all new entry-to-practice respiratory care programs must be offered at the baccalaureate or master's degree level. In addition, the American Association for Respiratory Care (AARC) recently published a position statement that all respiratory therapists should hold at least a bachelor's degree in respiratory care by the year 2030. There are also a number of respiratory care curricular models in operation in the United States. Broadly speaking, these can be divided into entry-to-practice respiratory therapist training programs offered both at the baccalaureate and master's degree level and programs for current respiratory therapists to advance their career.

The most common model for entry-to-practice programs is the traditional 2+2 baccalaureate degree (two years of undergraduate general education and prerequisite courses followed by two years of professional/health sciences courses). Entry-to-practice master's degree programs generally require no prior health care experience; however, applicants must have a non-RT bachelor's degree and appropriate prerequisite courses (e.g., biology, chemistry, anatomy, physiology). Programs designed for current respiratory therapists to advance their careers include degree completion baccalaureate programs (to provide associate degree program graduates the opportunity to complete their baccalaureate degree in respiratory care); and master's degree completion programs for current registered respiratory therapists (RRT's) holding non-RT baccalaureate degrees. Accreditation standards for advanced practice respiratory therapist (APRT) training programs have also been developed and such programs should provide current respiratory therapists with the clinical skills needed to serve in mid-level provider roles similar to a pulmonary physician assistant.

Currently, there is only one such accredited program in the U.S. (see: <https://gpadmissions.osu.edu/programs/program.aspx?prog=0269>).

Methodology

An on-site visit was conducted February 12-14, 2020 at which time key stakeholders were interviewed, and clinical and academic facilities reviewed. A summary of activities is found in Appendix D. In addition, U.S. Bureau of Labor Statistics and Nebraska Department of Labor employment projections were obtained and the current number of baccalaureate and graduate respiratory therapy educational programs reviewed (see: Commission on Accreditation for Respiratory Therapy Education Annual Report and the Coalition for Baccalaureate and Graduate Respiratory Therapy Education database; www.CoARC.com and www.CoBGRTE.org).

Results

Facilities and Support

The University Nebraska Medical Center (UNMC) is a world-class academic health center with the main campus located in Omaha, Nebraska. The stated mission of UNMC and Nebraska Medicine (UNMC's hospital partner) is to "lead the world in transforming lives to create a healthy future for all individuals and communities through premier educational programs, innovative research and extraordinary patient care." The major mission components of UNMC include teaching, research, service, and patient care. In collaboration with Nebraska Medicine, UNMC provides clinical services in about 50 specialties and subspecialties, including cancer, neurosciences, heart disease and others.

UNMC is comprised of six colleges and multiple institutes and centers. UNMC offers professional training programs in dentistry, medicine, nursing, pharmacy, public health, and allied health as well as research focused masters and doctoral degree programs in the biomedical sciences. Nebraska Medicine includes the Nebraska Medical Center, the Fred and Pamela Buffett Cancer Center, Bellevue Medical Center, and Village Point Health Center. Nebraska Medical Center is a 718-bed tertiary-care referral hospital caring for complex patients from across the region and nation while Bellevue Medical Center adds additional inpatient beds, intensive care services and emergency department services.

The proposed respiratory care program would be offered by the College of Allied Health Professions at UNMC. The mission of the College of Allied Health Professions (CAHP) is to advance health by delivering allied health educational programs that prepare graduates to "provide high quality, evidence-based, safe care for all patients; conducting scholarly activities that create and disseminate knowledge reflective of the unique contributions of allied health theory and practice; providing high quality, contemporary clinical care in the allied health disciplines; and providing outreach to underserved populations. The College of Allied Health Professions at UNMC offers training and education in 14 different allied health disciplines ranging from cardiovascular interventional technology to medical radiography (see: <https://www.unmc.edu/alliedhealth/education/index.html>).

UNMC and Nebraska Medicine are well positioned to provide the clinical training and related experiences needed to prepare outstanding advanced level respiratory therapists. An important focus for training advanced level respiratory therapists is the availability of critical care beds, personnel and procedures. Nebraska Medicine features a sophisticated group of ICUs including CVICU (cardiovascular), NSICU (neuroscience), SICU (surgical), MICU (medical), NICU (neonatal), PICU (pediatric) and Buffett ICU (oncology). Nebraska Medicine is a Level I trauma center (which includes a burn intensive care unit) and a Level IV Newborn Intensive Care Unit is located at Children's Hospital and Medical Center, providing the most sophisticated, state-of-the-art care possible for trauma and neonatal patients, respectively. Units are staffed with expert critical care physicians, advanced practice nurses, and respiratory therapists.

Critical care training opportunities and procedures abound across multiple care venues providing airway care, mechanical ventilatory support, hemodynamic monitoring, extracorporeal membrane oxygenation (ECMO), mechanical circulatory support, and perfusion services. Other core training opportunities readily available include provision of respiratory care in the acute care setting (e.g., oxygen therapy, aerosolized medication delivery, airway clearance techniques, patient assessment and care planning, asthma education), emergency care (e.g., CPR and advanced life support), cardiopulmonary diagnostics and pulmonary function laboratory, sleep laboratory, pulmonary rehabilitation, cardiac rehabilitation, hyperbaric medicine, cardiac catheterization lab and critical care ground and air transport. In

addition to the availability of advanced level care, students may have opportunities to participate in sophisticated outcomes/clinical research related to respiratory care.

Respiratory care clinical leadership personnel, including therapists and physicians are enthusiastic and well qualified to ensure that students receive an outstanding clinical education. Nebraska Medicine patient care operations leadership are also supportive and eager to have a ready source of well-qualified respiratory therapists to meet the medical center's workforce needs.

The College of Allied Health Professions is well positioned to support advanced level respiratory therapist training. The college is led by a sophisticated team of academicians including the dean, associate deans, department chairs, program directors, and administrative staff. The college has extensive experience in providing outstanding allied health graduate and undergraduate training programs, as well as appropriate classroom, teaching laboratory, offices, and related support resources. It's clear that should UNMC decide to develop and implement an advanced level respiratory therapist training and education program, they have the resources and experience to develop an outstanding program.

College administrative leadership (e.g. deans, associate deans, department chairs, program directors) are very supportive of the development of a respiratory therapist program with the aim of developing a program which will be recognized as a national leader within a few years. Clinical training opportunities and associated resources will certainly allow for the achievement of such a goal, assuming continued administrative support and successful employment of a visionary and capable program director and faculty. There seems to be a clear mission match between the university, college and proposed new program.

Workforce

Nebraska Department of Labor occupational data indicated that in 2019 there were approximately 1,213 respiratory therapists employed in the state. Median annual wage for respiratory therapists in Nebraska is listed at \$57,407 and there are currently only 18 candidates available for 79 job openings (see: <https://networks.nebraska.gov/vosnet/Default.aspx>). U.S Bureau of Labor Statistics estimated that there were 134,000 respiratory therapists in the U.S. in 2018 and that number would grow to 162,000 by 2028 with an average annual opening rate of 10,600 openings (see: <https://www.bls.gov/emp/tables/emp-by-detailed-occupation.htm>).

Nebraska Medical Center hospital leadership is fully supportive of the development of a new respiratory therapist training program because of workforce shortages and excessive PRN use and related cost. It was felt that the program should train advanced level respiratory therapists who possess additional assessment skills, allowing for administration of protocols (e.g., ventilator weaning, extubation, reduction of therapy misallocation), and contribute to reduction in hospital readmissions following discharge (e.g., asthma, COPD, other). In addition, there's a desire to continue to improve employee engagement and enhance recruitment and retention of respiratory care personnel.

As noted above, current accreditation standards require that all new entry-to-practice respiratory therapist training programs must be at the baccalaureate or master's level. Currently there are 71 accredited bachelor's degree programs and five entry to practice master's degree programs in the U.S., however, only one program in Nebraska offers an entry-to-practice bachelor's degree (CHI Health/Midland University) and there are currently no graduate-level programs in the state.

Consequently, the majority of the current Nebraska workforce received their training at one of the three associate degree programs in the state. Credit hour limitations of associate degree respiratory therapist training programs limit the breadth and depth of training possible needed to provide advanced patient care management skills for practice. Also as noted, the American Association for Respiratory Care has taken the position that all respiratory therapists should have a minimum of a respiratory care baccalaureate degree by 2030.

Challenges

Challenges to implementing a new program to train respiratory therapists at UNMC include recruiting well-qualified key personnel and instructional faculty, establishing an appropriate teaching laboratory, ensuring the program is financially sound and adequate financial resources are available, maintaining program enrollment, ensuring adequate clinical

placements for students, and choosing a curricular model which is a good fit for the University Nebraska Medical Center and the College of Allied Health Professions.

Key personnel. An entry-to-practice master's degree respiratory therapist training program would provide the best fit for an academic medical center such as UNMC. In order to achieve specialized accreditation, the program must have a qualified program director, director of clinical education, and medical director as well as sufficient instructional faculty to provide effective instruction in the didactic, laboratory, and clinical setting. The program director and director clinical education must be full-time, core faculty. The medical director is not required to have a full-time appointment within the program.

Finding doctorally prepared respiratory care faculty to provide program leadership and instruction can be challenging. Because of the shortage of doctorally prepared respiratory therapists to teach, the specialized accreditation agency (CoARC) currently states that the program director and director of clinical education *"of a program offering a bachelor's or master's degree must have earned at least a master's degree from an academic institution accredited by a regional or national accrediting agency recognized by the U.S. Department of Education (USDE)."* Use of master's level faculty to teach and provide program leadership will require documentation of preparation for teaching subject matter assigned in order to meet regional accreditation (HLC) standards.

Instructional Faculty. The program must demonstrate that instructional faculty are qualified in the content areas they are teaching and have demonstrated a sufficient level of knowledge, skills, and competency in those content areas, as well as being appropriately credentialed. (see: <https://www.coarc.com/News-and-Events/CoARC-Entry-Standards-7-1-2020.aspx>). There should be little difficulty in identifying highly qualified instructional faculty from the many physicians, advanced practice providers, and respiratory therapists currently employed at the medical center.

Teaching Laboratory. Access to a teaching laboratory properly equipped for student practice and demonstration of clinical skills will be required for an entry-to-practice program. This should include sufficient equipment and supplies for students to demonstrate core respiratory care clinical skills in the teaching laboratory. The teaching laboratory should include access to simulation models and equipment and supplies to deliver oxygen therapy, aerosol and humidity therapy, airway care, endotracheal intubation, arterial blood gas sampling, arterial line set-up, cardiac and hemodynamic monitoring, and invasive and noninvasive mechanical ventilation. Equipment used in the teaching laboratory for high ticket items (e.g. ventilators) can be rented or leased, but needs to be available to the students when that portion of the curriculum is covered. Students should also have access to cardiopulmonary diagnostic equipment and supplies in order to practice procedures such as pulmonary function testing on volunteers prior to practice on patients.

Financial Resources. The program should be able to self-fund through tuition, fees and state support provided. In some state systems, support is based on the discipline (e.g., health sciences), student semester credit hours taught and/or full-time student equivalents enrolled. It was unclear how state support is apportioned at UNMC, however, tuition and fees must be set appropriately in order to fully fund the program. Hospital financial support may be required, particularly in the area of allowing clinical personnel to serve as clinical preceptors and instructors.

Properly structured clinical rotations, however, can allow the clinical preceptor and his or her assigned students to perform (on average) about the same patient care workload as a respiratory therapist without students.

Maintaining Enrollment. Respiratory care is not as well-known as a career option as certain other allied health professions (e.g., physical therapy, occupational therapy, physician assistant) and marketing and student recruitment can be challenging. Structurally, a baccalaureate entry-to-practice respiratory care program located in a freestanding academic health center such as UNMC will require students to attend the first two years of college somewhere else and then transfer to UNMC. Students attending residential four-year colleges and universities are often reluctant to transfer to a different school for their third and fourth years, and this may impact applicant pool size should a traditional baccalaureate model be adopted.

On the other hand, there is generally a very large population of undergraduate students who plan to complete their bachelor's degree in an area such as biology or pre-medicine in preparation for application to a graduate level

professional degree program such as medicine or physician assistant studies, and there are generally many more well-qualified applicants to these programs than seats available. For example, both Rush University Medical Center in Chicago and UT Health San Antonio offer entry-to-practice MS degree respiratory therapist training programs. They have found that it is easier to recruit highly qualified students to these MS degree programs than their BS degree programs which require students transfer at the end of their sophomore year. Consequently, well-qualified applicants to the PA programs as well as lists of Graduate Record Exam (GRE) completers interested in the health professions provide an excellent source of prospective students for their graduate programs. Ongoing marketing and student recruitment, however, will be essential to ensure the viability of an entry-to-practice respiratory care educational program at UNMC.

Initial cohort size will largely be dependent on availability of clinical faculty and clinical placements. Suggested initial enrollment of 12 to 15 students is a common starting point then increasing to an enrollment of approximately 24 students per year. Some entry-to-practice programs, however, are much larger (e.g., 50 students per cohort and some degree completion programs accommodate 100 or more students).

Clinical Placements. Depending on class size, clinical training placements can be challenging for an entry-to-practice respiratory care program. Strong hospital support, as well as structuring the curriculum so that the second year allows for clinical rotations outside of Omaha can facilitate clinical placements. For example, programs which focus on intensive clinical training for the last year of student training often require students to complete “out-of-town” clinical rotations at clinical sites located in other cities and states. Programs that require out-of-town clinical rotations generally expect students to self-fund and they provide this information to prospective students prior to enrollment.

Program Curricular Model. A number of different curricular models for respiratory therapist education have been implemented at various colleges and universities across the U.S. as described below.

1. Traditional Baccalaureate Degree Program. A baccalaureate degree program using a 2+2 model (two years of lower division undergraduate general education and science coursework followed by two years of respiratory care/health sciences coursework) is commonly employed. Such a model has limitations including recruitment and retention of highly qualified students when a transfer to a new institution is required between the sophomore and junior years and limitations on the scope and depth of training that can be provided in the last two years of such a baccalaureate program due to credit hour restrictions.
2. Dual Track Baccalaureate and Master’s Degree Programs. As an alternative to a traditional 2+2 bachelor’s degree model, some programs (e.g., Rush University Medical Center/Rush University, UT Health San Antonio, and Georgia State University) have opted to offer dual-track BS/MS entry-to-practice respiratory care programs. Core courses which deliver the entry-to-practice competencies required for students in both tracks are double numbered. While core competencies taught are the same, standards of progress for MS degree students and a graduate competency assignment are required for each course. In addition, MS degree program students complete additional coursework in the areas of research, education, leadership, and advanced clinical practice (e.g., neonatal/pediatrics – NICU/PICU, pulmonary diagnostics, adult critical care, pulmonary rehabilitation, etc.). This design provides an efficient model for delivering the core competencies to both groups at the same time. This model also provides an opportunity for students who have not completed a bachelor’s degree to enter the field at the undergraduate level and also allows students with an associate degree in respiratory care a pathway to obtain a bachelor’s degree in respiratory care. It’s important to note that the master’s degree entry-to-practice program does not require that applicants have prior healthcare experience, thus ensuring a large pool of prospective applicants. A dual-track model, however, is more complex to administer, and requires that the institution identify one of the two programs as the base program and the other as an “additional degree track” for accreditation purposes. It is interesting to note that Rush University Medical Center/Rush University no longer offers the BS degree track, as they have found the MS degree entry-to-practice program better meets their needs as an academic medical center.
3. Baccalaureate Degree Program and Advanced Practice Masters. The third option is to offer a traditional 2+2 bachelor’s degree program and a separate advanced level master’s program. The bachelors program provides core competencies required for licensure and certification, while the master’s degree program may provide

advanced clinical competencies or focus on leadership competencies (e.g. management, education, research). Some programs have found this to be a good option, however the advanced practice master's requires that students entering have completed an entry-level respiratory care program which seriously limits the potential applicant pool. It should also be noted that such programs do not add to the total workforce because they require entering students to already hold the registered respiratory therapist credential. However, some institutions (e.g., the Ohio State University) have chosen to supplement their traditional 2+2 baccalaureate respiratory care program with an advanced practice respiratory therapist (APRT) program to prepare mid-level providers. Such an approach requires significant additional resources and separate accreditation approval (see: <https://www.coarc.com/Accreditation/Advanced-Practice-Standards.aspx>).

4. Entry-to-Practice Master's Degree Program. The last option to consider is a stand-alone entry-to-practice master's degree program. I believe such a program is the best fit for UNMC based on the advanced scope of practice and clinical expectations of the medical center. A single degree model will be easier to implement and able to recruit outstanding faculty and well-qualified students from a larger pool of potential applicants. Properly designed, such a program will provide an outstanding education to train advanced level respiratory therapists needed to work in a complex academic medical center environment. Additional degree track(s) could be added following successful implementation of the entry-to-practice master's degree program.

As noted earlier, decision makers should also be aware that many programs have developed degree completion options for currently licensed and credentialed respiratory therapists. Such degree completion programs may be offered at either the baccalaureate or master's level and provide a good option for current practitioners to obtain additional training and another degree for career advancement; as noted previously, such programs do not add to the total workforce. Degree completion programs may also require separate accreditation (see: <https://www.coarc.com/Accreditation/Degree-Advancement-Standards.aspx>). It must also be noted that a degree completion program to enable RRTs to complete their bachelor's degree is currently available at Nebraska Methodist College in Omaha.

Regardless of the curricular model chosen, CoARC accreditation standards will have to be met and can be challenging in terms of a rapid startup timeline.

Conclusions and Recommendations

The University Nebraska Medical Center and the College of Allied Health Professions provide a strong venue for the development and implementation of a baccalaureate and/or master's degree program in respiratory care. It is this report's recommendation that an entry-to-practice master's degree program be developed to train and educate advanced level respiratory therapists to provide direct patient care. Graduates of such a program will have the patient assessment skills to ensure that patients receive the right care, at the right time and minimize unnecessary care; apply respiratory care protocols (e.g., ventilator management, ventilator weaning, acute asthma and acute exacerbation of COPD management); provide chronic disease management to reduce hospital readmissions (e.g., asthma education, COPD rehabilitation); perform diagnostic testing (e.g., pulmonary function studies, sleep studies, exercise testing) as well as supporting advanced procedures such as ECMO and other rescue therapies for patients in acute respiratory failure. Such a program is needed if the medical center desires to continue to be able to recruit and retain outstanding respiratory therapists trained to provide the advanced level of respiratory care currently demanded.

Hospital leadership is fully supportive of developing a respiratory care educational program in order to address workforce shortages and excessive PRN use and related cost. The program would provide respiratory therapists with advanced assessment skills, allowing for administration of protocols (e.g., ventilator weaning, extubation, reduction of therapy misallocation) which could improve clinical outcomes, improve efficiency, reduce misallocation of care and reduce hospital readmissions following discharge (e.g., asthma, COPD, other chronic lung disease). In addition, there is a desire to continue to improve employee engagement and enhance recruitment and retention of personnel and an advanced level respiratory therapist training program would help address these goals.

The CAHP leadership and academic program support personnel are supportive of introducing a new respiratory care program and possess the infrastructure to manage student recruitment and admissions.

Nebraska Medicine respiratory care clinical services leadership and medical director are fully supportive to include interest in clinical personnel receiving cross appointments as adjunct clinical faculty in support of the educational program. Should UNMC opt to begin a new entry-to-practice master's degree program, it is highly recommended that Nebraska Medicine's career ladder for respiratory therapists integrate the achievement of the master's degree for clinical specialization and advanced practice.

Last, but not least Chancellor Gold is supportive, and this new program provides an opportunity to grow UNMC enrollment as well as providing a career path for students in collaboration with University Nebraska Omaha.

In summary, UNMC has the infrastructure, clinical facilities, and medical personnel to develop and support an excellent entry-to-practice master's degree respiratory care educational program to prepare outstanding respiratory therapists with a focus on clinical services delivery.

Appendix B Sample Plan of Study

Used with Permission; Available at: <http://catalog.uthsca.edu/schoolofhealthprofessions/respiratorycare/msrc/entry/entry.pdf>

Degree Requirements

To graduate from the Respiratory Care Master of Science in Respiratory Care program, students must:

- Complete all required respiratory care professional courses with a grade of **C** (75%) or better.
- Must have an overall GPA 3.0 to graduate.
- Successfully complete the self assessment examinations given by the National Board for Respiratory Care.
- Successfully complete a comprehensive end-of-year and program competency assessment.
- Successfully complete a research project (create and implement an educational project, create and implement a quality improvement plan, or create and implement a research project).
- Hold current certification in Basic Life Support for Healthcare Professionals (http://cpr.heart.org/AHA/ECC/CPRAandECC/Training/HealthcareProfessional/BasicLifeSupportBLS/UCM_473189_Basic-Life-Support-BLS.jsp) (BLS), Advanced Cardiac Life Support (http://cpr.heart.org/AHA/ECC/CPRAandECC/Training/HealthcareProfessional/AdvancedCardiovascularLifeSupportACLS/UCM_473186_Advanced-Cardiovascular-Life-Support-ACLS.jsp) (ACLS), Pediatric Advanced Life Support (http://cpr.heart.org/AHA/ECC/CPRAandECC/Training/HealthcareProfessional/Pediatric/UCM_473190_Pediatric.jsp) (PALS) and Neonatal Resuscitation Provider course (NRP) (<http://www2.aap.org/nrp/>).
- Complete all University requirements for graduation.

Master of Science in Respiratory Care Sample Plan of Study

First Year

Fall

	Credit Hours
RESC 5002 Introduction to Respiratory Care	5
RESC 5005 Pharmacology	4
RESC 5010 Cardiopulmonary Physiology	5
RESC 5011 Patient Assessment	5

Spring

RESC 5020 Diseases Affecting the Cardiopulmonary System	4
RESC 5023 Cardiopulmonary Diagnostics and Pulmonary Function Testing	3
RESC 5030 Pediatric & Neonatal Respiratory Care	4
RESC 5031 Critical Care & Mechanical Ventilation	5
RESC 5041 Clinical Practice Introduction	1

Summer

RESC 5013 Management & Leadership in Health Profession	3
RESC 5015 Education in Respiratory Care	3
RESC 5017 Introduction to Research	3
RESC 5042 Critical Care Introduction	3

Second Year

Fall

RESC 6011 Clinical Seminar 1	2
RESC 6019 Clinical Practice 1	12
RESC 6030 Research Project 1	2

Spring

RESC 6029 Clinical Practice 2	12
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RESC 6031	Research Project 2	2
RESC 6033	Clinical Seminar 2	2
Summer		
RESC 6032	Clinical Practice 3	8
RESC 6034	Research Project 3	2
RESC 6035	Clinical Seminar 3	2
Total Credit Hours:		92.0

Elective Courses

Students may enroll in elective courses with the approval of their division director or department chair.

RESC 6150	Independent Study	1-6
RESC 6301	Advanced Patient Assessment and Care Plan Development	3
RESC 6302	Advanced Critical Care and Ventilatory Support	3
INTD 5064	Applied Statistics for Health Care Practitioners	3

Courses

RESC 3002. Fundamentals of Respiratory Care. 5 Credit Hours.

The course will present the principles of chemistry and physics as they apply to respiratory care. Students will have the opportunity to gain hands-on experience with basic respiratory care equipment. Specific types of therapy are examined to understand the principles of application to patients, indications, hazards, contraindications, select, assemble, and troubleshoot equipment. Equipment will include oxygen delivery services, aerosol generators, medication delivery devices, pressure ventilators, gas delivery, metering and analyzing devices, percussor, positive pressure devices, environmental devices, manometers, gauges, and vacuum systems.

