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# Program Review: Mathematics and Statistics Department 

Katherine Kime
University of Nebraska at Kearney Department of Mathematics and Statistics Faculty \& Staff

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## DEPARTMENT OF MATHEMATICS AND STATISTICS SELF-STUDY ACADEMIC PROGRAM REVIEW MARCH 30-31, 2022

Dr. Katherine Kime, Chair, Department of Mathematics and Statistics, Department Faculty and Staff

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## Review Team Members and Schedule

## Members

Dr. Mark Hall
Professor, Department of Mathematics, Hastings College, Hastings, Nebraska.
Dr. Julie Campbell
Professor, Department of Criminal Justice, University of Nebraska Kearney.
Dr. Dena Harshbarger
Associate Professor, Department of Teacher Education, University of Nebraska Kearney.
Dr. Carla Kegley-Owen
Senior Lecturer, Department of Chemistry, University of Nebraska Kearney
Dr. Kenneth Trantham
Professor and Chair, Department of Physics, University of Nebraska Kearney
Mr. Kelan Schumacher
Math Teacher, St. Cecilia, Hastings, Nebraska; alumnus of UNK Math/Stat Dept.

## Schedule

March 30, 2022
8:00-9:00
Orientation Breakfast, Nebraskan Student Union
(Review Team, Dr. Jacob Weiss, Dean Teten, Dr. Beth Hinga)
9:15-9:45
Review Team meets with Dean Teten, NSU 310
10:00-10:30
Review Team meets with Dr. Beth Hinga, Assistant to the Senior Vice Chancellor for Academic Affairs, Director of Assessment, NSU 310

10:45-12:15
Review team meets with students, NSU 310

## 12:30-1:30

Lunch (Review team, Jacob Weiss), Sandhill's Room, 2nd Floor, Nebraskan Student Union

2:00-3:45
Review Team meets with mathematics faculty, NSU 310
4:00-4:30
Review Team meets with Katherine Kime, Chair, Dept of Mathematics, Zoom, NSU 310

## March 31, 2022

9:00-9:30
Tour of DSCH, with guide Dr. Kenneth Trantham, Building Co-Supervisor and Review Team Member. Meet at East Entrance, first floor.
9:45-12:15 Review Team prepares recommendations for exit interview, Ockinga Auditorium

12:30-1:15
Lunch (Review team), Ockinga Auditorium
1:30-2:00
Oral report to mathematics faculty, Ockinga Auditorium
2:30-3:30
Oral report to the Senior Vice Chancellor for Academic Affairs, Dr. Charles Bicak, and Dean Teten, Location TBD

## 1. General Program Characteristics

## History

Mathematics has apparently been taught on this campus since the inception of the Nebraska State Normal School at Kearney in 1903. The purpose of the normal school was to train high school graduates to be teachers. The institution's name changed to the Nebraska State Teachers College at Kearney in 1921, and then became Kearney State College in 1963. In 1991, Kearney State College joined the University of Nebraska system, and became the University of Nebraska Kearney.

Mrs. Polly Amstutz, who became a senior lecturer in the mathematics and statistics department, had an educational pathway that continued through the transitional period in the early sixties and indicates the strengths of the curriculum. Entering NSTC in 1962, she was in the last group to obtain a two-year certificate which qualified a student to teach elementary school. She recalls taking 20 hours of mathematics during those two years, including several five-hour courses in which she met her husband, Dave Amstutz, who later became a professor in the Physics Department at KSC and UNK. Classes had a good number of students, and fostered camaraderie. The five-hour courses were engrossing.

Polly taught second grade for a year and was confident in teaching the mathematics. She then returned to KSC for a year and finished the mathematics necessary to teach high school. Later she and her husband went to UNL, and after the birth of their son and return to Kearney, Polly finished her master's degree here, leading to her position as lecturer and senior lecturer. On their retirement from UNK, Polly and Dave gifted the university with a Foucault pendulum, which now executes motion in the lobby of Bruner Hall of Science.
While the institution was Kearney State College, much of the energy of the department's faculty went towards teaching undergraduates who wanted to become high school teachers. From at least 1968 on, the department had a master's degree program, which included at various times Abstract Algebra I and II, Theory of Fields, Analysis I and II, Topology, Nonparametric Statistics, Regression Analysis and other higher level courses. Graduate students who were already teaching took courses on campus in the summer. The graduate program was put on hold in 1998 and eliminated in 2002. Before 2003 the department offered a B.S. in Actuarial Science and a B.S. in Statistics. Due to low enrollments and budget problems, these programs were eliminated in 2003.

In 2008, in cooperation with the College of Education, the department started an online summer graduate program leading to a masters in Curriculum and Instruction with a mathematics emphasis. The intended audience for the program was current middle school and high school mathematics teachers. Currently, the Curriculum and Instruction, Master of Arts in Education, Secondary Education Concentration requires 12-18 hours from a content area, of which math is one. Further, the department is a participant in the STEM Education Program, which gives a Master of Science in Education and is a fully online program.

While research was not emphasized at Kearney State, when KSU joined the university system, scholarship became an important part of faculty endeavors. Since that time, the department
has been concentrating on the challenge of maintaining its quality degree programs, while developing the scholar-teacher model. This has taken numerous forms. Part of the challenge has been to continue to cultivate the personal qualities of faculty that benefit students, while also incorporating an interest in scholarship and research. The department has made great progress along these lines and has developed a group of faculty from whom students get to experience the different aspects of mathematical thinking. Some things about the approach of a professor can only be sensed by the listener, ideas evoked even if not articulated, and the small class sizes allow for that to happen.

Faculty hired since the 2012 APR are Amy Nebesniak, Jia Huang, Ted Rupnow, Derek Boeckner, Nathan VanderWerf, Scott Gensler, and Paul Bonk. These hirings occurred following retirements and other departures from the department. At the time of the 2012 APR, the department had 13 full-time faculty members and one adjunct faculty. In Spring 2022, the department has 13 full-time faculty members and two adjuncts. Ashley Mitchell served as office associate until approximately 5 years ago, then Cami Roach served until December 2020 and now Elizabeth Steele is our office associate, shared with Physics.

In the 2012 APR, goals for the future included reorganization of the committee structure, revision of the assessment plan and consideration of further development of online graduate courses. These have been done; the development of online courses is ongoing.

## Mission of the Department of Mathematics and Statistics

The department affirms the intrinsic beauty of Mathematics and Statistics as well as the essential applications of these disciplines in a wide range of areas. As our mission, we aim to enhance students' understanding of and abilities in Mathematics and Statistics and to promote broad public awareness of the subjects. To support this mission, the Department is committed to

- providing a high quality academic experience in and out of the classroom and caring for each student's welfare,
- imparting a foundational knowledge of Mathematics to those choosing the subject as their major,
- preparing students for careers or graduate studies in the disciplines of Mathematics, Statistics, and related fields,
- supporting scholarly pursuits of faculty and involving students in inquiry through independent study and undergraduate research
- offering support to the Mathematics and Statistics community at large in our role as stewards to the disciplines

Approved by the department on 2 October 2014.

## Goals

The following goals have been edited by the department chair, Dr. Kime, from the 2012 APR to reflect current conditions (e. g, writing intensive courses were offered in 2012 but are offered no longer), but are essentially the same as the goals at that time. To the knowledge of the chair, these have not been revisited by the department as a whole.

- Teaching and Curriculum-Related Objectives

In pursuit of the goal "to be the best undergraduate Mathematics Department in the University of Nebraska system," the department strives:
a) to continue to provide rigorous and contemporary programs of study in mathematics and statistics, and to continue to maintain our leadership in the state of Nebraska in the areas of mathematics education. In addition to meeting the standards and guidelines of the National Council of Teachers of Mathematics (NCTM), the programs the Department offers in mathematics education will meet Rule 24 requirements of the Nebraska Department of Education.
b) to provide high quality support courses in mathematics and statistics and seek means of exporting courses in these areas upon request by delivering appropriate courses both on campus, independent study, and to remote locations by way of distance learning.
c) to continue to contribute to the UNK goal to be Nebraska's premier scholarly teaching institution by emphasizing the importance of teaching, scholarship, and service that complements and enhances teaching and faculty development.
d) to continue to provide General Studies courses in mathematics and statistics for every undergraduate student at UNK.
e) to continue to provide educational opportunities for both traditional and nontraditional students in the region we serve by delivering appropriate courses both on campus and to remote locations, formerly by distance education and now through online teaching.
f) to continue to make use of technology in the teaching of our courses
g) to review and evaluate our programs and courses on a continuing basis and work to modernize and improve existing programs in order to provide our students with the best and most current mathematical and statistical training possible.
h) to build, expand, and improve existing library resources related tomathematics, mathematics education, and statistics.
i) to acquire additional scholarship funds for present and prospective mathematics and mathematics education students.
j) to continue trying to obtain funding for the department from outside funding sources.
k) to recruit highly qualified faculty who can broaden the department academically and who will enhance the scholarly and service functions and activities of the department.
l) to continue to establish scholarships for majors in our different programs of study in order to encourage talented students to seek degrees in the mathematical sciences.
$m$ ) to continue to encourage scholarship and professional development in mathematics and mathematics education, by various means including giving all tenured/tenure- track
faculty, who request it, three hours of reassigned time to pursue scholarship, by providing opportunities for sabbatical leaves and by providing funding to support faculty development.
n) to increase emphasis on development of student research skills through course work, collaborative efforts between students and faculty, and independent student research opportunities.
o) to continue to develop alumni relations through the department newsletter, and other methods of contact in order to establish a network of support for funding scholarships, attracting quality students, and placing interns and graduates into jobs.

- Research and Scholarship Objectives

In pursuit of integrating scholarship and teaching as part of the Departments efforts to contribute to making UNK the premier scholarly teaching institute in the state of Nebraska, the department of Mathematics and Statistics will strive:
a) to encourage and support faculty research and writing, scholarship and publication characterized by regular presentation of research at regional and national meetings and regular submission of review articles, chapters, monographs and books for publication.
b) to continue to support the scholarly endeavors of the faculty by financial means and providing all faculty of the department with up-to-date computer support.
c) to encourage the faculty to involve students in faculty research program as research assistants and co-authors, encouraging student presentations and publications.
d) to support faculty research and travel with departmental funds and to seek outside sources of funding through public and private foundations as well as from the UNK Research Council to support faculty scholarship.
e) to work for the continued improvement of the Calvin T. Ryan Library as aresearch facility for faculty and studentscholars.
f) to encourage faculty to contribute to the climate of scholarship on campus thorough involvement in research presentations, workshops, and other opportunities.
g) to encourage faculty to serve on editorial boards of scholarly journals.
h) to establish a national reputation within the discipline through scholarship while maintaining the departments' commitment to undergraduate teaching.

- Service to College, Community, State, and Discipline Objectives

In pursuit of these goals, "To interact with industries, institutions, state and local agencies, and the community on matters that address the technical mathematics, professional training, and statistical needs of the State, region, and nation," the Department strives:
a) to continue to be of service to the institution, the community, and the region we serve by being active participants in campus affairs at the college and institutional levels, by making our services available to the community at large through consultation and by providing development opportunities for personnel in public education in the areas of content, curriculum and evaluation.
b) to work closely with other departments which depend on the Department of Mathematics and Statistics for support, so that their students receive the kindof background in mathematics and statistics that is appropriate.
c) to continue the active participation in the Nebraska Network forEducational Renewal and the new College of Education Teacher Education Program.
d) to continue to serve professional organizations such as NCTM, MAA, AMA, ASA, etc. by assuming leadership roles (secretary, treasure, president, vice president, governor, etc.).
e) to participate in the development of the UNK community by membership on the Departmental, College, and University committees.
f) to continue to support student organizations, especially Kappa Mu Epsilon, the Mathematics honorary Fraternity, the Mortar Board, or community organizations such as the American Red Cross, and the Nebraska Chess Club.
g) to continue to develop internship opportunities for students in mathematicsand statistics.
h) to respond to the mathematical and statistical needs of public-school teachers with workshops, and special courses.

## Stakeholders

UNK's General Studies program requires all UNK students to take a minimum of three hours in LOPER 4, Mathematics, Statistics and Quantitative Reasoning. MATH 102, 103, 106, 115, $120,123,230$ and STAT 235 and 241 fulfill the LOPER 4 requirement. An incoming student who is ready for Calculus II or III may use those to satisfy LOPER 4. Currently, LOPER 4 may also be fulfilled by one of four courses in CYBR, one in MGT, or one in PSY. Thus, it is not the case that every undergraduate will satisfy their General Studies requirement with a course from our department. The current General Studies program has been in effect since F2020.

Several departments require, or have as an option, at least one mathematics or statistics course beyond the General Studies courses. We include MATH 115 in the list below, which is a General Studies course, as it is required or optional in a number of degree programs. Some other programs require two of the General Studies courses, e. g. MATH 102 and MATH 120. Not all courses listed below are required or serve as an option for all majors within the given department. Please consult the catalog for detail to determine if required or optional.

Chemistry - MATH 115, MATH 202
CYBR - MATH 115, 202, 250, 260,440(280), MATH 300-MATH499(possible elective), STAT 345, STAT 441
Physics - MATH 115, 202, 260, 305, MATH 300-499 (possible elective)
Health Sciences Pre-Cardiovascular Perfusion, Pre-Optometry, Pre-Pharmacy, Pre-Osteopathic-MATH 115

In addition, students have earned double majors in which one of the two majors is a math major. The most frequent such double major pairing is with business administration, which is also the second most frequent major with which a math minor is earned. See Section 2. Thus
the Department of Management, which houses the business administration majors, could be viewed as an indirect stakeholder, along with the other departments in the charts in Section 2.

## Academic, Creative and Research Endeavors to Engage UNK Students

## Math Club

Dr. Derek Boeckner is the faculty sponsor for Math Club. His description follows.
Math club meets approximately twice a month during the Fall and Spring semesters. The students have a large say in what the club does, but activities include talking about interesting math problems that students have or that the faculty suggests, invited talks, game nights, collaborations with other clubs including cyber club and physics club, or other math related things that the students come up with - e.g., this semester we're having a planetarium talk over the Spring equinox and a Pi Day pie contest.

Along with the activities there come responsibilities. The students have rewritten the Math Club Constitution and been reapproved by the student senate for club status this year. They have also thought about and worked on ideas to make the department more approachable and engaging to students. They have created communication and collaboration channels using Microsoft Teams and the app GroupMe to help better spread word about math club activities and meetings and to work on projects like the constitution or advertising posters for events.

Coming out of Covid it has been difficult to maintain and grow attendance. In 2019 we had an average attendance close to 10, but that dropped off without regular meetings through 2020. We now have a core of 5-6 students that attend most meetings and who do a good job of marketing the club to campus. I expect that through the next couple of years we continue to grow with their leadership.
------Dr. Boeckner (minor editing by KK)

## Kappa Mu Epsilon

Dr. Kime is the faculty sponsor of our Nebraska Beta chapter of the national mathematics honorary society Kappa Mu Epsilon. In normal times, initiations are held every fall and spring. Acceptance is based on courses completed and grades. In spring 2016, our chapter hosted the North Central Regional Convention here in the Bruner Hall of Science. Three UNK KME students gave talks. Dr. Mark Hall was our invited speaker. One student and Dr. Kime attended the National Convention at Evangel University in spring 2017, and four students and Dr. Kime attended the North Central Regional Convention in spring 2018. Dr. Kime has been the North Central Regional Director of KME since fall 2015.

## Undergraduate Mathematics Research Mini-Symposium

The mini-symposium was initiated in spring 2015 and began as an opportunity for faculty to inform students of potential undergraduate research projects. Later, students also gave talks. In spring 2017, Dr. Boeckner spoke on graph limits and functions, student Ryan Clark (mentor Dr. Carraher) spoke on graph theory, student Jianbia Xu (mentor Dr. Huang) spoke on binary trees and student Madison Mickey (mentor Dr. Huang) spoke on the double minus operator. In 2018, Dr. Willis spoke on a symplectic method for the Heisenberg equations and Stephanie Slayden (mentor Dr. Willis), spoke on quasi-Stirling permutations. Drs. Huang and Willis and their respective mentees later published papers in peer reviewed journals. See Section 3 for these and other undergraduate research, independent studies and honors projects. Dr. Huang organized the mini-symposium in 2017-2019 and is organizing it again in 2022. Students in any area in which mathematics plays a role are encouraged to attend.

## CAS Math Specialist

The office of the College of Arts and Sciences Math Specialist began in the fall semester of 2021 and is housed at Thomas Hall. We offer individualized supplemental instruction services at the faculty level, guiding students who are currently struggling, or have shown potential to struggle, to achieve successful learning outcomes in a mathematics or statistics course. The course undertaken is either a component, or a prerequisite to other courses, to successfully fulfill all academic requirements to achieve their undergraduate degree. Employing proven strategies in math and statistics teaching and learning, our office strives to support the student as they grow in competences and skills, and experience greater confidence in their abilities to learn and use math and statistics in their lives. We involve other academic support available, including the academic advisors, peer tutors and academic coaches, hoping to further leverage our efforts. The CAS Math Specialist office will continue to evolve as it responds to the ongoing educational needs of students.
---- Dr. Sorensen

## Strategic Plan

The Recruitment and Retention Committee (see Sec. 5) has developed a plan which puts forth a strategy for attracting and retaining students. The results of the Academic Program Review will suggest questions concerning further strategic planning.

## University of Nebraska at Kearney Mathematics and Statistics Department Recruitment and Retention Plan 2020-2021

Recruitment and Retention Mission: We aim to continue current initiatives as well as to develop and implement new strategies to recruit a student population with talents and strengths that will allow them to be successful in completing a Mathematics and Statistic program. We also endeavor to build a support system for all students in our programs which allows them to be successful and to feel that choosing a Mathematics and Statistics program was the correct choice for them.

## Mathematics and Statistics Recruitment and Retention Plan:

We believe each of these strategies have a relatively high likelihood of being effective and detail action steps involved in each in the table below.

Five strategies for recruitment and retention:

1) Focus on increasing the number of math minors.

We have been successful at recruiting Elementary Education students to pursue a mathematics minor and we believe we can replicate this success with a variety of programs because a math minor strengthens the student's education and ability to compete in the job market after graduation in multiple fields.
2) Increase outreach to Western Nebraska Schools and Communities.

We believe that our 6-12 Mathematics Teaching Endorsement is the best in the region. Research on teacher recruitment demonstrates that development of grow your own programs can be an effective means to address teacher shortages. We hope to leverage a grow your own type of approach through stronger collaboration with the communities in which our students will be teaching after graduation through connections with alumni and general outreach.
3) Build a stronger community within our department's student body and between our students and faculty.

Research demonstrates the positive impact that community can have on student retention. We believe that the new STEM building and commons areas near the department will help foster a better sense of community and belonging to our students, and we wish to leverage that in an effort to increase retention rates.
4) Focus on increasing general studies student credit hours.

Our data analysis shows decreasing student credit hours in our general studies courses. We believe that dual credit and community college transfers have taken a large number of student credit hours from the university as a whole and our department specifically, and we aim to find and implement ways to lessen their effects on our department.
5) Maintain efforts developed in prior years.

Our data analysis shows decreasing numbers in our 6-12 Mathematics Teaching program and some retention struggles across majors. We believe that we have, over the past 4 years, begun to explore the problem of recruitment and retention in the math department, and that we have developed some foundational efforts that need to be maintained as we move forward while also strengthening them by initiating new strategies.

| Strategy | Action Steps | Timeline | Method of reporting |
| :---: | :---: | :---: | :---: |
| 1) Focus on increasing the number of Math Minors | - Send out periodic reminders to the faculty encouraging them to reach out (provide handout) to strong students in 100-200 level courses about being a math minor. <br> - Create and have available handouts that details the requirements of adding a math minor to various degrees and how it is beneficial to students in those of programs. Programs to start with: Applied Computer Science, Computer Science Comp, Business Finance, Business Admin, Psychology, Physics, and Economics. <br> - In cases where a student wants to change their major from math encourage them to maintain a minor. Communicate this strategy with Academic Advising and provide correlating materials about the minors and the new programs. <br> - Encourage students who do exceptionally well on placement exams (particularly international students) to think about a math minor | Ongoing and initiating new avenues beginning Fall 2020 | R\&R agendas and minutes |
| 2) Increase outreach to Western Nebraska schools/communiti es | - Create a math competition for Western Nebraska schools <br> - Create a periodic (monthly/quarterly) `Math Challenge’ at different primary/secondary levels for students in rural communities that can be distributed through ESUs and have Zoom/School visits for schools with outstanding solutions as well as a short video talk about the problem and about ways to solve and think about it that area teachers can use in their classrooms. <br> - Explore ideas for grants which encourage campus/area school/community collaboration and education <br> - Increased guidance counselor and Jr. /Sr. level teacher education about the programs we offer at UNK and specific ideas about what you can do with a math degree from UNK. <br> - Ensure academic recruiters are aware of our scholarships/scholarships related to math and math education. | Begin Fall 2020 and increased Post-COVID | R\&R agenda and minutes |
| 3) Build stronger community within our student body and between our students and faculty | - Increase our advising presence by looking at restructuring how we advise students <br> - Create better program-specific advising guides for faculty to use when advising students <br> - Create lead advisors for each program who support faculty in advising for their program by offering advising assistance and by maintaining calendars and notifying all program students of important dates and deadlines. <br> - Encourage student collaboration and studying in the spaces near departmental offices by creating an inclusive space in which students will want to visit, study, and hang out. <br> - Create math buttons awarded to students upon completion of upper level courses that they can collect and put on backpacks/bags/etc. that allow them to be visible to each other for questions/studying/identify them as math majors/offer talking points. <br> - Maintain high levels of involvement in KME and Math Club <br> - Create/explore other ways to increase students' sense of belonging to and engagement with fellow students and faculty. Possible intramural teams (Mathletes?), Bowling outings? Other events social events once a month attended by both students and faculty. <br> - Create Student Ambassadors for department tours, academic appointments, general liaisons between faculty and students <br> - Ensure students of all demographics feel welcome and supported by the department | Beginning Fall 2020 and Increased post-COVID | R\&R <br> agendas and minutes <br> Department Agendas an Minutes |
| 4) Focus on increasing general study credit hour production | - Determine if there is a new general studies math course that we could offer that would draw students back to campus from community colleges/dual credit and still meet most program requirements across campus. <br> - Examine trends in the data on student credit loss and see the distribution of loss attributed to dual credit, transfer in with credit, here and go elsewhere for credit <br> - Look at feasibility of offering online courses for the general students rather than just online degree only. <br> - Explore an $8+8$ versions of $101+102,102+123$, and $102+103$ that can take place over one semester. <br> - Look at data about success rates for GS math freshman/sophomore year vs Jr. /Sr. year and look at distribution to advisors across campus. | $\begin{aligned} & \text { Begin Fall } \\ & 2020 \end{aligned}$ | R\&R agenda and minutes |
| :---: | :---: | :---: | :---: |
| 5) Maintain Efforts developed in prior years | - Updating website annually with recent graduates' accomplishments/quotes/pictures at their jobs and with current events/faculty research/undergrad research <br> - Reach out to undecided students with high math ability (based on ACT scores) <br> - Maintain good relations with the admissions department and admissions counselors and continue sharing annually information about degree offerings and emphasis areas and education about what a math degree does for a student. <br> - Keep working with area schools and MATHCounts regarding their math competitions <br> - Continue to collect data regarding retention of majors and minors <br> - Continue examining data exploring trends in courses which are difficult/roadblocks to students in completion of their degrees to determine where and when support for students is needed | Ongoing | R\&R agenda and minutes |
| 6) Action steps that tie into multiple Strategies | - Create a document that explains what you can do with a math degree. Highlight the emphasis areas of comprehensive program. Share with department faculty, Academic Advising, prospective students, etc. <br> - Create a document that details career opportunities available to math majors that can be provided to academic advisors specifically to help answer the question "what do I do with a math major?" <br> - Continue to gather and examine data related to student credit hours, student retention, degrees conferred, first year enrollment numbers in a math degree, etc. | Ongoing and Begin Fall 2020 | R\&R <br> agendas and minutes Department agendas and minutes |

## Organizational Structure

The department has a chair and an office associate. The office associate is shared with Physics. The committee structure has recently been revised.

## Chair Responsibilities

The Dean of CAS has recently instituted three-year terms for chairs. Dr. Willis served as chair for eight years, and Dr. Kime became chair in June 2019. The chair duties given below have been in existence for some time and have not been edited. The College of Natural and Social Sciences has now become part of the College of Arts and Sciences, CAS.

The Department Chair is the Instructional Leader and Chief Academic Officer of the Department of Mathematics and Statistics. The chair is directly responsible to the Dean of the College of Natural and Social Sciences and, through the Dean, to the Vice Chancellor of Academic Affairs and the Chancellor of the University.

The major function of the chair is to provide academic and administrative leadership for the improvement of instruction in the department. The chair works under the direction of, and in cooperation with, the Dean of the College of NSS in the discharge of all departmental duties and any other responsibilities, which may be delegated. In carrying out these responsibilities, the Department Chair will operate within the policies and guidelines of the Department of UNK, and the Board of Regents. With the advice and cooperation of departmental colleagues, the Chair is expected to accomplish defined academic, professional, and administrative responsibilities which include:

Academic and Professional Responsibilities

1. Determination of personal requirements; makes recommendations of departmental faculty needs to the department and the dean for their advice and consent; does the initial paperwork to form search committees to develop job descriptions and searches in accordance with departmental policy.
2. Makes recommendations for timely tenure and promotion of faculty in concert with UNK and Departmental Tenure/Promotion Committees.
3. Supervises the implementation of student evaluation of faculty each semester in a prompt and timely manner.
4. Evaluates the performance and the contributions of departmental faculty (both full and part time); consults with the faculty concerning these evaluations; and makes recommendations for and works with faculty for needed improvement. These evaluations must be done at least once per year for each tenured faculty member and each semester for non-tenured faculty member. It is noted here that student evaluations shall be done each semester by each departmental faculty member as per university policy, but the chair consultation with each faculty member concerning these evaluations must be done as often as specified above.
5. Recommends, implements, and monitors individual faculty improvement programs.
6. Promotes and encourages staff development through departmental programs for faculty self-improvement.
7. Coordinates the staff development and improvement programs.
8. Supervises the department/program curriculum revision based upon defined future requirements and projections in accordance with departmental direction.
9. Encourages departmental colleagues to participate in research, professional organizations, student organizations, and service activities.
10. Provides ethical and professional leadership to faculty and students in the academic and social community.
11. As a faculty member, the chair assumes a half-time teaching load during the academic year (or lower with the dean's approval but no less than three hours). Since fulltime loads are usually not available for the entire departmental faculty wishing to teach during the summer session, the duties of the chair during the summer may not constitute a fulltime summer load. If available, the chair may receive any "Administrative Compensation" provided outside the departmental salary budget but provided by the College of NSS or UNK. The teaching load for the chair during the summer session shall be the same as other departmental members. That is, the chair's summer teaching load shall be rotated and be assigned in a manner similar to that of any other departmental faculty member who wishes to teach in the summer session.
12. Completes students major and minor check sheets in accordance with all departmental requirements in effect at the time. If course substitutions or wavers are requested by the student, the policy is as follows until changed or amended by the department. Normally, course substitutions and/or waivers will not be permitted for any major or minor program of study which is offered by the department of mathematics and statistics at UNK. If extenuating circumstances seem to exist which would justify a substitution and/or waiver, the request for such substitution and/or waiver must be presented, in writing, to the department. Such matters will then be referred to the Departmental Faculty and Student Affairs Committee (if Mathematics) or the Statistics Committee (if Statistics) the decision of these committees will be considered as final in such matters unless a request is made to have the entire department reconsider the decision.
13. Administers the programs and policies of the faculty of the department. In this regard, it is the responsibility of the chair, with the registrar, to require all graduates of our departmental programs meet all of the programmatic requirements for graduate without exception. In addition, the chair is charged with the responsibility of requiring each UNK graduate meet departmental general studies requirements as provided by the UNK Catalog. It is to be noted here that it
is the responsibility of the faculty of the department to adopt the policies and programs of the department.
14. Is personally active in Academic and Professional Organizations: Campus, State, and Nationally.