RESC 3005. Respiratory Care Pharmacology. 3 Credit Hours.

This course introduces the physiologic and pharmacologic basis of pulmonary and cardiac medications. Students will study several aspects of the formulation and preparation of the most commonly prescribed respiratory drugs. Pharmacodynamics and pharmacokinetics will be discussed along with drug formulation, drug dosage calculations, indications, contraindications and side effects of cardiac and pulmonary medications. Topics covered include an overview of bronchactive agents, anti-inflammatory drugs, anti-asthmatics, neuromuscular blocking agents, diuretics, cardiac drugs and drugs that affect the central nervous system.

RESC 3007. Cardiopulmonary Physiology. 5 Credit Hours.

This course provides an in-depth study of cardiac and pulmonary anatomy and physiology, as well as the diagnostic procedures commonly used in the hospital to evaluate these systems. Topics include the function of the respiratory system, ventilatory mechanics, gas transport in the blood, natural and chemical regulation of breathing, circulation, blood flow and pressure, and cardiac output. The heart-lung relationship and clinical applications of these phenomena in the cardiopulmonary system will be emphasized.

**Appendix C
Letters of Support**



March 9th 2021

Kyle P. Meyer, PhD, MS, PT, FASAHP
Dean, College of Allied Health Professions
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dear Dr. Meyer:

I want to express my strong endorsement for the proposal to develop a master's level respiratory therapist education program in the UNMC College of Allied Health Professions. The COVID-19 pandemic that we experienced during the last year underscored the essential role that respiratory therapists play as members of the healthcare team. As the complexity of health care increases there is a need for respiratory therapists to manage advanced technology and assume more advanced roles in patient assessment and treatment, and to provide education to younger colleagues.

As the CEO of Nebraska Medicine I receive daily reports on the hundreds of treatments respiratory care professionals deliver each day. Without their commitment, many patients would not have survived.

I appreciate your excellent leadership in allied health and in developing this important program

Sincerely,

A handwritten signature in blue ink, appearing to read 'James Linder', written over a horizontal line.

James Linder, MD
Chief Executive Officer

SERIOUS MEDICINE. EXTRAORDINARY CARE.®

Executive Office | 987400 Nebraska Medical Center | Omaha, NE 68198-7400

PH: 402.552.2552 | FX: 402.552.2152 | NebraskaMed.com



April 1, 2021

Kyle Meyer, PhD
Dean
College of Allied Health Professions
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dear Dr. Meyer:

We are writing to strongly endorse and support the proposal to develop a master's entry-level respiratory therapist education program in the UNMC College of Allied Health Professions. As pulmonary & critical care leaders who interact with respiratory therapists daily, we know how essential respiratory therapists are to our healthcare system.

Our pulmonary/critical care/sleep medicine division provides physician leadership to Nebraska Medicine respiratory care services, critical care services, and sleep services. All of these areas are absolutely dependent on respiratory therapists in order to provide high quality and safe care to our patients. In addition, respiratory therapists make valuable educational contributions to the training of our internal medicine residents and pulmonary/critical care fellows. We are very aware of the value of respiratory therapists (RTs) as partners in the care of our patients and equally aware of the difficulty our healthcare system has had in recruiting enough of these professionals. In our intensive care units, it has been very challenging for us in the past 2 years as we have experienced consistent workforce shortages of RTs, requiring the need to pay considerable overtime, as well as hire contract respiratory therapists to meet patient and service demands. This unfilled demand for well-trained RTs was stretched to the breaking point when we were thrown into the COVID-19 pandemic crisis a year ago. During that time, we had our highest ICU admissions and ventilator needs nearly overwhelming our RTs, nurses, physicians and other colleagues. The challenge to support adequate oxygenation in the severely ill COVID-19 patients was met by our best RTs with advanced RT training and long-term ICU experience partnering to manage these patients and it made all the difference in the good outcomes the critical care teams were able to achieve for these patients.

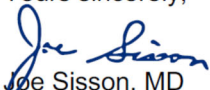
As the respiratory therapy profession continues to evolve, it is clear that well-trained RTs are vital members of the healthcare team. In this context, we strongly endorse the preparation of respiratory therapists at the master's level. Our division will enthusiastically support this RT training program and will involve the RT students in our existing ICU curriculum as well as at the bedside on ICU rounds. This will also include case-based didactic sessions in tandem with other ICU learners. In addition, we envision there will be opportunities for RT students to be involved in the outpatient care of pulmonary patients in some of our clinics where skilled RTs are very vital, including our cystic fibrosis clinic. Furthermore, we have a busy sleep medicine clinic and there may be RT student learning opportunities there as well.



College of Medicine, Internal Medicine Department
Division of Pulmonary, Critical Care & Sleep
985910 NE Medical Center, DRC 2 | Omaha, NE 68198-5910 | unmc.edu

Thank you for your leadership in developing this much needed program. I look forward to continuing to work with you in support of the development of the RT training program to ensure this vision becomes a reality.

Yours sincerely,



Joe Sisson, MD
Larson Professor and Chief
Division of Pulmonary, Critical Care & Sleep
Department of Internal Medicine



Debra J. Romberger, MD
Chair, Department of Internal Medicine
Lenhoff Professor of Internal Medicine



March 17, 2021

Kyle P. Meyer, PhD, MS, PT, FASAHP
Dean, College of Allied Health Professions
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dear Dr. Meyer:

I am writing to offer my strong endorsement and support for the proposal to develop a master's entry-level respiratory therapist education program in the UNMC College of Allied Health Professions. As a critical care physician who interacts with respiratory therapists on our critical care teams, I can attest to both the value of, and the increasing demand for, these highly skilled professionals. Respiratory therapists have always been vital members of the healthcare team taking care of patients with a variety of cardiopulmonary conditions. The pandemic of the past year has brought to light just how important these individuals are in the delivery of high-quality care under difficult conditions.

As Medical Director for Critical Care and Acute Care at UNMC/Nebraska Medicine, it is my responsibility to staff our ICUs with physicians and other providers, and to work with others to staff our ICUs with the other healthcare professionals that we need including respiratory therapists. For the past two years, we have experienced consistent workforce shortages, requiring the need to pay considerable overtime, as well as hire very costly contract (traveling) respiratory therapists to meet patient and service demands.

As the respiratory therapy profession continues to evolve, respiratory therapists are assuming more advanced roles in assessing and treating patients. This pattern will likely continue. As vital members of the healthcare team, particularly at academic medical centers such as UNMC/Nebraska Medicine, I endorse the preparation of respiratory therapists at the master's level.

I understand the extensive clinical education needs for all allied health professionals, including respiratory therapists. We have 20 very skilled and experienced full-time respiratory therapists on staff who are anxious to provide clinical education experiences for the students in the new respiratory therapy program.

Thank you for your leadership in developing this much needed program. I look forward to continuing to work with you in support of the development of the program to ensure that this vision becomes a reality.

Sincerely,

A handwritten signature in blue ink, appearing to read 'D. Gannon'.

David E. Gannon, MD, FACP, FCCP
Associate Professor of Medicine
Division of Pulmonary, Critical Care, and Sleep
University of Nebraska Medical Center
Critical Care Medical Director
Nebraska Medical Center
Phone: (402) 559-8336

UNIVERSITY OF
Nebraska
Medical Center

College of Medicine, Department of Internal Medicine, Division of Pulmonary, Critical Care and Sleep
987453 Nebraska Medical Center, Omaha, NE 68198-7453 | 402.559.8336 | dgannon@unmc.edu
<https://www.unmc.edu/intmed/divisions/pulm/index.html>



3/15/2021

Kyle P. Meyer, PhD, MS, PT, FASAHP
Dean, College of Allied Health Professions
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dr. Meyer,

I am writing to offer my strong endorsement and support for the proposal to develop a Master's entry-level respiratory therapist education program at the UNMC College of Allied Health Professions. As a respiratory therapist in our system and city, I can attest to both the value of, and the increasing demand for these professionals. Respiratory therapists have always been vital members of the healthcare team taking care of patients with a variety of cardiopulmonary conditions. The pandemic has brought to light just how important these individuals are in the delivery of high quality care.

As the President of the Nebraska Society for Respiratory Care it has been my experience that in the last twelve years we have had consistent workforce shortages requiring the need to pay considerable overtime as well as hire contract respiratory therapists across the state to meet patient and service demands.

As the respiratory therapy profession continues to evolve, respiratory therapists are assuming more advanced roles in patient assessment and treatment. I see this pattern continuing and I understand the extensive clinical education needs for all allied health professionals, including respiratory therapists. As vital members of the healthcare team, particularly at academic medical centers, I support and see the need to further develop respiratory therapists and this Master's level program will deliver that.

Thank you for your leadership in developing this much needed program. I look forward to continuing to work with you in support of the development of the program to ensure this vision becomes a reality.

Sincerely,

A handwritten signature in cursive script that reads "Heather K. Nichols".

Heather K. Nichols, MBA, BS RRT
Department Operation Lead Analyst, Emergency Medicine, University of Nebraska Medical Center
President of the Nebraska Society for Respiratory Care



March 9, 2021

Kyle P. Meyer, PhD, MS, PT, FASAHP
Dean, College of Allied Health Professions
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dear Dr. Meyer:

I am writing to offer my endorsement and support for the proposal to develop a master's entry-level respiratory therapist education program in the UNMC College of Allied Health Professions. As the Director of Emergency Services and Acute Care Support who sees the valuable services respiratory therapists provide our care teams, I can attest to both the value of, and the increasing demand for these professionals. Respiratory therapists have always been vital members of the healthcare team taking care of patients with a variety of cardiopulmonary conditions. The pandemic of the past year has brought to light just how important these individuals are in the delivery of high quality care.

As the Director of Emergency Services and Acute Care Support, it is my responsibility to align resources, including respiratory therapists, to staff daily hospital operations. For the past 2 years, we have experienced consistent workforce shortages, requiring the need to pay considerable overtime (sometimes mandatorily) and bonus, as well as hire contract respiratory therapists to meet patient and service demands

As the respiratory therapy profession continues to evolve, respiratory therapists are assuming more advanced roles in patient assessment and treatment. I see this pattern continuing. As vital members of the healthcare team, particularly at academic medical centers, I endorse the preparation of respiratory therapists at the master's level. This program would support Nebraska Medicine's mission in the community and region.

I understand the extensive clinical education needs for all allied health professionals, including respiratory therapists. We have 20 full-time respiratory therapists on staff who are anxious to provide clinical education experiences for the students in the new respiratory therapy program.

Thank you for your leadership in developing this much-needed program. I look forward to continuing to work with you in support of the development of the program to ensure this vision becomes a reality.

Sincerely,

Bill Koile, MS, MBA
Emergency Services and Acute Care Support Director
Nebraska Medicine
987444 Nebraska Medical Center, Omaha, NE 68198
402.552.3254
bkoile@nebraskamed.com



Coalition for Baccalaureate and Graduate Respiratory Therapy Education

Corporate Address: PO Box 392, 27 Spruce Lane
Tenants Harbor, Maine 04860-0392

May 3, 2021

Dr. Kyle Meyer
Dean, College of Allied Health Professions
University of Nebraska Medical Center
984000 Nebraska Medical Center
Omaha, NE 68198-4000

Dear Dr. Meyer,

The leadership of CoBGRTE supports the development of a master's degree respiratory therapy (RT) program at University of Nebraska Medical Center. Producing new respiratory therapists with the knowledge and skills needed for the 21st century has become increasingly important, especially considering the COVID-19 pandemic. There is a need to increase the number of respiratory therapists with advanced levels of training and education to meet the demands of providing services requiring complex cognitive abilities and patient management skills. Therefore, the CoBGRTE strongly encourages the continuing development of graduate RT education programs.

The US Bureau Labor Statistics notes the respiratory therapy profession is expected to grow much faster than average at a rate of 19%.¹ In April 2021, the New York Times listed respiratory therapy as one of top health care jobs on the rise.² In addition to the growth of the profession, the AARC 2020 Human Resource Survey notes that approximately 50% of all RTs will leave the profession by 2032.³

In 2009, the American Association for Respiratory Care (AARC) published the first of three reports on the AARC 2015 and Beyond conferences on the future direction of the profession. The first report addressed the following areas:⁴

- *What will the future health care system look like?*
- *What will be the roles and responsibilities of RTs in the future system?*

The AARC Board of Directors (BOD) accepted the direction for the future of health care and RTs roles and responsibilities as recommended in this report in April of 2012. The second report was published in 2010 addressed the competencies needed by respiratory therapists.⁵ The AARC BOD accepted the competencies as recommended in July of 2012. The third report, published in 2011, addressed the mechanisms by which the respiratory care workforce would acquire these needed competencies.⁶ Among other steps, this report recommended that entry level respiratory care education be (at a minimum) the baccalaureate level and the RRT credential be the entry level credential by the year 2020. In 2016, the AARC published its long awaited position paper on Respiratory Therapist Education.⁷ In publishing this paper, the AARC has taken a crucial step in advancing Respiratory Care as a true profession in the eyes of the medical community and governmental agencies. The AARC is on record that the education needed to enter professional practice as a respiratory therapist must be at a minimum of the baccalaureate level:

*“Training and education for entry-to-practice as a respiratory therapist should be provided within programs awarding a bachelor’s or master’s degree in respiratory care (or equivalent degree titles) and all newly accredited respiratory care educational programs must award, as a minimum, the bachelor’s degree in respiratory care (or equivalent degree title).”*⁷

Also, very important is the supportive response to the AARC position paper by the Commission on Accreditation for Respiratory Care (CoARC Response published on January 25, 2016). See excerpt below).⁸

“The CoARC acknowledges that respiratory therapists with baccalaureate and graduate education are needed in larger numbers to serve as educators, researchers, managers, clinical specialists, and other roles throughout the healthcare delivery system. Likewise, the CoARC recognizes the prominent role played by associate degree respiratory therapy programs. To support the increasing extent and complexity of the skills required of graduates of respiratory care programs and the associated movement of the profession toward baccalaureate and graduate degrees, the CoARC Board of Commissioners, in collaboration with the AARC, approved the following change to Standard 1.01 in the *Accreditation Standards for Entry into Respiratory Care Professional Practice*, to be effective January 1, 2018:

Except as provided in the following sentence, an educational sponsor must be a post-secondary academic institution accredited by a regional or national accrediting agency that is recognized by the U.S. Department of Education (USDE) and ~~must be~~ authorized under applicable law or other acceptable authority to award graduates of the program a ~~an associate or higher baccalaureate or graduate degree upon-at the~~ completion of the program.

We hope our letter demonstrates the level of support for new graduate programs needed to produce competent respiratory therapists for the 21st century over the next 10 years. In 2019, the AARC has published a position paper stated that by 2030 all RTs entering practice should hold a baccalaureate degree or higher in respiratory care.⁹ The number of BSRT and MSRT entry programs has increased but not at the pace needed to supply the workforce with RRTs with adequate education and training to meet the demands of complex current day healthcare delivery.¹⁰ As a strong medical center and leader in health professions education, the University of Nebraska Medical Center is poised to develop and implement a model RT master’s degree program. CoBGRTE strongly supports your efforts.

We hope the references above will help you feel confident in approving this important new master’s degree RT program at University of Nebraska Medical Center.

Sincerely,



Christy Kane, PhD, RRT, FAARC
President, CoBGRTE
ckane@bellarmine.edu



Thomas A. Barnes, EdD, RRT, FAARC
Executive Director, CoBGRTE
t.barnes@cobgrte.org

REFERENCES

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10. CoBGRTE list of BSRT and MSRT entry programs: [BSRT and MSRT Entry Programs](#) December 29, 2020

David Vines, PhD, RRT, FAARC, FCCP
Chair / Respiratory Care Program Director,
Department of Cardiopulmonary Sciences
College of Health Sciences

Rush University
College of Health Sciences
600 South Paulina Street
Suite 949 - AAC
Chicago, IL 60612

Tel. 312.942.4408
Fax: 312.563-7529
David_Vines@rush.edu
www.rushu.rush.edu



RUSH UNIVERSITY
COLLEGE OF HEALTH SCIENCES

6/15/2021

Dear Dr. Meyer:

I am writing to voice my support for a Master of Sciences Respiratory Therapy program at the University of Nebraska Medical Center. As an educator and leader of a clinical department in the profession and my role as the President of the National Board for Respiratory Care, I can assure you that there is a need for more MS programs in respiratory care.

Although a majority of entry-level programs in respiratory care are at the associate degree level, there is an effort by the American Association of Respiratory Care to raise the entry-level to a bachelor's degree by 2030. As more programs move toward a baccalaureate level, faculty will need to have a master's degree to meet regional accreditation standards. In addition, many leadership roles, such as department manager or director positions, also require the respiratory therapist to have a master's degree.

I have been a program director for an entry MS respiratory care program for over 10 years. I can attest to the clinical impact that this level of graduate can have at the bedside. Their ability to interpret and apply clinical research at the bedside has helped improve patient outcomes at Rush University Medical Center. The graduates' critical thinking ability has allowed more advanced "assess and treat" protocols as well as the implementation of a universal lung-protective ventilation strategy. Our respiratory care clinical services have received APEX awards from the AARC for our clinical excellence. We have also increased from limited publications in FY09 to numerous publications in FY21. However, more individuals are needed to conduct research to continue advancing the science in respiratory care.

As stated above, there are multiple professional needs for MS degree respiratory therapy/care programs. There is also a large demand in the market for this level of graduate. I routinely receive emails from employers around the country seeking to employ our MS graduates. This employer demand has increased due to the COVID-19 pandemic. The pandemic has also raised public awareness of the profession and created new opportunities for respiratory therapists. If I can answer any questions, please feel free to contact me.

Sincerely,

David Vines

David L. Vines, Ph.D., RRT, FAARC, FCCP
President of NBRC
Chair, Respiratory Care Program Director
Associate Professor, Department of Cardiopulmonary Sciences
Rush University Medical Center

Appendix D
Letter of Budgetary Support - College of Allied Health Professions



May 3, 2021

David Jackson, PhD
Vice Provost
University of Nebraska
3835 Holdrege
Lincoln, NE 68583-0743

Dear Dr. Jackson:

I am writing in support of the development of a new professional program, Masters of Respiratory Care, in the College of Allied Health Professions (CAHP) at the University of Nebraska Medical Center (UNMC). Specifically, I want to address the budget for the proposed program.

Should the proposal to develop a respiratory therapy education program be approved, the CAHP and UNMC have separate funding to support the initial 2 years of the startup of the program. The funding is available from college auxiliary activities, not from funds committed to supporting our existing programs. The startup of the respiratory therapy education program would have no negative financial impact on other programs in the CAHP. Tuition revenue for the proposed program is expected to commence with the first cohort of 30 students, anticipated in the Fall of 2023, and ultimately the program will generate tuition revenue sufficient to cover associated expenses.

The mission of the UNMC and the CAHP, as Nebraska's only public academic health science center is to offer health professions education programs to serve both the students and ultimately the citizens of Nebraska and the region. The CAHP is committed to educating the most highly-qualified allied health workforce, and believes there is a need in Nebraska and the region for graduate-level prepared respiratory therapists, and that this need will only increase in the years ahead.

As such, we are committed to the development of the proposed program, and the investment required to ensure the highest level of success.

Sincerely,

A handwritten signature in blue ink that reads "Kyle P. Meyer".

Kyle P. Meyer, PhD, MS, PT, FASAHP
Dean



College of Allied Health Professions
Office of the Dean
984000 Nebraska Medical Center
Omaha, NE 68198-4000 | 402.559.7428 | unmc.edu/alliedhealth/

**TABLE 1: PROJECTED EXPENSES - NEW INSTRUCTIONAL PROGRAM
UNMC Master of Respiratory Care**

	(FY2022) Year 1		(FY2023) Year 2		(FY2024) Year 3		(FY2025) Year 4		(FY2026) Year 5		Total
	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Personnel											
Faculty ¹	0.5	\$64,942	2.0	\$247,519	3.50	\$417,986	4.00	\$483,433	4.00	\$495,519	\$1,709,399
Professional											\$0
Graduate Assistants											\$0
Support Staff			0.50	\$34,057	1.00	\$69,817	1.00	\$71,563	1.00	\$73,352	\$248,789
Subtotal	0.5	\$64,942	2.5	\$281,576	4.50	\$487,803	5.00	\$554,996	5.00	\$568,871	\$1,958,188
Operating											
General Operating ²		\$16,235		\$70,394		\$121,951		\$138,749		\$142,218	\$489,547
Equipment ³		\$0		\$110,000		\$110,000		\$6,500		\$0	\$226,500
New or Renovated Space ⁴		\$0		\$200,000		\$100,000		\$0		\$0	\$300,000
Library/Information Resources											\$0
Other ⁵		\$30,000		\$45,000		\$32,000		\$5,500		\$0	\$112,500
Subtotal		\$46,235		\$425,394		\$363,951		\$150,749		\$142,218	\$1,128,547
Total Expenses		\$111,177		\$706,970		\$851,754		\$705,745		\$711,089	\$3,086,735

NOTE: All expenses are inflated at 2.5% per year.

¹ Faculty includes a program director, clinical education coordinator and two faculty.

² General operating expense includes faculty development, travel, office equipment and supplies, program events (convocation, professional ceremony, orientation), and typical marketing and recruiting costs.

³ Respiratory care involves the use of significant equipment resources such as hi-fidelity simulators and ventilators.

⁴ Classroom and laboratory space likely will require renovations and technology investments to ensure an outstanding student experience. Some funding may be needed for office renovations.

⁵ Projections include faculty recruitment and relocation expenses, one-time accreditation fees, and amplified program marketing and recruiting expenses in the first several years of the program.

**TABLE 2: PROJECTED REVENUES - NEW INSTRUCTIONAL PROGRAM
UNMC Master of Respiratory Care**

	(FY2022) Year 1	(FY2023) Year 2	(FY2024) Year 3	(FY2025) Year 4	(FY2026) Year 5	Total
Existing Funds ¹	\$111,177	\$706,970	\$434,727	\$0	\$0	\$1,252,874
Required New Public Funds						
1. State Funds						
2. Local Tax Funds (community colleges)						
Tuition and Fees ²			\$417,028	\$737,829	\$806,430	\$1,961,287
Other Funding						
Total Revenue	\$111,177	\$706,970	\$851,755	\$737,829	\$806,430	\$3,214,161

¹ College/Campus auxiliary funds will be used to support the program.

² Flat rate tuition will be charged based on the 2020-2021 approved rate for similar master's degree programs in the CAHP (\$367/credit hour for residents and \$965/credit hour for non-residents, inflated at 2.5% after the 2020-2023 tuition freeze expires). Net of 9% remissions on resident rates and 42% remissions on non-resident rates.

Tuition and Fees Revenue Calculation

Academic Year	2024	2025	2026	2027	
Number of Residents Matriculating 2024	16	\$322,960			
Number of Non-residents Matriculating 2024	4	\$212,300			
Number of Residents Matriculating 2025, on-going	18	\$534,672	\$568,260	\$583,020	
Number of Non-residents Matriculating 2025, on-going	6	\$433,237	\$498,816	\$511,286	
Tuition Generated		\$535,260	\$967,909	\$1,067,076	\$1,094,306
Projected Remissions = 9% resident, 42% non-resident		(\$118,232)	(\$230,080)	(\$260,646)	(\$267,212)
Net Revenue		\$417,028	\$737,829	\$806,430	\$827,094

Based on 55 credit hours in Year 1 and 27 credit hours in Year 2.

TO: The Board of Regents Addendum XI-A-7
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Establishment of Genome Editing and Education Center-Nebraska in the Department of Pharmacology and Experimental Neuroscience in the College of Medicine at the University of Nebraska Medical Center

RECOMMENDED ACTION: Approval to establish the Genome Editing and Education Center-Nebraska (GEEC-Nebraska) in the Department of Pharmacology and Experimental Neuroscience in the College of Medicine at the University of Nebraska Medical Center (UNMC)

PREVIOUS ACTION: None

EXPLANATION: The proposed UNMC Genome Editing and Education Center-Nebraska will transform its existing Mouse Genome Engineering Core Facility into a larger Academic Multidisciplinary Research Center. UNMC's current facility is used to create genetically engineered mouse models for researchers working to treat neurological and immunological dysfunctions, HIV and other viruses (including SARS-CoV-2), hearing and eye diseases, and various cancers. The core facility also supports many fields of basic science research. UNMC faculty and the core facility are recognized as global leaders in developing breakthrough genetic engineering technologies, some of which are used by the three major National Institutes of Health (NIH)-funded Knockout Mouse Phenotyping (KOMP) Centers (one located on each coast and one in Texas). The proposed Center will better position UNMC to scale up its scientific services to two to four times the number of investigators locally and globally, improve technologies further to address the problems of generating models for difficult-to-target genes, and perform these services for larger multi-disciplinary teams. One objective of the new Center will be to obtain an NIH KOMP Center designation, which will provide additional funding and identify the University as a primary resource for improving human and animal health in the Midwest and the world.

This proposal has been reviewed by the Council of Academic Officers; it also has been reviewed by the Academic Affairs Committee.

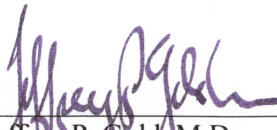
PROGRAM COST: \$591,000 for Year 1; \$1,051,000 over five years

SOURCE OF FUNDS: Extramural support, UNMC internal support, and revenue from core services

SPONSORS: H. Dele Davies
Senior Vice Chancellor for Academic Affairs

Jeffrey P. Gold, Chancellor
University of Nebraska Medical Center

RECOMMENDED:



Jeffrey P. Gold, M.D.
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

DATE:

July 16, 2021



May 12, 2021

Susan Fritz, Executive Vice President and Provost
University of Nebraska
3835 Holdrege Street
Lincoln, NE 68583
smfritz@nebraska.edu

Dear Provost Fritz:

I am forwarding you the materials relating to a proposed Genome Editing and Education Center- Nebraska (GEEC-Nebraska) to be administered by UNMC. This is a new application to transform UNMC's Mouse Genome Engineering Core Facility (MGEFCF) into an Academic Multidisciplinary Research Center. A major purpose of this proposal is to position UNMC to attract an NIH-designated KOMP/IMPC Center, of which there are none in the region. The current Core Facility is one of the leading laboratories in mouse genome editing technology development. Being in the mid-west region, a center designation will give UNMC a very high chance of attracting an NIH Center designation in the next few years.

Currently, similar to the KOMP centers, UNMC MGEFCF offers end-to-end services to develop mouse models for the scientific community within and outside of UNMC. Additionally, the UNMC MGEFCF has been outperforming other laboratories in terms of the number of models generated, and the number of investigators served when compared to the resources available at centers like KOMP. The center, once approved, will continue, expand, and improve current services and technologies.

This proposal has been reviewed, and it has my approval. I am requesting your review and approval and that it be reported to the Board of Regents at an upcoming meeting.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Jeffrey P. Gold'.

Jeffrey P. Gold, M.D.
Chancellor

University of Nebraska Medical Center

New Academic Center

Academic Centers include bureaus and institutes

I. Descriptive Information

Name of Institution Proposing New Center
University of Nebraska Medical Center
Name of Proposed Center
Genome Editing and Education Center- Nebraska (GEEC-Nebraska)
Name of the Programs (majors) Involved
Genome Editing, Animal models, Molecular Genetics, Genomics.
Other Programs Offered in this Field by Institution
None
Administrative Unit(s) for the Proposed Center [e.g. college, school, division, etc.]
College of Medicine, Department: Pharmacology and Experimental Neuroscience
Physical Location, if applicable
DRC II Room 1014 + Additional space to be allocated
Date Approved by the Governing Board
<i>Pending</i>
Proposed Date the Center will be Initiated
<i>Upon approval by the Coordinating Commission.</i>

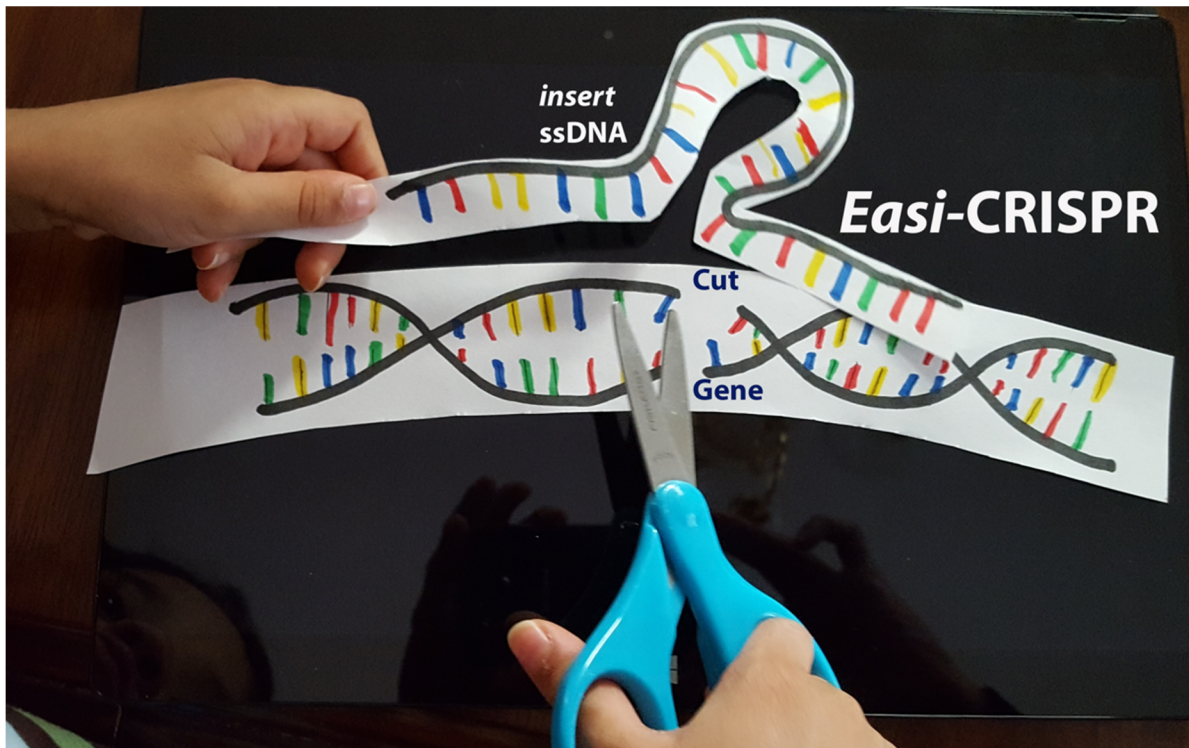
II. Review Criteria

A. Purpose and Context for the Center

Importance of animal models for understanding human physiology and for development of therapies for human and animal diseases. Invariably, all medicines approved for treating human and animal diseases have undergone prior testing in animal models. Experiments using animal models, such as mice, have also helped how our body works. Of all different laboratory animals, the mice are most predominantly used, because of the cost, their short life cycle and they also contain majority of the same type of genes that we humans have, and the molecular processes are highly similar between humans and mice. Nearly 70% of NIH funded research projects rely on mouse models. Another major reason why mouse has been a preferred laboratory animal species is that the genetic engineering technology to insert foreign genes into mice (called **transgenic mice**) or delete a gene of interest (called **knockout mice**) are well-established, and these technologies can create custom-made humanized mouse models suitable for studying numerous human diseases.

Several thousands of custom made mouse models have been developed so far, which are used for research to understand human physiology and disease. Here we provide two examples of custom made mouse models to emphasize their value for human health: *avatar mice* and *COVID19 mice*. **Avatar mice** represent miniature human cancer patients (termed “avatars”), wherein cancer cells from a patient are implanted into several groups of mice and each group of avatar mice are given different chemotherapy options to learn which chemotherapy works best against the patient’s cancer cells, and the clinicians can use this information for deciding a suitable chemotherapy regimen for the patient. If human cancer cells are implanted into regular (wild type) mice, they reject the cells because they are foreign to mice and the mouse immune system attacks human cells. Avatar mice are created by deleting several mouse immunological genes and inserting human genes in (through genetic engineering technology), so that the mice do not reject human cells. **COVID19 mouse models:** research community quickly learnt that SARS-CoV-2 does not infect mice because the protein receptor that the virus attaches on to human cell surface (called Ace2) is different in mice and the virus is unable to enter mouse cells. Fortunately, however, genetic engineering technology in mice are so advanced that human Ace2 gene can be transferred to mice to create humanized Ace2 mice that can be used for infecting SARS-CoV-2 and test medicines and vaccines against COVID19.

UNMC has been a global leader in developing breakthrough genetic engineering technologies, particularly the latest advance in the field called CRISPR (Clustered Regularly Interspersed Palindromic Repeats)-Cas system. UNMC has established a transgenic mouse core facility to create custom made genetically engineered mouse models for researchers working in various diseases including cancer, neuroscience, immunology, HIV, hearing, eye diseases, COVID19 research and many fields of basic science research. More importantly, the core has accomplished much more in this area by developing newer technologies and has earned a worldwide recognition. Specifically, a far simpler and a most robust version of CRISPR called, **Easi-CRISPR (Efficient additions with ssDNA inserts CRISPR)**, was developed at UNMC, which is now adapted at hundreds of laboratories worldwide as the method of choice for creating mouse models.



This is a proposal to transform UNMC’s Mouse Genome Engineering Core Facility (MGEFCF) into an Academic Multidisciplinary Research Center. The ultimate purpose of this proposal is to position UNMC to attract an NIH designated KOMP/IMPC Center. Specifics and additional details about the KOMP/IMPC program are described in section “I” (Constituencies to be Served), and we briefly describe the context of this application.

In April 2020, recognizing the outstanding accomplishments of the UNMC MGECEP, Dr. Bradley Britigan (Dean of the UNMC College Of Medicine) and Dr. Howard Gendelman (Chairperson of the Pharmacology and Experimental Neuroscience Department) enthusiastically agreed to support the launch of a new Center for Genome Editing Technologies. The new center will leverage UNMC's outstanding position in CRISPR mouse genome editing.

The NIH initiated a large-scale project, in 2006, called KnockOut Mouse Project (KOMP) with a goal to create knockout mice for every single gene in mice. The KOMP project has continuously funded three centers in the US, all located along coasts (approximately \$25-\$30M per center per 5 year period). By 2010 the focus of KOMP shifted from complete KO mice to conditional KO mice where a given gene is knocked out only in specific cells and at a certain stage of life in mice. In 2013, when CRISPR technology was first published, the mouse genetics community thought that it could radically change the mouse model generation workflow. However, many transgenic facilities worldwide, including the KOMP centers, were unable to use CRISPR technology for creating conditional KO mice. **The Easi-CRISPR technology developed at UNMC solved the major problem in the field which was the length of time it took to create a usable mouse model. The Easi-CRISPR method has now been adopted at the three NIH KOMP centers and is currently being used to develop important mouse models. Several of UNMC's scientific contributions (published in over a dozen articles in the past 5 years) have drawn significant attention from the NIH and from the transgenic mouse community worldwide, bringing attention to UNMC's strengths and capabilities.** The Director of MGECEP was also awarded a unique type of grant called the Outstanding Investigator Award from the National Human Genome Research Institute (NHGRI) for further improvement of the CRISPR technologies used for developing mouse models.

Workforce development: Currently the staff at UNMC MGECEP is the director, two technicians (3 FTEs) and a part time administrator. This core offers end-to-end services (including designing, construct generation, microinjection, genotyping up to germ line transmission, and breeding) while most cores offer mainly microinjection services. Excluding phenotyping and our mouse repository services, MGECEP core already operates similar to a mini-KOMP center. In the next three to four years, we aim to demonstrate to the NIH that: (a) we have infrastructure and capabilities on par with the existing KOMP centers, and; (b) that our unique technical capabilities will be particularly useful for the KOMP operations. Our specific plans to achieve KOMP status would be: (i) to recruit a few more technical personnel to the core which will allow us to develop new techniques and provide more services, (ii) this will increase our critical mass and provide the technical personnel necessary to compete for a center grant, and; (iii) to develop high throughput technologies and tools appropriate for plugging-in to the on-going operations of KOMP (through the use of the currently funded R35 grant to Dr. Gurusurthy).

In order to take the UNMC MGECEP's success to the next level (attracting a KOMP center to Nebraska, for example), MGECEP will need to achieve four major things: 1) scaling up of its scientific services by doubling or tripling in the next couple years, 2) offering those services to two to four times the number of investigators locally and globally, 3) improve technologies further to address the problems of generating models for difficult-to-target genes and 4) **more importantly perform these activities as part of a designated center at the University with multi-disciplinary teams of expertise utilizing and overseeing its services.** These activities should demonstrate to the funding agencies, such as NIH, that UNMC has exceptional faculty, well organized and functioning teams, plus the infrastructure and framework for initiating and operating a bigger center like KOMP. The launching of GEEC-Nebraska would be the first step in this direction, and will position the university to attract an NIH designated mouse genetics center like KOMP. **In addition, having an NIH designated center within the UN system will stimulate innovative research, contribute to the education and knowledge-sharing missions of the university and importantly it will also increase the skilled workforce and significantly contribute to the overall economic growth in Nebraska; the typical number of full time employees in the existing KOMP centers is 10-fold or more.**

This proposal builds upon a number of MGECEP core accomplishments made during the past half decade and extends the research to a larger number of investigators both inside and outside the University.

- MGECE laboratory has published a series of high impact papers on traditional transgenic technologies as well as the latest advanced technologies including the CRISPR-Cas (clustered regularly interspaced short palindromic repeats) system. Some of the MGECE papers are regarded as landmark papers in the field and several have been cited more than 50 times. Please see **Appendix A** for a list of 25 important papers from MGECE.
- Innovations made at the University of Nebraska Medical Center's (UNMC) MGECE, such as Efficient Additions with ssDNA inserts-CRISPR (*Easi*-CRISPR) and Genome editing by Oviductal Nucleic Acids Delivery (*i*-GONAD) methods, have been regarded as scientific breakthroughs *that have redefined transgenic technologies practiced for the last 30 years*".
- *Easi*-CRISPR and *i*-GONAD methods have now been adopted at over a hundred laboratories/core facilities worldwide.
- The inventions have earned the UNMC core director over 80 invitations for keynote talks and presentations, meetings and workshop organizations, and the prestigious position of serving as chair for sessions at international conferences (17 invitations in 12 countries).
- These scientific contributions have been instrumental in the awarding of NIH grants to UNMC researchers totaling 25M dollars and are responsible for the director receiving the **Outstanding Investigator Award from the National Human Genome Research Institute (NHGRI)**. This award allows the recipient complete flexibility to explore any research idea in the area of genomic technologies. See **Appendix B** for list of extramural funding received as a direct result of the technologies and/or mouse models developed at MGECE.
- **MGE Core's scientific accomplishments** have made several local, national and international news headlines (**See Appendix C**).
- **Attracted numerous collaborations, worldwide.** The UNMC MGECE work has attracted collaborations with diverse areas from neuroscience, immunology, developmental biology, virology and oncology. The director has demonstrated exceptional abilities in building and maintaining a large number of fruitful collaborations locally, nationally, and globally (see section H for list of external collaborations).
- **UNMC director received** one-of-a-kind NIH grant for developing CRISPR mouse genome engineering technologies and for advancing mouse genetics <https://www.genome.gov/news/news-release/NHGRI-announces-six-inaugural-genomic-innovator-awards>.
- **Developed breakthrough technologies:** PITT¹, *i*-PITT², CRISPR-First;PITT-next³, GONAD^{4,5}, *i*-GONAD⁶ & *Easi*-CRISPR^{7,8}. The research community regards MGECE contributions as *"breakthroughs that have redefined the previously Nobel Prize awarded transgenic technologies practiced for the last four decades"*⁹.

Important landmark papers relevant to MGECE's contribution on mouse genome engineering technologies

- 1 Ohtsuka M, Miura H, Sato M, Kimura M, Inoko H, Gurumurthy CB. PITT: pronuclear injection-based targeted transgenesis, a reliable transgene expression method in mice. *Exp Anim Jpn Assoc Lab Anim Sci* 2012;**61**:489–502.
- 2 Ohtsuka M, Miura H, Mochida K, Hirose M, Hasegawa A, Ogura A, *et al.* One-step generation of multiple transgenic mouse lines using an improved Pronuclear Injection-based Targeted Transgenesis (*i*-PITT). *BMC Genomics* 2015;**16**:274. <https://doi.org/10.1186/s12864-015-1432-5>.
- 3 Quadros RM, Harms DW, Ohtsuka M, Gurumurthy CB. Insertion of sequences at the original provirus integration site of mouse ROSA26 locus using the CRISPR/Cas9 system. *FEBS Open Bio* 2015;**5**:191–7. <https://doi.org/10.1016/j.fob.2015.03.003>.
- 4 Takahashi G, Gurumurthy CB, Wada K, Miura H, Sato M, Ohtsuka M. GONAD: Genome-editing via Oviductal Nucleic Acids Delivery system: a novel microinjection independent genome engineering method in mice. *Sci Rep* 2015;**5**:11406. <https://doi.org/10.1038/srep11406>.
- 5 Gurumurthy CB, Takahashi G, Wada K, Miura H, Sato M, Ohtsuka M. GONAD: A Novel CRISPR/Cas9 Genome Editing Method that Does Not Require Ex Vivo Handling of Embryos: GONAD: A Novel CRISPR/Cas9 Genome Editing Method. In: Haines JL, Korf BR, Morton CC, Seidman CE, Seidman JG, Smith DR, editors. *Curr. Protoc. Hum. Genet.* Hoboken, NJ, USA: John Wiley & Sons, Inc.; 2016. p. 15.8.1-15.8.12.
- 6 Ohtsuka M, Sato M, Miura H, Takabayashi S, Matsuyama M, Koyano T, *et al.* *i*-GONAD: a robust method for in situ germline genome engineering using CRISPR nucleases. *Genome Biol* 2018;**19**:25. <https://doi.org/10.1186/s13059-018-1400-x>.

- 7 Quadros RM, Miura H, Harms DW, Akatsuka H, Sato T, Aida T, *et al.* Easi-CRISPR: a robust method for one-step generation of mice carrying conditional and insertion alleles using long ssDNA donors and CRISPR ribonucleoproteins. *Genome Biol* 2017;**18**:92. <https://doi.org/10.1186/s13059-017-1220-4>.
- 8 Miura H, Quadros RM, Gurusurthy CB, Ohtsuka M. Easi-CRISPR for creating knock-in and conditional knockout mouse models using long ssDNA donors. *Nat Protoc* 2017;**13**:195.
- 9 Burgio G. Redefining mouse transgenesis with CRISPR/Cas9 genome editing technology. *Genome Biol* 2018;**19**:27. <https://doi.org/10.1186/s13059-018-1409-1>.

The overarching goal of the center will be to attract NIH funding to create a Nebraska Mouse Resource and Research Center (NMRRC). The NIH has a funding mechanism to support several centers called Mutant Mouse Resource and Research Center (NMRRC). The launching of a regional MMRRC center in Nebraska (NMRRC), will position UNMC to attract multi-million dollar program project grants from the NIH and it will increase the workforce and economic growth in Nebraska (described in the later sections).

The Center will have three objectives:

- **Research:** *The proposed center will develop novel technologies for animal genome engineering.*
- **Service:** *The center will offer services to internal and external researchers working on numerous human diseases and develop animal models suitable for their research.*
- **Education:** *The center will organize CRISPR and mouse genome editing workshops for new technologies. The director of the mouse genome engineering core has received over 80 invitations to deliver keynote talks, seminars and workshops worldwide. With the initiation of the center at UNMC, we will organize workshops at UNMC. The center will offer opportunities for teaching and training students, technicians and post-doctoral fellows including summer training programs for post-secondary students.*

The ultimate goal of these three objectives is to position UNMC to attract multi-million dollar program project grants from the NIH (see below) within 5-10 years.

B. Centrality to UNMC Role and Mission

The proposed center directly fulfills the UNMC missions of research innovation, services, and education as follows. **The UNMC MGE CF has excelled in research innovation (*several high impact methods and technologies have been developed at UNMC that are now followed as standard methods at hundreds of laboratories worldwide*).** The core has served numerous internal university researchers in addition to external research clients and has had significant impacts on their research projects. Our education and knowledge dissemination presentations are in high demand. *The MGE CF team has conducted highly popular workshops and offered seminars and lectures at conferences in several countries.* These activities have earned worldwide recognition for UNMC in the field of Genome Editing. The trajectory of these efforts—research innovation, education and services—will continue to climb and will be performed at an even higher level through the initiation of the GEEC-Nebraska Center. The work done by the center will raise the stature of the University with the ultimate goal for an NIH Designated Center to be established at UNMC in the next 5-10 years (see section I “**Anticipated Outcomes, Significance, and Specific Measures of Success**”).

C. Relationship of the proposal to the NU Five-Year Strategy

Broad themes of the NU Five-Year Strategy are:

- *student access and success,*
- *excellence in teaching and research,*
- *diversity and inclusion,*
- *partnerships, and*
- *fiscal effectiveness.*
- *Workforce development*

The goals of the GEEC-Nebraska align very well with these NU Five-Year Strategy themes as follows:

Student access and success: One of the objectives of GEEC-Nebraska is to provide education that will serve students at all levels. Specifically, the knowledge and the technologies developed at the center will be made available to the learning community through courses, lectures, seminars, and hands-on workshops.

Excellence in teaching and research: Genome editing technology is a very hot field. UNMC MGECF has made significant contributions to genome editing research already and the core director has received dozens of invitations for lectures and seminars all over the world. With the initiation of the GEEC-Nebraska center, we anticipate expanding the teaching of genome editing technologies and related applications and better serving the learning communities within and outside the state.

Diversity and inclusion: We anticipate recruiting additional workforce that includes faculty members and technicians. We thrive on fostering an Inclusive Culture and Environment while serving the community and expanding the GEEC-Nebraska team. The director of MGECF strongly believes in and practices diversity and inclusion. Dr. Gurumurthy was invited and is enrolled in an NIH mentoring and training program called Culture Change (C-Change) for leadership and diversity training; a one-year course that will be completed Fall 2021.

Partnerships: As evident in the list of collaborating institutes (see section H), UNMC MGECF has successfully partnered with research teams at dozens of institutes and universities external to the UN system. The initiation of GEEC-Nebraska is expected to greatly enhance the partnerships and collaborations that MGECF has established over the years.

Fiscal effectiveness: MGECF has developed highly efficient gene editing technologies (such as Easi-CRISPR and GONAD), which have reduced the costs of generating disease models by about one-third based on reducing the length of time from the one to two years that it used to take to make a model with the previous technologies. Easi-CRISPR technology can now produce a usable mouse model in approximately four to six months. With our demonstrated success in developing cost effective and efficient technologies and with additional newly trained workforce additions, we will be able to deliver the best (technologies and services and education) to the community.