Administrative Responsibilities

1. Preparation and administration of a departmental budget with the advice and consent of the departmental faculty.
2. Insures that faculty has adequate teaching materials and supplies.
3. Preparation of departmental academic schedules with prior approval of the department before submission to the Dean of CAS.
4. Supervision of faculty leaves: temporary or otherwise.
5. Approval of student field trips.
6. Scheduling and chairing periodic department faculty meetings for the purpose of planning and exchanging information. A recording secretary shall be present at all department meetings for the purpose of taking complete and accurate minutes. Copies of these minutes shall be distributed to all departmental members with a secure and permanent file of all minutes kept in the departmental office.
7. Supervision of departmental support staff.
8. Recommendation of physical facility modification as required for effective delivery of the departmental academic programs with the advice and consent of the faculty.
9. Supervision of departmental student recruiting.
10. Supervision of equipment maintenance and replacement schedules.
11. Supervision of the timely acquisition of state-of-the-art equipment required for the effective delivery of departmental programs.
12. Attend all meetings called by the Dean of CAS and other higher officers of UNK.
13. Participation in the meetings and work of the Association of Departmental Chairpersons. The association serves as an advisory body to the chancellor and provides a forum for discussions relating to improve administrative effectiveness.
14. Be on duty at least one week prior to the beginning of the academic year in August, be on campus and available during all formal registrations, final weeks, and commencements.
15. Consultation with the Dean of NSS and other Administrative Officers of UNK whenever necessary for the proper discharge of the chair's duties.
16. Act on behalf of the department as its advocate and liaison with the University Community.
17. Meet with students, parents, alumni, etc., as needed. Advise students with regard to possible career opportunities available to those with departmental majors or minors.
18. Meet deadlines for submission of reports, catalog copy, publications of newsletters and brochures, etc. with the advice and consent of the faculty.
19. With the advice and consent of the department, assign faculty to available departmental committees.
20. As the chair is mainly an administrative position, the chair shall faithfully carry out the policies and decisions of the department.
21. Maintain up-to-date files in the department office with appropriate security considerations given to sensitive files. Such files shall include but not necessarily be limited to:

Faculty/Staff files
Course descriptions and outlines
Policy Manuals
Records of Meetings of the various departmental committees
Official minute of all departmental meetings
Teaching assignments for each semester/summer including overloads.
CNSS meetings; both general and chair meetings.

## Office Associate

The list of duties has been provided by our Office Associate, Elizabeth Steele.

1. Provides direct or indirect assistance with department related tasks. This includes room or class scheduling, travel, budget and general support to all areas of the department.
2. Maintains office equipment, orders department and instructional supplies.
3. Inputs data from Canvas into Evaluation Kit to deploy faculty evaluations each semester.
4. Maintains records for Math Placement Test, communicating results with department chairs and/or student's advisors. Communicates with students concerning tests, scores and course options. Proctors the placement test as needed.
5. Greets faculty, staff, students and others by phone, in person or through electronic media. Assesses needs and explains services, processes, procedures and guidelines. Handles requests/transactions or directs the person or matter to the proper sources. Assists in resolving problems and ensuring satisfactory resolutions. Processes various forms or applications and ensures accuracy and completeness; enters, computes, verifies, compiles data and forwards for review/approval or files paperwork.
6. Coordinates, organizes, and takes minutes at meetings, and supports other department activities and functions. Schedules or obtains use of rooms and sets
up rooms and equipment for use.
7. Enters information into Digital Measures as needed and/or other large and complex databases of department records and services, ensures the accuracy completeness of the data and generates reports or outputs when necessary.
8. Hiring, supervising and monitoring of student workers.

## Committee Structure

The department approved the following new committee structure in December 2021. The development of a method of choosing committee members is in progress and the new structure should take effect in F2022. The former committee structure had six standing committees: Assessment, Peer Review, Academic Programs, Faculty and Student Affairs, Policy and Planning, and the Graduate Committee. In recent years a Recruitment and Retention Committee was initiated, but was not formalized. Its activities are part of the Outreach and Department Engagement committees in the new structure.

New Committee Structure
The Department of Mathematics and Statistics shall have 7 standing committees, including:

1. Assessment Committee (A)
2. Peer Review Committee (PR)
3. Outreach Committee (0)
4. Department Engagement Committee (DE)
5. Academic Programs Committee (AP)
6. Policy and Planning Committee (PP)
7. Graduate Committee (G)

Special ad hoc committees may be created upon majority vote of the department and subcommitteesmay be created upon majority vote within a committee. Possible reasons for Ad Hoc Committee formations may include:

- Developing, evaluating, and revising a set of policies and procedures regarding promotion,tenure, and annual review of faculty performance.
- Committees to address grievances of department members
- Hiring of new department members
- Specific tasks that don't fall under the purview of any of the current committees. General responsibilities of the standing committees shall include:

1. At the beginning of the academic year, the chair of the department will convene each committee to provide charge(s),
2. Committees shall convene at regular intervals, as determined by the committee at the beginningof each academic year,
3. Complete annual tasks,
4. Maintain minutes and upload to central location accessible to all department members,
5. Report committee progress and/or propose future work at each department meeting,
6. Developing, evaluating, revising, and following a committee plan which includes a calendar of annual tasks.

The Assessment committee focuses on the effectiveness of the department's coursework and programs. Annual duties related to this endeavor shall include, but not be limited to:

- Developing, evaluating, and revising a departmental assessment plan (in accordance with university requirements) for the continuous evaluation of department courses and programswith the goal of maintaining and improving high quality instructional and student learning outcome
- Providing administrative oversight and implementation of the established departmentalassessment plan in consultation with appropriate department faculty and students.
- Giving recommendations to the department regarding the implications of the results of annual assessment for the maintenance and continual improvement of high quality instructional and student learning outcomes.
- Evaluating the effectiveness of the department's service coursework and the extent to whichthey are meeting the needs of the university

The Peer Review committee focuses on the yearly peer review process. Annual duties related to this endeavor shall include, but not be limited to:

- Communicating appropriate dates to the department faculty (including early dates for first- and second-year faculty) regarding the submission of annual review materials to the committee andthe department chairperson.
- Communicating the guidelines and procedures for annual review to department faculty according to department policy.
- Conducting annual review of faculty materials in a timely manner, and in accordance with department policy.
- Submitting the peer review letter for each faculty member to that faculty member and thedepartment chair

The Outreach committee focuses on outreach activities beyond the department, such as the recruitment of majors/minors and connecting with alumni. Annual duties related to this endeavor shallinclude, but not be limited to:

- Developing, evaluating, and revising a departmental outreach plan, including
i. Organizing and/or participating in recruitment events, job fairs, etc.,
ii. Recruiting both new students and strong current students through outreach in classesand to undecided students,
iii. Organizing the involvement of current students in recruitment efforts,
iv. Maintaining a record of alumni and current job status.
- Providing administrative oversight and implementation of the established departmental outreach plan in consultation with appropriate department faculty and students, including thedepartment chairperson whose express duties include departmental representation.

The Department Engagement committee focuses on retention/advising of program students and the support of department faculty. Annual duties related to this endeavor shall include, but not be limitedto:

- Developing, evaluating, and revising an engagement plan, which shall include a plan for
- Developing high-quality advising and advising support for our faculty,
- Providing high-quality mentorship of new faculty,
- Organizing department social activities that support faculty and staff morale and collegiality,
- Organizing professional development activities that support faculty in performing their duties in the areas of teaching, research, or service,
- Creating an engaging and supportive environment for our students.
- Awarding scholarships based on information provided by undergraduate scholarship applicants.
- Providing administrative oversight and implementation of the Departmental Engagement plan in consultation with appropriate department faculty and students including the department chairperson whose express duties include mentorship of faculty.

The Academic Programs committee focuses on all undergraduate academic coursework and programs provided by the department. Annual duties related to this endeavor shall include, but not be limited to:

- Developing, revising and maintaining the following, with a goal of innovation and highquality:
- undergraduate academic programs that support high quality instructional, studentlearning, and post-graduation outcomes,
- academic coursework in upper-level mathematics and mathematics education,
- academic coursework for service-related courses and general studies coursework.
- Recommending department policy regarding academic programs, coursework, and relatedissues.
- Regularly reviewing department programs in accordance with recommendations from theassessment committee, considering assessment data and professional standards when appropriate.
- Providing the department with recommendations regarding the revision of programs in accordance with assessment data, peer institution practices, and professional standards atappropriate times.

The Policy and Planning committee focuses on department policies, procedures, and strategic plan.Annual duties related to this endeavor shall include, but not be limited to:

- Developing, evaluating, and revising policies and procedures to guide general departmental structure and activities.
- Developing, evaluating, and revising the strategic plan for the department.
- Assisting the department chair with the APR during the years it is due and ensuring resulting recommendations are addressed.
- Overseeing the selection of committees on an annual basis

The Graduate Committee focuses on all graduate academic coursework and programs connected to the department. Annual duties related to this endeavor shall include, but not be limited to:

- Reviewing and recommending appointment of members to the Graduate Faculty.
- Developing, revising and maintaining the following, with a goal of innovation and highquality:
- Graduate academic programs that support high quality instructional, student learning,and post-graduation outcomes,
- academic coursework in graduate-level mathematics and mathematics education.
- Maintaining a regular rotation of graduate courses.
- Address any recommendations brought forward by the STEM Education Masters ProgramCommittee.


## 2. Degree Programs and Curricula

## Undergraduate Degrees and Minors

The department offers four undergraduate degrees and two minors. The Field Endorsement is considered a mathematics degree in the UNK Factbook, although it is called a Bachelor of Science in Education.

- Mathematics, Bachelor of Science. The B.S. degree in mathematics is primarily intended for students who are planning for graduate studies in mathematics, statistics, or economics; it is also intended for students who would like to start a career in a technical field. It has more unrestricted electives than the B.S. Comprehensive.
- Mathematics, Bachelor of Arts. The B.A. degree in mathematics is primarily intended for students who have an interest in a foreign language and who are also planning for graduate studies in Mathematics, Statistics, or Economics; it is also intended for students who are planning careers in finance or business, especially careers related to actuarial science.
- Mathematics Comprehensive, Bachelor of Science. The B.S. Comprehensive degree is intended for students who are planning for graduate studies in mathematics, physics, engineering, or statistics, or would like to start a career in a technical field. It includes a choice of emphasis; the emphasis areas are Applied Mathematics, Computer Science, Actuarial Science, and General.
- Mathematics 6-12 Teaching Field Endorsement, Bachelor of Science in Education. The Field Endorsement is intended for students who are seeking an in-depth knowledge of mathematics who are also seeking an endorsement to teach mathematics in grades six through twelve.
- Mathematics Minor. The minor in mathematics is intended for students seeking majors in another field who need more than an understanding of elementary calculus.
- Mathematics (Elementary Education) Minor. The Mathematics (Elementary Education) Minor is intended for elementary education and early childhood majors who would like to specialize in mathematics education.


## Courses Taken for Degrees

The following table gives required courses and MATH/STAT elective hours, beyond General Studies, for the degrees and minors. Calc I (or higher when applicable) is the required choice for LOPER 4 in General Studies but is included below to show the full calculus sequence. PHYS 275/275L, ENG 101 and 102, and some other courses, depending on the degree, are also required choices in General Studies.

| Course | B.A. | B.S. | Comp | Field | Minor | El-Ed Minor |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| 230, Math for Elementary Teachers I (3 hrs) |  |  |  |  |  | x |
| 330, Math for Elementary Teachers II (3 hrs) |  |  |  |  |  | x |
| 430, Middle School Mathematics (3 hrs) |  |  |  | x |  | x |
| 115, Calculus I (5 hrs) (Gen Studies, LOPER 4) | x | x | x | x | x |  |
| 202, Calculus II (5 hrs) | x | x | x | x | x |  |
| 260, Calculus III (5 hrs) | x | x | x | x | x |  |
| 250, Foundations of Math (3 hrs) | x | x | x | x | x |  |
| 305, Diff Eqs. (3 hrs) | x | x | x |  |  |  |
| 310, College Geometry (3 hrs) |  |  |  | x |  |  |
| 350, Abstract Algebra (3 hrs) | x | x | x | x |  |  |
| 400, History Mathematics (3 hrs) |  |  |  | x |  |  |
| 404, Theory Numbers (3 hrs) |  |  | x | x |  |  |
| 413, Discrete Math (3 hrs) |  |  | x | x |  |  |
| 440 (280 F2022), Linear Algebra (3 hrs) | x | x | x | x |  |  |
| 365, Complex Analysis (3 hrs) | x | x | x |  |  |  |
| 420, Numerical Analysis (3 hrs) | x | x | x | x | x |  |
| 460, Advanced Calculus (3 hrs) |  |  |  | x |  |  |
| 251, Inquiry and Proof in 9-12 Mathematics (1 hr) |  |  |  | x |  |  |
| 270, Methods Middle High Schl Math Tching I (2 hrs) |  |  |  |  |  |  |
| 271, Field Exprnce Middle and High Schl Math I (1 hr) |  |  |  | x |  |  |
| 470, Methods Middle High Schl Math Tching II (2 hrs) |  |  |  | x |  |  |
| 471, Field Exprnce Middle and High School Math II (1hr) |  |  |  | x |  |  |
| 465, Advanced Study in 9-12 Mathematics (2 hrs) |  |  |  | x |  |  |
| CSP 417, Counseling Skills (3 hrs) |  |  |  | x |  |  |
| STAT 241, Elementary Statistics (3 hrs) |  |  |  | x |  |  |
| STAT 441, Probability and Stat (3 hrs) | x |  | x | x |  |  |
| Math Stat Electives (hrs according to degree) | 6 | 6 | $12-19$ |  | 6 | 11 |
| Total Required hours <br> (beyond Calc I in the cases of the majors) | 34 | 34 | $52-59$ | 58 | 24 | 20 |

The following table compares when required courses would be taken in possible four years plans for the bachelor's degrees (Gen Studies not shown, except for MATH 115 and PHYS $275 / 275 \mathrm{~L}$ ). See catalog for specific allowed electives; some may be taken in the first three semesters.

| Term | B.A. | B.S. | Comp. | Field |
| :---: | :---: | :---: | :---: | :---: |
| F 2021 | 115 | 115 | 115 | 115 |
| S 2022 | 202,250 | 202, 250 | 202,250 | 202 |
| F2022 | 260 | 260 | 260,413 | 250, 251, 260 |
| S 2023 | $\begin{aligned} & 305,280 \\ & \text { PHYS 275/275L } \end{aligned}$ | $\begin{aligned} & 305,280 \\ & \text { PHYS 275/275L } \end{aligned}$ | $\begin{aligned} & 305,350, \\ & \text { PHYS275/275L } \end{aligned}$ | $\begin{array}{\|l} 270,271,280,350 \\ 430 \\ \text { PHYS 275/275L } \\ \hline \end{array}$ |
| F 2023 | 460 |  | 460 | $\begin{aligned} & 310,413, \\ & \text { STAT } 241 \end{aligned}$ |
|  | 350 | 350, 365 | $\begin{aligned} & 365,280, \\ & \text { STAT } 441 \end{aligned}$ | $\begin{aligned} & 365,404, \\ & \text { STAT 441 } \end{aligned}$ |
| F 2024 | (Electives) | (Electives) | (Electives) | $\begin{aligned} & 460,465,470,471,4 \\ & 00, \text { CSP } 417 \end{aligned}$ |
| S 2025 | STAT 441 | (Electives) | 420, 404 | Student Tching |

## Changes in Degree Programs, Curricula since last APR

- A requirement that all undergraduate degrees be capped at 120 hours was implemented several years ago.
- The subject endorsement for the B.S. Ed, which required fewer hours than the field endorsement, was discontinued due to the 120 hour cap.
- The title of MATH 470, Teaching of Secondary Mathematics, was changed to Methods in Middle and High School Mathematics Teaching, and the catalog description was changed. The change went into effect in F2018.
- The Field Endorsement was revised, by adding STAT 241, CSP 417, the new courses MATH 251, 270,271,465, 471, and reducing 470 to 2 hours and giving it the numbering of II. This change went into effect in F2021, with the first of the new courses, 251, to be offered in F2022.
- The Math Minor -Elementary Education was revised and the change went into effect in F2021. The changes included reducing the number of optional courses, some of which had hidden prerequisites, and rectifying too much overlap between the minor and the El Ed Field endorsement.
- The Actuarial Science emphasis was added to the B.S. Comprehensive.
- The General Studies requirements were reduced from 45 hours to 30-31 hours, starting F2020. MATH 115 became a General Studies course about this time.
- The numbering of MATH 440, Linear Algebra, was changed to MATH 280 (effective F2022), to show the actual level of the course and in response to a request from CYBR.

Degrees, Minors, and Concentrations Awarded

- Majors, minors and concentrations

Data was taken from the UNK Factbook. The department has not awarded a B.A. in the past ten years.

|  | FY20- <br> 21 | FY19- <br> 20 | FY18- <br> 19 | FY17- <br> 18 | FY16- <br> 17 | FY15- <br> 16 | FY14- <br> 15 | FY13- <br> 14 | FY12- <br> 13 | FY11- <br> 12 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 6-12/7-12 Field BSE | 7 | 2 | 3 | 4 | 1 | 11 | 3 | 3 | 2 | 1 |
| 7-12 Subject |  |  |  |  |  |  | 1 |  |  |  |
| 7-12 Subject BSE |  |  |  |  |  | 2 | 6 | 1 | 5 | 2 |
| Math | 2 | 2 | 1 | 1 |  | 1 |  |  | 1 | 1 |
| MathBS | 1 | 3 | 1 | 3 | 1 | 1 | 1 | 6 | 3 | 2 |
| MathCMP/MathCMP <br> BS | 1 | 3 | 1 | 2 |  |  | 3 | 1 | 3 | 4 |
| Total | 11 | 10 | 6 | 10 | 2 | 15 | 14 | 11 | 14 | 10 |
|  |  |  |  |  |  |  |  |  |  |  |

Four-year Undergraduate Degrees by Major
Math and MathCMP indicate second majors, which are not distinguished as BS or BA

|  | $20-$ <br> 21 | $19-$ <br> 20 | $18-$ <br> 19 | $17-$ <br> 18 | $16-$ <br> 17 | $15-$ <br> 16 | $14-$ <br> 15 | $13-$ <br> 14 | $12-$ <br> 13 | $11-$ <br> 12 |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| MATHELED- <br> MN | 4 | 2 | 3 |  | 1 |  |  |  |  |  |
| MATH-MN | 3 | 5 | 2 | 1 | 11 | 9 | 7 | 4 | 3 | 6 |
| Total | 7 | 7 | 5 | 1 | 12 | 9 | 7 | 4 | 3 | 6 |

Minors

|  | Academic <br> Plan | $21-$ <br> 21 | $19-$ <br> 20 | $18-$ <br> 19 | $17-$ <br> 18 | $16-$ <br> 17 | $15-$ <br> 16 | $14-$ <br> 15 | $13-$ <br> 14 | $12-$ <br> 13 | $11-$ <br> 12 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| MATH-CN | MIDGRD- <br> BAE |  | 3 | 2 | 1 | 1 | 1 | 3 | 7 | 4 | 2 |
| MATHEM | MIDLVL |  |  | 2 |  |  |  |  |  |  |  |
| MATHEM- <br> CN | MIDLVL- <br> BSE | 4 | 2 | 1 |  |  |  |  |  |  |  |
| MATHF-CN | MIDGRD |  |  | 2 | 2 | 3 | 2 |  | 1 |  |  |
| MATHS-CN | MIDGRD- <br> BSE | 1 | 5 | 7 | 5 | 5 | 6 | 6 | 3 | 3 | 4 |
| Total |  | 5 | 10 | 14 | 8 | 9 | 9 | 9 | 11 | 7 | 6 |

Concentrations or emphasis areas associated with either the Middle Grades (now an inactive major) or Middle Level 5-9 Subject education majors

- Double Majors and Minors

Students who earn a double major have a first and second major. The double major pairings in the chart below are aggregated in that the math major in a pairing may be the first or second major.


The following table shows the frequencies of majors which also had a Math minor. All students with Math(El-Ed) minors had an Elementary Education major.


The two charts above were provided by Keri Pearson, Academic Resources and Inst. Research.

## Enrollment Patterns

We give enrollments for approximately the past ten years in a selection of introductory courses, in the main calculus sequence, in a selection of math major courses, in the preservice courses (new courses start F2022), and in two of the three statistics courses. Our 300 and 400 level courses are offered only in the fall or only in the spring.

We note that for most of the introductory courses shown, namely $90,101,102,103$ and 123 , enrollments are almost always higher in the fall. One possible explanation is that entering students who need a General Studies math course wisely choose to take it right away, while their high school or community college math courses are fresh in their minds. Or it may be that many degree programs in other departments have room for these courses in their schedules in the fall, or perhaps another reason.

In the calculus sequence, enrollments in Calc I are higher in the fall (likely due to the many entering students). In Calc II they are generally higher in the spring, and in Calc III generally higher in the fall, which indicates that there are cohorts of successful students moving in step through the sequence.

In MATH 230, enrollments were consistently higher in the spring, AYs 15-16 through 19-20, and consistently higher in MATH 330 in the fall, AYs 15-16 through 20-21. Again, this indicates a cohort of successful students moving through the sequence 230-330. MATH 430 has had a clear upward trend in enrollments since AY 17-18.

In STAT 241, fall enrollments were higher in AYS 13-14 and 14-15, then a lower-higher fall-spring pattern occurred for four years, and then fall enrollments were lower in AYS 19-20 and 20-21. Thus, fall went from higher, to bouncing, then lower.

To attempt to identify the factors likely influencing our enrollment patterns, we need more granular information-which students are proceeding through a sequence without repeats or stops? What have been changes in majors in other departments that contribute to changes in our enrollments? It would be very interesting to obtain and study such information and would likely require a course release for a faculty member to do so.

- Introductory Courses The term introductory courses will refer here to Math 90 and all 100 level MATH courses. The department uses the mathematics ACT score, or in rare cases, the mathematics SAT score, to place students into introductory courses. If neither is available, and a student has not taken a prior UNK mathematics course, the student may take the department's placement test. The placement policy including cutoffs is given at the following link:
https://www.unk.edu/academics/math/ files/mathematics-placement-policy.pdf.
The department is working on a transition to the use of the UNL math placement test, which we aim to have in place for F2023.

MATH 102, 103, 106, 115, 120, 123 fulfill the LOPER 4 requirement in the General Studies program, as do MATH 230 and STAT 235, 241 (see further below). MATH 90 does not count towards an undergraduate degree, and MATH 101 and MATH 104 do not count towards LOPER 4.

In Fall 2019, the department received two $\$ 10,000$ grants from the then existing eCampus for the development of online MATH 101 and MATH 102 courses, which have been offered since summer 2020 and will be offered summer and fall of 2022. While a number of elementary courses have been offered in the summer for years, cancellations happened due to low enrollments. The summer online Math 101 and 102, as well as other summer courses offered online in response to the pandemic have had sufficient to good enrollments in summers 2020 and 2021.

Below we show enrollment data for MATH 90, 101, 102, 103 and 123.

## MATH 90 - Elementary Algebra



AY 12-13 AY 13-14 AY 14-15 AY 15-16 AY 16-17 AY 17-18 AY 18-19 AY 19-20 AY 20-21 AY 21-22 $\square$ Fall ■ Spring

MATH 101 - Intermediate Algebra


MATH 102 - College Algebra


MATh 103 - Plane Trigonometry


MATH 123 - Applied Calculus I


- Calculus Sequence The calculus sequence for mathematics majors, and others, consists of three 5 credit courses. These courses meet either five days a week for 50 minutes each time, or four days a week with 50 -minute meetings on MW and 75 minute meetings on TTh. Below we show enrollment data for the calculus sequence.


## MATH 115 - Calculus I with Analytic Geometry



Math 202 - Calculus II with Analytic Geometry


Math 260 - Calculus III


- 200 and higher level major courses All majors take MATH 250, 350, 440 (soon to be 280) and 460. Below, we show enrollment data for these courses along with MATH 310, which is required for the Field Endorsement and serves as one of the electives for the other majors.


MATH 310 - College Geometry


MATH 350 - Abstract Algebra


MATH 440 (to be 280) - Linear Algebra


MATH 460 - Advanced Calculus I


- Preservice Courses for Elementary, Middle and High School Teachers

MATH 230 and 330 are required courses for the Elementary Education Teaching Field Endorsement, B.A. Ed., as well as programs in Special Education and Early Childhood Education. MATH 230, 330, 430 and 470, and other mathematics courses are required for the Middle Level 5-9 B.S.Ed. with math concentration. MATH 430 and 470 have been required for the previous 7-12 Field Endorsement, and are required in the new 6-12 endorsement, along with the new courses mentioned above and in the table showing courses taken for degrees above.

MATH 230 - Math for Elementary Teachers I


MATH 330 - Math for Elementary Teachers II


## MATH 430 - Middle School Mathematics



## MATH 470 - Methods in Middle and High School Mathematics Teaching II

(Teaching of Secondary Mathematics prior to F2018, title above with number I, 2018-2020)


- Statistics

STAT 235 and 241 are offered to satisfy requirements in social science and other majors. STAT 441 is required for three of the undergraduate majors. STAT 345 was offered about twice in the last ten years but has been essentially dormant for at least 4 years. Below are the enrollments for STAT 241 and STAT 441.