Workforce development: Currently the staff at UNMC MGECF is the director and two technicians (three FTEs) and a part time administrator. This core offers end-to-end services (including designing, construct generation, microinjection, genotyping up to germ line transmission, and breeding) while most cores offer mainly microinjection services. Excluding phenotyping and our mouse repository services, MGECF core already operates similar to a mini-KOMP center. In the next three to four years, we aim to demonstrate to the NIH that: (a) we have infrastructure and capabilities on par with the existing KOMP centers, and; (b) that our unique technical capabilities will be particularly useful for the KOMP operations. Our specific plans to achieve KOMP status would be: (i) to recruit a few more technical personnel to the core which will allow us to develop new techniques and provide more services, (ii) this will increase our critical mass and provide the technical personnel necessary to compete for a center grant, and; (iii) to develop high throughput technologies and tools appropriate for plugging-in to the on-going operations of KOMP (through the use of the currently funded R35 grant to Dr. Gurumurthy).

D. Consistency with the Comprehensive Statewide Plan for Post-Secondary Education

GEEC-Nebraska will contribute to five specific areas of Nebraska's statewide goals listed in four (of the seven) chapters: <https://ccpe.nebraska.gov/sites/ccpe.nebraska.gov/files/CompPlan.pdf>

Postsecondary education for Nebraska's future (Chapter 1) and meeting the educational needs of students (Chapter 2): There is local, regional, national, and international interest in CRISPR-based technologies. Dr. Gurumurthy has received numerous inquiries from high school students, schoolteachers, industry and the general public, all wanting to learn more about CRISPR and to visit the lab to learn how it is done. Under the

education component of GEEC-Nebraska, this need will be served (see below). The director has given talks at Omaha high schools, public libraries, and to colleges (Kearney) and at science cafes. This will be expanded, and plans are already underway to organize workshops every 18 months to two years that will integrate multiple campuses including and beyond UNMC. The director brings extensive experience in teaching GE technology. Dr. Gurumurthy has received and accepted multiple invitations to deliver talks and to organize conferences and workshops all over the world, including Greece, Belgium, Australia, UK, Czech Republic, and India. We plan to partner with teaching faculties from UNL, UNK and UNO, where undergraduate teaching is a major focus. Some of the participating teaching faculty have been involved in highly successful learning programs such as the Institutional Development Award Program Networks of Biomedical Research Excellence (INBRE) (Kimberly A. Carlson, Ph.D., Professor & Assistant Chair, Biology Department, UNK – Geneticist) and uBEATS, STEM e-learning program which is a UNMC-UNO partnership under the leadership of Dr. Paul Davis [faculty advisor to the Molecular and Biomedical Biology (MBB) and B.S. degree program at UNO] and Dr. Dele Davies (Senior Vice Chancellor for Academic Affairs at UNMC).

Meeting the needs of the state: workforce development, research and technology transfer, serving citizens, using technology to meet state needs (Chapter 3). As mentioned above (section A “Purpose and context of the center”), launching of GEEC-Nebraska is expected to ultimately attract an NIH designated center like KOMP leading to the opportunity to increase the workforce of the Genome Editing center by 10 fold or more. Under this new designation as a center (GEEC-Nebraska), MGECEP will continue to do cutting edge research and technology development as well as present through workshops and provide additional teaching activities. The Center will transfer those technologies and disseminate knowledge to the learning community.

Meeting needs through exemplary institutions (Chapter 4): Through continued success of the GEEC-Nebraska Center and with the support of an NIH funded center like KOMP, we envision a strong probability that such an investment could lead to the launch of an institute (for example Genome Editing Institute), which would be targeted to develop in a decade or so.

Meeting educational needs through partnerships and collaboration (Chapter 5): The center expects to partner with the major institutions locally (Creighton University, Boys Town National Research Hospital) and the other campuses of the University of Nebraska system in addition to dozens of external institutes (see list in section H)

E. Evidence of Need and Demand

Laboratory mice constitute over 70% of all types of animal models used in biomedical research. Genetic engineering technologies, that became highly feasible in the mouse system during the past 3 decades, have made mouse models the most preferred genetic model system. When cost and feasibility are taken into account, the mouse becomes the animal model of choice for many researchers.

UNMC MGECEP has developed hundreds of models for UNMC researchers in the past decade allowing them to publish dozens of papers and earn grant awards of over \$25M in the past five to six years (see **Appendix B** for list of grants).

UNMC MGECEP is also regarded as a role model core facility, attracting a large number of external collaborators to use its services. Unlike transgenic mouse core facilities at other institutes, UNMC MGECEP offers end-to-end services including designing, construct generation, microinjection, genotyping, breeding to segregate mosaic mice, re-genotyping the offspring in the next (F1) generation, generating figures and writing of the technical sections for grants/manuscripts and consultation and knowledge-sharing with the PI’s team on their model/s. Due to these unique and exceptional services, UNMC MGECEP has attracted several external clients. A list of a few examples of our external client base includes the NIH, Harvard University, Stanford University, University of Miami, University of Utah, University of Minnesota, University of North Dakota, University of California San Francisco, University of California San Diego, and University of California Davis.

The UNMC MGECEP director has demonstrated exceptional collaborative skills and published several papers in high profile journals through those collaborations. In a recent example, the UNMC MGECEP director led a consortium of 17 institutes around the world (from seven countries), publishing a comprehensive research study, with 112 authors, designed to understand the reproducibility of various CRISPR based methods of generating mouse models.

By establishing a center, we will provide the opportunity to undertake similar activities at a much higher level, serving two to four times the number of research teams and investigators, which will further the breakthrough research success we have achieved to date. As stated in section A, *performing these activities as part of a designated center at the University with multi-disciplinary teams of expertise utilizing its services and overseeing its services will ultimately position UNMC to attract the support needed to become an NIH designated Center.* In turn this will bring more recognition and financial support along with workforce development and economic growth to Nebraska.

F. Organizational Structure and Administration

Director: *Channabasavaiah Gurumurthy (provides overall leadership and direction to the center).*

The Center members will include several key faculty (listed below) who have been using genetically engineered mouse models for basic and translational research for several decades and who are from multiple disciplines ranging from pharmacology to cancer research to neuroscience. These faculty will serve as key users and advisers of the new center. The availability of this local expertise and faculty-pool will also serve as a critical factor in demonstrating (to extramural funding agencies in the future) the outstanding environment and expertise available at UNMC when applying for major center grants such as KOMP.

Within the Pharmacology and Experimental Neuroscience Department

*Howard Gendelman, Pharmacology and Experimental Neuroscience
Larisa Poluektova, Pharmacology and Experimental Neuroscience
Santhi Gorantla, Pharmacology and Experimental Neuroscience
Xinglong Wang, Pharmacology and Experimental Neuroscience*

Outside the Pharmacology and Experimental Neuroscience Department

*Surinder Batra, Biochemistry and Molecular Biology
Mark Carlson, Surgery
Zeljka Korade, Pediatrics
Merry Lindsey, Physiology
Karoly Mirnics, Munroe-Meyer Institute
Wallace Thoreson, Ophthalmology*

Outside the UNMC campus

Investigator	Campus	Area of expertise: Research and/or Education
<i>Bruce Chase</i>	<i>UNO</i>	<i>Education-Genetics, Developmental Biology Advanced Genetics</i>
<i>Kimberly Clarkson</i>	<i>UNK</i>	<i>Research and Education- Biology and undergraduate teaching and STEM education and outreach research and Intracellular pathogens</i>
<i>Thomas Clemente</i>	<i>UNL</i>	<i>Plant Transformation Core Research Facility</i>
<i>Paul Davis</i>	<i>UNO</i>	<i>Research and Education, Toxoplasma research laboratory, undergraduate teaching, STEM education, K8 teaching and outreach</i>
<i>Jeff French</i>	<i>UNO</i>	<i>Research-Behavioral neuroscience- Marmoset model</i>
<i>Clayton Keling</i>	<i>UNL</i>	<i>Research- cattle genomics</i>
<i>Brandon Luedtke</i>	<i>UNK</i>	<i>Research and Education- Molecular Biology and undergraduate research and teaching and STEM education and outreach</i>

<i>Jay Reddy</i>	<i>UNL</i>	<i>Research- Mouse models and Veterinary Immunology</i>
<i>Donald Reynolds</i>	<i>UNL</i>	<i>Research-Poultry Veterinarian</i>
<i>William Tapprich</i>	<i>UNO</i>	<i>Research and Education- Molecular Biology and undergraduate research and teaching and STEM education and outreach</i>
<i>Paul Twigg</i>	<i>UNK</i>	<i>Research and education- plant molecular biology and STEM education, K8 teaching and outreach</i>
<i>Brett White</i>	<i>UNL</i>	<i>Research- Transgenic pig model core</i>

Advisory board

Howard Gendelman
Surinder Batra
Karoly Mirnics
Larisa Poluektova
Bradley Britigan

External advisory board will be formed once the center is officially launched.

G. Partnerships with Business

UNMC Mouse Genome Engineering core services have attracted multiple collaborations across the country and internationally (please see section H for the list of external collaborators that UNMC MGECEP has attracted during the past 4 years). Some collaborations have led to several research grants from NIH popularly known as R21 and R01 grants with collaborators outside of UNMC (R21 with University of Colorado in which Dr. Gurumurthy is a contact PI and R01 with University of Utah; recently funded). More collaborations are underway.

The technologies and innovations made at UNMC MGE have attracted collaborations with industries and startup companies. Two patents and one provisional patent have been submitted. One technology (Easi-CRISPR) is licensed to Taconic. Easi-CRISPR is one of the leading model generation companies in the world. Tailored Therapeutics, a startup company is establishing a research collaboration with UNMC to leverage the potential of Easi-CRISPR in CAR-T therapy for cancer. Similar to this, we anticipate multiple collaborations from industries in the future.

H. Collaborations with Higher Education Institutions External to the University

UNMC MGECEP has also been regarded as the role model core facility attracting a large number of external collaborators to use its services. Below is a list of external investigators and their institutes collaborating with MGECEP on Mouse Genetics Projects.

External to UN system		
	Investigator	Institute
Within state of Nebraska	Dominic Cosgrove	Boys Town National Research Hospital
	Barb Morley	Boys Town National Research Hospital
	Yesha Lundberg	Boys Town National Research Hospital
	Shanshank Dravid	Creighton University
	Laura Hansen	Creighton University
	David He	Creighton University
	Weston, Michael	Creighton University
	Kirk Beisel	Creighton University
Outside state of Nebraska	Suzanne Mansour	University of Utah
	Jarrod Barnes	University of Alabama
	Ying-Xian Pan	Rockefeller University
	Tekin Mustafa	University of Miami
	Vadim Gladyshev	Brigham and Women's Hospital
	Michael Green	MD Anderson Cancer Center
	Christopher Gregg	University of Utah
	Prashant Mali	University of California San Diego
	Kent Lloyd	University of California Davis
	Cynthia Morton	Brigham and Women's Hospital
	Jyotika Sharma	University of North Dakota
	Brian North	Creighton University
	Sunil Sudarshan	University of Alabama
	Doris Wu	NIH
	Cynthia Morton	Harvard University
Doris Wu	NIH	
Paul Bray	University of Utah	
Luca Brunelli	University of Utah	
Xue Zhong Liu	University of Miami	
International	Francois Lallemand	Karolinska Institute Sweden
	Guy Richardson	University of Sussex, UK
	Claus Nerlov	Oxford University, UK

Even though the institutes/universities of all these external investigators (except Creighton and BTNRH) have transgenic mouse cores, they choose to work with UNMC because of the scientific excellence and the unique array of services and consultation offered at the UNMC MGE core

Establishing a center will provide the opportunity to undertake similar and additional activities that will take this success to the next level, earning accolades and further recognition for the UN system.

I. Constituencies to be Served

The center anticipates serving about 40 to 50 investigators annually, both internal and external to UNMC.

Below is the list of 47 UN system investigators and 32 external investigators that used the services of the Mouse Genome Engineering Core Facility services during the past three years (2017-2020)

Internal to UN system Investigator	Institute
Karoly Mirnics	UNMC
Kishore Bhakat	UNMC
Merry Lindsey	UNMC
Steve Bonasera	UNMC/VA
Larisa Poluektova	UNMC
Santhi Gorantla	UNMC
Wallace Thoreson	UNMC
Sung-Ho Huh	UNMC
Aiming Peng	UNMC
Kyle Hewitt	UNMC
Tieshi Li	UNMC
Surinder Batra	UNMC
Hamid Band	UNMC
Vimla Band	UNMC
Donald Becker	UNL
Abdalla Meher	UNMC
Jyothi Arikath	UNMC
Kishore Bidasee	UNMC
Kaustubh Datta	UNMC
Punitha Dhawan	UNMC/VA
Amar Singh	UNMC/VA
Jixin Dong	UNMC
Dunaevsky Anna	UNMC
Howard Gendelman	UNMC
Richard Gumina	UNMC
Kyle Hewitt	UNMC
Michael Hollingsworth	UNMC
Kate Hyde	UNMC
Peter Kador	UNMC
Adam Karpf	UNMC
Woo-Yang Kim	UNMC
Robert Lewis	UNMC
Paras Mishra	UNMC
Ram Mahato	UNMC
Ali Naushad	UNMC
Babu Padanilam	UNMC
William Rizzo	UNMC
Nora Sarvetnick	UNMC
Pankaj Singh	UNMC
Joyce Solheim	UNMC

Anna Spagnoli	UNMC
Keer Sun	UNMC
Xinghui Sun	UNL
Sarah Thayer	UNMC
Kay-Uwe Wagner	UNMC
Nicholas Woods	UNMC
Janos Zempleni	UNL

In addition to internal investigators, a large number of external investigators from institutes throughout USA and international (listed in section H) will be served.

Anticipated Outcomes, Significance, and Specific Measures of Success

As described in the section ‘Purpose and Context for the Center’ above, mouse models have made tremendous contributions to our understanding of human physiology and for development of therapies for human and animal diseases. During the past few years, UNMC’s mouse genome engineering core has created a couple hundred mouse models for investigators working in various research fields such as cancer, neuroscience, immunology, HIV, hearing, eye diseases, COVID19 research and many fields of basic science research. The center anticipates developing a greater number of mouse (and other animal) models, expanding collaborations, publishing impactful papers, disseminating knowledge and protocols through courses and workshops and attracting additional extramural funding.

Number of mouse models: *Currently MGECECF generates about 15-20 mouse models per year for investigators. In years one and two, the center will aim to attract additional users and to increase model development to 20-25 models per year. By years four and five, the center plans to develop an average of 30 to 50 models per year.*

Number of users: *Currently MGECECF serves about 35-45 investigators per year. In years one and two, the center will increase the user base to 50-55 users. By year five, we will increase this number to over 75 users per year.*

Publications: *MGECECF has consistently published high impact papers in the genetic engineering field. Some papers published by the UNMC MGECECF are regarded as landmark papers in the field (related to Easi-CRISPR and GONAD technologies). The center will continue to be a leader in genetic engineering. Historically, MGECECF users publish 10-20 papers per year as a direct result of the research findings they were able to achieve using services received through the core. The center anticipates this number to increase and by year five we expect at least 50 core citations per year.*

Education/dissemination of knowledge: *The center will organize workshops and courses for students and technicians within and outside of UNMC*

Attracting extramural funding: *One of the major goals of the center will be to prepare UNMC to attract a multi-million dollar KOMP center grant from NIH, which is described in detail below.*

Background: *In 2006, the NIH started a large-scale program called Knockout Mouse Project (KOMP) to create knockout mouse models for every gene. Several global organizations then joined efforts to form International Knockout Mouse Consortium (IKMC). The IKMC’s goal was to complete nearly 90% of genes in the first two-phases (of a five-year plan); however, only about 25% of the genes were completed by 2013, the year when CRISPR slowed the project’s workflow. The focus was diverted by the developing CRISPR methods. None of the efforts to create conditional knockout mice were successful until 2017. **That was when UNMC’s Easi-CRISPR method drew the world’s attention.** Now, Easi-CRISPR has not only been adopted by hundreds of laboratories worldwide but it has also helped steer activities at the KOMP centers. For instance, the KOMP centers had gone back to creating old fashioned knockout mice rather than conditional knockouts (cKO) using the \$85M (\$28.3M each) funds they received in KOMP2 phase because technologies to create cKO models were not available.*

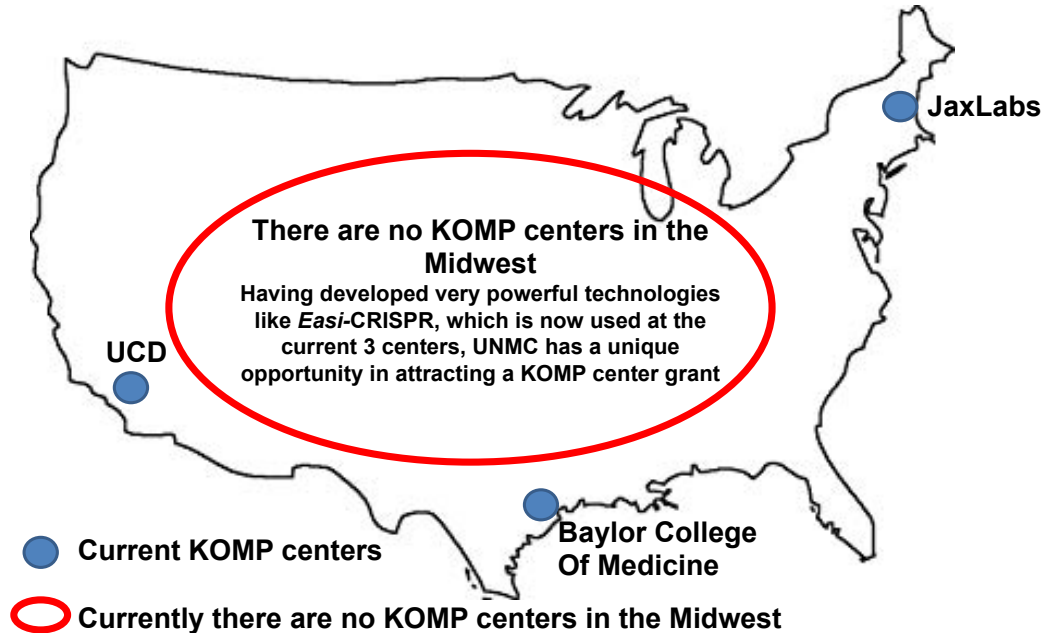
NIH has awarded its KOMP funds (>\$250M so far) to only three centers in the nation thus far (Jackson Labs in Maine, University of California Davis, and Baylor College of Medicine in Texas) which were all established over 10 years ago. Now, UNMC has made a significant impact in this field and we’ve drawn the attention of prominent NIH KOMP program officials (from NHGRI and Commons fund). Therefore, phase III funding could be

available to begin a KOMP center at UNMC to fill the noticeable gap in coverage for the Midwest region. The center plans to prepare our *organization and facility* to ultimately attract KOMP/IMPC program-project funding in the next 5-10 years.

Recently, IMPC released its strategic plan for the next 10 years (2021-2030). It proposes a strong commitment from the global funding agencies to support the development and use of mouse models for understanding and developing therapies against human diseases. https://www.mousephenotype.org/wp-content/uploads/2019/05/IMPC_Strategy_2021-30.pdf. IMPC lists six major goals for the next decade. The first three utilize CRISPR based technologies, particularly the ones developed at UNMC:

- **IMPC Goal One:** The IMPC will generate 8,000 new null alleles to complete the null resource. All mouse strains will continue to be made available and accessible through open access repositories to the global biomedical research community
- **IMPC Goal Two:** By 2025, the IMPC aims to be generating ~1,000 human coding disease-variant strains per year.
- **IMPC Goal Three:** By 2025, the IMPC aims to be generating around 500 targeted deletions of conserved noncoding elements (CNEs) per year.

Below is the current geographic distribution of KOMP/IMPC centers in the USA



Several funding opportunities will be available in the next 10 years through IMPC strategic plans. Anticipated funding amount received at each center would be about \$25-\$30M

There are no KOMP centers in the Midwest: having developed very powerful technologies like *Easi-CRISPR*, which is now used as the method of choice at the current three centers, UNMC has a unique opportunity to attract a KOMP center grant

The center will aim to attract IMPC funding in the next 5–10-year period with support from the GEEC-Nebraska center. Currently the staff at UNMC MGE core is the director, two technicians (three FTEs) and a part time administrator. The core offers end-to-end services (including designing, construct generation, microinjection, genotyping up to germ line transmission breeding) while most cores offer mainly microinjection services. Excluding phenotyping and mouse repository services, our core is already like a mini-KOMP center. In the next three to four years, we aim to demonstrate to the NIH that: (a) we have infrastructure and capabilities *on par* with the existing KOMP centers, and (b) our unique technical capabilities will be particularly useful for the KOMP operations. Our specific plans to achieve this would be: (i) to recruit a couple more technical personnel to the

core to help develop and provide more services, (ii) which will increase the critical mass of technical personnel necessary for competing for a center grant, and (iii) to develop high throughput technologies and tools appropriate for plugging-in to the on-going operations of KOMP. Through the initiation of “GEEC-Nebraska” and expanding the core services and activities, UNMC can be highly competitive in their application for the Phase III KOMP funding.

Beyond 5-10 years: With the initiation of GEEC-Nebraska, we would like to undertake research in technologies much bigger than CRISPR. We would like to take our success in developing impactful technologies to the next level. A new fascinating technology on the horizon is Genome Project-Write (GP-W). GP-W is a highly ambitious project where the whole genomes are written new, from scratch. In contrast to CRISPR technology that can “edit” the existing genomes, GP-W “writes” new genomes. The GP-Write project was recently conceived and launched by several prominent genomics technology-developers, led by Dr. George Church at Harvard University. Their ambition is to write the first human genome by 2025. GP-W is still in its infancy; many technologies are yet to be developed to accomplish its goals and fulfill its potential. Currently, the GP-W project is organizing the efforts of hundreds of scientists around the world in developing technologies. Dr. Church regards Dr. Gurumurthy as one of the leading experts in technology development and we plan to be involved with GP-M (M= mouse) in this large scale consortium.

A. Potential for the Center to contribute to Society and Economic Development

As stated in the above sections, GEEC-Nebraska will contribute to society and economic development in a number of ways. *First*, by performing world-class research and innovations, it will develop technologies that will advance scientific fields for multiple research groups (locally, nationally and globally) that are working from the basic research and into translational research areas. *Second*, it will contribute to the education and knowledge dissemination in teaching, training and technology transfer to students and researchers (technicians and post-doctoral trainees). *Third*, GEEC-Nebraska is expected to attract major grants to UNMC, such as KOMP, in the next 5-10 year period. *Fourth*, the center will provide opportunity to increase workforce (of the current core) to 10 fold or more. *Fifth*, the center will create several hundreds more of custom mouse models useful for scientists working in various fields of research such as cancer, immunology, HIV, hearing, eye diseases, Covid19 and many areas of basic research fields.

Beyond, mouse model generation and impacting several disciplines of basic and translational research, in the long run, establishing GEEC-Nebraska will most likely have a strong impact on local industries and the local economy. For example, CRISPR gene editing technology has been adapted to many areas of biology including agriculture and medicine, particularly for developing disease resistant crops or for combating infectious agents like viruses that infect livestock and humans. Here we provide a few examples of areas that could potentially benefit long-term from the scientific advances made by the GEEC- Nebraska. The first example is Costco’s site in Fremont, Nebraska to raise over 125 million chickens/yr. which is expected to generate business of \$1.2B. Deadly viruses like avian influenza can cause catastrophes to such businesses. Previous work done in Dr. Donald Reynolds laboratory at UNL, and by others, in understanding susceptibility differences of avian influenza in chickens versus ducks has shed some light on viral (hemagglutinin) and thrombocyte (cellular-receptor) genes. Further dissecting those molecular mechanisms was not easily possible earlier due to a lack of technologies. Now Easi-CRISPR can be a tool to undertake such studies that can help keep millions of birds healthy, and more importantly to become prepared for the worst—to protect the people of Nebraska, and the world, from public health consequences (because of the cross species infectability of influenza with other species including humans). Some examples of CRISPR developed livestock are cattle with no horns, which helps to avoid dehorning of the newborn calves, and super muscly pigs to produce lean meat. While such works used either the cumbersome traditional methods or the first-generation CRISPR technologies, where gene pieces were simply snipped out, newer technologies such as Easi-CRISPR (that have the capability to precisely insert new gene sequences), can open up an even broader range of possibilities to create designer crops and livestock species. Such accomplishments will undoubtedly change the world and will allow us to be able to feed the expected world population of 8.5B by 2030. Further, some scientists have already developed plants that can

metabolize carbon dioxide two or three times as fast as they otherwise would. Such plants can help solve the climate change issue of greenhouse gas emissions.

B. Adequacy of Resources:

1. Faculty/Staff

The key faculty needed for implementing the proposed program constitutes five members (Drs. Gurumurthy, Poluektova, Gorantla, Wang and Gendelman), all from the Pharmacology and Experimental Neuroscience. The primary staff of the mouse genome engineering core constitutes two highly skilled technicians Mr. Donald Harms and Mr. Rolan Quadros.

2. Physical Facilities and Equipment

No additional facilities or equipment needed.

3. Budget Projections *[see attached budget tables].*

Appendix A: List of 25 important papers from MGECE (* Corresponding author)

1. **Gurumurthy CB***, Quadros RM, Richardson GP, Poluektova LY, Mansour SL, Ohtsuka M. Genetically modified mouse models to help fight COVID-19. *Nat Protoc.* 2020 Dec;15(12):3777-3787. doi: 10.1038/s41596-020-00403-2. Epub 2020 Oct 26. PMID: 33106680; PMCID: PMC7704938.
2. Wu H, Petitpré C, Fontanet P, Sharma A, Bellardita C, Quadros RM, Jannig PR, Wang Y, Heimel JA, Cheung KKY, Wanderoy S, Xuan Y, Meletis K, Ruas J, **Gurumurthy CB**, Kiehn O, Hadjab S, Lallemand F. Distinct subtypes of proprioceptive dorsal root ganglion neurons regulate adaptive proprioception in mice. *Nat Commun.* 2021 Feb 15;12(1):1026. doi: 10.1038/s41467-021-21173-9. PMID: 33589589.
3. Urness LD, Wang X, Li C, Quadros RM, Harms DW, **Gurumurthy CB**, Mansour SL. Slc26a9P2ACre : a new CRE driver to regulate gene expression in the otic placode lineage and other FGFR2b-dependent epithelia. *Development.* 2020 Jul 8;147(13):dev191015. doi: 10.1242/dev.191015. PMID: 32541002; PMCID: PMC7358128.
4. Gomez-Ospina N, Scharenberg SG, Mostrel N, Bak RO, Mantri S, Quadros RM, **Gurumurthy CB**, Lee C, Bao G, Suarez CJ, Khan S, Sawamoto K, Tomatsu S, Raj N, Attardi LD, Aurelian L, Porteus MH. Human genome-edited hematopoietic stem cells phenotypically correct Mucopolysaccharidosis type I. *Nat Commun.* 2019 Sep 6;10(1):4045. doi: 10.1038/s41467-019-11962-8. PMID: 31492863
5. **Gurumurthy CB***, O'Brien AR, Quadros RM, Adams J Jr, Alcaide P, Ayabe S, Ballard J, Batra SK, Beauchamp MC, Becker KA, Bernas G, Brough D, Carrillo-Salinas F, Chan W, Chen H, Dawson R, DeMambro V, D'Hont J, Dibb KM, Eudy JD, Gan L, Gao J, Gonzales A, Guntur AR, Guo H, Harms DW, Harrington A, Hentges KE, Humphreys N, Imai S, Ishii H, Iwama M, Jonasch E, Karolak M, Keavney B, Khin NC, Konno M, Kotani Y, Kunihiro Y, Lakshmanan I, Larochelle C, Lawrence CB, Li L, Lindner V, Liu XD, Lopez-Castejon G, Loudon A, Lowe J, Jerome-Majewska LA, Matsusaka T, Miura H, Miyasaka Y, Morpurgo B, Motyl K, Nabeshima YI, Nakade K, Nakashiba T, Nakashima K, Obata Y, Ogiwara S, Ouellet M, Oxburgh L, Piltz S, Pinz I, Ponnusamy MP, Ray D, Redder RJ, Rosen CJ, Ross N, Ruhe MT, Ryzhova L, Salvador AM, Alam SS, Sedlacek R, Sharma K, Smith C, Staes K, Starrs L, Sugiyama F, Takahashi S, Tanaka T, Trafford AW, Uno Y, Vanhoutte L, Vanrockeghem F, Willis BJ, Wright CS, Yamauchi Y, Yi X, Yoshimi K, Zhang X, Zhang Y, Ohtsuka M, Das S, Garry DJ, Hochepped T, Thomas P, Parker-Thornburg J, Adamson AD, Yoshiki A, Schmouth JF, Golovko A, Thompson WR, Lloyd KCK, Wood JA, Cowan M, Mashimo T, Mizuno S, Zhu H, Kasperek P, Liaw L, Miano JM, Burgio G*. Reproducibility of CRISPR-Cas9 methods for generation of conditional mouse alleles: a multi-center evaluation, *Genome Biol.* 2019 Aug 26;20(1):171. doi: 10.1186/s13059-019-1776-2. PMCID: PMC6709553
6. **Gurumurthy CB***, Masahiro Sato, Ayaka Nakamura, Masafumi Inui, Natsuko Kawano, Md Atiqul Islam, Sanae Ogiwara, Shuji Takabayashi, Makoto Matsuyama, Shinichi Nakagawa, Hiromi Miura, Masato Ohtsuka*; Creating CRISPR-based germline genome engineered mice without ex vivo handling of zygotes by i-GONAD, *Nature Protoc.* 2019, doi:10.1038/s41596-019-0187-x, PMID: 31341289
7. Grassmeyer JJ, Cahill AL, Hays CL, Barta C, Quadros RM, **Gurumurthy CB**, Thoreson WB. Ca(2+) sensor synaptotagmin-1 mediates exocytosis in mammalian photoreceptors. *Elife.* 2019 Jun 7;8. pii: e45946. doi: 10.7554/eLife.45946. PMCID: PMC6588344.
8. **Gurumurthy CB**, Lloyd KCK. Generating mouse models for biomedical research: technological advances. *Dis Model Mech.* 2019 Jan 8;12(1). doi: 10.1242/dmm.029462. Review. PubMed PMID: 30626588.
9. Dagur RS, Branch-Woods A, Mathews S, Joshi PS, Quadros RM, Harms DW, Cheng Y, Miles SM, Pirruccello SJ, **Gurumurthy CB**, Gorantla S, Poluektova LY. Human-like NSG mouse glycoproteins sialylation pattern changes the phenotype of human lymphocytes and sensitivity to HIV-1 infection. *BMC Immunol.* 2019 Jan 7;20(1):2. PMC6322283.
10. Koczok K, **Gurumurthy CB**, Balogh I, Korade Z, Mirnics K. Subcellular localization of sterol biosynthesis enzymes. *J Mol Histol.* 2018 Dec 8. doi:10.1007/s10735-018-9807-y, PMID: 30535733.
11. Roth TL, Puig-Saus C, Yu R, Shifrut E, Carnevale J, Li PJ, Hiatt J, Saco J, Krystofinski P, Li H, Tobin V, Nguyen DN, Lee MR, Putnam AL, Ferris AL, Chen JW, Schickel JN, Pellerin L, Carmody D, Alkorta-Aranburu G, Del Gaudio D, Matsumoto H, Morell M, Mao Y, Cho M, Quadros RM, **Gurumurthy CB**, Smith B, Haugwitz M, Hughes SH, Weissman JS, Schumann K, Esensten JH, May AP, Ashworth A, Kupfer GM, Greeley SAW, Bacchetta R, Meffre E, Roncarolo MG, Romberg N, Herold KC, Ribas A, Leonetti MD, Marson A. Reprogramming human T cell function and specificity with non-viral genome targeting. *Nature.* 2018 Jul 11. doi: 10.1038/s41586-018-0326-5. PMID: 29995861.

12. McMillan JM*, Cobb DA, Lin Z, Banoub MG, Dagur RS, Branch Woods AA, Wang W, Makarov E, Kocher T, Joshi PS, Quadros RM, Harms DW, Cohen SM, Gendelman HE, **Gurumurthy CB***, Gorantla S, Poluektova LY*. Antiretroviral drug metabolism in humanized PXR-CAR-CYP3A-NOG mice. *J Pharmacol Exp Ther*. 2018 Feb 23. pii: jpet.117.247288. doi: 10.1124/jpet.117.247288. [Epub ahead of print] PMID: 29476044.
13. Miura H, Quadros RM, **Gurumurthy CB***, Ohtsuka M*. Easi-CRISPR for creating knock-in and conditional knockout mouse models using long ssDNA donors. *Nat Protoc*. 2018 Jan;13(1):195-215. doi: 10.1038/nprot.2017.153. PMID: 29266098.
14. Jung EM, Moffat JJ, Liu J, Dravid SM, **Gurumurthy CB**, Kim WY. Arid1b haploinsufficiency disrupts cortical interneuron development and mouse behavior. *Nat Neurosci*. 2017 Dec;20(12):1694-1707. doi: 10.1038/s41593-017-0013-0. PMCID: PMC5726525.
15. Quadros RM, Miura H, Harms DW, Akatsuka H, Sato T, Aida T, Redder R, Richardson GP, Inagaki Y, Sakai D, Buckley SM, Seshacharyulu P, Batra SK, Behlke MA, Zeiner SA, Jacobi AM, Izu Y, Thoreson WB, Urness LD, Mansour SL, Ohtsuka M, **Gurumurthy CB***. Easi-CRISPR: a robust method for one-step generation of mice carrying conditional and insertion alleles using long ssDNA donors and CRISPR ribonucleoproteins. *Genome Biol* 2017;18: <https://doi.org/10.1186/s13059-017-1220-4>
16. Jacobi AM, Rettig GR, Turk R, Collingwood MA, Zeiner SA, Quadros RM, Harms DW, Bonthuis PJ, Gregg C, Ohtsuka M, **Gurumurthy CB***, Behlke MA*. Simplified CRISPR tools for efficient genome editing and streamlined protocols for their delivery into mammalian cells and mouse zygotes. *Methods*. 2017 May 15;121-122:16-28. doi: 10.1016/j.ymeth.2017.03.021. PubMed PMID: 28351759.
17. Schilit SL, Ohtsuka M, Quadros RM, **Gurumurthy CB***. Pronuclear Injection-Based Targeted Transgenesis. *Curr Protoc Hum Genet*. 2016 Oct 11;91:15.10.1-15.10.28. PMID: 27727435
18. **Gurumurthy CB***, Grati M, Ohtsuka M, Schilit SL, Quadros RM, Liu XZ. CRISPR: a versatile tool for both forward and reverse genetics research. *Human Genetics*. 2016; 135 (9) : 971-976, PMCID PMC5002245.
19. Huang K, Zhang J, O'Neill KL, **Gurumurthy CB**, Quadros RM, Luo X. Cleavage by Caspase 8 and Mitochondrial Membrane Association Activate Bid during TRAIL-induced Apoptosis. *J Biol Chem*. 2016 Apr 6. pii: jbc.M115.71105.1PMID: 27053107.
20. **Gurumurthy CB***, Takahashi G, Wada K, Miura H, Sato M, Ohtsuka M. GONAD: A Novel CRISPR/Cas9 Genome Editing Method that Does Not Require Ex Vivo Handling of Embryos. *Curr Protoc Hum Genet*. 2016 (88):15.8.1-15.8.12. PMID: 26724720
21. Quadros R, Poluektova L, **Gurumurthy CB***: Simple and Reliable Genotyping Protocol for Mouse Prkdc^{SCID} Mutation. *J Immunol Methods*. Volume 431, April 2016, Pages 60–62. PMID: 26851521.
22. Mir RA, Bele A, Mirza S, Srivastava S, Olou A, Ammons SA, Kim JH, **Gurumurthy CB**, Qiu F, Band H, Band V. A novel interaction of ECD protein with R2TP complex component RUVBL1 is required for the functional role of ECD in cell cycle progression. *Mol Cell Biol*. 2015 Dec 28. pii: MCB.00594-15. [Epub ahead of print] PMID: 26711270
23. **Gurumurthy CB***, Joshi PS, Kurz SG, Ohtsuka M, Quadros RM, Harms DW, Lloyd KC. Validation of simple sequence length polymorphism regions of commonly used mouse strains for marker assisted speed congenics screening. *Int J Genomics*: 2015, 735845.
24. Quadros RM, Harms DW, Ohtsuka M, **Gurumurthy CB***. Insertion of sequences at the original provirus integration site of mouse ROSA26 locus using the CRISPR/Cas9 system. *FEBS Open Bio*. 2015, 5: 191-197.
25. Harms DW, Quadros RM, Seruggia D, Ohtsuka M, Takahashi G, Montoliu L, **Gurumurthy CB***. Mouse Genome Editing Using the CRISPR/Cas System. *Curr Protoc Hum Genet*. 2014, Editor. Board Jonathan Haines AI 83, 15.7.1–15.7.27.

Appendix B for list of extramural funding received as a direct result of the technologies and/or mouse models developed at MGECE.

Grant	Period	Direct cost	Indirect cost	MGECE contribution in the grant proposal that impacted the funding decision
R24OD018546 Larisa P	07/2014-06-2018	\$1,943,073	\$981,252	Established so called speed congenics method which was the key strength of the proposal to earn this award (Dr. Poluektova can provide more information)
P30GM110768 Shelley S	09/2014-08/2019	\$3,690,000	\$1,080,800	Mouse Core section received the best scores (1s & 2s) among 5 other cores, and was crucial for this grant to be funded
R01NS091220 Woo Y Kim	03/2015-02/2020	\$1,665,950	\$541,748	Designed & developed mouse models, which served as crucial tools for the Nature Neuroscience paper and for this funding
R01GM118437 Xu Luo	09/2017-08/2021	~ \$1,100,000	~ \$570,000	Designed and developed CRISPR reagents for a number of Apoptosis gene-knockouts in cells
R01CA210637 Ponnusamy M	06/2017-05/2022	~\$1,200,000	~\$620,000	Designed and developed mouse models , which served as crucial tools for the Easi-CRISPR paper and for this funding
R01CA222907 Mark Carlson	04/2018-03/2021	~ \$1,150,000	~\$600,000	Contributed to CRISPR genome editing strategies proposed
P01CA217798 S Batra Surinder	06/2018-05/2023	~\$5,200,000	~\$2,800,000	Designed and developed Muc16 conditional knockout model, one of the most difficult genes for which the existing transgenic technologies would not work.
R35HG010719 Gurumurthy	09/2019-08/2024	~\$1,500,000	~\$750,000	Development of Modular CRISPR Genome Editing Technologies and Tools
21GM129559 Gurumurthy	07/2019-06/2022	~\$275,000	~\$140,000	Engineering Long ssDNA for Genome Editing Applications
21AI143394 Poluektova/Gurumurthy	04/2019-03/2022	~\$425,000	~\$220,000	Development of humanized transgenic mice for HBV/HIV co-infection studies
Total financial benefits to UNMC		\$18.3M	\$8.4M	

Appendix C: Local, National and International news headlines about MGECF scientific contributions

- http://www.omaha.com/livewellnebraska/molecular-scissors-used-in-gene-editing-receive-an-upgrade-courtesy/article_2ebb9930-07ec-5ad6-8b93-fc87e0059fe9.html
- <https://www.omahamagazine.com/2020/01/02/300961/using-cut-and-paste-to-edit-out-human-disease>
- <http://blog.addgene.org/easi-crispr-generating-knock-in-and-conditional-mouse-models>
- <https://www.technologynetworks.com/genomics/articles/easi-crispr-technology-could-revolutionize-animal-testing-299680>
- <https://www.unmc.edu/news.cfm?match=24317>
- <https://www.genengnews.com/gen-articles/genome-editing-explores-new-depths/5924>
- https://www.aucd.org//template/news.cfm?news_id=13312
- <https://www.technology.org/2018/01/09/easi-crispr-thanks-to-a-new-method-gene-editing-becomes-much-easier/>
- <http://www.genengnews.com/gen-articles/toward-a-faster-easier-more-precise-crispr/6224>
- <https://www.sciencedaily.com/releases/2017/05/170518134954.htm>
- <https://www.genomeweb.com/gene-silencinggene-editing/research-team-creates-crispr-strategy-more-efficient-engineering-animal>
- <https://www.technologynetworks.com/genomics/news/an-easi-crispr-recipe-for-creating-the-perfect-mouse-model-295847>
- <http://blogs.biomedcentral.com/on-biology/2017/12/15/best-of-2017-genome-biology/>
- <https://www.unmc.edu/news.cfm?match=21425>
- http://www.dailynebraskan.com/news/unmc-researchers-assist-with-curing-cancer-in-mice-with-genome/article_7ee5054a-b0b1-11e8-8896-ffaa41ffedb2.html
- https://images.apollo.ai/articles/pdfs/2511573_240_07-25-2018.pdf
- <https://www.spreaker.com/user/9808558/dr-guru-07-17>
- <https://www.bigtenrc.org/member-feature-university-of-nebraska-medical-center/>
- <https://www.genome.gov/news/news-release/NHGRI-announces-six-inaugural-genomic-innovator-awards>
- <http://www.wowt.com/content/news/UNMC-scientists-cure-cancer-in-mice-488322711.html>



7005 Durham Research Center
985870 Nebraska Medical Center
Omaha NE 68198-5870
Office (402) 559-5455
Lab (402) 559-7754
FAX (402) 559-6650
Email: sbatra@unmc.edu

University of Nebraska Medical Center

Associate Director of Education and Training
Fred and Pamela Buffett Cancer Center
Eppley Institute for Research in Cancer

Surinder K. Batra, MSc., Ph.D.

Stokes-Shackelford Professor and Chairman
Department of Biochemistry and Molecular
Biology, College of Medicine

May 14, 2021

Re: Letter of support for Genome Editing and Education Center-Nebraska (GEEC-Nebraska)

Dear Members of the NU Board of Regents:

As the chair of the Department of Biochemistry and Molecular Biology at UNMC, College of Medicine, I am writing this letter to support the Genome Editing and Education Center-Nebraska (GEEC-Nebraska) proposal submitted by Dr. Gurumurthy. As we all know, CRISPR genome editing, which received a Nobel prize last year, is a revolutionary technology that has impacted multiple fields of biology including medicine and agriculture. It is a right time now for research and education institutes like UNMC to invest in the CRISPR technology.

Dr. Gurumurthy, while serving as the director of UNMC's mouse genome engineering core facility has made significant contributions in the field of CRISPR genome editing. Of note, he developed technologies like Easi-CRISPR, which has solved one of the major problems of the first version of CRISPR that could not be used for generating widely usable mouse models.

A large number of research projects in my laboratory use genetically engineered mouse models. Unfortunately, the majority of the genes that my laboratory is interested in are quite complex containing highly repetitive sequences. They are not easy for generating models like conditional knockout and inducible transgenic mice. In fact, we had tried collaborating with other well-known service laboratories including NIH funded KOMP centers for generating the models without success. A few years ago when the CRISPR technology was very new, Dr. Gurumurthy, director of UNMC's mouse genome engineering core facility, had some elegant ideas of technology development and he was looking for collaborators (that are willing to use his innovative ideas for generating mouse models). He pitched some of those ideas with me for collaboration. His collaboration with my team, combined with his innovative technology development ideas (like Easi-CRISPR) led to several high impact publications. Dr. Gurumurthy and I have published 5 papers together (3 from his laboratory and 2 from mine) which have been already cited highly. His technologies and the mouse models he developed have also helped us in getting NIH grants. Specifically, two of the models he developed were key reagents for receiving one of our program projects and two R01s.

About 2 years ago, Dr. Gurumurthy discussed with me his big idea grant submitted to NU. I was very impressed with the idea because of its high potential of impacting large number of researchers at UN system including students. I am very glad to hear that UNMC is interested in initiating a Center in the theme of genome editing.

I would be delighted to be part of the center serving as an advisory committee member and I strongly support launching of the Center. Please do not hesitate to contact me if you need further information in support of the center application.

Sincerely,



Surinder K. Batra, Ph.D.
Professor & Chair,
Department of Biochemistry and Molecular Biology,
Dr. Alfred and Linda Hartmann Chair of Biochemistry and Molecular Biology
Associate Director for Translational Research, Fred & Pamela Buffett Cancer Center, Eppley Institute
for Research in Cancer

Enclosures

cj/SKB

May 8, 2021

Re: Letter of support for the Genome Editing and Education Center-Nebraska
(GEEC-Nebraska)

Dear Board and Regents of the University of Nebraska,

Greetings! I write this letter with the greatest of enthusiasm in support of the establishment of the GEEC-Nebraska Center. I have seen the growth, implementation, development and impact of this research first-hand. Indeed, the work moving forward has already seen dozens of new human disease models, propelled research efforts amongst many faculties and have led to new support for many research investigators in our state of Nebraska and globally. To our own University ends we have made the first humanized mouse model of Alzheimer's disease, helped secure innovative models for the neurological manifestations of HIV/AIDS, developed novel cancer therapies and propelled efforts to find a final cure for a spectrum of inflammatory, infectious and degenerative disease. Other examples include those of Drs Surinder Batra and Donald Reynolds whose pioneering work has led to a greater understanding of the causes and remedies of cancer and viral diseases were supported directly through these works. For the latter, the susceptibility differences of avian influenza in chickens were made possible through studies of the viral (hemagglutinin) and thrombocyte (cellular receptor) genes and aided by this research and its activities. Further dissecting those molecular mechanisms of human diseases was moved forward through the proposed center's technologies. Easi-CRISPR was one tool now used to generate the science to deal directly with a myriad of current and future potential public health needs and the proposed remedies. I myself see this Center as the future of our biomedical research efforts for the state, the country and the world. Please do not hesitate to contact me if further questions do arise in a favorable judgment in moving this important and timely proposal forward.

Sincerely yours,



Howard E. Gendelman, M.D.
Margaret R. Larson Professor of Internal Medicine and Infectious Diseases
Professor and Chairman, Department of Pharmacology and Experimental Neuroscience

May 11, 2021

To whom it may concern

With great enthusiasm, I am writing this letter to support Dr. Gurumurthy Channabasavaiah (Guru)' efforts to establish the Genome Editing and Education Center-Nebraska. At the outset, I know Guru for over 10 years and I have received unmeasurable support on various aspects of his genomic technological platforms, which really gave a new direction to our research. To exemplify a few of these, Guru was instrumental in generating the T cell receptor transgenic mice for the first time to one heart protein, and his collaboration has led me to secure NIH grants, which otherwise was not possible.