## Participation in Graduate Programs

The department offers online graduate courses which serve the STEM Education Program, the Curriculum and Instruction Master of Arts in Education, and some non-degree students. Dr. Ted Rupnow is the current chair of the department's Graduate Committee and has given the description below.

The STEM Education Program is designed for science and math educators in grades $7-12$ who want to gain advanced pedagogical skills to become more effective teachers. Students can select either the Integrated Option or the Chemistry Option of the program, based on the expertise and qualifications needed for their classroom or school. The integrated option provides graduate course experience across disciplines while also focusing on a Major Emphasis in one of the following endorsement areas: Biology, Chemistry, Mathematics, or Physics/Physical Science. The chemistry option is geared toward chemistry teachers who want a greater focus on chemistry within their graduate degree. Students in this program must possess a bachelor's degree and a teaching certificate with an endorsement in biology, math, chemistry, physics or physical science.

The STEM Education Program has conferred 125 degrees over the past ten years. Over $20 \%$ or 27 of those students have chosen the Mathematics Emphasis for their STEM Education degree. Total graduates for each calendar year are included in the following table (data obtained from Linda JohnsonDirector of Graduate Admissions).

|  | 2021 | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| STEM Ed <br> Graduates | 18 | 18 | 15 | 15 | 13 | 16 | 12 | 10 | 4 | 4 |
| Math <br> Emphasis | 4 | 7 | 3 | 0 | 1 | 6 | 3 | 2 | 1 | 0 |

The department supports students in this program in a few key ways. The department elects a representative to serve on the STEM Education Program Committee, which is responsible for working with the program director to oversee all aspects of the program. The mathematics department also offers coursework to fulfill the mathematics major emphasis of the integrated degree option or supporting coursework for other emphases. In the past, faculty have also served as content or pedagogy mentors for students completing the capstone course, as well as graded comprehensive examinations. In this role, faculty advised students who were completing a culminating project that involved developing an innovative instructional unit and assessing the impact of the instruction in an actionresearch type study. After recent program changes, these mentoring and comprehensive examination grading roles are no longer necessary for the program.

Over the past ten years, the department has offered the following courses:

| 2012 | MATH 815 Topics in Discrete Mathematics for Secondary Teachers |
| :---: | :---: |
|  | MATH 852 Foundations of Calculus |
| 2013 | None |
|  | MATH 871 Modern Algebra with Geometry |
|  | MATH 871 Topics in Difference Equations |
| 2014 | MATH 871 Mathematical Knowledge for Teachers |
|  | MATH 871 Algebraic Geometry |
| 2015 | MATH 871 Current Research in Mathematics Education |
|  | MATH 871 Modern Algebra with Geometry |
| 2016 | MATH 871 Using Mathematics to Understand our World |
|  | MATH 871 Discrete Math for Teachers |
| 2017 | MATH 862 Mathematical Analysis for Teachers |
|  | MATH 871 Current Research in Mathematics Education |
| 2018 | MATH 864 Geometry for Teachers |
| 2019 | MATH 862 Mathematical Analysis for Teachers |
|  | MATH 864 Geometry for Teachers |
| 2020 | MATH 871 Experimentation, Conjecture, and Reasoning for Teachers |
|  | MATH 862 Mathematical Analysis for Teachers |
|  | MATH 871 Discrete Math for Teachers |
| 2021 | MATH 864 Geometry for Teachers |
|  | MATH 862 Mathematical Analysis for Teachers |

These courses account for over 500 student credit hours. Approximately $70 \%$ of the students taking these courses were/are seeking a M.S. Ed. in STEM Education (formerly Science/Math Education). Approximately $10 \%$ are seeking an M.A. Ed. in Curriculum and Instruction Secondary Education Concentration, mathematics. Students in this program are required to take 12-18 hours of graduate level mathematics coursework. Nearly all the other $20 \%$ of students served in these courses were nondegree seeking students. Data on course enrollments was obtained from course instructors. The table below shows courses taught, instructors and enrollments.
-----Dr. Rupnow (minor editing by KK)

| Course | 862 | 864 | 871 | 862 | 871 | 864 | 862 | 871 | 864 | 862 | 871 | 871 | 871 | 871 | 871 | 871 | 871 | 871 |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Instructor | B | Hu | W | B | R | Hu | B | N | Hu | B | W | N | He | N | He | He | W | F |  |  |  |  |
| Term | F21 | U21 | S21 | F20 | U20 | U20 | U19 | U18 | U18 | U17 | U17 | U16 | U16 | U15 | U15 | U14 | U14 | U14 | U12 | U12 |  |  |
| STEM Education | 1 | 7 |  | 4 | 5 | 6 | 9 | 9 | 11 | 6 |  | 9 |  | 11 |  |  |  |  |  |  | 78 | 0.69643 |
| Curriculum and Instruct. |  |  |  |  | 1 | 2 | 3 | 2 | 1 |  |  |  |  | 1 |  |  |  |  |  |  | 10 | 0.08929 |
| Non-Degree Initial Cert. |  |  |  |  | 0 |  |  | 1 |  |  |  |  |  |  |  |  |  |  |  |  | 1 | 0.00893 |
| Non-Degree Other | 3 | 1 |  | 2 | 1 | 1 | 2 | 2 | 3 | 4 |  |  |  | 3 |  |  |  |  |  |  | 22 | 0.19643 |
| School Principalship 7-12 |  |  |  |  |  |  |  |  |  | 1 |  |  |  |  |  |  |  |  |  |  | 1 | 0.00893 |
| Total | 4 | 8 | 2 | 6 | 7 | 9 | 14 | 14 | 15 | 11 | 16 | 9 | 9 | 15 | 15 | 8 | 5 | 13 | 20 | 8 | 180 |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  | 540 |  |
|  | Not |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | B: D | r. De | rek | Boeck | kner |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | Hu: | Dr. Ji | a Hua | ang |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | W: | Dr. Ja | cob | Weis |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | R: D | Dr. Ted | d Rup | pnow |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | N: D | Dr. Am | my N | ebesn | niak |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | He: | Dr. | Nick | Heins |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | F: D | Dr. Pa | ri Ford |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  | som | e spe | ecific | s not | ava | ilable | for | early | year |  |  |  |  |  |  |  |  |  |  |  |  |  |

## 3. Student Performance Measures

## Assessment

The department revised its assessment plan in 2019. It has submitted data for AY 2019-2020 and 2020-2021.

The assessment includes evaluation, with a rubric, of a written proof of a theorem by students in MATH 250 and MATH 350 or 460, alternating, each year. In 2019-2020, the theorem in MATH 250 was of one of DeMorgan's Laws, and the theorem in MATH 350 was: If $p$ is prime in $Z$, then ( $p$ ) is a prime ideal in Z. Averages were 9.67 and 10.5 , respectively, out of 12 possible, with 8 considered acceptable, 9 good, 10 very good and 11 to 12 excellent. In 2020-2021, Problem 1 in MATH 250 was the proof of a set equality involving Cartesian products, (AUB) X C = (A X C) U (B X C). Problem 2, actually a fact to show algebra, was: If a is congruent to $7(\bmod 8)$ and $b$ is congruent to $3(\bmod 8)$, then $a b$ is congruent to $5(\bmod 8)$. The theorem in MATH 460 was to show that $f(x)=x^{\wedge} 2$ is continuous at $\mathrm{x}=5$. Averages were $10,10.3$ and 11.1, respectively.

Charlotte Danielson Indicator scores are given by supervising teachers based on student teaching done in their last semester by Field Endorsement majors, and are included in the assessment. A recent compilation for the last five years was given by Dr. Rupnow, below.

|  | Charlotte Danielson Indicator | $\begin{gathered} 2016- \\ 2017 \\ \mathrm{~N}=1 \end{gathered}$ | $\begin{gathered} 2017- \\ 2018 \\ \mathrm{~N}=4 \end{gathered}$ | $\begin{gathered} 2018- \\ 2019 \\ \mathrm{~N}=3 \\ \hline \end{gathered}$ | $\begin{gathered} 2019 \\ 2020 \\ \mathrm{~N}=2 \end{gathered}$ | $\begin{gathered} 2020- \\ 2021 \\ \mathrm{~N}=7 \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1b-1. Knowledge of child and adolescent development | 3 | 2.75 | 3 | 3 | 2.57 |
|  | 1b-2. Knowledge of the learning process | 3 | 3 | 3 | 3 | 2.7 |
|  | 1b-3. Knowledge of P-12 students' skills, knowledge, and language proficiency | 2 | 2.75 | 3 | 3 | 2.57 |
|  | 1b-4. Knowledge of P-12 students' interests and cultural heritage | 2 | 2.75 | 3 | 3 | 2.57 |
|  | 1b-5. Knowledge of P-12 students' special needs | 3 | 2.75 | 3 | 3 | 2.86 |
|  | 1c-1. Value, sequence, and alignment | 3 | 3 | 2.67 | 3 | 3 |
|  | 1c-2. Clarity | 3 | 2.5 | 2.67 | 3 | 2.86 |
|  | 1c-3. Balance | 3 | 3 | 3 | 3 |  |
|  | 1c-4. Suitability for diverse learners | 3 | 3 | 2.67 | 3 | 2.71 |
|  | $1 \mathrm{e}-1$. Learning activities | 3 | 2.75 | 3 | 3 | 2.86 |
|  | $1 \mathrm{e}-2$. Instructional materials and resources | 3 | 3 | 3 | 3 | 3 |
|  | 1e-3. Instructional groups | 3 | 3 | 2.67 | 3 | 3 |
|  | 1e-4. Lesson and unit structure | 3 | 3 | 2.67 | 3 | 2.86 |
|  | 2a-1. Candidate interaction with P-12 students | 3 | 3 | 3 | 3 | 2.57 |
|  | 2a-2. Student interactions with other P-12 students | 3 | 3 | 3 | 2.5 |  |
|  | $3 \mathrm{c}-1$. Activities and assignments | 3 | 2.75 | 2.67 | 3 |  |
|  | $3 \mathrm{c}-2$. Grouping of $\mathrm{P}-12$ students | 3 | 3 | 2.67 | 3 | 2.86 |
|  | 3 c -3. Instructional materials and resources | 3 | 3 | 3 | 3 | 2.71 |
|  | 3c-4. Structure and pacing | 3 | 3 | 3 | 3 | 2.71 |
|  | Mean for Category | 2.89 | 2.89 | 2.88 | 2.97 | 2.78 |
|  | 1a-1. Knowledge of content and the structure of the discipline | 3 | 3 | 2.67 | 3 | 3 |
|  | 1a-2. Knowledge of prerequisite relationships (What do the P-12 students already know and are able to do?) | 3 | 2.75 | 3 | 3 | 2.86 |
|  | 1a-3. Knowledge of content-related pedagogy | 3 | 3 | 2.67 | 3 | 3 |
|  | 1e-1. Learning activities | 3 | 2.75 | 3 | 3 | 2.86 |
|  | 1e-2. Instructional materials and resources | 3 | 3 | 3 | 3 | 3 |
|  | 1e-3. Instructional groups | 3 | 3 | 2.67 | 3 | 3 |
|  | 1e-4. Lesson and unit structure | 3 | 3 | 2.67 | 3 | 2.86 |
|  | 3a-1. Expectations for learning | 3 | 3 | 3 | 3 | 2.86 |
|  | 3a-2. Directions and procedures | 3 | 3 | 3 | 3 | 2.86 |
|  | 3a-3. Explanations of content | 3 | 3 | 3 | 3 | 2.86 |
|  | 3a-4. Use of oral and written language | 3 | 3 | 2.67 | 3 | 2.57 |
|  | 3c-1. Activities and assignments | 3 | 2.75 | 2.67 | 3 |  |
|  | 3c-2. Grouping of P-12 students | 3 | 3 | 2.67 | 3 | 2.86 |
|  | 3c-3. Instructional materials and resources | 3 | 3 | 3 | 3 | 2.71 |
|  | 3c-4. Structure and pacing | 3 | 3 | 3 | 3 | 2.71 |
|  | 3e-1. Lesson adjustment | 3 | 3 | 2.67 | 3 | 2.71 |
|  | 3e-2. Response to P-12 students | 3 | 3 | 3 | 3 | 2.86 |
|  | 3e-3. Persistence | 3 | 3 | 3 | 3 |  |
|  | Mean For Category | 3 | 2.96 | 2.85 | 3 | 2.85 |
| $\begin{aligned} & \text { 与y } \\ & \text { n } \end{aligned}$ | 1b-1. Knowledge of child and adolescent development | 3 | 2.75 | 3 | 3 | 2.57 |
|  | $1 \mathrm{~b}-2$. Knowledge of the learning process | 3 | 3 | 3 | 3 | 2.7 |
|  | 1b-3. Knowledge of P-12 students' skills, knowledge, and language proficiency | 2 | 2.75 | 3 | 3 | 2.57 |
|  | 1b-4. Knowledge of P-12 students' interests and cultural heritage | 2 | 2.75 | 3 | 3 | 2.57 |
|  | 1b-5. Knowledge of P-12 students' special needs | 3 | 2.75 | 3 | 3 | 2.86 |
|  | 1e-1. Learning activities | 3 | 2.75 | 3 | 3 | 2.86 |
|  | $1 \mathrm{e}-2$. Instructional materials and resources | 3 | 3 | 3 | 3 | 3 |


|  | Charlotte Danielson Indicator | $\begin{aligned} & \hline 2016- \\ & 2017 \\ & \mathrm{~N}=1 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 2017- \\ & 2018 \\ & \mathrm{~N}=4 \\ & \hline \end{aligned}$ | $\begin{gathered} \hline 2018- \\ 2019 \\ \mathrm{~N}=3 \\ \hline \end{gathered}$ | $\begin{aligned} & \hline 2019- \\ & 2020 \\ & \mathrm{~N}=2 \\ & \hline \end{aligned}$ | $\begin{aligned} & \hline 2020- \\ & 2021 \\ & \mathrm{~N}=7 \\ & \hline \end{aligned}$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | 1e-3. Instructional groups | 3 | 3 | 2.67 | 3 | 3 |
|  | 1e-4. Lesson and unit structure | 3 | 3 | 2.67 | 3 | 2.86 |
|  | $1 \mathrm{f}-1$. Post assessment congruence with instructional objectives | 3 | 3 | 3 | 3 | 2.71 |
|  | 1f-2. Criteria and standards | 3 | 3 | 3 | 3 | 2.71 |
|  | 1f-3. Design of formative assessments | 3 | 2.75 | 3 | 2.5 | 3 |
|  | 1f-4. Use for planning | 3 | 2.75 | 2.67 | 3 | 3 |
|  | $3 \mathrm{~b}-1$. Quality of questions | 3 | 2.75 | 2.67 | 3 | 2.71 |
|  | 3b-2. Discussion techniques | 3 | 3 | 2.33 | 3 | 2.43 |
|  | 3b-3. Student participation | 3 | 2.75 | 3 | 3 | 2.29 |
|  | $3 \mathrm{c}-1$. Activities and assignments | 3 | 2.75 | 2.67 | 3 |  |
|  | $3 \mathrm{c}-2$. Grouping of P-12 students | 3 | 3 | 2.67 | 3 | 2.86 |
|  | 3 c -3. Instructional materials and resources | 3 | 3 | 3 | 3 | 2.71 |
|  | $3 \mathrm{c}-4$. Structure and pacing | 3 | 3 | 3 | 3 | 2.71 |
|  | 3d-1. Assessment criteria | 3 | 3 | 3 | 3 |  |
|  | 3d-2. Monitoring of student learning | 3 | 3 | 3 | 3 | 2.57 |
|  | 3d-3. Feedback to P-12 students | 3 | 3 | 2.67 | 3 | 2.57 |
|  | 3d-4. Student self-assessment and monitoring of progress | 3 | 2.75 | 3 | 3 |  |
|  | Mean For Category | 2.92 | 2.89 | 2.88 | 2.98 | 2.73 |
|  | 4a-1. Accuracy | 3 | 3 | 3 | 3 | 3 |
|  | 4a-2. Use in future teaching | 3 | 3 | 3 | 3 | 3 |
|  | $4 \mathrm{c}-1$. Information about the instructional program | 3 | 2.5 | 2.67 | 3 |  |
|  | $4 \mathrm{c}-2$. Information about individual P-12 students | 3 | 2.75 | 2.67 | 3 |  |
|  | 4c-3. Engagement of families in the instructional program | 3 | 2.5 | 2.33 | 3 |  |
|  | 4d-1. Relationships with colleagues | 3 | 3 | 3 | 3 |  |
|  | 4d-2. Involvement in a culture of professional inquiry | 3 | 2.75 | 3 | 3 |  |
|  | 4d-3. Service to the school | 3 | 2.5 | 3 | 3 |  |
|  | 4d-4. Participation in school and district projects | 3 | 2.5 | 3 | 3 |  |
|  | $4 \mathrm{e}-1$. Enhancement of content knowledge and pedagogical skill | 3 | 2.75 | 2.67 | 3 |  |
|  | 4e-2. Receptivity to feedback from educators (Lesson \& Unit Plan until 2019-2020. Lesson Plan starting 20202021) | 3 | 3 | 3 | 3 | 3 |
|  | 4e-2. Receptivity to feedback from educators (Unit Plan starting 2020-2021) |  |  |  |  | 3 |
|  | 4e-3. Service to the profession | 3 | 3 | 3 | 3 |  |
|  | 4f-1. Integrity and ethical conduct | 3 | 3 | 3 | 3 |  |
|  | 4f-2. Service to P-12 students | 3 | 3 | 3 | 3 |  |
|  | 4f-3. Advocacy | 3 | 3 | 3 | 3 |  |
|  | 4f-4. Decision making | 3 | 3 | 3 | 3 |  |
|  | 4f-5. Compliance with school and district regulations | 3 | 3 | 3 | 3 |  |
|  | Mean For Category | 3 | 2.84 | 2.9 | 3 | 3 |

## Undergraduate Research Fellowships, Independent Studies (Math 495) and Honors Projects

Students generally approach professors informally if they are interested in pursuing one of the above opportunities for a creative project beyond required courses for their degree. As mentioned in Section 1, the department has had in recent years a mini-symposium in the spring which gives students a chance to see possible projects that professors have, as well as present their own work. Below we give a list of these projects.

| AY | Project | Title | Student | Faculty |
| :---: | :---: | :---: | :---: | :---: |
| 2012-2013 | Math 413H | Graph Models of the Influence of the Federal Reserve Banking System | Michael Cristen | Katherine Kime |
| 2013-2014 | Math330H <br> Math330H <br> Math495 | Age-appropriate Math Lesson Planning Connected to Content <br> Age-appropriate Math lesson Planning Connected to Content <br> Investigations into the Packing of Vortices in a Bose-Einstein Condensate | Jordan Jansky <br> Alexis Delvaux <br> Nathan Brady | Amy Nebesniak <br> Amy Nebesniak <br> Katherine Kime |
| 2014-2015 | Math330H <br> Math330H <br> Math495 <br> Math495 | Age-appropriate Math lesson Planning Connected to Content <br> Age-appropriate Math lesson Planning Connected to Content <br> A Mathematical Foundation for the Study of Atomic and Molecular Systems <br> From Hydrogen to Helium to Lithium and Slater Determinants | Laura Juenemann <br> Emily Kassmeier <br> Kayla McMahon <br> Kayla McMahon | Amy Nebesniak <br> Amy Nebesniak <br> Katherine Kime <br> Katherine Kime |
| 2015-2016 | Math330H <br> Math330H <br> Math330H <br> Math430H <br> Math470H <br> Math404H | Age-appropriate Math lesson Planning Connected to Content <br> Age-appropriate Math lesson Planning Connected to Content <br> Age-appropriate Math lesson Planning Connected to Content <br> Compare/Contrast instructional techniques in 6-8th grade classrooms, interview and shadow <br> Extended Unit Plan to include an additional lesson taught in practicum field experiences. <br> The Evolution of Cryptography, with presentation at the KME North Central Regional Convention S2016, held at UNK | Kayla Peters <br> Megan Kreutzer <br> Brenda Neville <br> Kayla Peters <br> Sophia Weinert <br> Alexandria <br> Linnerson | Amy Nebesniak <br> Amy Nebesniak <br> Amy Nebesniak <br> Amy Nebesniak <br> Amy Nebesniak <br> Katherine Kime |


| 2015-2016 | URF | Binomial Transform of P-recursive Sequences, resulted in a publication: The Binomial Transform of $P$ recursive Sequences and the Dilogarithm Function, Applications and Applied Mathematics: An International Journal, Vol. 15, Issue 2 (December 2020), pp. 1025-1030. (Stephanie Slayden co-author) | Stephanie Slayden | Barton Willis |
| :---: | :---: | :---: | :---: | :---: |
| 2016-2017 | Math330H | Age-appropriate Math lesson Planning Connected to Content | Brittany Mrkvicka | Amy Nebesniak |
|  | Math330H | Age-appropriate Math lesson Planning Connected to Content | Braelyn Verba | Amy Nebesniak |
|  | Math330H | Age-appropriate Math lesson Planning Connected to Content | Elizabeth Schott | Amy Nebesniak |
|  | Math330H | Age-appropriate Math lesson Planning Connected to Content | Kristen <br> Wullschleger | Amy Nebesniak |
|  | Math330H | Reflections on the Application of Elementary Mathematics Content in Teaching | Emily Springer | Ted Rupnow |
|  | Math 430 H | Low-floor, high-ceiling problem solving tasks for middle grade students | Madi Casper | Amy Nebesniak |
|  | URF | Nonassociativity of the Double Minus Operation, presented at the UNK Undergraduate Research Mathematics Mini-Symposium and the UNK Research Day Publication: J. Huang, M. Mickey and J. Xu, The nonassociativity of the double minus operation, Journal of Integer Sequences 20 (2017) Article 17.10.3. | Chenli Huang Madison Mickey Jianbai Xu | Jia Huang |
|  | URF | Presentation: Jianbai Xu, Parity of Leaf Depths in Binary Trees, presented at the UNK Undergraduate Research Mathematics Mini-Symposium and the UNK Research Day | Jianbai Xu | Jia Huang |
|  | URF | Technology in the Mathematics Classroom | Tim Marx | Amy Nebesniak |
| 2017-2018 | Math330H | Lesson Planning in Upper Elementary Mathematics | Sarah Laden | Ted Rupnow |


| 2017-2018 | Math330H | Low-floor, high ceiling problem solving tasks for middle grades students | Madi Casper | Amy Nebesniak |
| :---: | :---: | :---: | :---: | :---: |
|  | Math330H | High-needs elementary math specialist; research, interview and shadow | Ahnika Lutz | Amy Nebesniak |
|  | Math330H | Different math educator rolls within the K-12 system: research, interview and shadow. | Samantha <br> Snogren | Amy Nebesniak |
|  | Math330H | Students with special needs in mathematics classroom; research, interviews and shadowing | Jachob Wiedeburg | Amy Nebesniak |
|  | Math495 | Fractals | Tiffany Collins, Madison Mickey | Derek Boeckner |
|  | URF | Mathematical Mindsets, Presented poster at UNK Research Day 2018 | Courtney <br> Harwager | Amy Nebesniak Kaye Sorensen |
|  | URF | Equilibrium Solutions of a Planar Difference Equation | Julie Kent Candy Smith | Jake Weiss |
|  | Publication | See publication in Journal of Integer Sequences, above | Jianbai Xu | Jia Huang |
| 2018-2019 | Math430H | Instructional techniques in middle and high school math classrooms in the United States; shadowing and discussions | Doyeon Kim | Amy Nebesniak |
|  | Math430H | Exploring math education positions in K -12 school districts; interviews and shadowing | Cassie Kenedy | Amy Nebesniak |
|  | Math470H | Interdisciplinary unit connecting mathematics, language arts, and social sciences * Received Honors Program <br> H-option Award | Cassie Kenedy Ali Rowse | Amy Nebesniak |
|  | URF | Exploration of Addition, Subtraction and Beyond, Presentation: Binary Operations Involving Roots of Unity, presented at the UNK Undergraduate Research Mathematics MiniSymposium and the UNK Research Day | Evan Olson | Jia Huang |


| 2018-2019 | URF | Technology Integration in High School Mathematics Classrooms, presented a poster at UNK Research Day S2019 | Anna Porter | Ted Rupnow |
| :---: | :---: | :---: | :---: | :---: |
| 2019-2020 | Math330H | ELL in the mathematics classroom; research, interviews and shadowing | Ashley Pachta | Amy Nebesniak |
|  | Math330H | Planning and Teaching Upper Elementary Mathematics | Sierra Morris | Ted Rupnow |
|  | Math430H | What it Means to be a Math Coach/Specialist | Abigail Heller | Ted Rupnow |
|  | Math 430 H | Using Basketball Statistics to Predict Teams Success | Emma Thede | Ted Rupnow |
|  | Math495 | Graph Theory | Emily Meyer, Evan Olson | Derek Boeckner |
|  | Math495 | A Study of the Propagation of Initial Data for the One-Dimensional Wave Equation | Doyeon Kim | Katherine Kime |
|  | Math495 | Systemic Risk and Data Collection in the Financial System | Corbin Snow | Katherine Kime |
|  | Math495 | Data Science in the United States Financial Sector | Corbin Snow | Katherine Kime |
|  | SSRP | A Genderqueer Autoethnography, presented a poster at the Fall Research Symposium at UNK Fall 2020 <br> A paper is in preparation for submission to a peer reviewed journal | Erin Green | Ted Rupnow |
|  | Stat495 | Actuarial Science Exam Prep | Evan Olson <br> Tiffany Collins | Derek Boeckner |
|  | URF | The Second Neighborhood Conjecture and Kneser graphs | Julie Kent | Derek Boeckner |
|  | URF | Exploring Prime Numbers, Presentation: Primes Between Consecutive Powers | Gamaliel Montero Alcaraz Jr | Jia Huang |
|  | URF | Technology Integration in High School Mathematics Classrooms | Anna Porter | Ted Rupnow |
| 2020-2021 | Math330H | Lesson Planning; adjusting lessons for remote math instruction | Kyle Letak | Amy Nebesniak |


| 2020-2021 | Math430H | Compare/Contrast instructional techniques in middle and high school math classrooms; research and shadowing | Aryanna Warner | Amy Nebesniak |
| :---: | :---: | :---: | :---: | :---: |
|  | Math 430 H | Transitioning from middle school math teacher to administrator; interviews and shadowing administrators | Kyle Letak Truman Lauck | Amy Nebesniak |
|  | Math495 | Visual Representations in 9-16 Mathematics | Erin Green | Ted Rupnow |
|  | Math495 | Graph Theory | Zihao Wang | Derek Boeckner |
|  | Math495 | Mathematics for Machine Learning | Trenton Chramosta | Barton Willis |
| 2021-2022 | Math430H | Investigating masters degree options; research and interviews | Hannah Krabel | Amy Nebesniak |
|  | Math470H | Students with special needs in mathematics classroom, research, interviews and shadowing | Truman Lauck Kyle Letak | Amy Nebesniak |

## Alumni and Exit Surveys: Employment and Education after Graduation, Feedback

In December 2021, an alumni survey was sent to graduates and an exit survey to graduating seniors. The results are shown below. Further, Dr. Nebesniak provided the following information on how El-Ed minors are using those minors.