Guru brought to my attention about the big idea grant in 2019 and as I was excited to learn about his vision to develop a center described above, a few of my colleagues joined me to participate in this grant submission. Although, not funded, Guru's conviction stayed strong and I simply hope that his efforts will pay all of us as Nebraska residents and the research community. I say this with an element of emotion that if all of us as one Nebraska University unit cannot establish a cutting-edge center described above, who else can take such an initiative, is my thinking. Hope that we will not be too late in competing with others in the region or across the country.

I am a strong believer that our actions must speak better than words, and establishing a center is not a joke. Fundamentally, everything must be right, and the most important element is the need to have a committed individual on board to initiate the process. In that direction, I cannot think of any other better individual than Guru. He has a good breadth of expertise in life sciences, most importantly, molecular biology. This includes, cutting edge technologies such as CRISPR genome editing (Easi-CRISPR), i-GONAD, and CRISPR-First: PITT-next. In fact, he is a cofounder of Easi-CRISPR technology that has earned him a remarkable success, and reputation in the research community. I am very pleased to note such an advancement has been made in our own sister concern institute. I begin to wonder, how many people are out there to have 'all-in one' category i.e., DVM education, PhD in virology; postdoc training in the mouse genetics and expertise in the cutting-edge technologies, and an MBA degree. I am sure that all of these qualities synergistically help him to establish the proposed centre quite successfully.


Speaking about my own research about the utility of the centre, we focus on the determination of immune mechanisms of non-ischemic heart diseases and their prevention. One such condition is dilated cardiomyopathy (DCM) and ~50% of those affected undergo heart transplantations due to the lack of effective chemotherapeutic options. The estimated cost of caring for DCM patients is more than \$7 billion annually

in the U.S alone. Serendipitously, a discovery was made that deficiency of taurine, an essential amino acid, can lead to the development of DCM in dogs and cats. However, recent investigations suggest that taurine deficiency can lead to pathological changes that can affect various organs such as, heart, eye, pancreas, liver, kidney and brain, in addition to modulating immune functions. However, it has been a challenge to mechanistically delineate the functionalities of taurine in these tissues involving a complex mixture of cells, since all express receptors for taurine. Thus, we propose to use CRISPR technology to conditionally knockout the taurine-receptor organ-specifically, such that receptor expression (on and off) can be controlled that can serve as an excellent platform to dissect taurine's biology in human and animal health and disease. Likewise, we propose to use CRISPR-based tools to engineer some of the vaccine candidates that we have recently identified in the prevention of both heart and pancreatic diseases by developing edible vaccines in the plants.

In summary, I am glad to have an opportunity to share my thoughts as to the vision of the proposed centre under the leadership of Guru both in the context of my own research and also other stakeholders of NE. Personally, Guru is a passionate individual and he makes extraordinary commitments, and very selflessly extend his helping hand when needed. I wish him all the very best in his attempts to establish this centre within our own state of Nebraska.

Please do not hesitate to contact me, if you need any additional information for your evaluations.

Sincerely,



Jay Reddy, MVSc., PhD
Professor
Ph: (402) 472 8541
Fax: (402) 472 9690
E-mail: nreddy2@unl.edu
Web: <http://jayreddy.unl.edu>

May 9, 2021

Re: Letter of support for the Genome Editing and Education Center-Nebraska (GEEC-Nebraska)

Dear Members of the NU Board of Regents:

It is my great pleasure as dean of the UNMC College of Medicine to provide my highest level of endorsement for the establishment of the Genome Editing and Education Center-Nebraska (GEEC-Nebraska), which will function under the direction of Dr. Channabasavaiah Gurumurthy, Professor of Pharmacology and Experimental Neuroscience. Genetically engineered animal models of human disease have become a mainstay of research into pathogenesis, prevention, and treatment of these diseases. One of the most highly impactful advances in biomedical research in the last several decades has been the development of clustered regularly interspaced short palindromic repeats (CRISPR)-based genome editing technologies. This technology allows targeted and rapid editing of genes at both a cellular and whole animal level. Indeed, CRISPR is being explored as a treatment of human genetic diseases such as beta thalassemia and sickle cell anemia. This technology has already begun to revolutionize medicine.

This new center will result from a transformation of UNMC's Mouse Genome Engineering Core Facility (MGEFCF) into an Academic Multidisciplinary Research Center. It will utilize the and build of the unique accomplishments that director and other members of the proposed center have already achieved. Most notable has been the development of novel technology that enhances the ability to utilize CRISPR, including Efficient Additions with ssDNA inserts-CRISPR (*Easi-CRISPR*) and Genome editing by Oviductal Nucleic Acids Delivery (*i-GONAD*) methods. These approaches are both major breakthroughs transgenic technologies. These UNMC approaches are now being utilized by over one hundred laboratories across the globe.

The research to date at UNMC has already resulted in \$25M in grant funding, including the highly prestigious outstanding investigator award from the NHGRI to the director of the proposed center, Dr. Gurumurthy. As detailed in the application, numerous current and potential users and members of the center, both within and outside UNMC, have already been identified. Thus, there is no question that the timing is right for the establishment of the center to further and support the use of CRISPR technology and development of animal models of disease at UNMC.

In summary, CRISPR technology is one of the most impactful advances in biomedicine in decades. We are fortunate at UNMC to have faculty and staff who have demonstrated their abilities to lead the field in the sue of CRISPR technology. It is timely and important for the advance of gene-based science at UNMC that the center proposed move forward. Therefore, this application has my full support and I will work with its leadership to assure its success.

Sincerely,



Bradley E, Britigan, M.D.
Stokes-Shackelford Professor and Dean

May 6, 2021

Channabasavaiah Gurumurthy, MVSC, PhD, Exec. MBA
Director, Mouse Genome Engineering Core Facility
Durham Research Center II 1030/8187
985930 Nebraska Medical Center
Omaha, NE 68198-5930

RE: Genome Editing and Education Center-Nebraska

Dear Dr. Gurumurthy:

Greetings! It is my pleasure to write this letter of support for the Genome Editing and Education Center-Nebraska. The Genome Editing and Education Center-Nebraska has a very well-devised plan for success, which I endorse and support. One of the goals in creating this Center is to further develop the infrastructure, services, resources, educational opportunities, and community relationships for not only the University of Nebraska System, but the state as a whole. I can attest that my campus will benefit from such a Center. At the University of Nebraska at Kearney (UNK), teaching and education are paramount. We utilize the research setting as a teaching and mentoring tool for students, as well as our own research interests. I have a strong connection with UNMC, especially in terms of education and training and for this Center, I would be happy to serve as a UNK campus liaison or in any capacity you see fit. I am so excited, as are a number of faculty and students at UNK, especially after the talk you gave to us recently. It was such an honor and pleasure for us to have you as our 7th Distinguished Speaker for Doug Lund DNA Day. Who would have thought 7 years after meeting Dr. Mario Capecchi at this same event that you would give a talk that rivaled the Nobel prize laureate! The technology you have developed is fantastic. In fact, I would like to use EASI-CRISPR in both my work with fruit flies and the immune genes underlying aging, as well as in the cell culture work to study the RNA virus we found in *Drosophila melanogaster*, Nora virus. In addition, there are a number of faculty in the Biology department who are interested in using EASI-CRISPR for questions dealing with microbes, such as *Staphylococcus aureus*, Rickettsia, mouse models for allergy, mouse models for diabetes, and a whole host of other questions.

In terms of educational experiences, we would like to have you come and lecture to in Genetics course, Molecular Biology course, Bioethics course, as well as give a seminar for our Molecular Biology class that is offered each semester. Because this technology is at the forefront of research, I, as an officer of our award winning local chapter of Sigma Xi – The Scientific Research Honorary, would like to invite you to give a talk to the lay public on this topic. These talks will help to engage faculty, students, and the lay public in the technology and the Center, as well as the collaboration between UNK and UNMC.

Another goal that can be addressed at UNK through the Center is to expand professional development activities to cultivate a cadre of successful investigators who are prepared to develop and implement innovative tools and approaches to address biomedical issues pertinent to all areas. In addition, we have amply demonstrated at UNK the ability to create an environment that fosters innovative multidisciplinary (EPSCOR), multisite and cross-entity (e.g., public-private) partnerships, IDeA (national CTR, COBRE, INBRE, ICPCTN, SEPA) and other national (e.g., CTSA) collaborations. I have been a member of the NE-INBRE program since 2003 and serve as the Institutional Coordinator for UNK for that program, as well as being the Campus coordinator and Steering committee member for the UNMC Great Plains Center in Translational Research (GP-CTR). I commend you for your efforts to create a Center that will further establish areas of collaboration across the NU system.

In closing, on behalf of the UNK campus, we wholeheartedly support your application to create the Genome Editing and Education Center-Nebraska. We have created cross campus and cross region collaborations that are invaluable. In addition, the educational opportunities that you are willing to provide us and our students are invaluable. As stated previously, I will gladly serve in any capacity you deem necessary to aid in fostering a connection between the Center, UNK, NE-INBRE and the GP-CTR. I am highly supportive of the creation of the Genome Editing and Education Center-Nebraska. If I can be of any help in any way, please do not hesitate to contact me.

Sincerely,

Kim Carlson

Kim Carlson
Professor & Assistant Chair
Biology Department
University of Nebraska at Kearney
Kearney, NE 68849
carlsonka1@unk.edu
308-865-1554



May 13, 2021

Nebraska University Board of Regents
University of Nebraska–Lincoln
Lincoln, NE 68583-0907

Re: Letter of support for the Genome Editing and Education Center-Nebraska (GEEC-Nebraska)

Dear Members of the NU Board of Regents:

It is my great pleasure to provide a letter of support for the establishment of the Genome Editing and Education Center-Nebraska (GEEC-Nebraska). I currently serve as the Stokes-Shackleford Professor and Chair of the Department of Cellular and Integrative Physiology and Director of the Center for Heart and Vascular Research at the University of Nebraska Medical Center.

I first came to know about the outstanding contributions made by UNMC in the CRISPR field, when I was interviewing at UNMC in 2018 and met with Dr. Gurumurthy. I also follow the literature and conversations on Twitter regarding CRISPR technology and can see that it has revolutionized biomedical research. It has impacted translational research as a gene therapy tool in less than 6 years from its invention, which is truly remarkable. Dr. Channabasavaiah Gurumurthy, Director of GEEC-Nebraska, has made significant contributions to CRISPR technology. It is clear this is a passion for him. The improvements he has made, such as Easi-CRISPR and GONAD technologies, have drawn worldwide attention to UNMC in a very positive way. Dr. Gurumurthy has published in over two dozen high-impact papers in just the past several years on technology development and mouse models generated. He has also earned UNMC over \$25M and has attracted dozens of collaborators nationally and internationally.

As an advisory committee member and a user of mouse models, the CRISPR technology mouse models, and technologies like CRISPR are highly valuable and now almost indispensable for a multitude of research projects. When Dr. Gurumurthy mentioned his big idea grant that was submitted to NU in early 2019, I was already impressed with his work and its potential benefits to the UN research community. I am now thrilled to hear that UNMC is interested in investing in this area by launching a Center. A designated center for genome editing, and converting it from the existing mouse genome engineering core would help us to conduct the best research possible.

In summary, I strongly support the launching of a center in the area of genome editing. Dr. Gurumurthy possesses the attributes and expertise in establishing the Genome Editing and Education Center-Nebraska (GEEC-Nebraska). Let me know if I can provide any additional information.

Sincerely,

Merry L. Lindsey, Ph.D.
Chair and Stokes-Shackleford Professor,
Department of Cellular and Integrative Physiology
Director, Center for Heart and Vascular Research
MLL:cb



May 12, 2021

Subject: Letter of support for the proposal of Genome Editing and Education Center-Nebraska (GEEC-Nebraska)

Dear Members of the NU Board of Regents:

It is my pleasure to provide this letter of support for the establishment of the Genome Editing and Education Center-Nebraska (GEEC-Nebraska) which is being organized by my long-term collaborator, Dr. C.B. Gurumurthy.

Dr. Gurumurthy has developed some impactful CRISPR technologies while a faculty member at UNMC, such as Easi-CRISPR and GONAD. These technologies have been widely popular and have drawn worldwide attention to our university. In general, CRISPR has revolutionized biomedical research, changing the whole field of gene therapy in the 6 years since its initial description.

Dr. Gurumurthy also is Director of the UNMC Mouse Genome Engineering Core Facility. The research collaborations and services available through this Core Facility are exceptional and have contributed to the success of dozens of researchers at UNMC and elsewhere.

I have known and worked with Dr. Gurumurthy for over five years now. Together we have been developing several novel transgenic swine for use in pancreatic cancer and breast cancer research (Dr. Gurumurthy's expertise is applicable to numerous species, not just mice). We have also prepared and submitted multiple federal grants together, and have several manuscripts in preparation. Dr. Gurumurthy currently is a Co-Investigator on our NCI R01 award to develop a porcine model of pancreatic cancer.

When Dr. Gurumurthy mentioned his Big Idea proposal on a gene editing center to NU in early 2019, I was already impressed with this concept and the potentially enormous benefits to the NU research community. I am thrilled to hear that UNMC is interested in initiating the Genome Editing and Education Center. This should enable Dr. Gurumurthy's team to deliver the best possible service to NU investigators.

It is my privilege to be associated with this Center, both as an end user and as an advisory committee member. I strongly support the establishment of GEEC. I am happy to provide further information in support of the Center's application as needed.

A handwritten signature in blue ink, appearing to read 'Mark A. Carlson'.

Mark A. Carlson, MD, FACS
Professor, Department of Surgery
Director, Center for Advanced Surgical Technology (CAST)
University of Nebraska Medical Center
Office: 402-995-5371; Mobile: 402-650-4219
Assistant: Sarah Dawson (sarah.dawson@unmc.edu; 402-559-4581)

21 May 2021

Dear Dr. C.B. Gurumurthy:

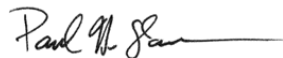
I am writing in support of the concept you've described as the Genome Editing and Education Center-Nebraska (GEEC-NE).

As a tenured faculty member in the UNO Department of Biology, I believe this Center would be a beneficial resource to our nearly 1000 Biology students. As the faculty academic coordinator for the Molecular and Biomedical Biology (MBB) B.S. degree program, I could envision that GEEC-NE could support MBB students through the development of hands-on learning modules which could be incorporated into the senior-level Molecular Genetics course.

Further, UNO Biology faculty and students could work together to generate e-learning modules for grades 7-12 across the state, in conjunction with the already established uBEATS STEM e-learning program. Partnering with the strong STEM outreach leadership experience of UNO, GEEC-NE could leverage such training modules beyond the state through the STEM TRAIL center and lead the nation in learning more about and encouraging discussion on gene editing.

I'm happy to continue to work with you as this Center is further developed.

Sincerely,



Paul H. Davis, Ph.D.
Associate Professor of Biology
University of Nebraska at Omaha
pdavis@unomaha.edu
402-554-3379

**TABLE 1: PROJECTED EXPENSES - NEW ORGANIZATIONAL UNIT
UNMC Genome Editing and Education Center - Nebraska**

	(FY2020-21) Year 1		(FY2021-22) Year 2		(FY2022-23) Year 3		(FY2023-24) Year 4		(FY2024-25) Year 5		Total
Personnel	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	FTE	Cost	Cost
Faculty	0.10	\$20,000	0.50	\$100,000	0.50	\$100,000	0.50	\$100,000	0.50	\$100,000	\$420,000
Non-teaching Staff: Professional	0.20	\$10,000	1.00	\$50,000	1.00	\$50,000	1.00	\$50,000	1.00	\$50,000	\$210,000
Core Administration	0.01	\$1,000	0.05	\$5,000	0.05	\$5,000	0.05	\$5,000	0.05	\$5,000	\$21,000
Non-teaching Staff: Support											
Subtotal	0.31	\$31,000	1.55	\$155,000	1.55	\$155,000	1.55	\$155,000	1.55	\$155,000	\$651,000
Operating											
General Operating		\$60,000		\$70,000		\$80,000		\$90,000		\$100,000	\$400,000
Equipment											\$0
New or renovated space				One module close to DRC II, room 1014 is requested.							\$0
Library/Information Resources											\$0
Other											\$0
Subtotal		\$60,000		\$70,000		\$80,000		\$90,000		\$100,000	\$400,000
Total Expenses		\$91,000		\$225,000		\$235,000		\$245,000		\$255,000	\$1,051,000

**TABLE 2: PROJECTED REVENUES - NEW ORGANIZATIONAL UNIT
UNMC Genome Editing and Education Center - Nebraska**

	(FY2020-21) Year 1	(FY2021-22) Year 2	(FY2022-23) Year 3	(FY2023-24) Year 4	(FY2024-25) Year 5	Total
Existing Funds ¹						
Extramural grants	\$40,000	\$50,000	\$50,000	\$50,000	\$50,000	\$240,000
UNMC internal support	\$40,000	\$50,000	\$50,000	\$50,000	\$50,000	\$240,000
Required New Public Funds						\$0
1. State Funds						\$0
2. Local Funds						\$0
Tuition and Fees						\$0
Other Funding						
1 Revenue from core services	\$11,000	\$105,000	\$105,000	\$105,000	\$105,000	\$431,000
2 Extramural grants	\$0	\$20,000	\$30,000	\$40,000	\$50,000	\$140,000
Total Revenue	\$91,000	\$225,000	\$235,000	\$245,000	\$255,000	\$1,051,000

¹ The funds are from Dr. Gurumurthy's R35 NIH grant (34-5160-2132-001) and from institutional start ups for his research. Dr. Gurumurthy has been provided \$550,000 over 2 years (\$275,000 from the Vice Chancellor for Research Office and \$275,000 from the Dean of the College of Medicine).

TO: The Board of Regents Addendum XI-A-8
Academic Affairs

MEETING DATE: August 13, 2021


SUBJECT: Honorary Degree

RECOMMENDED ACTION: Approve the award of Honorary Degree [Please note: this item may be voted on after the Closed Session]

PREVIOUS ACTION: The Board of Regents approved the current policies for awards found in the *University of Nebraska Board of Regents Policies* under RP-1.5.1 through RP-1.5.5.

EXPLANATION: None

SPONSOR: Honorary Degrees Committee
Board of Regents

RECOMMENDED: 
Walter E. Carter, President
University of Nebraska

DATE: July 29, 2021

TO: The Board of Regents Addendum XI-B-1
Business and Finance Committee

MEETING DATE: August 13, 2021

SUBJECT: Strategic supplier agreement for IT hardware for the University of Nebraska

RECOMMENDED ACTION: Approve agreement designating CDWG as strategic supplier of IT hardware for University of Nebraska system

PREVIOUS ACTION: None

EXPLANATION: In accordance with a formal RFP bid process, and subject to Board of Regents approval, CDWG is awarded a contract as the strategic supplier for IT hardware.

The contract, effective September 1, 2021, has a term of three (3) years, with options to renew for five (5) additional 1-year periods.

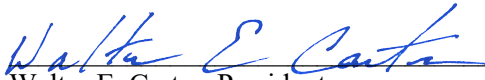
This item has been reviewed by the Business and Finance Committee.

PROJECT COST: Estimated at \$9.4 million annually

SOURCE OF FUNDS: State Funds and Student Fees

SPONSOR: Bret Blackman
Vice President for IT and CIO

Chris Kabourek
Vice President for Business and Finance | CFO

RECOMMENDED: 
Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-B-2

Business and Finance Committee

MEETING DATE: August 13, 2021

SUBJECT: Revisions to the Kiewit Hall project at the University of Nebraska-Lincoln (UNL)

RECOMMENDED ACTION: Approve revisions to the Kiewit Hall project and receive report from Business and Finance Committee regarding Intermediate Design Review

PREVIOUS ACTION: October 25, 2019- The Board of Regents approved the Program Statement for New College of Engineering Building at UNL.

December 5, 2019- The Board of Regents approved the naming of the new College of Engineering Building “Kiewit Hall” at UNL.

April 9, 2021- The Board of Regents approved a Capital Project Budget Increase for Kiewit Hall at UNL.

June 25, 2021- The Board of Regents approved and authorized execution of standard form Guaranteed Maximum Price contract amendments for Kiewit Hall at UNL.

EXPLANATION: The Program Statement for Kiewit Hall at UNL was approved by the Board of Regents on October 25, 2019. Since approval, the global pandemic has resulted in a multitude of unforeseen impacts to the market and, as such, a budget increase of eighteen million dollars is requested for a total budget of \$115 million.

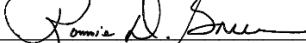
In addition, this submittal will constitute the report of the Business and Finance Committee approving the project Intermediate Design and fixing the scope and budget for the project.

This item has been approved by the Business and Finance Committee.

	<u>Original</u>	<u>Proposed</u>
PROJECT COST:	Total Project Budget \$97,000,000	\$115,000,000

SOURCES OF FUNDS: Private funds

SPONSOR: William J. Nunez
Vice Chancellor for Business and Finance

RECOMMENDED: 

Ronnie D. Green, Chancellor
University of Nebraska-Lincoln

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-C-1

Executive Committee

MEETING DATE: August 13, 2021

SUBJECT: Amendment of the Standing Rules of the Board of Regents

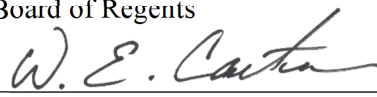
RECOMMENDED ACTION: Approve the proposed amendments of the Standing Rules of the Board of Regents

PREVIOUS ACTION: June 25, 2021 – The proposed amendments of the Standing Rules were presented for information only in accordance with the requirements of Section 7.2 of the Standing Rules and Section 1.11 of the *Bylaws of the Board of Regents*.

October 8, 2020 – The Standing Rules were last amended.

EXPLANATION: On April 21, 2021, Governor Ricketts approved LB83, which permits public entities subject to the Nebraska Open Meetings Act to hold up to half of their meetings by virtual conferencing during a calendar year. The attached amendments set forth a process by which Regents may request virtual attendance at a meeting of the Board of Regents.

SPONSOR: Executive Committee
Board of Regents

RECOMMENDED: 

Walter E. Carter, President
University of Nebraska

DATE: July 29, 2021

SECTION 2. Meetings of the Board.

2.1 Annual Meeting. The Board shall hold its annual meeting as required by Section 1.4 of its Bylaws.

2.2 Additional Meetings. The Board may hold such additional meetings during the year as it deems necessary, either as scheduled meetings or as emergency meetings called at the request of the Chairperson or by any two voting members of the Board.

2.3 Location of Meetings. The Board shall normally meet in the Boardroom at Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska. The Board may, however, meet at other locations as desired.

2.4 Notice for Annual and Scheduled Meetings. Public notice of each annual meeting and any scheduled meeting shall be given at least five (5) days prior to the meeting; provided, that public notice of any item scheduled for public hearing before the Board shall be given at least ten (10) days prior to the date of the hearing. The Corporation Secretary shall maintain a list of news media which have requested advance notification of Board meetings and shall provide advance notification to them of the time and place of each annual and scheduled meeting and the agenda for any such meeting.

2.5 Notice of Emergency Meetings. When it is necessary to hold an emergency meeting without the advance public notice provided in Section 2.4 of these Rules, the Corporation Secretary shall make a reasonable effort to contact those members of the news media who have requested notification of Board meetings and advise them of the agenda for the emergency meeting.

2.6 Virtual Meetings. In the absence of an emergency declared by the Governor, meetings of the Board ordinarily will be conducted in person. Upon written application to and approval by the Chairperson, individual Board members may attend by virtual conferencing. Applications for virtual attendance should be for good cause, such as sickness, military orders, required business travel, or other essential reasons and shall be submitted to the Chairperson at least ten (10) days prior to the date of the meeting at which virtual attendance is requested. Unless pursuant to an emergency declared by the Governor, no more than one-half of the meetings of the Board during any calendar year will be conducted with one or more voting members of the Board in virtual attendance.

2.76 Scheduling and General Conduct of Meetings. All meetings of the Board shall be scheduled and conducted in ways which are consistent with the Bylaws of the Board, these Rules, and the Nebraska Open Meetings Act, Neb. Rev. Stat. §§ 84-1408 to 84-1414.

TO: The Board of Regents Addendum XI-C-2
 Executive Committee

MEETING DATE: August 13, 2021

SUBJECT: President’s Performance-Based Merit Pay

RECOMMENDED ACTION: Approve Grant of Performance-Based Merit Pay to President Carter for FY2020-21

PREVIOUS ACTION: December 19, 2019 – The Board of Regents approved the Revised Contract of Employment for Walter E. Carter, Jr. as President of the University of Nebraska.

EXPLANATION: Section 2(c) of President Carter’s Contract of Employment provides that he shall be eligible for performance-based merit pay of up to fifteen percent (15%) of his Base Salary at the end of each full year of employment.

President Carter’s Performance-Based Merit Pay for FY2020-21 is based on a qualitative score relating his performance to the Core Leadership Pillars; and a quantitative score relating his performance to certain deliverables. The summary below details the calculation of President Carter’s Performance-Based Merit Pay.

	Period	Score	Weight	Total
Qualitative Score	CY2020	90.56%	0.5	45.28%
Quantitative Score	FY2020-21	100.00%	0.5	50.00%
Total				95.28%

Performance-Based Merit Pay Guidelines

Total Score 90% or greater	100% of merit pool paid out
Total Score between 80 and 89.99%	75% of merit pool paid out
Total Score between 70 and 79.99%	50% of merit pool paid out
Total Score 69.99% or below	0% of merit pool paid out

Eligible Performance-Based Merit Pay

Current Base Salary	\$934,600
Performance-Based Merit Pay Pool (15% of base)	\$140,190
Performance Score	95.28%
<u>% of Merit Pool Granted</u>	<u>100%</u>
Performance-Based Merit Pay	\$140,190

Approval of this agenda item grants President Carter payment of the full fifteen percent (15%) Performance-Based Merit Pay Pool for FY2020-21.

SOURCE OF FUNDS: General Funds/Cash Funds

SPONSOR: Paul Kenney
 Chair, Board of Regents

DATE: July 29, 2021

TO: The Board of Regents Addendum XI-C-3
Executive Committee

FROM: August 13, 2021

SUBJECT: Request for Approval of Paid Service on Outside Board of Directors

RECOMMENDED ACTION: Approve request from President Carter, in accordance with his employment contract and the *Bylaws of the Board of Regents of the University of Nebraska*, to serve on the board of directors of an outside organization.

PREVIOUS ACTION: None

EXPLANATION: Section 11 of President Carter’s Contract of Employment requires approval by the Board of Regents prior to his service “...as a compensated member of the board of directors of any for-profit organization.” Section 3.4.5 of the *Bylaws of the Board of Regents of the University of Nebraska* states that full-time professional staff members employed by the University are encouraged to engage in outside professional employment or activities, provided the outside employment does not interfere with the employee’s regular duties at the University or represent a conflict of interest. Section 3.4.5 further requires Board of Regents approval, if professional services may be provided over a period lasting more than two years.

President Carter has been invited to serve as a director and requests the Board of Regents approve his service on the board of “TeraWulf, Inc.” with a headquarters in Easton, Maryland. If this item is adopted, approval for this appointment shall remain in effect for so long as President Carter serves continuously without a break or separation from the TeraWulf board.

SPONSOR: Executive Committee
Board of Regents

RECOMMENDED: Paul Kenney
Chair, Board of Regents

DATE: August 4, 2021

D. REPORTS

1. Expedited Approval of French Graduate Certificate, Addendum XI-D-1
2. Expedited Approval of Machine Learning Graduate Certificate, Addendum XI-D-2
3. Expedited Approval of Sociology Graduate Certificate, Addendum XI-D-3
4. Expedited Approval of Teaching Spanish to Heritage/Bilingual Learners Graduate Certificate, Addendum XI-D-4
5. Approve the correct naming of The History of Teaching Tools Exhibit within the Wigton Heritage Center, Addendum XI-D-5
6. Bids and Contracts, Addendum XI-D-6
7. President's FY2020-21 Self-assessment, Addendum XI-D-7

TO: The Board of Regents Addendum XI-D-1
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Expedited Approval of the French Graduate Certificate in the Department of Foreign Languages and Literature in the College of Arts and Sciences at the University of Nebraska at Omaha (UNO)

RECOMMENDED ACTION: Report

PREVIOUS ACTIONS: September 16, 2005 – The Board approved the creation of the Master of Arts in Language Teaching (MALT) at UNO.

July 15, 2000 – The Board delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.


EXPLANATION: The proposed UNO French Graduate Certificate is an online and in-person 18-credit hour certificate program designed to provide intensive language proficiency training in French, including courses in French/Francophone cultures and literatures. For students interested in language teaching, six of the 18 credits would be devoted to language teaching pedagogy. All coursework will partially satisfy requirements toward a Master of Arts in Language Teaching degree, and completion of the Certificate will allow high school teachers to be eligible to teach dual-enrollment classes through UNO or other Universities.

This proposal has been reviewed by the Council of Academic Officers; it also has been reported to the Academic Affairs Committee.

PROGRAM COST: \$0 (No new faculty/staff resources will be required.)

SOURCE OF FUNDS: Not applicable

SPONSOR: Jeffrey P. Gold, MD
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

APPROVED: 
Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-D-2
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Expedited Approval of the Machine Learning Graduate Certificate in the Department of Computer Science in the College of Information Science and Technology at the University of Nebraska at Omaha (UNO)

RECOMMENDED ACTION: Report

PREVIOUS ACTIONS: July 15, 2000 – The Board delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.

EXPLANATION: July 21, 1990 – The Board approved the creation of the Master of Arts/Master of Science degree program in Computer Science at UNO.


The proposed UNO Machine Learning Graduate Certificate is an online and in-person 12-credit hour certificate program designed to provide students with skills in the fields of artificial intelligence and database systems. For students without a computing background, a course in Python (a computing language) and a course covering the fundamentals of data structures would be recommended prior to starting the program. The proposed graduate certificate will prepare students for careers across multiple industries. Employment opportunities would include being hired as data scientists, machine learning algorithm designers, deep learning systems engineers, computer vision experts, software and application developers, and other machine-learning related professionals. All coursework will partially satisfy requirements towards a Master of Science in Computer Science.

This proposal has been reviewed by the Council of Academic Officers; it also has been reported to the Academic Affairs Committee.

PROGRAM COST: \$0 (No new faculty/staff resources will be required.)

SOURCE OF FUNDS: Not applicable

SPONSOR: Jeffrey P. Gold, MD
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

APPROVED: 
Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-D-3
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Expedited Approval of the Sociology Graduate Certificate in the Department of Sociology and Anthropology in the College of Arts and Sciences at the University of Nebraska at Omaha (UNO)

RECOMMENDED ACTION: Report

PREVIOUS ACTIONS: July 15, 2000 – The Board delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.

The Master of Arts (MA) in Sociology at UNO was established prior to modern records of Board approvals.


EXPLANATION: The proposed UNO Sociology Graduate Certificate is an online and in-person 18-credit hour certificate program designed to provide high school teachers with the professional training and formal qualifications needed to teach Dual Enrollment college courses in Sociology. The Certificate also is designed to enhance the skills of individuals working in social service/non-profit organizations. All coursework will partially satisfy requirements towards a Master of Arts degree in Sociology.

This proposal has been reviewed by the Council of Academic Officers; it also has been reported to the Academic Affairs Committee.

PROGRAM COST: \$0 (No new faculty/staff resources will be required.)

SOURCE OF FUNDS: Not applicable

SPONSOR: Jeffrey P. Gold, MD
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

APPROVED: 
Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-D-4
Academic Affairs Committee

MEETING DATE: August 13, 2021

SUBJECT: Expedited Approval of the Teaching Spanish to Heritage/Bilingual Learners Graduate Certificate in the Department of Foreign Language and Literature in the College of Arts and Sciences at the University of Nebraska at Omaha (UNO)

RECOMMENDED ACTION: Report

PREVIOUS ACTIONS: September 16, 2005 – The Board approved the creation of the Master of Arts in Language Teaching (MALT) at UNO
July 15, 2000 – The Board delegated to the President authority to give expedited approval to certain graduate certificates that were based on existing graduate courses. Such an arrangement allows the University to respond in a timely fashion to the needs and demands of our students and Nebraska businesses.


EXPLANATION: The proposed UNO Teaching Spanish to Heritage/Bilingual Learners Graduate Certificate is an online 18-credit hour certificate program. The curriculum is designed to provide K-12 schoolteachers and administrators sociolinguistic and pedagogical (theory and practice) expertise relevant to the intricacies and challenges of teaching Spanish to bilingual learners (children who are bilingual) and heritage learners (bilingual adults). The Certificate also is designed for those seeking to teach heritage language courses in institutions of higher education. All coursework will partially satisfy requirements towards a Master of Arts in Language Teaching with a concentration in Spanish.

This proposal has been reviewed by the Council of Academic Officers; it also has been reported to the Academic Affairs Committee.

PROGRAM COST: \$0 (No new faculty/staff resources will be required.)

SOURCE OF FUNDS: Not applicable

SPONSOR: Jeffrey P. Gold, MD
Chancellor, University of Nebraska Medical Center
Executive Vice President and Provost, University of Nebraska

APPROVED: 
Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-D-5

Business and Finance Committee

MEETING DATE: August 13, 2021

SUBJECT: Approve the corrected naming of The History of Teaching Tools Exhibit within the Wigton Heritage Center at the University of Nebraska Medical pursuant to the Board of Regents Policy RP-6.2.7.3.b.

RECOMMENDED ACTION: Approve the correct naming of The History of Teaching Tools Exhibit within the Wigton Heritage Center

PREVIOUS ACTION: June 25, 2021 - Approval of the exhibit naming as “The History of Teaching Tools Exhibit” within the Wigton Heritage Center

February 12, 2021 - Approval of the Rare Book Gallery within the Wigton Heritage Center

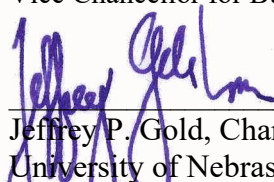
EXPLANATION: President Carter and Chancellor Gold have approved the naming, “In recognition of Robert S. Wigton, MD, Given by Vincent L. Hoellerich, MD, Class of 1983”, within the Wigton Heritage Center.

The exhibit, The History of Teaching Tools Exhibit, should have properly been named “In recognition of Robert S. Wigton, MD, Given by Vincent L. Hoellerich, MD, Class of 1983”.


This item has been reviewed by the Business and Finance Committee.

SPONSOR: Douglas A. Ewald
Vice Chancellor for Business, Finance and Business Development

RECOMMENDED:



Jeffrey P. Gold, Chancellor
University of Nebraska Medical Center



Walter E. Carter, President
University of Nebraska

DATE: July 16, 2021

TO: The Board of Regents Addendum XI-D-6

Business and Finance Committee

MEETING DATE: August 13, 2021

SUBJECT: Report of Bids and Contracts

RECOMMENDED ACTION: Report

PREVIOUS ACTION: None

EXPLANATION: The attached report is a summary of bids and contracts as provided by the campuses pursuant to Section 6.4 of the *Bylaws of the Board of Regents of the University of Nebraska* for the period ended June 14, 2021.

The report outlines the following: type of action; campus; description and use of the product, service, or project; funding source; approved budget amount; contract amount; contractor or vendor; and a bid review or bid explanation if the low responsible bid was not accepted.

APPROVED:



Chris J. Kabourek
Vice President for Business and Finance | CFO

DATE: July 16, 2021

Contracts over \$1,000,000 April 17, 2021 to June 14, 2021
 NU Facilities, Planning and Capital Programs (UNK, UNL, UNMC, UNO)
 Business and Finance Report – Bids and Contracts

Type of Action	Campus	Description	Funding Source	Approved Budget Amount*	Contract Amount	Contractor / Vendor	Bid Review or Explanation
Construction	UNL	(UNL) Outdoor Track Replacement	Foundation	\$13,200,000	\$7,299,210	Nemaha Landscape Construction	Low Bid Construction
Construction	UNL	Barkley Memorial Center(A087) Expansion and Renovation	Foundation	\$7,075,000	\$7,047,686	Beckenbauer Construction Inc	CMR GMP**
Construction	UNL	Selleck Quad Building L(C342) Dining Renovation	Bonds	\$1,458,300	\$1,457,000	Cheever Construction Company	Low Bid Construction
Construction	UNO	Health and Kinesiology(U014) RM123 Replace pool bulkheads	Bonds	\$1,458,300	\$1,359,738	MECO HENNE Contracting Inc.	Low Bid Construction
Contract	UNK	Installation of a new audio system in the Health & Sports arena	State Aided Project Funds	\$1,100,000	\$1,014,498.33	AVI Systems, Inc.	Low Responsible Bid
Construction	UNK	Interior remodel of the food service area of the Nebraskan Student Union	Facility Operating and Reserve Funds	\$1,417,400	\$1,417,400	Sampson Construction Co., Inc.	Low Responsible Bid

*Approved budget amount represents the entirety of the applicable budget lines.

** GMP = Guaranteed Maximum Price; entry is a GMP amendment to a prior contract.

TO: The Board of Regents Addendum XI-D-7

MEETING DATE: August 13, 2021

SUBJECT: President's FY2020-21 Year-in-Review

RECOMMENDED ACTION: Report

PREVIOUS ACTION: August 13, 2021 – The Board of Regents will consider approving grant of performance-based merit pay to President Carter for FY2020-21.

December 19, 2019 – The Board of Regents approved the Revised Contract of Employment for Walter E. Carter, Jr. as President of the University of Nebraska.

EXPLANATION: The attached report outlines the President's performance against eight quantitative metrics set for FY2020-21.

RECOMMENDED: Walter E. Carter
President

DATE: July 29, 2021



UNIVERSITY OF NEBRASKA
OFFICE OF THE PRESIDENT

MEMORANDUM

DATE: July 29, 2021
TO: Board of Regents
FROM: Ted Carter, President
RE: FY2020-21 Year-in-Review

As I reflect on the past fiscal year, I am filled with energy and optimism about the future of the University of Nebraska System. We are emerging from a global pandemic in a position of strength—a great credit to your leadership and the incredible efforts of the chancellors, vice presidents, and leaders across our university. Earlier this year, you set eight quantitative metrics to measure my performance; below, you will find a brief narrative on each metric.

Public Five-Year Strategy and Set Associated Metrics

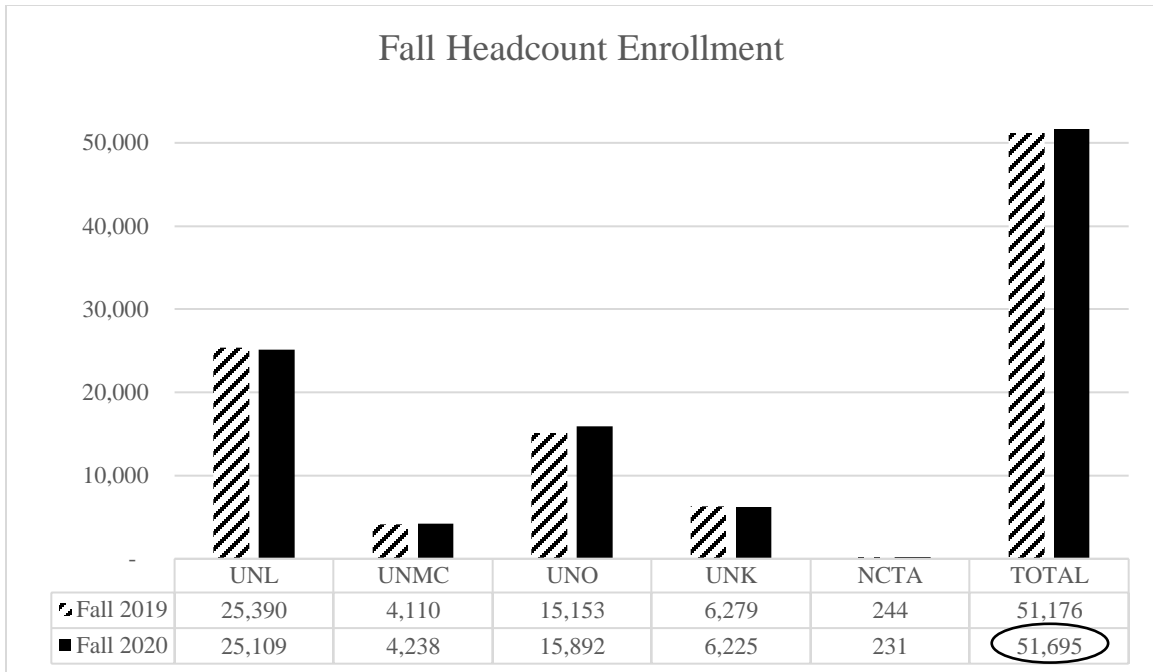
In August 2020, we published the “University of Nebraska Five-Year Strategy,” a living document that gives us a clear path forward, articulates our priorities and offers specific targets against which we will measure our progress. I am pleased to share that all thirty strategies have either been implemented or are in process. Attached to this memorandum is a dashboard that indicates the status of each strategy.

Launch 2021 Capital Repair and Renewal Strategy

Governor Ricketts and the Nebraska Legislature approved LB384 (formerly LB588), which allowed us to holistically execute the deferred maintenance strategy. We were able to lock in a historically low interest rate of 2.99% on a \$400 million bond issuance which will be put to immediate use. The Board approved the first program statement utilizing LB384 funding when the Kayser Hall renovation at UNO was approved on June 25th.

Fall 2020 Headcount Enrollment \geq Fall 2019

Amid the uncertainties of the COVID-19 pandemic, I’m incredibly pleased we enrolled over 500 more students in Fall 2020 than in Fall 2019 (a one percent increase). Specific successes included UNO’s highest enrollment since 1992 and UNMC’s 20th straight record-high enrollment. For specific figures, please reference the chart on the following page.



Source: data.nebraska.edu

FY2020-21 University-wide Research Awards >= FY2019-20

Our campus research offices continue to close the books on FY2020-21; however, we conservatively estimate our University-wide research awards were \$17.9 million greater this fiscal year.

	<u>FY2020-21</u>	<u>FY2019-20</u>	<u>△</u>
Extramural Research Awards	334,882,356	316,954,044	17,928,312

Develop relationships with Governor and meet with each member of the Nebraska Legislature

Governor Ricketts and I have developed a close relationship and worked collaboratively on several projects over the past year including pandemic response, U.S. Space Command recruitment, and deferred maintenance. The Governor's visit to our June Board of Regents' meeting was the first visit by a sitting Governor in modern history.

Since arriving in January 2020, I have met with every member of the Nebraska Legislature at least once. And while the pandemic challenged relationship building efforts, I have had over 100 meaningful interactions with Senators since my arrival.

Obtain 2% Annual State Appropriations Budget Request

Thanks to the incredible support of Governor Ricketts and the Nebraska Legislature, we have been appropriated our full biennial budget request. This represents a 2.21% increase in FY2021-22 and a 2.02% increase in FY2022-23. Additionally, we received \$2 million in each year of the biennium for new cohorts of Nebraska Career Scholarship students.

Conduct University-wide Climate Survey

The Chancellors and I made the intentional choice to deploy the University-wide climate survey in September-October 2021 to ensure strong participation by students, staff, and faculty. We have selected Gallup to administer and design the survey in collaboration with an internal working group. We're looking forward to analyzing the results in December 2021 and developing action plans to address any issues we identify. Further, the 2021 survey will serve as a baseline from which we will measure future work.

Active Participation in Global/National Organizations Advancing Higher Education and Research

For several years, I have been an active participant in the Aspen Institute for Higher Education. In fact, the Aspen Institute is where I first met President Emeritus Milliken. This past June, I moderated a panel discussion with the President of Kansas State University, Chancellor of the North Dakota University System, and President of Metropolitan State University of Denver regarding "what higher education leaders can learn from how the military conducts scenario planning and responds to crises like pandemics." In addition to the Aspen Institute, I've also participated in the Association of Public Land-grant Universities (APLU) Council of Presidents and the National Association of System Heads (NASH) activities to learn from my colleagues across our nation.

During the early months of the pandemic, I participated in weekly webinars with the Asia Group as one of two higher education representatives (the other hailing from Harvard University). This group was helpful in monitoring responses to the pandemic worldwide and gleaning strategies from other industries and geographies.

Finally, I've actively linked the University of Nebraska with my connections in the Federal government. We're currently exploring partnership opportunities with the National Defense University, developed a Higher Education Space Research and Workforce Alliance concept, and have connected the Daugherty Water for Food Global Institute (DWFI) with the National Oceanic and Atmospheric Administration (NOAA).