- Elementary teacher appointed to district level math curriculum team
- Elementary teacher requested to be building math instructional leader
- Elementary teacher who has a $4^{\text {th }}$ grade homeroom, but then teaches math to all $4^{\text {th }}$ and $5^{\text {th }}$ graders in her school
- Elementary teacher teaching $6^{\text {th }}$ grade math

| Alumni Survey |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Semester of Graduation | Year of Graduation | Degree | Math Jobs | Non-Math Jobs | Grad School | Math Professional Experience |
| Fall | 2010 | Mathematics Minor |  |  |  |  |
| Spring | 2012 | Mathematics Minor | - MidAmerican Energy, Sioux City, IA , Operator <br> - Omaha Public Power District, Nebraska City, NE, Chemist |  | Bellevue University, MBA |  |
| Spring | 2012 | Mathematics Comprehensive B.S. | - Software development | - Software development |  |  |
| Spring | 2012 | Mathematics Comprehensive B.S. | - Lead Software <br> Engineer - The Walt Disney Company remote <br> - Software Engineer ESPN - CT <br> - Application DeveloperLands End - WI |  | University of Wisconsin Madison. MS in Computer Sciences |  |
| Spring | 2012 | Mathematics B.S. | - Residential <br> Appraiser, Metro Appraisers in Omaha, NE <br> - Double K Appraisals in Springfield, NE (selfemployed) |  |  |  |
| Spring | 2013 | Mathematics B.S., <br> Mathematics Teaching Endorsement B.S.E. (6-12 or 7-12 and Field or Subject) | - Omaha Public Schools, mathematics teacher, Burke High School |  | UNL - MAT in mathematics UNO - 18 hours graduate mathematics courses (numerical analysis, partial | APSI training for AP <br> Calculus AB/ <br> BC Dual <br> Enrollment <br> (with UNO) <br> teaching <br> endorsement in AP <br> Calculus AB, |


| Alumni Survey |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Semester <br> of <br> Graduation | Year of Graduation | Degree | Math Jobs | Non-Math Jobs | Grad School | Math Professional Experience |
|  |  |  |  |  | differential equations, analysis) | AP Calculus BC, AP Statistics |
| Spring | 2014 | Mathematics B.S. | - Xpanxion, Kearney, Software QAPhynd, Remote, Data Acquisition <br> - ETL QATrackAbout, Remote, QA Engineer |  | University of Southern Queensland, in progress | Tutoring high school and college students |
| Spring | 2014 | Mathematics B.S. |  | - Assistant <br> Director of <br> Business <br> Services <br> - Director of Business <br> Services <br> Executive <br> - Director of University Village University of Nebraska at Kearney Kearney, NE | Kansas University, MBA with emphasis in Marketing and Supply Chain Management |  |
| Spring | 2014 | Mathematics B.S. |  |  |  |  |
| Spring | 2015 | Mathematics Comprehensive B.S. | - Graduate research assistant, UNL Dept of Computer Science, Lincoln, NE <br> - Software engineer, Lona | - I've done some side gigs as a brand ambassador while unemployed and job hunting | UNL, Master of Computer Science |  |


| $\begin{array}{l}\text { Semester } \\ \text { of } \\ \text { Graduation }\end{array}$ |  | $\begin{array}{l}\text { Year of } \\ \text { Graduation }\end{array}$ | Degree | Math Jobs | Non-Math Jobs | Grad School |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | \(\left.\begin{array}{l}Math <br>

Professional <br>
Experience\end{array}\right]\)


| Alumni Survey |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Semester <br> of <br> Graduation | Year of Graduation | Degree | Math Jobs | Non-Math Jobs | Grad School | Math <br> Professional <br> Experience |
| Fall | 2020 | Mathematics Minor |  | - Full-time substitute teaching at Norfolk Public Schools, Social Studies teacher at Norfolk Senior High School |  |  |
| Spring | 2020 | Mathematics Comprehensive B.S. |  |  |  |  |
| Spring | 2020 | Mathematics Comprehensive B.S. | - Business <br> Analyst - Data and Analytics Department <br> - Mathematics Teacher Lakewood Middle School |  |  |  |
| Spring | 2020 | Mathematics B.S. |  | - Annie Jeffrey <br> Memorial <br> County <br> Hospital, Osceola NE, Network Administrator |  |  |
| Spring | 2021 | Mathematics Teaching Endorsement B.S.E. (6-12 or 7-12 and Field or Subject) | - Maywood <br> Public schools <br> 7-12 <br> Mathematics <br> Teachers |  |  |  |


| Semeste <br> r of <br> Graduati <br> on | Year of <br> Graduati <br> on | Degree | Math Jobs | Non-Math Jobs | Grad School | Math <br> Professional <br> Experience |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Fall | 2021 | Math for <br> Elementar <br> y Teachers <br> Minor | Substitute Teaching | Elementary <br> Teacher |  |  |
| Fall | 2021 | Mathemati <br> cs B.S. |  |  | UNO Masters in <br> Architectural <br> Engineering |  |
| Fall | 2021 | Mathemati <br> cs Minor |  |  |  |  |
| Fall | 2021 | Math for <br> Elementar <br> y Teachers <br> Minor | Substitute Teaching |  |  |  |

A

## Program Feedback from Alumni Survey

What aspects of your program of study did you find least helpful?

- Having the same professor for all
- The course I thought was least helpful was differential equations, as not much new information was taught there.
- Most of the mathematical algorithms haven't been helpful in my career as much as to be able to say I could do them.
- None come to mind.
- Theorems
- Some of the higher level courses that seemed to be placed in the curriculum to just finish out requirements; it would have been more helpful to have real life applications to many of these high level concepts
- Many classes for the math minor overlapped with my physics major so there weren't to many additional classes needed beyond what I was already taking.
- I can't think of anything negative about my time as a math student at Kearney.
- The sheer number of gen ed classes that were required
- Some of the classes that I took were at a very high math level, which is very different from the math that I am teaching.
- Physics and Computer Programming. I dropped my math major because of these course requirements.


## What aspects of your program of study did you find most helpful?

- The variety of courses we had to take
- A computational math class taught by Dr. Willis.
- The courses I thought were most helpful were real analysis, linear algebra, and number theory, as those are the fields I use the most now.
- Mathematical writing and logic courses taught me ways of thinking that have continued to benefit me. Every course that pushed for the meaning behind the math (or any topic really). Especially advanced calculus. I think I was in the last semester that that
- The focus on applying logic to solve problems, such as in proofs.
- Field experience and Math Methods course
- Learned to appreciate and discover a deeper sense of understanding of concepts and calculations and even beyond math itself; I learned to discover and prove ideas and not just accept them
- Being able break down a complex problem and solve it in a systematic way.
- I truly felt prepared after my time at UNK to be a high school math teacher. I was very successful in my courses at Kearney despite taking some challenging courses. I had some amazing instructors who fostered an environment of learning and growth as a mat
- While I do not necessarily use the actual theories or concepts from my degree; the overall logic, analysis, and thought process has been an extreme asset to analyzing complex housing markets to determine market-driven values of homes.
- The access to research and professors due to the small class sizes
- The math education class with Dr. Nebesniak and some of those first few math classes that were a lower level (as that is closer to the content I am teaching).
- Calculus courses, abstract algebra, foundations of math, history of math


## What suggestions do you have that we could use to improve your program of

 study?- More demanding courses
- Better networking opportunities and alumni features
- Incorporating more statistics courses. This would be very helpful for student who want to pursue data science/machine learning fields.
- For me, I wished I would have taken more stats classes since the mathematics department didn't offer courses in probability theory and I wasn't as aware of the offerings from the statistics department.
- Somehow, I got through my degree without taking any statistics. I eventually took statistics at UNL, but it was a bit awkward for a while to tell people I hadn't learned any except for in my own time. The reason was that the course wasn't offered frequently
- I'm satisfied with the education I received in Mathematics, I would say keep doing what you're doing.
- More Field experience and more Math Methods courses
- A math methods course for elementary just to understand what is taught and how it is taught in elementary to help the students transition to their high school courses and relate concepts they already know
- Would love to see more integration of the program with other disciplines to show the possible application of math in different occupations
- Applying analytical methods used for problem solving to different types of real world examples.
- It would be wonderful to have more hands on learning experiences in college mathematics courses. I have had many graduate courses where the time in class was not focused on lecturing and was a more self-directed / group problem solving learning experience
- More exposure to research and job options in the field of Mathematics. I felt completely unprepared to attempt to find a job after finishing my degree, because I didn't know what jobs a Bachelor degree in math would be good for.
- The computer science class was very unrelated to anything I have done since I have started teaching.
- Require courses that are actually relevant to the programs. I didn't need physics or computer programming for teaching because I never intended to teach either of those courses. They dropped my GPA, and they weren't even relevant to my program.


## Program Feedback from Exit Survey

Would you recommend to a friend to pursue the same major at UNK? Why or Why not?

- Yes
- Yes, math is a fun field that is constantly advancing and the professors are all amazing
- Yes, the math minor was useful for a physics degree
- Sure, it will just take a ton of time from you.

What aspects of your program of study did you find least helpful?

- Some of the higher level math classes.
- Advanced Calculus
- Theoretical Math
- In person homework

What aspects of your program of study did you find most helpful?

- I really enjoyed my math methods class and felt I learned a lot about teaching. I also really liked that all my classes were small and that I was able to get extra help when needed.
- Discrete or complex analysis
- Calculus
- Online homework. I got feedback right away and could fix it.

What suggestions do you have that we could use to improve your program of study?

- Provide a class or two where topics you will actually teach in junior high and high school are reviewed and talk about different ways to present the material to future students.
- If a class is supposed to be about solving equations, don't make it all about proofs
- None
- More female/girl advisors for female/girl students.


## 4. Institutional Contributions

UNKs General Studies program requires three hours in LOPER 4, for which many but not all of the accepted courses come from our department. Other than teaching General Studies courses, the department makes no contribution to cross-listed courses such as Women's and Gender Studies, Ethnic Studies, or International Studies.

## 5. Student Profile and Support Data

## Support Endeavors

The department works with the Admissions Office to meet with prospective students and their parents. Advising is shared among all faculty. Difficult advising cases generally arehandled by the chair. We have no definitive data on retention.

The Learning Commons provides free peer tutoring to our students (both majors and nonmajors). Emily Bahr, the Assistant Director of the Learning Commons, is teaching two courses for the department and this strengthens the good connection we have had with this important service. A number of faculty have volunteered to work with students in the Learning Commons.

Through the generosity of alumni and retired faculty, the department has generally been able to award at least $\$ 10,000$ in scholarships each year. See the department webpage for details.

## Recruitment and Retention Committee

The department formed a committee for Recruitment and Retention of math majors and minors in the fall of 2017 by then chair Barton Willis in order to address the problem of dropping numbers of students in the department, closely tied to the dropping number of students attending the university as a whole. The committee was charged with finding ways to better present our department to possible incoming freshmen as well as to find ways to obtain new majors and minors from the current student body.

In 2017, the committee mostly spent time updating current marketing materials such as the fliers that we send to guidance counselors and give out during campus visits. We also began discussions with the recruitment office for campus and developed an annual timeline for guidance about when key recruitment events around campus would be happening, as well as for a general guide to what we as a department should do each month to maintain a level of interest in recruitment and retention of students. I have attached the updated fliers and the annual timeline.

In 2018, we worked closely with the new webpage development team making sure the information for the pages was up-to-date and new department photos were included on the website. In the spring, we also cooperated with MathCounts getting student volunteers and a department presence at their annual competition. We also developed new guidelines and packets for academic appointments that better matched the generation Z student and their Generation X parents based on information presented to us by the recruitment office. During this year, we also began to reach out to recent graduates using a Qualtrics survey to gauge how well the department was doing meeting in their needs in their post graduate positions and also to see if they had suggestions for us that we could use to better the department. We also began reaching out to specific students that we thought could give us good quotes for the website and/or fliers that we send out. We tasked Math Club with writing handwritten postcards to the students who had been admitted to UNK and indicated an interest in a math degree.

In 2019, we continued to implement the methods for recruitment and retention developed in the initial two years. We also put together a math scavenger hunt across campus to coincide
with a math competition taking place at Kearney High. This let us have 27 high school students who are interested in math on campus for a memorable event and allowed us to focus some recruitment on local area schools.
------Dr. Boeckner

## 6. Faculty Matters

Faculty Expertise

Derek Boeckner Graph Theory, Discrete Mathematics
Paul Bonk Introductory Mathematics and Statistics
Scott Gensler Difference Equations, Derivatives on Time Scales
Jia Huang Combinatorics, Discrete Mathematics
Julieta Johnston Introductory Mathematics and Statistics
Katherine Kime Partial Differential Equations and Control Theory
Amy Nebesniak Mathematics Education
Patty Reifenrath Introductory Mathematics and Statistics
Ted Rupnow Mathematics Education
Kaye Sorensen Introductory Mathematics and Statistics, Mathematics Education.
Nathan Vander Werf Vertex Operator Algebras
Jacob Weiss Dynamical Systems.
Barton Willis Mathematical Physics and Computer Algebra Systems

## Faculty CVs—Separate File

Please see separate file, attached.

## 7. Resource Bases

## Discovery Hall

The department has its faculty and staff offices on the third floor of Discovery Hall. While there are no classrooms in DSCH allocated specifically to Mathematics and Statistics, since moving into DSCH in summer 2020, the department has been able to use the third floor shared classrooms and at times other classrooms in the building. A number of classes are taught in Bruner Hall of Science. Some West Center classrooms are apparently available but have not been recently requested by faculty.

Some needs that have been identified in DSCH are:

- Projectors in our classrooms reoriented to project on a screen off to one side of center (similar to the way BHS 270 is set-up; that room's projector projects onto an angled screen off to the left side of the classroom. This set-up allows us to use the front whiteboard *and* the projector at the same time.)
- Outdoor pavilion/meeting space with chalkboards (and tables, electricity, internet).
- Patio furniture (tables and chairs) so we can use the 3rd floor outdoor space.
- Bike tire pump ... a nice, unbreakable, solid one like they installed recently (sometime within the last 6 months) at the bike rack at the Calvin T. Ryan Library.


## Computing and Technology Resources

The College replaces computers about every five years. The distribution of desk computers and/or laptops varies. The university has site licenses for Mathematica and MATLAB. Dr. Willis is a developer for the Maxima Computer Algebra System; he uses Maxima for instruction. Dr. Katherine Kime uses MatLab for research and instruction.

## Sources of Revenue

The department has received funds from the Thompson Scholars program for the last two years, as Dr. Weiss has taught a section of Math 101 and a section of Math 102 for Thompson Scholars only. As mentioned in Section 2, the department had two \$10,000 grants from the then existing eCampus for the development of online Math 102 and 102. The department will receive approximately $\$ 6567$ from the Office of Graduate Studies for Math 871 this summer, if it meets the enrollment threshold of 12 students.

## 8. Peer Comparison Group

UNK has ten peer institutions. The peer intuitions are
https://www.unk.edu/factbook/peer-comparisons.php :

- University of CentralArkansas
- University of Northern Colorado
- Western Illinois University
- University of Northern Iowa
- Murray State University
- Northern Michigan University
- Minnesota State University-Moorhead
- University of Central Missouri
- Sam Houston State University
- University of Wisconsin-Stevens Point


## Comparison of Degree Programs

In the following table, we list the degree programs offered by the mathematics or similarly titled department at our peer institutions. Information was taken from department webpages in early March 2022, by Dr. Kime. Most of the departments do offer a graduate degree. Many offer different options for a bachelor's degree. Our Math Comprehensive BS has emphasis areas which roughly correspond to the structures elsewhere.

|  | Bachelor's Degrees | Education <br> Bachelor's | Minors | Graduate | Univ. <br> Enrollment |
| :---: | :---: | :---: | :---: | :---: | :---: |
| University of Central Arkansas <br> Mathematics | Pure <br> Applied <br> Data Science | STEM Teach Pure, Applied, Mathematics Education | Mathematics (2 options), Statistics | MS Applied Mathematics <br> MA <br> Mathematics <br> Education | $\left\lvert\, \begin{aligned} & 10,869 \\ & 2019 \end{aligned}\right.$ |
| University of Northern Colorado <br> Mathematical Sciences | Liberal Arts, <br> Applied Math, 3 concentrat. | Secondary <br> Middle School | Comp Sci. <br> Applied Stat. <br> Liberal Arts <br> Secondary <br> Teaching | MA <br> Mathematics <br> -Teaching <br> Ph.D. <br> Educational <br> Mathematics <br> Master's en route to Ph.D. in Ed. Math | 6979 Undergrad <br> 2902 Grad <br> Fall 2021 |
| Western Illinois University <br> Mathematics and Philosophy | Mathematics <br> Options: <br> Mathematics <br> Data Science and Statistics <br> Actuarial <br> Science | Mathematics <br> Option: Teacher Education | Applied Mathematics <br> Mathematics <br> Middle <br> Level Teaching <br> Philosophy | MS <br> Mathematics <br> Integrated <br> Bacc and MS | $\begin{aligned} & 7,455 \\ & \text { Fall } 2021 \end{aligned}$ |
| University of Northern Iowa <br> Mathematics | Mathematics <br> Statistics and Actuarial Science | Mathematics Teaching | Mathematics Teaching <br> Statistics and Actuarial Science K-8 Mathematics Mathematics Data Science | MA <br> Mathematics <br> MA Math <br> Education (K-8) <br> MA Math <br> Education <br> Community <br> College <br> Teaching <br> MA Math <br> Education <br> Secondary <br> Teaching | $\left\lvert\, \begin{aligned} & \text { 11, } 907 \\ & \text { Fall } 2017 \end{aligned}\right.$ |


| Murray State University <br> Mathematics and Statistics | Mathematics Major <br> Math/Applied Mathematics Area <br> Math/Data Science Area <br> Math/Pre- <br> MBA Area <br> Math/Pre-MS in Biostatistics Area | Math/Secondary Certification Area <br> Math/Secondary Certification Major | Mathematics Teaching <br> Statistics and Actuarial Science <br> K-8 <br> Mathematics <br> Mathematics <br> Data Science | MA <br> Teaching <br> MS <br> MA | 9, 456 <br> (website as of <br> Spring 2022) |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Northern Michigan University <br> Math and Computer Science | Computer Science <br> Embedded <br> Systems <br> Mathematics <br> Mobile and Web App Development | Secondary <br> Education <br> Mathematics | Actuarial Sciences <br> Computer Science <br> Mathematical Statistics <br> Mathematics <br> Secondary <br> Education <br> Mathematics | MS <br> Mathematics <br> Master of Computer Science | 7,732 <br> Fall 2019 |
| Minnesota State University -Moorhead Mathematics | Mathematics <br> Mathematics: <br> Computational <br> Emphasis <br> Mathematics: <br> Actuarial <br> Science | Mathematics <br> Education | Mathematics Education <br> Mathematics <br> Statistics | Apparently, none | 5,547 <br> (website as of Spring 2022) |
| University of Central Missouri <br> Mathematics | Mathematics <br> Mathematics <br> BS/MS <br> Accelerated | Secondary <br> Education, BSE- <br> Mathematics | Mathematics | MS in Mathematics | Fall 2021 <br> headcount 5.7 percent higher than a year ago |
|  |  |  |  |  |  |


| Sam Houston State University <br> Mathematics and Statistics | Mathematics | Mathematics <br> Teacher <br> Certification <br> Mathematics with Secondary Certification with Two Teaching Fields | Mathematics with Teacher Certification <br> Mathematics without Teacher Certification <br> Statistical Theory <br> Statistical Methods | MA Mathematics <br> MS <br> Mathematics <br> MS Statistics | $\left\lvert\, \begin{aligned} & 21,612 \\ & \text { Fall } 2021 \end{aligned}\right.$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| University of WisconsinStevens Point <br> Mathematical Sciences | Mathematics <br> Mathematics with <br> Actuarial <br> Emphasis | Mathematics Education | Applied Mathematics <br> Mathematics <br> Mathematics for <br> Elementary <br> Education <br> Mathematics for teacher Certification | Apparently, none | 8,135 <br> Fall 2021, Stevens Point, Marshfield and Wausau campuses |

## Salary Comparisons

For the rank of Instructor, UNK is $11^{\text {th }}$ out of 11 . For the rank of Assistant Professor, UNK is $8^{\text {th }}$ out of 11. For the rank of Associate Professor, UNK is 7th out of 11. For the rank of Professor, UNK is $6^{\text {th }}$ out of 11 .

|  | Professor | Associate | Assistant | Instructor |
| :--- | :--- | :--- | :--- | :--- |
| University of Central Arkansas | $\$ 80,495$ | $\$ 67,691$ | $\$ 64,762$ | $\$ 53,500$ |
| University of Northern Colorado | $\$ 86,835$ | $\$ 63,145$ | $\$ 58,421$ | $\$ 45,057$ |
| Western Illinois University | $\$ 99,600$ | $\$ 79,481$ | $\$ 65,304$ | $\$ 52,187$ |
| University of Northern Iowa | $\$ 90,131$ | $\$ 75,850$ | $\$ 67,774$ | $\$ 60,152$ |
| Murray State University | $\$ 73,787$ | $\$ 65,038$ | $\$ 59,406$ | $\$ 40,747$ |
| Northern Michigan University | $\$ 90,559$ | $\$ 77,067$ | $\$ 69,294$ | $\$ 56,552$ |
| Minnesota State University -Moorhead | $\$ 93,168$ | $\$ 80,178$ | $\$ 73,181$ | $\$ 52,207$ |
| University of Central Missouri | $\$ 83,338$ | $\$ 72,847$ | $\$ 67,997$ | $\$ 43,733$ |
| Sam Houston State University | $\$ 100,115$ | $\$ 81,545$ | $\$ 69,271$ | $\$ 66,528$ |
| University of Wisconsin- Stevens Point | $\$ 73,404$ | $\$ 60,121$ | $\$ 60,600$ | $\$ 66,928$ |
| University of Nebraska Kearney | $\$ 87,758$ | $\$ 70,517$ | $\$ 62,711$ | $\$ 39,073$ |

Table () Average Salary by rank for peer institutions. Data taken from AAPU data "The Chronicle of Higher Education".
------Elizabeth Steele

## 9. Future

## Statistics

After losing the Statistics and Actuarial Science majors in 2003, some statistics courses gradually fell into disuse. STAT 345, the course intermediate between the 200 level service courses and the 400 level majors' course, has not had sufficient enrollment to be offered for at least four years. The department's one statistician/actuarial scientist took a position at another university in 2018.

A high priority is to hire a statistician/ probabilist, who can mentor undergraduates in undergraduate research or other projects, see career paths for them, and develop needed courses. An alumnus of our program, Dr. Daniel Mowrey, funds one of our scholarships and gave a talk to us in spring 2018. He has expressed that a course geared towards experimental methods would be of interest and a starting point. As it appears competition is strong for the type of faculty member we would wish to hire, additional funding would be needed for a competitive salary.

## Fill the lecturer position left open by a retirement

Margaret Michener, a senior lecturer, retired at the end of AY 20-21. Due to a budgetary and hiring freeze that accompanied the COVID pandemic, we have not been authorized to hire her position. We are stretched to the maximum in the introductory level courses and are turning students away, while class sizes are extending some over the usual limits. This position needs to be filled.

## Amplify recruitment efforts

The department has a quality program and our graduates find success in many directions, as shown in Section 3. In the new committee structure, the Outreach Committee will engage in recruitment. In particular, we need to pay attention to item iv) in the first bullet point in the committee description, "Maintaining a record of alumni and current job status", as well as the many good ideas in the Recruitment and Retention plan (Sec. 1).

## Develop new online graduate courses, and put courses no longer offered into dormancy

At this time, many students in the STEM Education Program take mathematics courses at UNL and transfer them to their UNK program. Part of the problem is that we do not offer enough courses, and part is that UNL offers similar courses. We were asked to share our course materials for the graduate analysis course with UNL; the outcome of this is unknown to us. We need to develop courses that deal with topics not offered by UNL, including a statistics course of some kind. Also, many UNL grad online courses that qualify for transfer in to UNK's program have the letter T at the end of the course number, to indicate that the courses are for teachers. Here, we say a number of our courses are for teachers in the title of the course, to communicate that these are not 800 level mathematics courses as would be found in a graduate program in mathematics. The T suffix might be a better choice and would standardize us with UNL.

We have graduate courses listed on the UNK website which have not been offered for a long time. Also, the 8XX-P courses, which are supposed to be taken along with the corresponding 400 level course and have an additional component, are taken very rarely. We need to examine what to keep active and what to make dormant.

## Examine online undergraduate courses

Due to the pandemic, a number of undergraduate courses have been taught online in addition to MATH 101 and 102. These include MATH 90, 103, 120, 123, 250, and STAT 235 and 241. The General Studies courses have been in demand and the College of Business and Technology specifically would like 120 and 123 online options. MATH 90 online has been of interest to Social Work. An online MATH 230 is planned for this summer at the request of the Early Childhood Education program. Some faculty are receiving individual stipends for course developments. More and more universities offer online courses which can be transferred in to UNK. The higher education environment has changed in this respect, and we need to keep responding to this new reality.

## Observations of the Policy and Planning Committee

The current Policy and Planning Committee has made the following statement.
There is concern among Math Department faculty regarding our department's service to other UNK departments. There seems to be growing discontent among other departments with the Math Department. Several departments have, or are considering, dropping their math course requirement, or creating their own general courses to fulfill the Loper 4 category. Our committee is bringing this concern forward with the hope of being proactive. Future plans to address these concerns may include analyzing data on trending credit hours loss in service courses, surveying departments for feedback, tenure-track position specific for leading/organizing service courses, and a plan for continued assessment of our collaborative efforts with other departments.

Others on the committee also mentioned the following concerns:

- The need for a statistician in the department.
- Open positions that remain unfilled.


## Student Study Area

As mentioned in the 2012 self-study, the MAA document "Guidelines for Programs and Departments in Undergraduate Mathematical Sciences" (http:/ /www. maa. org/ guidelines/ guidelines. html) advises

There should be dedicated space for use by mathematical sciences majors for conversation and study. It is desirable that this space be near faculty offices to allow opportunity for frequent contact between students and faculty.

While there are small shared spaces with tables for students near our offices, nothing is specifically dedicated to mathematics. Majoring in mathematics requires great focus and a space that says math would provide support.

## Curriculum Development

Mathematics faculty have expertise in subjects that are not a part of curriculum. The 120-hour rule makes it more difficult for us to require more course work. If we could increase the number of majors in our B.S., B.A., and Comprehensive degree programs, we could offer (and require) more mathematics courses. This issue was raised in the 2012 self-study.

# Derek Christopher Boeckner 

Department of Mathematics and StatisticsUniversity of Nebraska-Kearney

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1.402.213.1075

## EDUCATION

Ph. D. Mathematics, May 2013
University of Nebraska-Lincoln
Thesis Advisor: Jamie Radcliffe
Dissertation: Directed Graph Limits and Directed Threshold Graphs
Research Interests: Algebraic Combinatorics, Graph Theory
M.S. Mathematics, May 2007

University of Nebraska-Lincoln
B.S. Mathematics, May 2006

University of Nebraska-Lincoln
Developmental Activities
Faculty On-line Training, Fall 2016

## EMPLOYMENT

University of Nebraska at Kearney
Associate Professor (Tenure Track), Fall 2021-Present
Assistant Professor (Tenure Track), Fall 2016-Fall 2021
Assistant Professor (Visiting), Fall 2015-Fall 2016
University of Nebraska at Omaha
Math Specialist for TRIO program, Fall 2014-Fall 2015
Union College, Lincoln NE
Adjunct Professor, Spring 2013-Spring 2014
Nebraska Wesleyan, Lincoln NE
Adjunct Professor, Fall 2012-Spring 2014
University of Nebraska at Lincoln
Adjunct Professor, Fall 2013-Spring 2014, Summer 2015
Graduate Teaching Assistant, Fall 2006-Spring 2013

## PUBLICATIONS

Robust Population Management under Uncertainty for Structured Population Models, Ecological Applications 17(8) (2007), 2175-2183 A. Deines, E. Peterson, D. Boeckner, J. Boyle, A. Keighley, J. Kogut, J. Lubben, R. Rebarber, R. Ryan, B. Tenhumburg, S. Townley, and A.J. Tyre

Parameterizing the growth-decline boundary for uncertain population projection models, Theoretical Population Biology 75 (2009), 85-97 D. Boeckner, J. Lubben, R. Rebarber, B. Tenhumburg, S. Townley

Oriented Threshold Graphs, Australasian Journal of Combinatorics $7 \mathbf{1}$ (2018), 43-53 D. Boeckner

Higher Order Differences on Arbitrary Discrete Timescales and Related Generating Functions D. Boeckner and S. Gensler- accepted to Rocky Mountain Journal of Mathematics, August 2021

## TALK

Undergraduate Research Symposium Spring 2019 The Second Neighborhood Problem

Undergraduate Research Symposium Spring 2018 Math From Elementary School

Undergraduate Research Symposium Spring 2017 Graphons

Math Club Spring 2018 Math and Monopoly

## SERVIC

## Departmental

Recruitment and Retention Committee, Fall 2017-Spring 2021(Chair), Fall 2021-present
Faculty Senate Department Representative, Fall 2018-present
Academic Programs Committee, Fall 2020-present
Faculty and Student Affairs Committee, Fall 2020-Spring 2021, Fall 2021-present (Chair)
Graduate Committee Member, Fall 2015-present
Assessment Committee, Fall 2017-Spring 2020, Fall 2019-Spring 2020(Chair)
Peer Review Committee, Fall 2017-Spring 2019(Chair)
Policy and Planning Committee, Fall 2019-Spring 2020, Fall 2021-present
Mathematics Chair Search Committee, Fall 2018
Tenure Track Search Committee Member, Fall 2017
Associate Professor/Math Department Chair Hiring Committee Member, Fall 2016

## University Wide

Faculty Senate Academic Affairs Committee, October 2018-September 2020
Faculty Senate Executive Committee, Fall 2020-Spring 2021(Secretary), Fall 2021 (PresidentElect), Spring 2021 (President)

Faculty Senate Oversight Committee, Fall 2020-Spring 2021, Fall 2021-present
Faculty Senate Professional Conduct Committee, Summer 2021-present
Math Club Faculty Advisor, Fall 2016-present
Problem of The Fortnight Organizer (UNK), Fall 2015-Spring 2018

## Academic Community

Referee for Journal Articles
'Representing graphs as the intersection of cographs and threshold graphs', Electronic Journal of Combinatorics, Spring 2021
'Oriented coloring on recursively defined digraphs', Algorithms, Spring 2019
'Mock Threshold Graphs', Electronic Journal of Combinatorics, Fall 2016

| Math 101 | Intermediate Algebra (3 SCH) | Fall 2015 |
| :--- | :--- | :--- |
| Math 102 | College Algebra (3 SCH) | Fall 2015 (3 sections), Fall 2016, |
|  |  | Spring 2016 (3 sections), Spring 2017, |
|  |  | Spring 2018, Spring 2019 |
| Math 104 | Concepts in Math and Statistics (3 SCH) | Spring 2020 |
| Math 106 | Math for Liberal Arts (3 SCH) | Spring 2016 |
| Math 115 | Calculus I (5 SCH) | Fall 2020, Spring 2022 |
| Math 123 | Applied Calculus (3 SCH) | Summer 2018, Fall 2021 |
| Math 202 | Calculus II (5 SCH) | Fall 2016, Spring 2017, Spring 2018, |
|  |  | Fall 2019 |
| Math 250 | Foundations of Mathematics (3 SCH) | Fall 2017, Spring 2021 |
| Math 260 | Calculus III (5 SCH) | Fall 2018 |
| Math 330 | Math for Elementary Teachers II (3 SCH) | Spring 2016* |
| Math 350 | Abstract Algebra (3 SCH) | Spring 2020 |
| Math 365 | Complex Analysis (3 SCH) | Spring 2021 |
| Math 400 | History of Mathematics (3 SCH) | Fall 2017 |
| Math 413 | Discrete Mathematics (3 SCH) | Fall 2017, Fall 2018 |
| Math 440 | Linear Algebra (3 SCH) | Spring 2019 |
| Math 460 | Advanced Calculus (3 SCH) | Fall 2019, Fall 2021 |
| Math 495 | Independent Study (on Fractals) (3 SCH) | Spring 2017, Spring 2018 |
| Math 495 | Independent Study (on Graph Theory) (3 SCH) | Spring 2020, Fall 2020 |
| Math 862 | Mathematical Analysis for | Summer 2017, Summer 2019, |
|  | $\quad$ High School Teachers (3 SCH) | Fall 2020, Fall 2021 |
| Stat 241 | Elementary Statistics (3 SCH) | Spring 2020, Spring 2021 |
| Stat 441 | Probability and Statistics (3 SCH) | Spring 2019 |
| Stat 495 | Independent Study (on Actuarial Science) (1 SCH) | Fall 2019 |

* Due to unusual circumstances I only taught the second half of this course.


## Curriculum Development

Analysis for High School Teachers - Fall and Spring 2017, Fall 2020
I've developed curriculum for a new graduate level course to be taught on-line during the summers. The course is designed for high school teachers who teach/will teach calculus. It is intended to better understand calculus concepts and to be able to answer deeper questions students may have about the analysis behind many of the topics covered in a high school course. The course was first offered in Summer 2017. It is currently being adapted to run in a full 16 week semester as well and being shared with UNL so that they can adapt it to run in semesters which we don't offer it.

On-line Intermediate and College Algebra - Spring 2020-Spring 2021
I was on a team charged with designing on-line versions of our Math 101 and Math 102 courses. These courses are intended to serve our on-line only student population, but if successful may be adapted to serve on campus students at some point in the future. The course was finalized in Spring 2021, but future refinement may take place.

## Other Teaching Experience

Undergraduate Research Mentor for Julie Kent, Fall 2019-Spring 2020

## Summary

-Adept at critical thinking and quantitative reasoning through education in Philosophy and Mathematics
-Able to work in a group setting while actively participating and maintaining professionalism
-Confident in clear communication through both writing and speech
-Computer literate, can use Microsoft Office, ALEKS, MyMathLab, Maple, and other algebra software

## Education

-M.S. Degree in Mathematics, 2014 University of Nebraska at Omaha
-B.S. Degree in Mathematics and Philosophy, 2009 University of Nebraska at Kearney

## Recent Employment History

Mathematics Lecturer, University of Nebraska at Kearney, Kearney, NE 8/2015 to Present
-Instruct Intermediate and College Algebra, Mathematics for Liberal Arts, Trigonometry, Applied Calculus, and Elementary Statistics courses
-Maintain daily office hours, encourage student engagement outside of the classroom by volunteering at the peer tutoring center in the UNK Library
-Exercise classroom management of 30-40 students per class
Adjunct Mathematics Instructor, Iowa Western CC, Council Bluffs, IA 6/2015 to 12/2015
-Instructed online College Algebra and Differential Equations courses

- Maintained online presence through active discussion boards using ROC

Adjunct Mathematics Instructor, Metro Community College, Omaha, NE 9/2014 to 8/2015
-Instructed Beginning Algebra, Intermediate Algebra, and Statistics courses
-Created amicable working relationship with students, fostering participation in and out of the classroom

- Exercised classroom management of 20-25 students per class

Mathematics Tutor, Metro Community College, Omaha, NE 7/2014 to 8/2015
-Tutored students in courses from elementary math through Calculus III
-Quickly evaluated students' abilities and knowledge and adjusted instruction accordingly
Mathematics Instructor, Creighton University Upward Bound, Omaha, NE 6/2012 to 7/2014
-Instructed high school level summer mathematics survey courses for first generation college students and students from low-income families
-Developed lesson plans for subjects including Algebra, Geometry, Trigonometry, and Calculus
-Exercised classroom management of 15-20 students per class

## Scott Charles Gensler

Contact<br>Information

Education

University of Nebraska-Kearney
Department of Mathematics \& Statistics genslersc@unk.edu 378 Discovery Hall Kearney, Nebraska 68849

University of Nebraska-Lincoln
Doctor of Philosophy in Mathematics August 2018
Dissertation Title: Fractional Difference Operators and Related BVPs.
Advisor: Allan C. Peterson

## University of Michigan

Master of Science April, 2000
Majors: Mathematics, Physics
United States Military Academy (West Point, NY)
Bachelor of Science June, 1991
Majors: Mathematics, Physics

Military - Ranger School (1992), Airborne School (1992), Air Assault School (1989)
Education \&
Qualifications

- Awarded Bronze Star Medal and Iraq Campaign Medal with Two Campaign Stars for service in Iraq (2007-2009)
- Top Secret - Sensitive Compartmented Information (TS-SCI) clearance; continuously held a TS-SCI clearance and positions requiring such clearance from Jan 05-Apr 12

Analysis on Time Scales and Differential/Difference Equations
Research
Interests

Publications - Higher order differences on arbitrary discrete time scales and related generating functions, with D. Boeckner. Accepted for publication in the Rocky Mountain Journal of Mathematics.

- Convergence of approximate solutions to nonlinear Caputo nabla fractional difference equations with boundary conditions, with X. Liu, B. Jia, L. Erbe and A. Peterson. Electronic Journal of Differential Equations, Vol. 2020 (2020), No.04, pp. 1-19.
- Eliminating domain shifting issues for the fractional nabla operators $\ddot{B}_{\square}$ and $\nabla_{a}$. In draft. Experience


## Teaching University of Nebraska-Kearney (UNK) (Kearney, NE) 2018 - present Assistant Professor

As a tenure-track assistant professor at UNK I have taught: Linear Algebra, College Geometry, Discrete Math, Calculus II, Calculus I, Applied Calculus, College Algebra, and Elementary Statistics.

As Chair of the Math Department's Academic Programs Committee I led the Math Department's efforts in the Fall of 2019 to enter into an agreement with UNK eCam-
pus to develop and offer two online, general studies math courses. These two courses were the first general studies math courses UNK has offered online and are enabling many remote students to complete their entire graduate UNK degree online.

## United States Military Academy (USMA) (West Point, NY) $2000-2003$

 Assistant Professor/Course DirectorCourse Director for: Topology (MA493D), Partial Differential Equations (MA484), and Vector Calculus \& Ordinary Differential Equations (MA363). Responsible for course content, syllabus, and grading strategy. Structured courses to include concepts from linear algebra (vector spaces, linear operators, and inner products) in order to make Quantum Mechanics a more intelligible experience for physics majors and to broaden the scope of material to which math majors were exposed.

As Head Academic Counselor, I advised cadets on their specific programs of study and increased awareness of math and operations research as potential academic majors.

## University of Nebraska-Lincoln (UNL) (Lincoln, NE) 2012 - 2018

 Graduate Teaching AssistantFull-time student in mathematics with an assistantship. As a graduate teaching assistant I taught: Calculus I, Calculus II, and every Pre-calculus course UNL offers (Math 100A, 101, 102, and 103). Primary instructor of record for all of the precalculus courses I taught. During the years I taught at UNL, the Math De- partment mounted a tremendous effort to transition all of their pre-calculus courses (and later the Calculus I and Calculus II courses I taught as well) from a lecture based style of instruction to an active learning based style of classroom instruction.As a result I now have years of experience running an active learning classroom and have enjoyed a wonderful opportunity to hone my skills facilitating group work andusing it as an effective teaching technique.

## Special Teaching Assignments:

Nebraska Math \& Science Summer Institute (NMSSI) Summer 2015
This was a summer teaching assignment where I was part of a team that taught discrete math to elementary and middle school teachers. I participated in teaching this course (Math 805T Discrete Mathematics) on two separate occasions this summer. The first class met for 4 hours/day 8-12 June in Lincoln, NE and the second met for 8 hours/day 20-24 July in Omaha, NE. Instructors on the teaching team rotated responsibility for presenting material throughout the day.

## West Point Invitational Academic Workshop <br> Summer 2000 <br> This was an academic workshop for high school students held at West Point, NY in June 2000. I was the instructor for a 2 day "Probability and Counting Seminar" that met for $50 \mathrm{~min} /$ day in Thayer Hall.

Experience (Abbreviated)

Professional United States Army Officer Jun 91 - May 12 Lieutenant Colonel (Retired)
U.S. Army officer for 21 years, served in a variety of capacities. Highlights are expanded upon below.

## US Army Europe (USAREUR) (Heidelberg, Germany)

Sep 09-May 12 Senior Space Operations Officer
Staff officer to a four-star general and leader of a staff section that coordinated for optimal use of the nation's satellite systems to support United States European Command (EUCOM) and their Army component (USAREUR) missions. Trained US Army and NATO/Coalition forces stationed in Europe in obtaining space support for their upcoming operations in Afghanistan and Iraq.

4th Infantry Division (Fort Hood, TX - Baghdad, Iraq) May 07 - Aug 09 G3 Space and Special Technical Operations Chief
As part of the division assigned to MND-B (Multi-National Division-Baghdad), I deployed to Iraq during "The Surge" (Nov 07-- Feb 09). Led the division's Special Technical Operations section. Responsible for integrating military deception and special technical operations into division operations designed to: (i) kill or capture high-value targets and (ii) secure the population from violent extremists and criminal groups.

Arranged for the use of classified, special technical capabilities to support division operations.

1st Armored Division (FWD) (Tuzla, Bosnia-Herzegovina) Feb 98 - Aug 98 Federation Army Liaison Officer
As part of the division assigned to MND-N (Multi-National Division-North), the U.S. led Army division in Bosnia, I deployed to Bosnia-Herzegovina and was responsible for coordinating with Bosnian military leaders and staffs to identify and resolve issues of mutual concern.

Note: $\operatorname{MND}(\mathrm{N})$ is an acronym for the (one) U.S. Army Division that was in Bosnia at that time it. It was comprised of a Turkish Bn, Russian Bn, U.S. Bn, and NORDPOL (i.e. Norwegian, Polish, Danish, and other Scandinavian peoples) Bn.

2nd Battalion, 63rd Armor Regiment, 3rd Brigade, 1st Infantry Division (Vilseck, Germany)

Nov 96 - Feb 98
Tank Company Commander
Responsible for building and maintaining a confident, combat-ready team capable of deploying, fighting, and winning anywhere in the world. Responsible for the training and welfare of 57 soldiers and 4 officers, as well as the maintenance and operational readiness of 14 M 1 A 1 main battle tanks and associated equipment valued in excess of 35 million dollars.

Invited \& Contributed Talks

Joint Mathematics Meetings: AMS Special Session on Analysis of and Recent Advances in Difference, Differential and Dynamic Equations with Applications (Invited Talk - upcoming - JMM 2022 was postponed.) April 2022 "Higher Order Differences on Arbitrary Discrete Time Scales." 20 minute Invited Talk.

Seattle, WA

University of Nebraska-Kearney Math Club.
January 2019
"Riddles, Differential Equations, and Fractional Derivatives/Differences"
30 minutes.
Kearney, NE

Joint Mathematics Meetings: AMS Special Session on Fractional Difference Operators and Their Applications January 2018 "The General Operator $\nabla^{V}$ and Using It to Extend Results Involving $\nabla_{a}^{a}$ and $\nabla_{a}^{a}$." 20 minutes. San Diego, CA


| Midwest Numerical Analysis Day (MWNADay) | April 2017 |
| :--- | ---: |
| "Discrete Fractional Difference Equations." 20 minutes. | Omaha, NE |

National Science Foundation (NSF) Division of Mathematical Sciences (DMS) Weekly Seminar

October 2011
"Bancroft Method for Solving the GPS Equations." 30 minutes. Baltimore, MD

Joint Mathematics Meetings: MAA General Contributed Paper Session, III

January 2003
"Differential Equations Lite." 10 minutes. Baltimore, MD

Conferences \& Nebraska Open Access Materials Online Workshop
Workshops University of Nebraska-Lincoln (organizers)
6-8 July 2020
Attended
UNK rep at a 3-day workshop about engaging students with online, open resources.

MSRI Summer Graduate School -- Mathematical General Relativity
Cortona, Italy. 29 July -- 9 August 2013
Participation by application and department recommendation.

## Hudson River Undergraduate Mathematics Conference IX <br> Skidmore College, Saratoga Springs, New York. <br> April 2002 <br> Adviser to undergraduate presenter, Cadet Barrett Campbell.

West Point Faculty Development Workshop
West Point, New York.
5 July -- 4 August 2000.
5-wk orientation/training program for new faculty in the USMA Math Department.

Courses Taught Instructor of Record at UNK

| Math 440 Linear Algebra | Spring 2020, Spring 2021 |
| :--- | ---: |
| Math 413 Discrete Math | Fall 2021 |
| Math 310 College Geometry | Fall 2020 |
| Math 260 Calculus III | Spring 2022 |
| Math 202 Calculus II | Spring 2021 |
| Math 115 Calculus I | Fall 2019, Spring 2020, Fall 2021 |
| Math 123 Applied Calculus | Spring 2019, Fall 2020 |
| Math 102 College Algebra | Spring 2019 |

Stat 441 Probability and Statistics
Spring 2022
Stat 241 Elementary Statistics Fall 2018, Spring 2019, Fall 2019, Fall 2020
Course Director \& Instructor of Record at USMA
$\begin{array}{lr}\text { MA493D Introduction to Topology } & \text { Spring } 2003 \\ \text { MA484 Partial Differential Equations } & \text { Fall } 2002 \\ \text { MA363 Vector Calculus and Ordinary Differential Equations } & \text { Spring } 2003\end{array}$
Instructor of Record at USMA
MA493D Introduction to Topology Spring 2002
MA491 Research Seminar in Applied Mathematics Projects
Cadet Les Craig - Cellular Automata
Spring 2003
Cadet Darrell Stepter - Missile Evasion Strategies Spring 2003
Cadet Jim Starling - General Relativity
Spring 2002
Cadet Matt Vandevender - Quantum Mechanics Spring 2001
MA255 Advanced Calculus II
Spring 2002
MA205 Calculus II (STAP) Summer 2003
MA153 Advanced DDS and Introduction to Differential Equations Fall 2001
MA104 Calculus I
Spring 2001
MA103 Discrete Dynamical Systems (DDS) and Intro to Calculus Fall 2000

## Instructor of Record at UNL

MATH-104 Applied Calculus
Summer 2018
MATH-103 College Algebra and Trigonometry
MATH-102 Trigonometry
MATH-101 College Algebra
MATH-10oA Intermediate Algebra

## Recitations at UNL

MATH-107 Calculus II
MATH-106 Calculus I
MATH-104 Applied

Spring 2015, Summer 2017, Fall 2017
Fall 2012, Spring 2013, Fall 2015, Spring 2016

## Jia Huang

Contact<br>Information

Research Interests

Employment

Education

Teaching
Experience

Publication

Discovery Hall 377, 2502 19th Avenue
Department of Mathematics and Statistics
University of Nebraska, Kearney, NE 68849

Phone: (308) 865-8494
Email: huangj2@unk.edu

Discrete Mathematics and its connections with other fields.

Department of Mathematics and Statistics, University of Nebraska at Kearney: Associate Professor, 2018-present Assistant Professor, 2014-2018

School of Mathematics, University of Minnesota-Twin Cities:
Postdoctoral Associate, 2013-2014

University of Minnesota-Twin Cities, 2007-2013:
Ph.D. in Mathematics, advised by Professor Victor Reiner (Thesis: o-Hecke algebra actions on flags, polynomials, and Stanley-Reisner rings)

University of Science and Technology of China, 1999-2007:
B.S. in Mathematics and Applied Mathematics, D.S. in Applied Mathematics

University of Nebraska at Kearney, 2014-present:

- College Algebra, Plane Trigonometry, Applied Calculus I, Calculus with Analytic Geometry I \& II, Calculus III, Abstract Algebra, College Geometry, Complex Analysis, History of Mathematics, Discrete Mathematics, Theory of Numbers, Geometry for Teachers (online)

University of Minnesota-Twin Cities, 2007-2014:

- Lecturer for Calculus II, Multivariable Calculus, CSE Calculus II
- Teaching assistant for Calculus I \& II, Multivariable Calculus, Short Calculus

31. N. Hein and J. Huang, Variations of the Catalan numbers from some nonassociative binary operations, Discrete Mathematics 345 (2022), no. 3, Paper No. 112711, 18 pp.
32. J. Huang, Norton algebras of the Hamming Graphs via linear characters, The Electronic Journal of Combinatorics 28 (2021), \#P2.30, 36 pp.
29 J. Huang, Nonassociativity of the Norton algebras of some distance regular graphs, Electronic Journal of Cominatorics 27 (2020), \#P4.27, 22 pp.
33. J. Huang, Compositions with restricted parts, Discrete Mathematics 343 (2020), 111875, 9 pp.
27 D. Grinberg, J. Huang, and V. Reiner, Critical groups for Hopf algebra modules, Mathematical Proceedings of the Cambridge Philosophical Society 168 (2020), 473503.

26 J. Huang, Domination ratio of integer distance digraphs, Discrete Applied Mathematics 262 (2019), 104-115.
25. J. Huang, B. Rhoades, and T. Scrimshaw, Hall-Littlewood polynomials and a Hecke action on ordered set partitions, Proceedings of the American Mathematical Society 147 (2019) 1839-1850.
24 J. Huang and J. Shen, New upper bounds for the bondage number of a graph in terms of its maximum degree and Euler characteristic, Ars Combinatoria 140 (2018) 373-387.

23 J. Huang and B. Rhoades, Ordered set partitions and the o-Hecke algebra, Algebraic Combinatorics 1 (2018) 47-80.
22 J. Huang, M. Mickey and J. Xu, The nonassociativity of the double minus operation, Journal of Integer Sequences 20 (2017) Article 17.10.3.
21. J. Huang, A uniform generalization of some combinatorial Hopf algebras, Algebras and Representation Theory 20 (2017) 379-431.
20. J. Huang, J. B. Lewis, and V. Reiner, Absolute order in general linear groups, Journal of the London Mathematical Society 95 (2017) 223-247.
19. N. Hein and J. Huang, Modular Catalan numbers, European Journal of Combinatorics 61 (2017) 197-218.
18. J. Huang, A tableau approach to the representation theory of o-Hecke algebras, Annals of Combinatorics 20 (2016) 831-868.
17. J. Huang, Hecke algebras with independent parameters, Journal of Algebraic Combinatorics 43 (2016) 521-551.
16. J. Huang, o-Hecke algebra action on the Stanley-Reisner ring of the Boolean algebra, Annals of Combinatorics 19 (2015) 293-323.
15. J. Huang, o-Hecke algebra actions on coinvariants and flags, Journal of Algebraic Combinatorics 40 (2014) 245-278.
14. Y.-C. Cao, J. Huang, and J.-M. Xu, The bondage number of graphs with crossing number less than four, Ars Combinatoria 112 (2013) 493-502.
13. J. Huang, An improved upper bound for the bondage number of graphs on surfaces, Discrete Mathematics 312 (2012) 2776-2781.
12. J. Huang and J.-M. Xu, Note on conjectures of bondage numbers of planar graphs, Applied Mathematical Sciences 6 (2012) 3277-3287.
11. A. Berget and J. Huang, Cyclic sieving of finite Grassmannians and flag varieties, Discrete Mathematics 312 (2012) 898-910.
10 J. Huang, A gluing construction for polynomial invariants, Journal of Algebra 328 (2011) 432-442.

9 J. Huang and J.-M. Xu, Domination and total domination contraction numbers of graphs, Ars Combinatoria 94 (2010) 431-443.
8 J. Huang, J.-W. Wang, and J.-M. Xu, Reinforcement numbers of digraphs, Discrete Applied Mathematics 157 (2009) 1938-1946.
7. J. Huang and J.-M. Xu, The bondage numbers and efficient dominations of vertextransitive graphs, Discrete Mathematics 308 (2008) 571-582.
6 J . Huang and J.-M. Xu, The bondage numbers of graphs with small crossing numbers, Discrete Mathematics 307 (2007) 1881-1897.
5. J.-M. Xu, Y.-Z. Wu, J. Huang, and C. Yang, Feedback numbers of Kautz digraphs, Discrete Mathematics 307 (2007) 1589-1599.
4 J. Huang and J.-M. Xu, The total domination and total bondage numbers of extended de Bruijn and Kautz digraphs, Computers \& Mathematics with Applications 53 (2007) 1206-1213.
3 J.-M. Xu, F. Tian, and J. Huang, Distance irredundance and connected domination numbers of a graph, Discrete Mathematics 306 (2006) 2943-2953.
2 J. Huang and J.-M. Xu, The bondage numbers of extended de Bruijn and Kautz digraphs, Computers \& Mathematics with Applications 51 (2006) 1137-1147.

1. J. Huang and J.-M. Xu, Multiply-twisted hypercube with four or less dimensions is vertex-transitive, Chinese Quarterly Journal of Mathematics 20 (2005) 430-434.