**UNIVERSITY OF NEBRASKA
FIVE-YEAR STRATEGY**

STATUS

Access, Affordability, and Attainment

- | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ✓ • Launch <i>Nebraska Promise</i> ✓ • Evaluate all University-imposed costs to students and limit increases ✓ • Adopt a 4-year undergraduate graduation guarantee ↗ • Shift University's undergraduate tuition model to a "block" basis ↗ • Evaluate innovation academic calendar models ↗ • Strengthen pathways to higher education | <p>Launched April 17, 2020.</p> <p>Across-the-board tuition freeze enacted AY2021-22.</p> <p>Adopted June 25, 2021.</p> <p>CBOs modeling impact and implementation strategies.</p> <p>Conducted "winterim" test in 2021.</p> <p>Reengaging Nebraska P-16 effort; hosted all public higher ed leaders in June 2021.</p> |
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Workforce Development

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| <ul style="list-style-type: none"> ✓ • Pursue partnerships to fund scholarships in key workforce areas ↗ • Develop scholarship programs to attract nonresident students ↗ • Build/test models to guarantee internships, jobs, and debt forgiveness | <p>Governor and Legislature approved \$6 million for Nebraska Career Scholarships.</p> <p>UNK launched <i>New Nebraskans</i> scholarship; other campuses in planning.</p> <p>Working with Nebraska Chamber to deploy "Handshake" platform as internship "matchmaker" for all public higher education.</p> |
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Culture, Diversity, and Inclusion

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| <ul style="list-style-type: none"> ↗ • Develop implicit bias training program. ↗ • Refine policies and procedures to more fully support students/employees | <p>Curriculum under development; intended deployment during FY2021-22.</p> <p>Adopted University-wide Student Code of Conduct and amended Regents' Policies related to procedures for sexual misconduct complaints on August 14, 2020. Amended Bylaws to codify administrative leave processes.</p> |
| <ul style="list-style-type: none"> ↗ • Conduct annual climate survey ↗ • Commit to no new state-aided non-faculty FTEs until faculty salaries reach their peer averages at UNL and UNMC | <p>Under development for implementation in fall 2021.</p> <p>2021-2023 biennial budget includes faculty market compensation pools intended to bring UNL and UNMC faculty to their peer averages.</p> |
| <ul style="list-style-type: none"> ↗ • Identify and reduce gender and racial equity pay gaps | <p>Compensation study in process.</p> |

Partnerships

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> • Focus University investments on: <ul style="list-style-type: none"> ↗ - Water and Food Security ↗ - Infectious Disease ↗ - Rural Community Vitality ↗ - National and Cyber Security ↗ - Early Childhood Education ↗ • Increase sense of bond and connection among alumni and donors ↗ • Increase number of annual donors to 75,000 by 2027 ↗ • Increase annual total private support to \$300 million by 2027 ↗ • Engage 374,000 alumni in events and advisory/advocacy network | <p>\$5 million gift for water and public health nexus.</p> <p>State awarded \$300 million for NEXT project; UNMC named pilot site.</p> <p><i>Rural Prosperity Nebraska</i> launched in August 2020.</p> <p>NSRI received IDIQ 3 in September 2020 and affirmation of sponsorship; PIA and multiple CPOs awarded to NDRC by U.S. Strategic Command. Partnership with U.S. Space Command under development.</p> <p>Testified on LR390 (fiscal/economic impact of pandemic on early childhood workforce/care).</p> <p>Continuing NU Foundation alumni/donor survey.</p> <p>Progressing comprehensive fundraising campaign planning.</p> <p>Progressing comprehensive fundraising campaign planning.</p> <p>Substrategies being led by Office of External Relations (e.g., D.C. Alumni Engagement).</p> |
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Efficiency and Effectiveness

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| <ul style="list-style-type: none"> ↗ Develop a 5-year rolling budget ↗ Maintain a structurally balanced budget ↗ Launch <i>Red Tape Review</i> initiative ↗ Develop comprehensive University-wide capital master plan ✓ Launch 2021 University Facilities Program ↗ Evaluate all University assets for monetization/maximization ↗ Set and achieve University-wide sustainability goals | <p>5-year budget under development.</p> <p>Budget is currently structurally balanced.</p> <p>Chapter 6 policy review underway.</p> <p>5-year capital plans developed as part of 2021 University Facilities Program.</p> <p>LB384 (formerly LB588) approved by Governor and Legislature; \$400 million bonds issued.</p> <p>Excess land and spectrum licenses sold.</p> <p>Chief Sustainability Officer appointed; University-wide goals under development.</p> |
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Lincoln, Nebraska
June 25, 2021

The Board of Regents of the University of Nebraska met on June 25, 2021, at 9:00 a.m. in the board room at Varner Hall, 3835 Holdrege Street, Lincoln, in a publicly convened session, the same being open to the public and having been preceded by advance publicized notice, a copy of which are attached to the minutes of this meeting as Attachment 1 (pages 109).

In compliance with the provisions of *Neb. Rev. Stat.* § 84-1411, printed notice of this meeting was sent to each member of the Board and was posted on the front of the first floor entrance of Varner Hall. In addition, copies of such notice were sent to the Lincoln Journal Star, Omaha World Herald, the Daily Nebraskan, the Gateway, the Antelope, the Kearney Hub, and the Lincoln office of the Associated Press on June 18, 2021.

Regents present:

Timothy Clare
Paul Kenney, Chair
Elizabeth O'Connor
Bob Phares, Vice Chair
Jim Pillen
Robert Schafer
Jack Stark
Barbara Weitz
Noah Limbach, University of Nebraska at Kearney
Batool Ibrahim, University of Nebraska-Lincoln
Taylor Kratochvil, University of Nebraska Medical Center
Maeve Hemmer, University of Nebraska at Omaha

University officials present:

Walter E. Carter, President
Susan M. Fritz, Executive Vice President and Provost
Stacia L. Palser, Interim Corporation Secretary
Jeffrey P. Gold, Chancellor, University of Nebraska Medical Center and
University of Nebraska at Omaha
Joanne Li, Chancellor-Elect, University of Nebraska at Omaha
Ronnie D. Green, Chancellor, University of Nebraska-Lincoln
Douglas A. Kristensen, Chancellor, University of Nebraska at Kearney
Michael J. Boehm, Vice President for Agriculture and Natural Resources
Christopher J. Kabourek, Vice President for Business and Finance | CFO
Heath M. Mello, Vice President for External Relations
James P. Pottorff, Vice President and General Counsel

I. CALL TO ORDER

II. ROLL CALL

The Board convened at 9:00 a.m. in the board room of Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska. Attendance is indicated above.

III. APPROVAL OF MINUTES AND RATIFICATION OF ACTIONS

Motion Moved by Clare and seconded by Stark to approve the minutes and ratify the actions of the regularly scheduled meeting on May 1, 2021.

Action Student Opinion: Voting Aye: Ibrahim, Kratochvil, Limbach, and Hemmer. Voting Aye: Kenney, O'Connor, Phares, Pillen, Schafer, Stark, Weitz, and Clare. Motion carried.

Chairman Kenney announced the location of the Notice of Meeting and Open Meetings Act.

Chairman Kenney welcomed newly-elected student regents Noah Limbach, University of Nebraska at Kearney; Batool Ibrahim, University of Nebraska-Lincoln; Taylor Kratochvil, University of Nebraska Medical Center; and Maeve Hemmer, University of Nebraska at Omaha.

President Carter welcomed newly-elected Faculty Senate Presidents Ben Malczyk, University of Nebraska at Kearney; Steve Kolbe, University of Nebraska-Lincoln; Aaron Mohs, University of Nebraska Medical Center; and Elizabeth Wessling, University of Nebraska at Omaha.

IV. PRESENTATIONS

Governor Ricketts addressed the Board, commending the University for its strong leadership and success despite the challenges presented by the COVID-19 pandemic and highlighting the strong partnership between the University and the State of Nebraska.

V. KUDOS

Regent Pillen presented a KUDOS award to Michael Christen, Director of Business Services and Executive Director of University Village at the University of Nebraska at Kearney.

Regent Hemmer presented a KUDOS award to Scott Kurz, Physiology Laboratory Manager at the University of Nebraska-Lincoln.

Regent Stark presented a KUDOS award to Juli Bohnenkamp, Online Testing Resource Coordinator for the UNMC College of Nursing at the University of Nebraska Medical Center.

Regent Kratochvil presented a KUDOS award to Sarah Weil, Title IX Coordinator at the University of Nebraska at Omaha.

VI. RESOLUTIONS

Regent Weitz presented the following resolution:

WHEREAS, Dr. Susan Fritz served as a Professor in the University of Nebraska-Lincoln's Department of Agricultural Leadership, Education and Communication with an

appointment in Women's and Gender Studies since 1994 where she excelled in teaching, research and service.

WHEREAS, Dr. Fritz's professional expertise led to her service as a two-time U. S. Department of Commerce Baldrige Evaluator, a North Central Higher Learning Commission Evaluator, a W K Kellogg/APLU Food Systems Leadership Institute Commissioner and a Fulbright Senior Specialist with an assignment in Croatia.

WHEREAS, Dr. Fritz honorably served the University of Nebraska as the Executive Vice President and Provost and Dean of the Graduate College from 2012 to 2021.

WHEREAS, Dr. Fritz has been a role model for aspiring women, students, staff, faculty and administrators as the first woman to serve as head of a peer department nationally; the first woman to serve as Associate Dean of the College of Agricultural Sciences and Natural Resources, Interim Dean of the Agricultural Research Division and Director of the Nebraska Experiment Station at UNL; and the first woman to serve as NU Associate Vice President of Academic Affairs and Interim University of Nebraska President.

WHEREAS, Dr. Fritz, during her service as Interim NU President, led the partnership of the University of Nebraska, Nebraska State College System, and Nebraska community colleges to garner a potential \$32 million annual commitment from the State of Nebraska to fund scholarships for resident students majoring in programs leading to careers with high skill, high need, and high wages.

WHEREAS, Dr. Fritz led the development and implementation of the systemwide shared application allowing resident students to apply to multiple NU campuses at one time, and spearheaded the development of a systemwide Student Code of Conduct which reflects the paths of students enrolled in more than one NU campus at a time.

WHEREAS, Dr. Fritz led the effort to establish and fund the Nebraska Statewide Workforce and Educational Research System in partnership with the Nebraska State College System, Nebraska community colleges, Nebraska Department of Education, the Nebraska Department of Labor and the University of Nebraska creating an opportunity to use "good data for great decisions" for Nebraska's students and workforce.

WHEREAS, Dr. Fritz served as the NU point of contact with the Susan Thompson Buffett Foundation whose generosity to Thompson Scholars has impacted the lives of thousands of "at promise" NU students.

WHEREAS, Dr. Fritz led the Budget Response Team process charged with identifying budget cuts and process improvements to yield \$22 million in permanent cuts.

WHEREAS, Dr. Fritz partnered with the NU Foundation to launch the 'Big Ideas' process as an initial step in the Foundation's Campaign to identify multi-campus, faculty-driven proposals for funding which build on campus strengths and position the NU system for increased national and international prominence.

WHEREAS, Dr. Fritz championed initiatives to increase the inclusivity of NU and its campuses through efforts such as establishing and supporting the work of the Non-binary Gender Values Committee.

WHEREAS, Dr. Fritz mentored many students, staff, faculty and administrators across the NU system and the United States, inclusive of gender, race, ethnicity and sexual orientation.

NOW, THEREFORE, BE IT RESOLVED, that the Board of Regents of the University of Nebraska extends its thanks and congratulations to Dr. Susan Fritz for her leadership, vision, service and passion for the academic community and her unwavering commitment to people and place.

Resolution Adopted There being no objection, the above resolution was approved and adopted by the general consent of the Board.

VII. HEARINGS

None

VIII. PRESIDENT’S REMARKS

President Carter addressed the Board, providing detail on the FY 2021-22 operating budget and the impressive growth trajectory of the University over the last year in enrollment, research, technology and facilities.

IX. PUBLIC COMMENT

None

X. UNIVERSITY CONSENT AGENDA

Motion Moved by Clare and seconded by Phares to approve items X-A-1, X-A-2, X-A-3, X-A-4, X-A-5, X-B-1, X-B-2, and X-B-3

A. ACADEMIC AFFAIRS

University of Nebraska

X-A-1 President’s Personnel Recommendations

X-A-2 Approve the academic program reviews report required by the Nebraska Coordinating Commission for Postsecondary Education (NCCPE) and approve forwarding of the program review reports to the NCCPE

University of Nebraska at Kearney

X-A-3 Approve the monitoring report on the August 3, 2018 Action Plan for the Bachelor of Arts (BA) degree in Philosophy at the University of Nebraska at Kearney (UNK) and forward the report to the Nebraska Coordinating Commission for Postsecondary Education (NCCPE)

X-A-4 Approve the monitoring report on the Bachelor of Science (BS) degree in Interior Design Comprehensive at the University of Nebraska at Kearney (UNK) and forward the report to the Nebraska Coordinating Commission for Postsecondary Education (NCCPE)

University of Nebraska at Omaha

- X-A-5 Approval is requested to continue the Bachelor of Science (BS) in Black Studies at the University of Nebraska at Omaha (UNO) and to forward the associated review report and monitoring plan to the Nebraska Coordinating Commission for Postsecondary Education (NCCPE)

B. BUSINESS AND FINANCE

University of Nebraska

- X-B-1 Authorize the Vice President for Business and Finance to approve the amended University of Nebraska Group Health, General Risk-Loss, and Reimbursement Trust Fund Agreements between the Board of Regents of the University of Nebraska and Wells Fargo Bank

University of Nebraska Medical Center

- X-B-2 Approve the NEXt pilot project, subject to Board of Regents policies, federal state, and local government approvals needed to complete the project and subject to obtaining the funding, financing, and donations needed for the project, and approve the submission of an application by the University of Nebraska for matching funds from the State of Nebraska under the Nebraska Transformational Projects Act

University of Nebraska at Omaha

- X-B-3 Extend the Scott Campus at the University of Nebraska at Omaha (UNO) to include all UNO's property south of Pacific Street
- Action Student Opinion: Voting Aye: Kratochvil, Limbach, Hemmer, and Ibrahim. Voting Aye: O'Connor, Phares, Pillen, Schafer, Stark, Weitz, Clare, and Kenney. Motion carried.

XI. UNIVERSITY ADMINISTRATIVE AGENDA

A. ACADEMIC AFFAIRS

University of Nebraska

- Motion Moved by Clare and seconded by Weitz to approve item XI-A-1
- XI-A-1 Approve the establishment of RP-3.3.15 of the *Policies of the Board of Regents* related to the University-wide Consensual Relationships Policy
- Action Student Opinion: Voting Aye: Limbach, Hemmer, Ibrahim, and Kratochvil. Voting Aye: Phares, Pillen, Schafer, Stark, Weitz, Clare, Kenney, and O'Connor. Motion carried.
- Motion Moved by Phares and seconded by Clare to approve item XI-A-2
- XI-A-2 Approval to amend the University of Nebraska Four-Year Graduation Guarantee

- Action Student Opinion: Voting Aye: Hemmer, Ibrahim, Kratochvil, and Limbach. Voting Aye: Pillen, Schafer, Stark, Weitz, Clare, Kenney, O'Connor, and Phares. Motion carried.
- University of Nebraska-Lincoln
- Motion Moved by Phares and seconded by Stark to approve item XI-A-3
- XI-A-3 Approval to eliminate the Bachelor of Arts (BA) in Hospitality, Restaurant and Tourism Management in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln (UNL)
- Action Student Opinion: Voting Aye: Ibrahim, Kratochvil, Limbach, Hemmer. Voting Aye: Schafer, Stark, Weitz, Clare, Kenney, O'Connor, Phares, and Pillen. Motion carried.
- Motion Moved by Pillen and seconded by Clare to approve items XI-A-4, XI-A-5, and XI-A-6
- XI-A-4 Approval to eliminate the Leadership Undergraduate Certificate in the Department of Agricultural Leadership, Education and Communication in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln (UNL)
- XI-A-5 Approval to eliminate the Legal Studies Undergraduate Certificate in the Department of Agricultural Economics in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln (UNL)
- XI-A-6 Approval to eliminate the Nebraska Beef Industry Scholars Undergraduate Certificate in the Department of Animal Science in the College of Agricultural Sciences and Natural Resources at the University of Nebraska-Lincoln (UNL)
- Action Student Opinion: Voting Aye: Kratochvil, Limbach, Hemmer, and Ibrahim. Voting Aye: Stark, Weitz, Clare, Kenney, O'Connor, Phares, Pillen, and Schafer. Motion carried.
- Motion Moved by Stark and seconded by Weitz to approve item XI-A-7
- XI-A-7 Approval to create a Bachelor of Fine Arts in Acting in the Johnny Carson School of Theatre and Film in the Hixson-Lied College of Fine and Performing Arts at the University of Nebraska-Lincoln (UNL)
- Action Student Opinion: Voting Aye: Limbach, Hemmer, Ibrahim, and Kratochvil. Voting Aye: Weitz, Clare, Kenney, O'Connor, Phares, Pillen, Schafer, and Stark. Motion carried.
- University of Nebraska at Omaha
- Motion Moved by Weitz and seconded by Phares to approve item XI-A-8
- XI-A-8 Approval to create a Master of Arts (MA) in History and Government in the Department of History and Department of Political Science in the College of Arts and Sciences at the University of Nebraska at Omaha (UNO)
- Action Student Opinion: Voting Aye: Hemmer, Ibrahim, Kratochvil, and Limbach. Voting Aye: Clare, Kenney, O'Connor, Phares, Pillen, Schafer, Stark, and Weitz. Motion carried.

B. BUSINESS AND FINANCE

University of Nebraska

- Motion Moved by Pillen and seconded by O'Connor to approve items XI-B-1, XI-B-2, XI-B-3, and IX-B-4
- XI-B-1 Approve the Fund B, University Program and Facilities Fee (UPFF) 2021-22 Allocation for the University of Nebraska at Kearney
- XI-B-2 Approve the Fund B University Program and Facilities Fees (UPFF) 2021-22 Allocation for the University of Nebraska-Lincoln
- XI-B-3 Approve the Fund B, University Program and Facilities Fee (UPFF) 2021-22 Allocation for the University of Nebraska Medical Center
- XI-B-4 Approve the Fund B, University Program and Facilities Fees (UPFF) 2021-22 Allocation for the University of Nebraska Omaha
- Action Student Opinion: Voting Aye: Ibrahim, Kratochvil, Limbach, and Hemmer. Voting Aye: Kenney, O'Connor, Phares, Pillen, Schafer, Stark, Weitz, and Clare. Motion carried.
- Motion Moved by O'Connor and seconded by Phares to approve items XI-B-5 and XI-B-6
- XI-B-5 Approve the FY 2021-22 Operating Budget and 2021-22 and 2021-22 tuition rates for the University of Nebraska
- IX-B-6 Approve the FY 2021-22 Operating Budget and 2021-22 and 2021-22 tuition rates for the Nebraska College of Technical Agriculture
- Action Student Opinion: Voting Aye: Kratochvil, Limbach, Hemmer, and Ibrahim. Voting Aye: O'Connor, Phares, Pillen, Schafer, Stark, Weitz, Clare, and Kenney. Motion carried.

University of Nebraska at Kearney

- Motion Moved by Pillen and seconded by Stark to approve items XI-B-7 and XI-B-8
- XI-B-7 Approve and authorize execution of standard form Guaranteed Maximum Price contract amendments for New Fraternity and Sorority Life Housing at UNK

University of Nebraska-Lincoln

- XI-B-8 Approve and authorize execution of standard form Guaranteed Maximum Price contract amendments for Kiewit Hall at UNL
- Action Student Opinion: Voting Aye: Limbach, Hemmer, Ibrahim, and Kratochvil. Voting Aye: Phares, Pillen, Schafer, Stark, Weitz, Clare, Kenney, and O'Connor. Motion carried.

University of Nebraska Medical Center

- Motion Moved by Pillen and seconded by Clare to approve items XI-B-9, XI-B-10, and XI-B-11

- XI-B-9 Approve the acquisition of the property known as American National Bank, Saddle Creek Lots OLA Block 0, Outlots A&B for the University of Nebraska Medical Center
- XI-B-10 Approve the acquisition of the properties located at 4616, 4625, 4627, and 4631 Farnam Street, Omaha, Nebraska for the University of Nebraska Medical Center
- XI-B-11 Approve the acquisition of the properties located at 4308, 4314, 4338, and 4342 Leavenworth Street, Omaha, Nebraska for the University of Nebraska Medical Center
- Action Student Opinion: Voting Aye: Hemmer, Ibrahim, Kratochvil, and Limbach. Voting Aye: Pillen, Schafer, Stark, Weitz, Clare, Kenney, O'Connor, and Phares. Motion carried.
- University of Nebraska at Omaha
- Motion Moved by Clare and seconded by Ibrahim to approve item XI-B-12
- XI-B-12 Approve the Program Statement for Kayser Hall Renovation for the Samuel Bak Museum and Academic Learning Center at UNO
- Action Student Opinion: Voting Aye: Ibrahim, Kratochvil, Limbach, and Hemmer. Voting Aye: Schafer, Stark, Weitz, Clare, Kenney, O'Connor, Phares and Pillen. Motion carried.
- Motion Moved by Phares and seconded by Weitz to approve item XI-B-13
- XI-B-13 Approve the University of Nebraska at Omaha Department of Public Safety (UNODPS) joining the Interlocal Agreement allowing cooperating law enforcement agencies within Douglas and Sarpy counties in Nebraska to provide assistance in time of emergency or other time of need
- Action Student Opinion: Voting Aye: Kratochvil, Limbach, Hemmer, and Ibrahim. Voting Aye: Stark, Weitz, Clare, Kenney, Phares, Pillen, and Schafer. Abstain: O'Connor. Motion carried.

C. FOR INFORMATION ONLY

- XI-C-1 Amendment of the Standing Rules of the Board of Regents

D. REPORTS

- XI-D-1 Quarterly Personnel Report for the period January through March 2021
- XI-D-2 Spring 2021 Enrollment Report
- XI-D-3 Expedited Approval of the Mathematics Education Graduate Certificate to be administered by the Department of Teaching, Learning and Teacher Education in the College of Education and Human Sciences in consultation with the College of Arts and Sciences at the University of Nebraska-Lincoln (UNL)
- XI-D-4 Laboratory, Student, and Miscellaneous Fees for 2021-2022

- XI-D-5 Annual Program Monitoring Reports to the Board of Regents
- XI-D-6 Quarterly report of Gifts, Grants, Contracts and Bequests
- XI-D-7 Quarterly Status of Capital Construction Projects
- XI-D-8 Bids and Contracts
- XI-D-9 Intermediate Design Report for the Schmid Law Library Renovation at the University of Nebraska-Lincoln (UNL)
- XI-D-10 Naming of an exhibit in the Wigton Heritage Center “In Recognition of Bernice M. Hetzner, Director, McGoogan Library, (1948-1973) a Pioneer” pursuant to the *Board of Regents Policy RP-2.7.3.b*
- XI-D-11 Naming of an exhibit in the Wigton Heritage Center “The History of Teaching Tools Exhibit” pursuant to the *Board of Regents Policy RP-6.2.7.3.b*
- XI-D-12 Approve the naming of selected spaces within the Rod Rhoden Business Innovation Center at the University of Nebraska at Omaha, pursuant to *Board of Regents Policy RP-6.2.7.3.b*
- XI-D-13 Renewal of Student Health Insurance Policies

Chairman Kenney accepted the reports on behalf of the Board.

XII. ADDITIONAL BUSINESS

Motion Moved by O’Connor and seconded by Weitz that the Board go into closed session as authorized by Neb. Rev. Stat. § 84-1410 of the Revised Statutes of Nebraska for the protection of the public interest, and to prevent needless injury to the reputation of persons who have not requested a public hearing, for the purpose of holding a discussion limited to the following subject:

- Personnel matters involving members of the University staff.

Chair Kenney declared that the closed session would be strictly limited to a discussion of:

- Personnel matters involving members of the University staff.

Action Student Opinion: Voting Aye: Limbach, Hemmer, Ibrahim, and Kratochvil. Voting Aye: Weitz, Clare, Kenney, O’Connor, Phares, Pillen, Schafer, and Stark. Motion carried.

The Board went into closed session at 10:52 a.m. The Board reconvened the open meeting at 11:37 a.m.

XIII. ADJOURNMENT

There being no further business, the meeting was adjourned by Chairman Kenney at 11:37 a.m.

Respectfully submitted,

Stacia L. Palser
Interim Corporation Secretary

Paul R. Kenney, Chair

ATTACHMENT 1



NOTICE OF MEETING

Notice is hereby given that the Board of Regents of the University of Nebraska will meet in a publicly convened session on Friday, June 25, 2021, at 9:00 a.m. in the board room of Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska.

An agenda of subjects to be considered at said meeting, kept on a continually current basis, is available for inspection in the office of the Corporation Secretary of the Board of Regents, Varner Hall, 3835 Holdrege Street, Lincoln, Nebraska, or at <https://nebraska.edu/regents/agendas-minutes>

A copy of this notice will be delivered to the Lincoln Journal Star, the Omaha World-Herald, the Daily Nebraskan, the Gateway, the Antelope, the Kearney Hub, the Lincoln office of the Associated Press, members of the Board of Regents, and the President's Council of the University of Nebraska.

Dated: June 18, 2021

Stacia L. Palser
Interim Corporation Secretary
Board of Regents
University of Nebraska

Board of Regents

Varner Hall | 3835 Holdrege Street | Lincoln, NE 68583-0745 | 402.472.3906 | FAX: 402.472.1237 | nebraska.edu/regents