Invited Talks
28. The Norton algebras of some distance regular graphs, Discrete Mathematics Seminar, Texas State University, November 2020.
27 Integer Tillings and Domination Ratio, Graph Theory and Combinatorics Seminar, Anhui University, Jun. 2019.
26 Variations of the Catalan number from non-associative binary operations, Combinatorics Seminar, University of Wisconsin, Apr. 2019.
25. An improved upper bound for the bondage number of graphs on surfaces, Graph Theory and Combinatorial Network Theory Conference, Beijing Normal University, Jun. 2018.
24 Polynomial invariants of finite groups of sparse matrices, Public Talk, Beijing Normal University, Jun. 2018.
23 o-Hecke algebra actions on quotients of polynomial rings, Discrete Mathematics Seminar, Sun Yat-Sen University, Jun. 2018.
22 Critical groups for Hopf algebra modules, Great Plains Combinatorics Conference, Kansas State University, Apr. 2018.
21. o-Hecke algebra actions on quotients of polynomial rings, Combinatorics Seminar, Shanghai Jiao Tong University, Dec. 2017.
20. Domination ratio of infinite circulant graphs, Graph Theory Seminar, Jiangsu Normal University, China, Dec. 2017.
19. Combinatorics of non-associative binary operations, Graph Theory and Combinatorics Seminar, Anhui University, China, Dec. 2017.
18. o-Hecke algebra actions on quotients of polynomial rings, Algebra Seminar, University of Science and Technology of China, Dec. 2017.
17. Domination ratio of infinite circulant graphs, Graph Theory Seminar, University of Science and Technology of China, Dec. 2017.
16. Nilpotent ideals of upper triangular matrices and Variations of the Catalan numbers, Algebraic Combinatorics and Mathematical Physics Seminar, University of NebraskaLincoln, Oct. 2017.
15. Nonassociativity of some binary operations, Combinatorics Seminar, University of California, San Diego, Jun. 2017.
14. Nonassociativity of some binary operations, Midwest Combinatorics Conference, University of Minnesota, May 2017.
13. Hecke algebras with independent parameters, AMS Spring Central Sectional Meeting, North Dakota State University, Apr. 2016.
12. Modular Catalan numbers, Combinatorics Seminar, University of Kansas, Sep. 2015. An
11. improved upper bound on the bondage number of graphs on surfaces, Discrete Math Seminar, Texas State University, Apr. 2014.
10 o-Hecke algebra actions on coinvariants, flags, and Stanley-Reisner rings, Algebra-Geometry-Combinatorics Seminar, University of Illinois at Urbana-Champaign, Feb. 2014.

9 o-Hecke algebra action on the Stanley-Reisner ring of the Boolean algebra, CMS Winter Meeting, Ottawa, Dec. 2013.
8 o-Hecke algebra actions on coinvariants and flags, Algebra \& Discrete Mathematics Seminar, North Dakota State University, Nov. 2013.
7. o-Hecke algebra actions on polynomials and Stanley-Reisner rings, Combinatorics Seminar, University of Washington, Oct. 2013.
6 A gluing construction for polynomial invariants, AMS Fall Southeastern meeting, Tulane University, Oct. 2012.
5. o-Hecke algebra action on polynomials, LaCIM seminar, Université du Québec à Montréal, Mar. 2012.
4 o-Hecke algebra action on polynomials, AMS Spring Southeastern Section Meeting, University of South Florida, Mar. 2012.
3 o-Hecke algebra actions on coinvariants and flags, Workshop on Quasisymmetric Functions, Banff International Research Station, Nov. 2010.
2 o-Hecke algebra actions on flags and coinvariants, Algebra and Discrete Mathematics Seminar, University of California, Davis, Oct. 2010.

1. Linear sparsity groups and their polynomial invariants, CMS Summer Meeting, Memorial University of Newfoundland, Jun. 2009.

Contributed
5. Ordered set partitions and the o-Hecke algebra, The 30th International Conference Presentations
on Formal Power Series and Algebraic Combinatorics (FPSAC), Dartmouth College, Jul. 2018.
4 o-Hecke algebra action on the Stanley-Reisner ring of the Boolean algebra, The 26th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Chicago, Jun. 2014.
3 o-Hecke algebra actions on coinvariants and flags, The 23rd International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC), Reykjavik, Jun. 2011,
2 Bondage Number and Efficient Domination of Vertex-transitive Graphs, 2nd China National Conference on Combinatorics and Graph Theory, Tianjin, China, Aug. 2006.

1. Bondage numbers of graphs with small crossing numbers, 2005 International and 3rd Cross-strait Conference on Graph Theory and Combinatorics, Jinhua, China, Jun. 2005.

Recent Collaborators
ssional Services

Darij Grinberg (University of Minnesota), Nickolas Hein (Benedictine College), Joel Lewis (George Washington University), Victor Reiner (University of Minnesota), Brendon Rhoades (University of California San Diego), Travis Scrimshaw (University of Queensland), Jian Shen (Texas State University)

- Referee for the following journals: Advances in Mathematics, Algebraic Combinatorics, Australasian Journal of Combinatorics, Canadian Journal of Mathematics, Czechoslovak Mathematical Journal, Discrete Mathematics, Discrete Applied Mathematics, Electronic Journal of Combinatorics, European Journal of Combinatorics, International Journal of Computer Mathematics, Journal of Combinatorial Theory, Series A, Journal of Combinatorics, Proceedings of the American Mathematical Society, Transactions on Combinatorics
- Referee for the following conferences: The 29th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC 2017), The 30th International Symposium on Algorithms and Computation (ISAAC 2019)
- Reviewer for Mathematical Reviews, 2015-present

University - Member/chair of various departmental committees, 2014-present.
Service

- Organizer for the annual Undergraduate Research Mathematics Mini-Symposium at UNK, 2016-present (no 2020 \& 2021 due to COVID-19).
- Member of the UNK Faculty Senate Academic Information Technology Committee, 2016-2018.
- Member of the UNK General Studies working groups, Fall 2019.
- Maintainer for the webpages of the department, 2018-present.

Awards \& Grants • PI: Jae Sung Park, Mentor: Tim Wei, Co-PIs: Sangjin Ryu, Jia Huang, Simon Song, and Dong Rip Kim, "Elucidating the laminar-to-turbulent transition for drag reduction and flow stability", Global Impact Planning Grant, University of Nebraska Collaboration Initiative, \$20,000, 2020-2021.

- PI: Jae Sung Park, Mentor: Tim Wei, Co-PIs: Sangjin Ryu, Kyungyong Lee, and Jia Huang, "Finding order in chaos: a systematic approach to turbulence control", Planning and Proposal Generation Grant, University of Nebraska Collaboration Initiative, \$20,000, 2018-2019.
- Reported by the UNK New Frontiers, 2018-2019
- Travel Awards, College of Natural and Social Sciences, UNK, Spring 2016, Spring 2017, Spring 2018

Students Mentored

UNK Undergraduate Research Fellows: Chenli Huang (Fall 2016), Madison Mickey (2016-2017), Jianbai Xu (2016-2017), Evan Olson (2018-2019), Gamaliel Montero Alcaraz Jr (2019-2020).

# Mrs. Julieta O. Johnston 

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Mathematics
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## Education

MST, Ateneo de Manila University, 1986.
Major: Mathematics
Dissertation Title: The Upper Half-Plane Model of Hyperbolic Geometry
BS, University of San Carlos, 1979.
Major: Chemical Engineering

## Professional Positions

## Academic - P-12

Substitute teacher, Laramie County School District \#1. (September 2003 - October 2008).
full-time high school teacher, Fatima College of Camiguin. (June 1979 - March 1980).
Academic - Post-Secondary
Mathematics/Statistics Instructor, United States Air Force Academy. (December 2008 - May 2011).
Adjunct Math instructor, Laramie County Community College. (August 2004 - May 2006).
Associate Professor, Xavier University. (June 1982 - May 2002).
Study tutor, University of the Philippines-Open University. (June 1998 - May 1999).

## Professional/Managerial

Laboratory analyst, Limketkai Sons Milling, Inc. (September 1980 - May 1982).

## SERVICE

## University Service

Committee Member, Assessment Committee. (August 2018 - Present).

## CURRICULUM VITAE <br> KATHERINE A. KIME

Associate Professor
Department of Mathematics and Statistics
University of Nebraska at Kearney

## EDUCATION

Ph.D. University of Wisconsin-Madison, Mathematics, August 1986
Minor: Statistics Thesis Advisor: Prof. David Russell
M.A. University of Wisconsin-Madison, Mathematics, December 1982
B.A. University of Colorado-Boulder, Chemistry, May 1978 Phi Beta Kappa

## PROFESSIONAL EXPERIENCE

2020- Professor, Dept. of Mathematics and Statistics, UNK
2019- Chair, Dept. of Mathematics and Statistics, UNK
2001-19 Associate Professor, Dept. of Mathematics and Statistics, UNK Tenured 2003

1997- 01: Assistant Professor, Dept. of Mathematics and Statistics, UNK Graduate Faculty Member of the Univ. of Nebraska, November 1997

1996-97: Instructor, Department of Mathematics, University of New Orleans
1988-96: Assistant Professor, Department of Mathematics, Case Western Reserve University
1987-88: Post-Doctoral Research Associate for Prof. Herschel Rabitz, Dept. of Chemistry, Princeton University

1986-87: Recipient of "Bourse Chateaubriand" research grant from French Government; visiting researcher under this grant at INRIA (Institute Nationale de Recherche en Informatique et Automatique), Le Chesnay, and with Prof. Austin Blaquiere, Laboratoire d'Automatique Theorique, Universite Paris 7, Paris

1979-86: Teaching Assistant, Research Assistant, Department of Mathematics, UW-Madison, Madison, Wisconsin

1978-79: Support Scientist, Convective Storms Division, National Center for Atmospheric Research, Boulder, Colorado

## PUBLICATIONS

1. "Palindromic control and mirror symmetries in finite difference discretizations of 1-D Schrodinger equations", Katherine A. Kime, Discrete and Continuous Dynamical Systems-B, 2018, 23(4): 16011621.
2."The Hydrogen Molecular Ion with Time-Dependent Magnetic Field Strength As Control", Katherine A. Kime, Proceedings of the ASME 2014 International Design Engineering Technical Conferences \& Computers and Information in Engineering Conference, Buffalo, New York
2. "Solving for Quantum Controls", Katherine A. Kime, Proceedings of the ASME 2011 International Design Engineering Technical Conferences \& Computers and Information in Engineering Conference, Washington, D.C.
3. "Finite Difference Approximation of Quantum Mechanical Wave Packets", Katherine A. Kime, Integration: Mathematical Theory and Applications, Vol. 1, No. 3 (2010), (Special Issue), pp. 253 278.
4. "Effect of the Spatial Extent of the Control in a Bilinear Control Problem for the Schroedinger Equation", Katherine A. Kime, Proceedings of the ASME 2009 International Design Engineering Technical Conferences \& Computers and Information in Engineering Conference, San Diego, California
5. "Spatial Restriction of Bilinear Control of a Schrodinger Equation", K.A. Kime, Proceedings of the $18^{\text {th }}$ International Symposium on Mathematical Theory of Networks and Systems, Blacksburg, Virginia, 2008
6. "Control Lie Algebras of Semi-Discretizations of the Schroedinger Equation", Katherine A. Kime, Proceedings of the ASME 2007 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Las Vegas, Nevada
7. "Numerical Approximation of Bilinear Control of the Schroedinger Equation", Katherine A. Kime, Proceedings of the ASME 2005 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Long Beach, California
8. "Implementation of Numerical Approximations of Control of the Schrodinger Equation with MATLAB", K. Kime, Proceedings of the $11^{\text {th }}$ Mediterranean Conference on Control and Automation MED '03, Rhodes, Greece, 2003
9. "Control of Electronic Materials", K. Kime, Proceedings of the $15^{\text {th }}$ International Symposium on the Mathematical Theory of Networks and Systems, Notre Dame, Indiana, 2002
10. "Finite difference approximation of control via the potential in a 1-D Schrodinger equation", K. Kime, Electronic Journal of Differential Equations, Vol. 2000(2000), No. 26, pp. 1-10
11. "Control of Matter Waves in Adjacent Potential Wells", K. Kime, Mathematical Methods in the Applied Sciences, 20 (1997), pp. 369-381
12. "Simultaneous Control of a Rod Equation and A Simple Schrodinger Equation", K. Kime, Systems and Control Letters, 24 (1995), pp. 301-306
13. "Control of Transition Probabilities of the Quantum-Mechanical Harmonic Oscillator", K. Kime, Applied Mathematics Letters, Vol. 6, No. 3 (1993), pp. 11-15
14. "Boundary Controllability of Maxwell's Equations in a Spherical Region", K. Kime, SIAM J. Control and Optimization, 28(1990), pp. 294-319
15. "From Two Stochastic Optimal Control Problems to the Schrodinger Equation", K. A. Kime and A. Blaquiere, Bellman Continuum 1988: Modeling and Control of Systems in Engineering, Quantum Mechanics, Economics and Biosciences, Lecture Notes in Control and Info. Sci. 121, Springer Verlag, (1989), pp. 193-215
16. "Deuterium Contents of Storm Inflow and Hailstone Growth Layers", C.A. Knight, N.C. Knight, and K.A. Kime, J. Atm. Sciences, 38 (1981), pp. 2485-2499
17. "A Practical Guide to Uses of Lanthanide NMR Shift Reagents", K.A. Kime and R.E. Sievers, Aldrichimica Acta, 10 (1977), pp. 54-62

## SELECTED PRESENTATIONS AT PROFESSIONAL MEETINGS

"Data Use in the Measurement of Systemic Risk in Financial Systems", South Dakota State University Data Science Symposium, Brookings, 2019
"Finding Explicit Controls for Discretizations of the Schrodinger Equation with Maple", 22nd International Symposium on Mathematical Theory of Networks and Systems, Minneapolis, 2016
"A Lie Algebraic Approach to Molecular Vibration and Rotation", The $4^{\text {th }}$ International Conference on Multibody System Dynamics, Montreal, 2016
"Explicit Approximations of Bilinear Controls using Interpolation", Invited Presentation, Preliminary report, AMS Special Session on Control Theory and Qualitative Analysis of Partial Differential Equations, Spring Sectional Meeting, Ames, Iowa, 2013
"Explicit Quantum Controls", Invited Presentation, AMS Special Session on Interplays Between Feynman Operational Calculus, Wiener and Feynman Integrals, Physics, and Analysis on Wiener Space, 2013 Joint Mathematics Meetings, San Diego, Calif.
"Mechanism of Default Contagion with Graph Representations", Katherine Kime and Shuangshi Han, Poster Presentation, SIAM Annual Meeting, Minneapolis. 2012
"Schrodinger and Wave Equation Approximations of the Impingement of a Quantum Mechanical Wave Packet", International Conference on Industrial and Applied Mathematics, ICIAM 2011, Vancouver, Canada.
"Comparison of numerical methods for quantum mechanical transmission and reflection at an interface", ECCM 2010, IV European Conference on Computational Mechanics, Paris, France, 2010
"Comparison of Coupled Harmonic Oscillators and Finite Difference Approximations of the Wave and Schrodinger Equations for Control",
SIAM Conference on Control \& Its Applications, Denver, Colorado, 2009
"Control of the Schrodinger Equation through the Potential"; Invited presentation
International Conference on Mathematical Control Theory, In honor of David L. Russell on the occasion of his $70^{\text {th }}$ Birthday, Academy of Mathematics and System Science, Chinese Academy of Sciences (CAS), Beijing, China, 2009
"Finite Difference Approximation of Quantum-Mechanical Wave Packets",
The Feynman Integral and Related Topics in Mathematics and Physics, Lincoln, Nebraska, 200
"Computation of controllable pairs in discretizations of the Schroedinger equation", Preliminary Report; Invited presentation, AMS Special Session on Nonlinear Analysis and Control of Partial Differential Equations, Lincoln, Nebraska, 2005
"Control of Nanostructures", Pluralism in Distributed Parameter Systems, Twente, Netherlands, 2001
"Differential Geometric Approaches for Approximation of Infinite Dimensional Bilinear
Control"; Invited presentation, Workshop on Control of Partial Differential Equations, Lincoln, Nebraska, 2001
"Numerical Approximation of Control by Time-Dependent Potentials", Preliminary Report; Invited Presentation, AMS Special Session on Control Theory for Partial Differential Equations, Washington, D.C. 2000
"Discretizations of control systems for the Schrodinger equation"
Advances in Control on Nonlinear Distributed Parameter Systems, Bryan/College Station, Texas, 1999
"Control via a Moving Potential Barrier"
SIAM/SEAS (Southeastern-Atlantic Section of SIAM), Raleigh, North Carolina, 1997
"Control of Quantum Systems"
Third SIAM Conference on Control Theory and its Applications, St. Louis, Missouri, 1995
"Controlling quantum-mechanical systems"; Invited Presentation
AMS Special Session on Control Theory and Partial Differential Equations, Dayton, Ohio, 1992
Bellman Continuum, Antibes, France, 1988 (with A. Blaquiere, see publications)

## TEACHING

Courses taught at University of Nebraska at Kearney, 1997-2022:
College Algebra, Trigonometry, Scientific Topics in Mathematics, Finite Mathematics, Applied Calculus I, Foundations of Mathematics, Calculus I with Analytical Geometry, Calculus II with Analytical Geometry, Calculus III, Differential Equations, Abstract Algebra, Complex Analysis, Discrete Mathematics, Number Theory, Numerical Analysis, Linear Algebra, Advanced Calculus I, Special Topics in Mathematics (Fourier Series and Boundary Value Problems), Probability and Statistics, Mathematical Statistics

Courses taught at University of New Orleans, 1996-97:
A Survey of Mathematical Thought (for liberal arts students), College Algebra, Calculus and Analytic Geometry
Courses taught at Case Western Reserve University, 1988-96:
Math I-II, Calculus for Science and Engineering, Elementary Differential Equations, Discrete and Continuous Models, Introduction to Linear Algebra,
Fundamentals of Analysis, Advanced Calculus, Introduction to Applied Mathematics, Fourier Analysis, Matrix Theory, Advanced Engineering Mathematics, Statistics for Business and Management Science, Statistical Methods (for engineers and scientists)
Coordinator of one year of Math I-II at CWRU, with graduate student teaching assistants
Teaching Distinction: Focke Professorial Fellowship, CWRU, 1990-91
Software used in teaching: MATLAB, Maple, SPSS, Sto

## GRANTS

"Numerical approximations of control of the Schrodinger equation", NSF EPSCoR Small Grant Program for Nebraska Women in Science, 2003
"Investigation of numerical methods for wave propagation; applications to control", Research Services Council University Mini-Grant, UNK, 1997-98
"Controllability of the Schrodinger Equation", NSF-ROW research planning grant, 1990-91

## ADDITIONAL

- Session Chair, "Computational Issues in Systems and Control", MTNS 2016, Minneapolis (gave presentation in this session, above)
- Regional Director, North Central Region, Kappa Mu Epsilon, F2015 - present; organize regional conferences in even years, with 2016 held at UNK
- Referee: ASME 2007, 2011; Journal of Mathematical Analysis and Applications (2007), Mathematische Nachrichten (2018)
- Session Chair, "Nonlinear Systems II", SIAM Conference on Control \& Its Applications, Denver, Colorado, 2009 (gave presentation in this session, above)
- Minisymposium Organizer, "Control of Electronic Materials", SIAM Conference on Control, 2001
- Panel Evaluator, NSF, Small Business Innovation Research, Mathematical Sciences, Sept. 1995, Aug. 1996
- Elected to Phi Kappa Phi Honorary Society, UNK Chapter, 2002.


# Amy L. Nebesniak 

## EDUCATION

University of Nebraska-Lincoln
Ed.D. in Teaching, Learning, and Teacher Education
Dissertation title: Learning to Teach Mathematics with Reasoning and Sense MakingAdvisor:
Ruth Heaton, Ph. D.
Practitioner research using instructional coaching to explore what and how a teacherlearns about reasoning and sense making in mathematics and in teaching.

University of Nebraska-Lincoln 2007
M.A. in Teaching, Learning, Teacher Education with Mathematics Minor Master's Action Research title: Using Cooperative Learning to Promote a Problem-Solving Classroom
Advisor: Stephen Swidler, Ph.D.
Action research conducted in an eighth-grade mathematics classroom investigating the influence of cooperative learning strategies on students' learning.

University of Nebraska-Kearney
2002
B.S. in Education

Endorsement Area: Middle School Education
Subject Areas: Mathematics, Natural Sciences, and Social Sciences

## TEACHING EXPERIENCE

## University Teaching Experience

Associate Professor, University of Nebraska-Kearney, 2017 - Present
Assistant Professor, University of Nebraska-Kearney, 2013-2017

- Teach math content courses for undergraduate students, the majority of whom are elementaryand middle level pre-service teachers, and methods courses for secondary pre-service teachers
- Undergraduate Courses Taught: Math for Elementary Teachers I, Math for Elementary TeachersII, Middle School Mathematics, Teaching of Secondary Mathematics, College Algebra, Intermediate Algebra
- Graduate Courses Developed and Taught: Current Research in Mathematics Education, Using Mathematics to Understand Our World
- Model effective math instructional methods to future teachers
- Conduct research in the areas of math education to produce professional writings and presentations
- Provide service to the department, college, and university
- Advise students in programmatic decision-making
- Advisor to students conducting undergraduate research and honors projects

Adjunct Professor, University of Nebraska-Lincoln, 2008-2016

- Develop and teach courses through the NSF-MSP NebraskaMATH grant
- Graduate Courses Taught: Using Mathematics to Understand Our World, Issues in Mathematics Education, Algebra for Algebra Teachers, Mathematics as a Second Language, Teacher as Scholarly Practitioner

Assistant Professor, Washburn University, 2012 - 2013

- Created and implemented lessons on effectively teaching mathematics for elementary and middlelevel preservice teachers
- Courses Taught/Supervised: Math Methods, Math/Science Field Experience
- Researched and wrote on topics within mathematics education and teacher education
- Served as the sponsor of a student organization that took approximately 20 pre-service teachersto a national mathematics conference
- Served on various committees such as the Education Department Undergraduate committee, Technology committee, and Field Experience committee


## Other Professional Experience

Honors Program Associate Director, University of Nebraska-Kearney, 2021 - Present

- Provide support to the Director in daily operations and administration of the 400-studentprogram Advise Honors students in their first-year and sophomore years
- Work with the Director and the Honors Faculty Advisory Board (HFAB) in formulating policyfor the
- program and helping with curriculum planning and recruitment efforts Assist students applying for national and international fellowships.Assist with program assessment

PAWS University Director, University of Nebraska-Kearney, 2019 - Present

- Recruit, evaluate, market, and assess 50+ curriculum-based summer classes for elementary-aged students, ensuring quality programming and instruction
- Hire, manage, and support a staff of $25+$ teachers and 4+ para professionals
- Manage a budge of approximately $\$ 150,000$ and obtain grant funding
- Communicate and collaborate with school districts, community organizations, and parents regarding
camp registration, scholarships, camp logistics, and individual student matters Collaborate with numerous campus departments to plan, schedule, and facilitate a 4-week camp
- Serve as the lead camp administrator, focusing on students' safety and high-quality education

Secondary Mathematics Instructional Coach, Lincoln Public Schools, 2008-2012

- Facilitated learning opportunities for teachers, including the learning of mathematics at a deeperlevel, effective teaching strategies, positive classroom management approaches, and the development of reasoning and sense making skills.
- Engaged teachers in planning sessions and reflective discussions, individually and through professional learning communities
- Created and implemented professional development, district-wide assessments, and curriula

High School Mathematics Teacher, Lincoln Public Schools, 2008-2009

- Taught Algebra to primarily ninth grade students
- Collaborated with other mathematics teachers in a Professional Learning Community to discusseffective teaching techniques
Middle and High School Mathematics Teacher, Grand Island Public Schools, 2006-2008
- Created and implemented lessons in eighth grade mathematics and Algebra courses
- Wrote common assessments and course syllabi to be used by teachers across the district
- Piloted an Algebra course aimed at supporting at-risk mathematics students

Middle and High School Mathematics Teacher, Lincoln Public Schools, 2002-2006

- Created and implemented lessons in eighth grade mathematics and Algebra courses
- Served in leadership roles such as department liaison, Algebra Assessment Writing committee,School Improvement Plan committee
- Co-developed and piloted Algebra course aimed at supporting at-risk mathematics students


## SCHOLARLY ACTIVITIES

## Grants

Grants to support PAWS University; University of Nebraska-KearneyTotal 2019 - Present Awarded \$110,021

Improving Teacher Quality: State Grants Program, Engaging Math: Professional Development through the Flipped Classroom Model, Coordinating Commission for Postsecondary Education; Primary Project Director/Coordinator
Awarded \$73,000

Research Services Council: Collaborative Research Grant Proposal, Academic Coaching to Excellence (ACE), University of Nebraska-Kearney; Principal Investigator Awarded \$34,283

Program of Excellence Grant, Pre-Service Mathematics Teachers Conference, University of Nebraska-Kearney Department of Teacher Education; Co-Investigator Awarded \$4,500

Program of Excellence Grant, Teaching Mathematics with Mini Projectors, University of Nebraska-Kearney Department of Teacher Education; Co-Investigator Awarded \$1000

Program of Excellence Grant, Using Manipulatives in Math Courses for Elementary Teachers, University of Nebraska-Kearney Department of Teacher Education; Principal Investigator Awarded $\$ 760$

Travel Grants, University of Nebraska-Kearney
Total Awarded \$2900
2013-Present

## Peer Reviewed Publications

Nebesniak, A., Vanness, C.*, Casper, M. (in progress). Growth Mindsets and Achievement of Academically At-Risk Students and Preservice Teachers.

Bice, M., Nebesniak, A., Mocarski, R., and Vanness, C.* (in progress). Influence of curriculum-based camps during COVID-19.

Mocarski, R., Bice, M., Nebesniak, A., and Moore, T.* (under review). Positive college perception: The impact of a curriculum-based summer camp's transition. Journal for Leadership and Instruction.

Nebesniak, A., Gomez-Johnson, K. \& Rupnow, T. J. (in review/resubmit process). The impact of professional development partnerships on elementary math teacher beliefs and practices duringcurriculum change. Professional Development in Education.

Gomez-Johnson, K., Nebesniak, A. \& Rupnow, T. J. (2019). District-university collaborationsto support reform-based mathematics curriculum. Journal of Mathematics Education at Teachers College, 10(1), 17-20.

Vu, P., Knoell, C., Nebesniak, A. L., \& Strawhecker, J. (2017). Gamified-blended learning professional development: A descriptive case study. In C. Martin \& D. Polly (Eds.), Handbook of Research on Teacher Education and Professional Development (pp. 385-394) Hershey, PA: IGI Global.

Nebesniak, A. L. \& Burgoa, A. A. (2015). Developing the vertex formula MEAN-ingfully. Mathematics Teacher, 108 (6), 429-433.

Nebesniak, A. L. (2012). Effective instruction: A math coach's perspective. MathematicsTeacher, 106 (5), 354-358.

Nebesniak, A. L. \& Heaton, R. M. (2010). Student confidence and student involvement.
Mathematics Teaching in the Middle School, 16 (2), 96-103.
*indicates undergraduate or graduate student

## Peer Reviewed Scholarly Presentations

Gomez-Johnson, K., Nebesniak, A. \& Rupnow, T. (2021). Powerful Partnerships: Leveraging District and University Pairings to Improve Teacher Effectiveness. National Council of Teachers of Mathematics (NCTM) Annual Conference, St. Louis, IL (moved to virtual due to COVID-19).

Nebesniak, A. (2018). Growth Mindset in (Taking) Action. National Council of Teachers of Mathematics (NCTM) Regional Conference, Hartford, CT.

Nebesniak, A. L., Sorensen, K., \& Pearson, K. (2018). Mind over matter: Growth mindset in the
postsecondary classroom. National Council of Teachers of Mathematics (NCTM) Annual Conference, Washington D.C.

Nebesniak, A. (2016). Flippin'fun professional development. National Council of Teachers of Mathematics (NCTM) Annual Conference, San Francisco, CA.

Ford, P. \& Nebesniak, A. (2015). How to hook pre-service teachers on professional development. Mathematical Association of America (MAA) MathFest Annual Conference, Washington D.C.

Nebesniak, A. L. (2015). Using pattern blocks to shape fraction knowledge. National Council of Teachers of Mathematics (NCTM) Regional Conference, Nashville, TN.
Nebesniak A. (2015). Using content mapping to provide direction in professional development. National Council of Teachers of Mathematics (NCTM) Regional Conference, Nashville, TN.

Nebesniak, A. L. \& Burgoa, A. A. (2013). Math: A not-so-universal language. National Council of Teachers of Mathematics (NCTM) Regional Conference, Louisville, KY.

Nebesniak, A. L. \& Berks, D. (2013). Racecars, pennies, and men with hats: Teaching algebra for understanding. National Council of Teachers of Mathematics Annual Conference, Denver, CO.

Nebesniak, A. L. \& Heaton, R. M. (2009). Using cooperative learning to promote a problemsolving classroom. Paper presented at symposium, Investigating rurality within mathematics education research using four qualitative studies of teachers' practices and perspectives at theannual meeting of the American Education Research Association (AERA), San Diego, CA.

## Other Scholarly Presentations

Nebesniak, A. L. (2018). Encouraging growth mindsets in STEM classrooms. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, Kearney, NE.

Nebesniak, A. L. (2017). Fun (not fearful) fact fluency. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, Kearney, NE.

Nebesniak, A. L. (2017). Let's talk about math talk. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, Kearney, NE.

Nebesniak, A. L. (2016). Task talks: Crossing the river of expressions and equations. National Council of Teachers of Mathematics (NCTM) Innov8 Conference, St. Louis, MO.

Nebesniak, A. L. (2016). Using pattern blocks to shape fraction knowledge. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, Kearney, NE.

Nebesniak, A. L. (2016). Using content mapping to provide direction in professional development. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, Kearney, NE.

## Invited Talks

Nebesniak A. L., Sorensen, K., \& Pearson, K. (2018). Mind over matter: Growth mindset in the postsecondary classroom. University of Nebraska at Kearney's College of Education Research and Teaching Forum.

Nebesniak, A. L. (2016). Team time facilitator. National Council of Teachers of Mathematics(NCTM) Innov8 Conference, St. Louis, MO.

Nebesniak, A. L. (2014, 2015). Questioning to foster understanding. University of Nebraska, Learning Commons Tutor Training, Kearney, NE.

Nebesniak, A. L. (2012). Using content mapping to make instructional decisions. University of Nebraska, Algebra for Algebra Teachers, Lincoln, NE.

Nebesniak, A. L. (2010). How to get started: Tips and ideas for the first days of school.
Nebraska Association of Teachers of Mathematics Pre-Professional Conference, Lincoln, NE.

Nebesniak, A. L. \& Parn, L. (2009). Using cooperative learning to engage students in mathematics. Invited talk at the University of Nebraska-Lincoln Department of Mathematics colloquium series.

## SERVICE

## Committee Membership

University
UNK Advisory Council for Teacher Education, Appointed Teacher
2015 - Present
Education Department Student Success CommitteeLearning
2015 - Present
Strategies Office Advisory Committee, Invited Faculty Senate
2017-2020
eCampus Committee, Elected
2017-2019
Pre-Service Teachers Mathematics Conference, Committee Chair
2014-2015

## College

Science and Mathematics Education Graduate Program Committee
2015-2020
College of Arts and Sciences Dean Search Committee, Appointed
College of Arts and Sciences-Committee Structure and Policy Merger CommitteeCollege
2018-2019
of Natural and Social Sciences Dean Advisory Committee, Elected College of Natural and
Social Sciences Educational Policy Committee, Elected
2017-2018
2016-2018
2015-2016

## Department

Academic Programs
Assessment
Faculty \& Student Affairs
Graduate
Peer Review
Policy and Planning

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2017-2019; 2015-16; 2013-14
2016-17 (chair); 2015-16; 2013-14
2020-21; 2019-20 (chair); 2014-15
2013-Present
2016-2019
2020-21; 2018-19 (chair); 2014-16;
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| Recruitment \& Retention | 2018-Present |
| :--- | :--- |
| Search Committee | 2016-17 (2); 2015-16 (2); 2013-14 (3) |

## Professional Activities

| Education Consultant, Ord Public Schools Education | $2019-$ Present |
| :--- | ---: |
| Consultant, North Bend Public Schools | $2019-2020$ |
| Education Consultant, Kearney Public Schools (KPS), Central Administration | $2016-2019$ |
| Undergraduate Research Fellows Mentor | $2016-2018$ |
| Education Consultant (paid \& pro bono), KPS, Emerson Elementary | $2016-2018$ |
| emiUNK Professional Development Program, Co-Director Nebraska State | $2015-2016$ |
| Standards for Mathematics Revision Committee | 2015 |
| NU Nebraska State Standards for Mathematics RepresentativePeer | 2015 |
| Reviewer, IGI Global | 2015 |
| Education Consultant, KPS Middle School and Elementary PrincipalsPeer | $2014-2016$ |
| Reviewer, National Council of Supervisors of Mathematics | 2014 |

## Professional Affiliations

Association of Mathematics Teacher Educators National
Council of Teachers of Mathematics (NCTM)
Nebraska Association of Teachers of Mathematics (NATM)Vice
2016 - Present
2008 - Present
2002 - Present
President, 2012
TODOS: Mathematics for All
National Council of Supervisors of Mathematics (NCSM) Association for
Supervisors and Curriculum Development (ASCD)American
Educational Research Association (AERA)
$2016-$ Present
$2008-2013$
$2010-2013$
$2008-2013$

## Other Service

PAWS University, Director
Advisor for Undergraduate/Graduate students (n~12) Teacher
Education Data Retreats and Secondary CommitteeUNK
International Friendship Program

2019 - Present
2015 - Present
2014 - Present
2015-2020

## PATTY REIFENRATH

## EDUCATION

M.A.E. Chadron State College, 2008
M.B.A. University of Nebraska at Lincoln, 1996
B.A.E. Wayne State College, 1975

Mathematics
Academic Distinction
Mathematics /Business

## ACADEMIC EXPERIENCE

| 2009- Present | UNIVERSITY OF NEBRASKA - KEARNEY, NE <br> Mathematics/Statistics Lecturer/Senior Lecturer <br> 2009-2012 <br> CENTRAL COMMUNITY COLLEGE - KEARNEY, NE <br> Adjunct Mathematics Instructor |
| :---: | :---: |
| 1994-2003 | SOUTHEAST COMMUNITY COLLEGE - MILFORD, NE <br> Mathematics/Physics Instructor |
| 1982-1988 | NORTHEAST COMMUNITY COLLEGE - NORFOLK, NE |
|  | Applied Technical Math Coordinator/Math Instructor |
| 1978-1982 | STANTON PUBLIC SCHOOLS - STANTON, NE |
| Mathematics Instructor/Title IV Textbook Author |  |
| 1976-1978 | WALTHILL PUBLIC SCHOOLS - Walthill, NE |
|  | Mathematics Instructor |

OTHER PROFESSIONAL EXPERIENCE
2006-2009 UNIVERSITY OF NEBRASKA - KEARNEY, NE Office Associate/Mathematics and Statistics Department
2005-2006 GLADRAGS - KEARNEY, NE
Store Manager
1989-1993 METROMAIL CORPORATION - SEWARD, NE
Client Services Manager/Senior Client Service Representative

## FACULTY RESPONSIBILITIES

## University of Nebraska at Kearney:

Typical course load - 12 credit hours/semester
Courses taught: Elementary, Intermediate, and College Algebra, Elementary Statistics, Statistical Techniques for Research I, Concepts in Mathematics and Statistics, Finite Mathematics, and Applied Calculus I.
Other duties:
Served as a member of the search committee for the new Office Associate for the Mathematics and Statistics Department.
Served as the College Algebra course coordinator.

Served as a member of several committees including the Policy and Planning Committee, the Faculty and Student Affairs Committee and the Math 230/330 Online Planning Committee and the Peer Review Committee.

## Southeast Community College:

Typical course load - 25 credit hours/quarter
Courses taught: Applied Calculus for Electronics, Math I, II, \& III for Surveyors
Algebra \& Trigonometry, Business Math, Basic College Mathematics, Geometry,
Math Fundamentals, Beginning Algebra, Applied Mathematics, Pre-Algebra,
Developmental Mathematics, and Physics for Electromechanical, Welding, Manufacturing and Non-Destructive Testing Majors.
Other duties:
Coordinated program and course requirements with program instructors, advisory boards, and program deans.
Chaired interview teams for hiring new instructors.
Mentored new instructors.

## Northeast Community College:

Typical course load - Developmental Mathematics Laboratory 2ohrs/week plus 12 credit hours/semester.
Courses taught: Prescriptive Mathematics I \& II and Individualized Mathematics I \& II in the
Developmental Mathematics Laboratory. Basic College Mathematics, Applied Mathematics I \& II, Foundations of Mathematics, Math for Electronics, and Algebra and Trigonometry for Electronics. Other duties:
Trained and supervised instructors, tutors, work-study students, and teacher assistants for the developmental mathematics laboratory.
Increased the developmental mathematics laboratory enrollment from 15 students per term to 117 students per term.
Wrote the mathematics portion of the grant for the developmental laboratory.

## Stanton Public Schools:

Taught 7-12 mathematics courses as assigned.
Other duties:
Authored a textbook as a Title IV project.
Assisted in the grant writing process for the Title IV textbook project.
Attended a Department of Education conference in Washington D.C. to discuss the Title IV project.
Girls golf coach.
Walthill Public Schools:
Taught 7-12 mathematics courses as assigned.
Other duties:
Head volleyball coach.

## Patty Reifenrath Page 3

## CURRICULUM DEVELOPMENT

Developed the curriculum for several courses during the restructuring of the General Education core while at Southeast Community College (SCC). These courses included:
Algebra and Trigonometry, Basic College Mathematics, Business Math, and Math I, II, and III for Surveyors.
Wrote all the materials used in my Applied Calculus for Electronics class taught at SCC.
Wrote and developed curriculum for and taught academically disadvantaged and disabled students in the Developmental Mathematics Laboratory at Northeast Community College.
Wrote the textbook SPAM (Stanton Practical Agricultural Math) as a Title IV project while teaching at Stanton Public Schools.
Reviewed the textbook, Technical Mathematics by Robert Smith, Delmar Publishing
Wrote a PowerPoint presentation for the textbook, Technical Mathematics by Robert Smith for Delmar Publishing.

## PROFESSIONAL MEMBERSHIPS

Member of the General Education Core Team at SCC - 3 years
Member of the Assessment Team at SCC - 1 year
Member of the Curriculum Development Committee for Math \& Physics at SCC - 3 yrs
National Education Association - 14 years
Southeast Community College Faculty Association - 7 years
Northeast Community College Faculty Association - 6 years
Title IV Advisory Board - 4 years
Chapter I Advisory Board - 2 years

## PRESENTATIONS

"You Can Teach an Old Dog New Tricks" while at Northeast Community College.
Annual presentations to the Advisory Boards for Surveying and Electronics while at Southeast Community College.

## ACTIVITIES

Board of Directors - Seward Youth Wrestling - 10 years
Sunday School \& Catechism Teacher - 6 years
Treasurer - Family of Christ Lutheran Church - 2 years
Social Ministry Group Member - 3 years
4-H Leader - 3 years

## Theodore J. Rupnow

## Education

Ph.D. in Mathematics Education
December 2016
Illinois State University, Normal, Illinois
Phares O'Daffer Fellow 2013-2014
Graduate Assistant for Children's Measurement Project 2014-2015
Dissertation: Secondary Mathematics Teachers' Learning Through Practice: The Case of Rudy
M.Ed. in Learning and Technology

February 2011
Western Governors University, Online
Capstone Project: Teaching Geometric Proof in High School Geometry

## B.A. in Mathematics/Secondary Education

May 2008
Trinity International University, Deerfield, Illinois
Summa Cum Laude with Completion of Honors Program
Senior Honors Project: Mathematics Anxiety

## Teaching Experience

Assistant/Associate Professor
University of Nebraska at Kearney, Kearney, Nebraska August 2016 - Present

- MATH 230 Math for Elementary Teachers I
- MATH 330 Math for Elementary Teachers II
- MATH 430 Middle School Math
- MATH 104 Concepts in Mathematics and Statistics
- MATH 102 College Algebra
- MATH 871 Topics in Math: Experimentation, Conjecture, and Reasoning for Teachers


## Graduate Student

August 2013 - May 2016
Illinois State University, Normal, Illinois
Courses Taught: Dimensions of Numerical Reasoning
Courses Co-Taught: Teaching Mathematics in the Secondary School, Mathematical Problem Solving Using Technology, Mathematics for Secondary Teachers: A Capstone Experience

Teacher's Assistant (Part-time)
August 2013 - June 2014
Regional Office of Education \#17 Clean Start Program, Bloomington, Illinois
Program: School program at a residential facility for teen males receiving treatment for substance abuse

High School Mathematics Teacher
August 2011 - June 2013
Sahel Academy, Niamey, Niger, West Africa
Courses: Algebra I (IGCSE), Geometry (IGCSE), Algebra II, Precalculus, Calculus, Economics, Physics, Christian Leadership, Introduction to Philosophy

High School Mathematics Teacher
August 2008 - June 2011
Ralston High School, Ralston, Nebraska
Courses: Prealgebra, Algebra I, Geometry, Algebra II, Honors AP Calculus AB

## Publications

## Peer-Reviewed Journal Articles

Rupnow, T. J., O’Dell, J. R., Cullen, C. J., Barrett, J. E., Clements, D., Sarama, J., Rutherford, G. H. (Submitted). Children's invention of a volume calculation algorithm for a rectangular prism with a dynamic virtual manipulative. Journal of Mathematical Behavior.

Rupnow, T. J. \& Barker, D. (2021). A mathematics teacher's learning through Reflection-in-Action. Perspectives in Learning, 19(1), pp. 65-83.

Gomez-Johnson, K., Nebesniak, A., \& Rupnow, T. J. (2019). District-university collaborations to support reform-based mathematics curriculum implementation. Journal of Mathematics Education at Teacher's College, 10(1), 17-20.

## Peer-Reviewed Book Chapter

Barker, D., Winsor, M., Kirwan, J. V., \& Rupnow, T. J. (2020). Searching for the key to knowledge integration: A lens to detect the promotion and use of integrated knowledge. In T. Lehmann (Ed.), International Perspectives on Knowledge Integration. Brill | Sense.

## Peer-Reviewed Published Conference Proceedings

O’Dell, J. R., Barrett, J. E., Cullen, C. J., Rupnow, T. J., Clements, D., Sarama, J., Rutherford, G., Beck, P. S. (2017). Using a Virtual Manipulative Environment to Support Students' Organizational Structuring of Volume Units. In E. Galindo \& J. Newton (Eds.), Proceedings of the $39^{\text {th }}$ annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (pp. 1329-1336). Indianapolis, IN: Hoosier Association of Mathematics Teacher Educators.

O’Dell, J. R., Rupnow, T. J., Cullen, C. J., Barrett, J. E., Clements, D., Van Dine, D. W., Sarama, J. (2016). Developing an Understanding of Children's Justifications for the Circle Area Formula. In M. B. Wood, E. E. Turner, M. Civil, J. A. Eli (Eds.), Proceedings of the $38^{\text {th }}$ annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (pp. 235-242). Tucson, AZ: University of Arizona.

Rupnow, T. J., Cullen, C. J., Barrett, J. E., Beck, P. S., Clements, D., Sarama, J. (2015). Children's Three-Dimensional Mental Structuring using a Dynamic Computer Environment. In T. G. Bartell, K. N. Bieda, R. T. Putnam, K. Bradfield, \& H. Dominguez (Eds.), Proceedings of the $37^{\text {th }}$ annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education (pp. 304-307). East Lansing, MI: Michigan State University.

## University Archives

Rupnow, T. J. (2016). Secondary Mathematics Teachers' Learning Through Practice: The Case of Rudy (Doctoral dissertation). Retrieved from ISU ReD.

## Recent Presentations

Gomez-Johnson, K., Nebesniak, A., \& Rupnow, T. J. (2021). Powerful Partnerships: Leveraging District and University Pairings to Improve Teacher Effectiveness. Pre-recorded session presented at the National Council of Teachers of Mathematics (NCTM) Virtual Annual Meeting, April 21 - May 1, 2021.

# Theodore J. Rupnow 

Email: rupnowtj@unk.edu

## Recent Presentations Continued

Barrett, J. E., Rupnow, T. J., O’Dell, J. R., Cullen, C. J., Sarama, J., Clements, D. H. (2019, March). Investigating Children's Structure, Interpretation and Representation of Space with an Intervention for Measuring Prism Volume. In D. H. Clements (Chair), Development, Refinement, and Evaluation of Learning Trajectories for Geometric Measurement. Symposium conducted at the biennial meeting of the Society for Research in Child Development, Baltimore, MD.

Rupnow, T. J. (2018). Investigating Conic Sections. Session presented at the annual conference of the Nebraska Association of Teachers of Mathematics, Kearney, NE, September 20-22, 2018.

Rupnow, T. J., Barker, D. (2018). Informal Reflection as a Stimulus for Teacher Learning. Session presented at the annual conference of the Association of Mathematics Teacher Educators: Houston, TX, February 8-10, 2018.

Rupnow, T. J., Cullen, C. J., Barrett, J. E., Beck, P. S., (2016). Students' Reasoning about Volume Structuring: Right and Oblique Prisms. Paper presented in a Roundtable Session at the annual conference of the American Education Research Association: Washington, DC, April 8-12, 2016.

Beck, P. S., Barrett, J. E., \& Rupnow, T. J. (2016). Volume Formulas...Are They All Right? Session presented at the annual conference of the National Council of Teachers of Mathematics: San Francisco, CA, April 13-16, 2016.

Cullen, C. J., Van Dine, D. W., Barrett, J. E., Clements, D.H., Rupnow, T. J., Sarama, J. (2016). Structuring Two and Three-Dimensional Space: A Focus on Representations. Research Symposium presented at the research conference of the National Council of Teachers of Mathematics: San Francisco, CA, April 11-12, 2016.

Beck, P. S., Cullen, C. J., Barrett, J. E., \& Rupnow, T. J. (2015). Measuring the Base and Height of Triangles. Session presented at the annual conference of the Illinois Council of Teachers of Mathematics: Tinley Park, IL, October 23-24, 2015.

Rupnow, T. J., Cullen, C. J., Barrett, J. E., \& Beck, P. S. (2015). Measurement as a Concrete Introduction to Variable. Session presented at the annual conference of the Illinois Council of Teachers of Mathematics: Tinley Park, IL, October 23-24, 2015.

Rupnow, T. J., Cullen, C. J., Barrett, J. E., \& Beck, P. S. (2015). Measurement as a Concrete Introduction to Variable. Presentation at the weekly meeting of the Group for Educational Research in Mathematics (GERM) at Illinois State University: Normal, IL, October 16, 2015.

Rupnow, T. J., Barker, D., Graziano, V. (2015). Knowledge Integration and DecisionMaking: A Tale of Two Teachers. Presentation at the weekly meeting of the Group for Educational Research in Mathematics (GERM) at Illinois State University: Normal, IL, October 16, 2015.

## Theodore J. Rupnow

## Service

## Department Committees

Graduate Committee
Recruitment and Retention Committee
Search Committees
Policy and Planning2017-2018 (Chair), 2018-2019, 2019-2020, 2020-2021, 2021-2022
Peer Review 2017-2018, 2018-2019, 2019-2020 (Chair)
Assessment 2017-2018, 2018-2019, 2019-2020
Academic Programs Committee2016-2017 (Chair), 2020-2021 (Chair), 2021-2022 (Chair)
Faculty and Student Affairs 2016-2017, 2020-2021, 2021-2022

## University Service

STEM Education Program Committee
Faculty Senate Academic Affairs Committee
Productive Dialogues Group Member
General Studies Working Group
Recruitment and Retention Task Force (COE)

## Student Organization Advising

Secondary Educators' Club Founding Advisor
January 2021-Present
October 2020-Present
January 2020-May 2021
Fall 2019
2017-2020

## Academic Advising

Consistent load of 8 to 10 advisees including:
Mathematics Majors/Minors, Math Teaching Majors, El Ed Math Minors2017-Present

## Reviewing

Invited Reviewer for Cognition and Instruction
Reviewer for the $38^{\text {th }}$ annual meeting of PME-NA.
Invited Reviewer for The Mathematics Enthusiast selected articles for a Special Issue

## Professional Memberships

Association of Mathematics Teacher Educators 2017-present
National Council of Teachers of Mathematics
Nebraska Association of Teachers of Mathematics

2015-present
2017-present

Dr. Kaye M. Sorensen<br>University of Nebraska at Kearney<br>Department of Mathematics and Statistics<br>(308) 865-8633<br>Email: sorensenkm@unk.edu

## Education

EdD, University of South Dakota
Major: Educational Administration--Higher Education (Adult and Higher Ed Mathematics)
MS, University of Nebraska
Major: Mathematics (Educational Technology)
BS, Kearney State College
Major: Mathematics (Business General/ Accounting)

## Certifications

Nebraska Professional Teaching Certificates, Department of Education, dual endorsements: Mathematics, Business

Faculty Certification for Online Teaching, NU System/UNK eCampus.

## Professional Experience

University of Nebraska-Kearney College of Arts/Sciences, Mathematics Specialist
University of Nebraska-Kearney Department of Mathematics/Statistics, Senior Lecturer University of Nebraska—Kearney Department of Mathematics and Statistics, Lecturer

## Professional Teaching Experience

University of Nebraska at Kearney, Department of Mathematics and Statistics
Calculus, Statistics, Algebra, Trigonometry, Finite Mathematics.

## Fellowship and Grant Awards

Sorensen, K. M., "CNSS Faculty Fellowship," office of the Dean, University of Nebraska at Kearney.
Albrecht, M. C. (Co-Principal), Sorensen, K. M. (Co-Principal), "Rural Futures Initiative Teaching Grant," Sponsored by State of Nebraska Rural Futures Initiative, State, $\$ 24,782.00$.
Sorensen, K. M. (Principal), "OAT NU Open Access Textbook Project," \$1,000.00.

## Directed Student Learning/ Supervision of Students

Supervised Research - UGRD, "Mindsets in Mathematics Education,"
"Study Abroad" UNK-sponsored: Cuba, Mexico, Spain, Portugal, Turkey, Greece, Costa Rica, Israel.

Faculty consultant for College Algebra, Learning Commons, UNK.

## Presentations/Conferences/Continued Relevant Education

Nebesniak, A. L., Sorensen, K. M. Nebraska Association of Teachers of Mathematics (NATM) Annual Conference, "Encouraging Growth Mindsets in STEM Classrooms," NATM, Kearney, NE.

Nebesniak, A. L. (Presenter), Sorensen, K. M. (Presenter). NCTM Annual Conference, "Mind over matter: Growth mindset in the postsecondary classroom.," National Council of Teachers of Mathematics (NCTM), Washington D.C.

Nebesniak, A. L., Sorensen, K. M. Research and Teaching Forum., "Mind over matter: Growth mindset in the postsecondary classroom," University of Nebraska at Kearney's College of Education, UNK.

Nebesniak, A. L., Sorensen, K. M. NCTM 2016 Innov8 Conference, "Taking Time to Explore our Problems of Practice," National Council of Teachers of Mathematics, St. Louis, Mo. (November 2016).

Albrecht, M. C., Sorensen, K. M. Nebraska Rural Futures Conference—Seed Grant Recipients Presentations for the Students Engaged in Economic Development in Rural Areas Project" Nebraska Rural Futures Institute, Lincoln, NE.

Albrecht, M. C., Sorensen, K. M. Nebraska Rural Futures Conference--Hope Inspires Vision, "Project Overview: SEEDRA Teaching Engagement Project, Two Years Later," Nebraska Rural Futures Institute, Lincoln, NE.

Dean's Faculty Fellowship Award, 2015, College of Natural and Social Sciences, University of Nebraska at Kearney. Resided minimum of 10 hours/week as a fellow in the dean's office. Invitee to Council of Chairs meetings, liaison to college departments and faculty.
Development and implementation of pilot bridge in mathematics, "JUMP FOR MATH", Summer High School to College Academic Bridge Program.

Recent Conferences. "NCTM Innov8 Conference," National Council of Teachers of Mathematics, St. Louis, Missouri. "Nebraska-SESD Sectional of the MAA," Mathematics Association of America, Seward, Nebraska. "Annual Meeting, 50th Anniversary Conference,"
Dean's Office to CCAS (Council of Colleges of Arts and Sciences), Washington, D.C. "Nebraska Summit on Math and Science Education," NU system and NSF, Lincoln, NE. "National MathFest Conference, 100 Years," MAA (Mathematical Assn of America), Washington, D.C.

Doctoral Program, "Accessibility to Lecture Capture Technology and Students' Perceived Success in College Level Mathematics Courses". University of South Dakota, Vermillion, South Dakota.

Language/Culture courses. Spanish, Department of Modern Languages, UNK, Kearney, NE.

## University/College/Department Service

College Committee Member. CNSS Dean's Ad-hoc Summer Institutes Committee, CNSS Educational Policy Committee.

Department Committee Member. Assessment Committee, Academic Programs Committee, Chair's Recruitment and Retention Committee, Peer Review Committee, Policy and Planning Committee.

Past Department Faculty Advisor. UNK Math Club.

## Professional/Public Service Organizations

Mathematical Association of America, National Council of Teachers of Mathematics.
Kearney Area Adult Leadership Alumni, Kearney Area Chamber of Commerce.
Board of Directors, TRIUS Kearney Federal Credit Union.

# Jacob J. Weiss 

369 Discovery Hall Kearney, Nebraska 68849-1296
University of Nebraska-Kearney Department of Mathematics and Statistics
(308) 865-8635 (308) 865-1540, fax
weissjj@unk.edu

## Education

Ph.D. in Mathematics, University of Nebraska-Lincoln, December, 2007
Advisors: Drs. Lynn Erbe and Allan Peterson
Master of Science in Mathematics, University of Nebraska-Lincoln, 2002
Bachelor of Science in Mathematics, University of Nebraska-Kearney, 2000

## Research Interests

Dynamic Equations on Time Scales Differential Equations Difference Equations

## Teaching experience

I have a tenure-track position as associate professor at the University of Nebraska-Kearney from August 2009 to the present, and I had a temporary position as visiting professor at the University of Nebraska-Kearney from August 2007 through May 2009. My teaching duties at the University of Nebraska-Kearney include

| Math 101 | Intermediate Algebra |
| :--- | :--- |
| Math 102 | College Algebra |
| Math 103 | Trigonometry |
| Math 115 | Calculus I with Analytic Geometry |
| Math 123 | Applied Calculus |
| Math 202 | Calculus II with Analytic Geometry |
| Math 260 | Calculus III with Analytic Geometry |
| Math 305 | Differential Equations |
| Math 440 | Linear Algebra |
| Math 460 | Advanced Calculus |
| Stat 241 | Elementary Statistics |
| Stat 345 | Applied Statistics |
| Stat 441 | Probability and Statistics. |

As a graduate teaching assistant at the University of Nebraska-Lincoln I was responsible for writing and grading tests and quizzes, grading projects and papers, and in some cases writing the final examination for the course. Courses taught at the University of Nebraska-Lincoln include

| Math 100a | Intermediate Algebra |
| :--- | :--- |
| Math 101 | College Algebra |
| Math 106 | Calculus I Recitation and MathExcel |
| Math 107 | Calculus II Recitation and MathExcel |
| Math 208 | Calculus III |
| Math 203 | Contemporary Mathematics |
| Math 221 | Differential Equations. |

## Fellowships and Recognitions

2002-2003 Emeritus Faculty Fellowship: Departmental Fellowship awarded to five graduate students each year.

2005 Half MCTP Traineeship: Awarded to fourth or fifth year graduate students to help prepare for jobs after graduate school.

2005-2006 Outstanding Graduate Teaching Award: Given to one outstanding graduate student teacher each year.

Committee Membership

2015-2017 Faculty Senate
2012 - 2014 Ad Hoc General Studies Assessment Committee
2012 - 2013 Faculty and Student Affairs (chair), Academic Programs, Graduate (chair), Peer Review, Annual and Endowed Scholarships
2013-2014 Faculty and Student Affairs (chair), Assessment, Graduate, Peer Review (chair), Annual and Endowed Scholarships

2013-2016 Dean's Advisory Committee
2014-2015 Graduate (chair), Assessment, Academic Programs, Annual and Endowed Scholarships

## Undergraduate Research

2012-2013 Josh Brummer, Sign of the Exponential Function on Time Scales
2013-2014 Stephanie Smith, Delta and Nabla Exponential Functions
2017-2018 Julie Kent, Stability of Fixed Points on a Planar System
2017-2018 Candy Smith, Stability of Fixed Points on a Planar System

## Professional Activities

2002, 2004-2006 REU
Graduate student mentor in summer program for undergraduate students at universities nationwide.

## 2004 Project MESA

Taught a summer course for minority and low income students on how to use TI-86 graphing calculators in mathematics.

2004-2005 Power Math Camp Councilor for summer math camp for middle school students.

## Publications

J. Weiss,On the Equilibria of a Four-Parameter Rational Planar System of Difference Equations, International Journal of Difference Equations 12 (2) (2017) 303-312
J. Weiss, Positive Solutions to a Second Order Dynamic Equation, International Journal of Difference Equations 8 (2) (2013) 225-236
A. Clark, J. Weiss, On the geometry of a four-parameter rational planar system of difference equations, Journal of Difference Equations and Applications 18 (3) (2012) 509-524.
J. Weiss, Limit-Point Criteria for a Second Order Dynamic Equation on Time Scales, Nonlinear Dynamics and Systems Theory 9 (1) (2009) 99-108.
L. Erbe, A. Peterson, J. Weiss, Positive Solutions to a Singular Second Order Boundary Value Problem, Advances in Dynamical Systems and Applications, (3) (2008) 89-105.

## Papers Refereed

International Journal of Dynamical Systems and Differential Equations, IJDSDE-0806, "Interval Oscillation for Second Order Sublinear Differential Equations with a Damping Term" by Elmetwally M. Elabbasy and Taher S. Hassan.

## Talks Given

| 2001 - Present | Various Seminar Talks <br> UNL Time Scales Seminar, UNL Graduate Students Seminar, UNK SciMath Colloquium <br> Multiple Positive Solutions to a Second Order Dynamic Equation |
| :--- | :--- |
| 2014 Apr. | AMS Spring Sectional Meeting, Texas Tech University <br> Positive Solutions to a Second Order Dynamic Equation <br> AMS Fall Sectional Meeting, Washington University, St. Louis |
| 2013 Oct. | AMS <br> Positive Solutions to a Singular Second Order Boundary Value Problem <br> AMS Fall Sectional Meeting, Baylor University |
| 2009 Oct. | Limit-Point Conditions for a Second Order Self-Adjoint Dynamic Equation <br> Lan. |
| 2004 Apr. | Joint Mathematics Meeting, Atlanta <br> Exponential Functions on Time Scales <br> MAA Nebraska/Southeast South Dakota Section Meeting, University of Nebraska Kearney |

## Seminars Attended

2007 - Present SciMath Colloquium Presentations on mathematics and science with a mathematical influence.
2005-2007 Issues in Undergraduate Research Presentations on how to develop a successful research experience for undergraduates, and the development of a capstone course.
2005 Professional Development Seminar
Discussions on how to transition from being a graduate student to a faculty member.
2004-2007 Issues in Mathematics Education
Presentations on how mathematics departments can help other disciplines as a service department and ideas for improving mathematics education in general.
2001-2007 Time Scales Seminar
Presentations on both Dynamic Equations on Time Scales as well as Differential Equations and Difference Equations.

## Professional Society Memberships

American Mathematical Society, Mathematical Association of America

# Barton Willis • Mathematics and Statistics • University of Nebraska at Kearney willisb@unk.edu•308 UNK 8868 

# Employment Professor of Mathematics and Statistics, University of Nebraska at 

 Kearney. Specialties Mathematical Physics, Functional Analysis, Computer Algebra
\Skill Common Lisp and Julia programming, Maxima CAS programming, and LaTEX

- Hobbie Exercise, gardening, creative humor writing, and painting and collage


## Summary

Doctorate in Mathematical Physics from Virginia Tech • Author or co-author of twenty research articles in mathematics and mathematical physics • Developer for the open-source Maxima Computer Algebra System • Served seven years and ten months as chair of a diverse department of fifteen faculty, one staff member, and a budget over \$900,000.

## Talks in past Three Years

- (invited talk) ""My life as an academic mathematician," Kansas State University first year undergraduate seminar. (September, 2018).
- (local talk) For our departmental Mini symposium (27 March 2018), I gave a talk "A symplectic method for the Heisenberg equations."
- (local talk) For our departmental Mini symposium (spring 2020), I prepared slides for a talk on the Gini Index. Although the mini symposium was made asynchronous and virtual, a few people (including one student) looked at my slides and commented on them.
- (scholarship) I created a new version of the core Maxima code that f i n d the minimum and maximum of expressions; fixed numerous bugs, reduced memory usage and increased speed, created a new algorithm for detecting the expressions that are in between. This work was completed in July, 2021.
- (scholarship) I initiated a GitHub project for a new package for solving equations. As co-developers, I recruited Richard Fateman (emeritus, University of California, Berkeley) and Stavros Macrakis (Cambridge, Massachusetts). This work was initiated in January 2020.


## Submitted work

- "Analytical expression of tensorial rotational operators for semi-classical interpretation of molecular spectra. Relations between molecular Hamiltonian parameters in different formalisms." (with V. Boudon, C. Richard, M. Loëte (CNRS- University. Bourgogne Franche-Comté)) Submitted 20 January 2022 to Journal of Molecular Spectroscopy)


## Refereed Publications

- "The binomial transform of p-recursive sequences and the dilogarithm function," Applications and Applied Mathematics: An International Journal, Vol. 15, Issue 2 (December 2020), pp.1025-1030. (Stephanie Slayden, coauthor)
- "Analytic continuation of the ${ }_{3} \mathrm{~F}_{2}$ hypergeometric series," Integral Transforms and Special Functions, Volume 27,Issue 11, 2016.
- "An extensible differential equation solver,"SIGSAM, Volume 35, 2001.
- "A new approach to force-free static electromagnetic elds," Journal of Mathematical Physics, Volume 43, 2002.
- "Similarity and interwining of Dirac operators," Journal of Mathematical Physics, Volume 39, 1998.
- "Condition for Sudden Passage in the Earth's-Field NMR Technique," (with Melton, B. F., Pollak, V. L., Mayes, T. W, University of North Carolina at Charlotte), Journal of Magnetic Resonance, Series A. 117, 2, p. 164-170, 1995.


## Refereed Publications (continued)

- "Classical description of the absence of bound states for strong coulomb elds," Il Nuovo Cimento B. 108, 2, p.217218, 1993.
- "Electromagnetic momenta for systems of charged particles," Journal of Mathematical Physics, 32, 5, p. 1400-1402,1991.
"Generalization of the Larmor radiation formula," International Journal of Theoretical Physics, 30, 12, p. 1655-1661,1991.
- "Radiation of electromagnetic momentum from systems of particles," Physics Letters A., 155, 6-7, p. 351-356, 1991.
"Conservation of angular momentum for systems of charged particles," Journal of Mathematical Physics, 30, 3,p.
- 732-734, 1989.
- "Conservation of momentum for systems of charged particles," Journal of Mathematical Physics, 30, 1, p. 197-200, 1989.
- "Multigroup transport equations with nondiagonal cross-section matrices," Journal of Mathematical Physics, 27,6, p. 1633-1638, 1986.
- "Solution of a generalized Chandrasekhar H-equation," Journal of Mathematical Physics, 27, 4, p. 1110-1112, 1986.
"Linear and nonlinear plasma oscillations," Il Nuovo Cimento A (1971-1996), 87, p. 162-173, 1985 (with C. Burnap, M.
- Miklavčič \& P.F. Zweifel).
- "Normal and antinormal ordering of boson operator functions," Physics Letters A, 108, p. 322-324, 1985 (with P.F. Zweifel).
- "Single-mode saturation of a linearly unstable plasma," Physics of Fluids, 28, 1, p. 110-115, 1985 (with Burnap, C., Miklavčǐč, M., and Zweifel, P. F.).
- "Whither existence theory?" Transport Theory and Statistical Physics, 14, 5, p. 669-678, 1985 (with Zweifel, P. F. \& van der Mee, C. V. M.).
- "Spectrum of a vlasov-fokker-planck operator - II," Transport Theory and Statistical Physics, 10, 4, p. 137-147, 1981(with Paveri-Fontana, S., \& Zweifel, P. F.).
- "Vlasov-Fokker-Planck Description of Plasma Stabilitym," Transport Theory and Statistical Physics, 10,4, p. 149-160, 1981 (with Zweifel, P. F. \& Spiga, G.).


## Self-published

."Eigenvalues by row operations," https://www.semanticscholar.org/paper/Eigenvalues-by-row-operationsWillis/ 8db293e57272ae5f882c948b35a4bae7a3c6a4ea.

## Administrative Accomplishments

Created Departmental course placement scheme • Oversaw increase of student success rates to historically high levels • Successfully negotiated with administration for additional faculty member • Served as hiring manager for one staff member and for sixteen faculty, including nine with continuing appointments • Successfully negotiated higher salaries for eight faculty • Initiated participation in Sci/Math Master's in Teaching • Strengthened and revised programs of study and clarifi ed course prerequisites • Revitalized Mathematics Minor-Elementary Education degree Lead effort to create a new Actuarial Science emphasis • Created departmental brochure and fliers for each major - Created and maintained departmental web pages • Proposed and completed paperwork for allowing AP credit for STAT 241 • Expanded faculty participation in student recruitment, advising, governance, and class scheduling

- Increased departmental participation in undergraduate research • Enhanced ergonomics of main office and the appearance of the Math Commons • Oversaw construction of two new offices • Guided the plan for Discovery Hall •


# Barton Willis • Mathematics and Statistics • University of Nebraska at Kearney 

 willisb@unk.edu•308 UNK 8868Revised January 24, 2022
Advocated for faculty and staff and successfully worked with UNK facilities to resolve the Founders Hall cluster fly infestation.

## Work Experience

| $1973-1980$ | Manual laborer, Blueville Nursery, Inc. | Manhattan, KS |
| :--- | :--- | :--- |
| $1978-1980$ | Manual laborer, Kansas State University Facilities | KSU |
| $1980-1985$ | Teaching/Research Assistant | Virginia |
| $1985-1986$ | Visiting Assistant Professor of Mathematics | NC State |
| $1986-1992$ | Assistant Professor of Mathematics | UNC-Charlotte |
| $1992-1996$ | Assistant Professor of Mathematics and Statistics | UNK |
| $1996-2003$ | Associate Professor of Mathematics and Statistics | UNK |
| $2003-$ | Professor of Mathematics and Statistics | UNK |
| $2011-2019$ | Department Chair, Mathematics and Statistics | UNK |

## Education

| 1972-1976 | High School Diploma | RCHS |
| :--- | :--- | :--- |
|  | Awards: Kansas Honor Student (University of Kansas award), National Honor <br> Society <br> Bachelor of Science, Mathematics and Physics |  |
| 1976-1980 | Awards: Sigma Phi Sigma, Phi Kappa Phi, Pi Mu Epsilon, Eastman Kodak |  |

》 Dissertation: "Multigroup transport equations with nondiagonal cross-section matrices."
Paul F. Zweifel, University Distinguished Professor, advisor.

## Recent Teaching Workload

Fall 2020
Spring 2021
Fall 2021
Spring 2022

Advanced Calculus I, Calculus I with Analytic Geometry
Calculus III, Numerical Analysis
Calculus II, Trigonometry
Applied Calculus, Foundations of Mathematics, Theory of Numbers

Eight credit hours
Eight credit hours
Eight credit hours
Nine credit hours

## Classes Taught

College Algebra • Trigonometry • Business Calculus • Calculus I•Calculus II • Calculus III • Differential Equations
$\cdot$ Foundations of Mathematics $\bullet$ Linear Algebra • Abstract Algebra • Discrete Mathematics • Advanced Calculus (Real

- Analysis) • Complex Analysis • Numerical Analysis • Theory of Numbers (spring 2022) • Partial Diff erential Equations • Advanced Engineering Mathematics I (graduate) • Advanced Engineering Mathematics II (graduate)


## Recent Undergraduate Research Mentoring \& Honors Projects

- Numerical evaluation of the $\mathrm{F}_{1}$ Appel Function (UNK Undergraduate Research Fellow), Grant Person, 2013.
- Binomial transform of p-recursive sequences (UNK Undergraduate Research Fellow), Stephanie Slayden, 2017
- Symplectic methods for the Heisenberg equations of motion (UNK Honors Project), Evan Folk, 2017
- Numerical Analysis methods for automated EKG analysis (UNK Undergraduate Research Fellow), TrentonChramosta, 2021.


## Recent mentoring of Independent Study

- Mathematics for machine learning, Trenton Chramosta, fall 2020.
- Real Analysis, Emily Meyer, fall 2021.


## Miscellaneous Teaching Related Work

- With former colleague Aaron Clark, we proposed the new class in Complex Analysis.
- Created and purchased the first class buttons for MATH 460.
- Responding to a request from students, I created standardized crib sheets for some of my classes.
- Created a public GitHub repository of Julia Language worksheets for Numerical Analysis.


## Recent Committee Work

- (2019 - $\mathbf{2 0 2 0}$ AY) Peer Review, Retention and Recruitment, and Faculty and Student Affairs.
- (2020 - $\mathbf{2 0 2 1}$ AY) Policy and Planning, Academic Programs (chair), and Retention and Recruitment.
- (2021 - 2022 AY) Faculty and Student Affairs and Academic Programs (chair).


## Recent College-wide Service

## 2011-2019

Spring 2016
College of Natural and Social Sciences (CNSS) Council of Chairs

## Open Source Developer

- Contributions: Packages for symbolic and numerical evaluation of hypergeometric functions, Fourier-Motzkin elimination, finite sets, complex conjugate, symbolic maximum and minimum, linear algebra, orthogonal polynomials, symbolic differential equations, symbolic equation solver, and many bug fixes.
2016 Julia Language
Open source package for arbitrary precision numerical evaluation of the ${ }_{3} \mathrm{~F}_{2}$ hypergeo-metric function


## Miscellaneous Service

- Judge for the Central Nebraska Science and Engineering Fair (March 2021).
- In fall 2020, I wrote the new GS syllabus for MATH 115 and completed the associated paperwork.
- For the 2021-2022 AY, I advise six mathematics students.
- I created and maintain guides for how various majors can add a mathematics major or minor.
- I've volunteered to meet with prospective students for the past few decades.


## Consulting Work

MathSoft, Cambridge, Massachusetts (consulting on CAS issues) • Coleman PowerMate, Kearney, Nebraska (design of a Stirling Engine) • Intermotion Inc, Kearney, Nebraska (camshaft and crankshaft manufacturing)

## Community Service

For a neighbor who is unable to do some kinds of yard work, I do some mowing, trimming, and most of the snow removal.

# Final Report <br> Academic Program Review Department of Mathematics and Statistics University of Nebraska-Kearney 

Site Visit: March 30-31, 2022
Report Date: May 26, 2022

Review Team Members<br>Dr. Julie Campbell<br>Dr. Mark Hall (External Reviewer, Hastings College)<br>Dr. Dena Harshbarger<br>Dr. Carla Kegley-Owen<br>Mr. Kelan Schumacher (Alumnus, St. Cecilia School, Hastings)<br>Dr. Kenneth Trantham


#### Abstract

Overall the Department of Mathematics and Statistics is in good condition at the present time, and carries out its mission successfully. Its primary strength is its talented and passionate faculty. Its graduates are generally successful, especially those who choose a major in mathematics education. Although the total number of majors has declined some over the past decade, the department has come up with a comprehensive recruitment and retention plan that includes many good ideas.

There is no indication the department needs to make any significant changes to its mission or direction at the present time. It should continue its focus on both traditional mathematics majors and mathematics education majors, as well as service to other departments and the General Studies program. As with any department, it would benefit from making some adjustments in various areas, but none of them amounts to a significant change in mission or direction.


Some specific aspects that need the department's attention are the following:

- Make some additional adjustments to its Mathematics 6-12 Teaching Field Endorsement major, to reduce the number of credit hours required and potentially improve retention.
- Address some concerns regarding collegiality within the department.
- Fill an instructor position vacated by retirement at the end of the 2020-2021 academic year (the position has not yet been filled because of a pandemic-induced hiring freeze).
- Expand and improve its assessment plan, and look into ways to use assessment results to improve its programs and courses.
- Continue efforts to determine the needs of the department's clients and ensure they are being met.


## Evaluation of the Self-Study Document

Overall, the self-study document (abbreviated as "SSD" from here on) is well-organized and provides considerable detail for some topics. It addresses all of the topics listed in the APR guidelines, although the level of detail varies, with considerable detail provided for the first three topics and less detail for the remaining ones. Some of the difference in detail is due to the fact that the department's only institutional contribution is to LOPER 4 in the General Studies program and the faculty vitas are contained in a separate document. Furthermore, data that could reasonably be listed in some of the later topics appears in earlier topics (where it is also appropriate). On the other hand, some data and summaries called for in the APR guidelines, such as summaries of faculty characteristics, are not included. It would also be desirable to see data on student persistence and graduation rates and time to degree; perhaps such data was not available.

The following are some specific strengths of the SSD:

- Copious detail and data are provided on the first three topics the document addresses (general program characteristics, degree programs and curricula, and student performance measures).
- There is a table listing all of the courses required for the various majors and minors in the department (page 24), which makes it easy to see what the requirements are, and to compare the requirements for different programs of study.
- Charts showing enrollments in multiple courses over the past decade are given, which makes it easy to see enrollment trends in representative groups of courses of various types.
- There are nice descriptions of several initiatives the department has undertaken in recent years, such as the Undergraduate Mathematics Research Mini-Symposium and the CAS Math Specialist project.
- The description of the departmental organization is detailed, including listing the duties of the chair and departmental administrative assistant (pages 15-19) and descriptions and lists of responsibilities for the departmental committees (pages 19-22).
- Similarly, there is a well-written and detailed description of the department's new recruitment and retention plan (pages 12-14).

Similarly, here are some specific weaknesses of the SSD:

- Despite large amounts of data being presented, there are few summaries or analyses of that data, which means the reader must often perform those summaries and analyses themselves. It should, however, be noted that the SSD did mention an interest by the department in doing certain analyses that it was unable to do because of the limited data that was available.
- Some faculty in the department felt that they had little input to the SSD.
- No information was provided in several areas, including the following:
- student retention in the department's majors,
- DFWs and grade distributions, and
- the departmental budget.
- Although detailed data was provided for the Charlotte Danielson Indicator scores given to students in the Mathematics 6-12 Teaching Field Endorsement major (pages 43-44; from here on this major's name will be abbreviated as "MFE"), no scale was given indicating what constituted a good score or a poor score, making it difficult to interpret the data.

Specific strengths and weaknesses aside, the self-study document does provide a reasonably complete picture of the current state of the department and where it has been in the years since its previous APR. It also clearly states its specific plans for the future. It does not articulate an overall vision for the future of the department; however, that may well be because its goals have not changed since the previous APR, and the department is now focused on how to achieve those goals.

The following are some recommendations for the next APR's SSD:

- Obtain and present data on the following:
- student retention and number of years to graduate in each of the department's majors, - gender and ethnicity for departmental faculty and (if possible) majors,
- DFWs and (if possible) grade distributions in a representative sample of the department's courses, including introductory courses and major courses.
- Calculate and present moving averages (3-year or 5-year) for multi-year data, to make it easier to see trends.
- Revisit the departmental goals as a department sometime before the next APR. (According to the current SSD, the present mission was approved in 2014, but the departmental goals apparently have not been revisited since the 2012 APR.)
- Provide some information on the department budget. At the very least, it would be good for the review team to see the total budget amounts and percentages spent for the preceding few years.


## Evaluation of the Mission of the Department

Overall, the department's mission statement is well-balanced and broad, covering students/teaching, faculty research, and service to the community. Its first sentence is excellent in recognizing both mathematics' intellectual beauty (even the German poet Goethe admired the "cold, austere beauty" of mathematics) and its utility in applications. The mission statement is also laudable for its brevity. Nonetheless, it is a bit disappointing that it says nothing about imparting knowledge to and sparking interest among all students, or about preparing secondary school mathematics teachers. If the department could find a way to incorporate these two items while maintaining the mission statement's brevity, that would be good.

Regarding the departmental goals, overall they are good-all of them are relevant and there are none we can think of that should appear but do not. However, they could be better organized. With 31 distinct goals, they are likely too numerous to all be of practical use. Fortunately, it should be possible to reduce their number without losing anything that is significant, and we recommend that the department undertake such a reorganization. To start with, some of the goals overlap (though are still distinct). For example, in the group "Teaching and Curriculum-Related Objectives", the goals (i), (j), and (l) could probably be reorganized into only two goals; similarly the goals (b), (d), and (e) overlap and could surely be reorganized to reduce their number. The last group, "Service to College, Community, State, and Discipline Objectives" is the best organized among the three groups, and its goals should need little if any reworking. Note, incidentally, that the current choice of three groups is not necessarily the best way to group the goals, and the department is advised to consider other possible groupings. In particular, grouping the goals based on the mission statement's bullet points is worth considering.

Of course, even with a reorganization of the goals, the department will need to review them periodically to determine how well they are being met, and to prioritize work on those not being met.

## Evaluation of Department Resources

## Department structure and policies

The departmental structure is reasonable for a department of its size, with a chair, an administrative assistant that is shared with another department, and several committees. A new committee structure was approved in December, 2021, and will take effect starting this fall. The only information given about the previous committee structure is the names of the committees, so it is not possible to compare the previous structure with the new structure. However, the new committees appear to be well chosen, and their duties well thought out and clearly spelled out, so it is quite likely that the new structure will work well.

Not much information was provided to our team regarding departmental policy, although some hints appeared in our conversations with faculty members. One area that deserves mention concerns online courses.

Overall, the department's attitude toward teaching online courses is positive, recognizing that they are here to stay, and the department needs to figure out how to respond to the demand for them appropriately. However, there is a concern about cheating in such classes, and that their concerns are not being taken seriously. Those concerns are likely to be well-founded. There is substantial agreement among mathematics faculty nationwide that cheating in online courses is widespread. For example, there is now at least one site accessible on the Web at which a visitor can type in an algebra problem and instantaneously receive a complete, step-by-step solution that can be copied onto a homework assignment or exam. Furthermore, such Web sites can easily and discretely be accessed using a smartphone. When you consider that the ability to solve a broad range of problems in a particular area is a core competency (and perhaps the core competency) in many mathematics courses, and that the best way to demonstrate mastery of that competency is to actually solve a selection of such problems, the ability to instantaneously receive complete solutions from an outside source clearly presents a major challenge. This helps explain why many mathematics faculty members worry about cheating in online courses, and feel that in-person proctored exams should be the primary tool for evaluating students.

Concerns were raised with our team about other departments considering creating their own versions of certain mathematics courses, because they do not feel their students' needs are being met by the courses taught by the Mathematics Department. The department is aware of this and actively looking into it. One especially encouraging sign is that this past semester two mathematics faculty members sat in on one of the physics classes, to see what mathematical techniques were being used in the course and to make sure those techniques were being adequately taught in mathematics classes.

## Department culture

Department culture can be simultaneously an important factor in the effectiveness of a department and difficult to pin down. Certainly the latter appears to be the case with this department, although it is not clear to what extent the department's culture might be keeping it from reaching its full potential.

On the one hand, many of the faculty members who met with our team said they felt the atmosphere in the department was good, and that their colleagues were appropriately respectful and helpful. In particular, all of the non-tenure track instructors felt respected and appreciated by their tenured colleagues, and said they were not treated as second-class citizens, as happens all too often in such arrangements.

On the other hand, a few said that the mathematics education faculty members were treated differently, and not respected, by the traditional mathematics faculty members (here we use the term "traditional mathematics" to refer to the subject of mathematics as it is typically understood, as distinguished from mathematics education, which is primarily concerned with the teaching of mathematics). In particular, the two current mathematics education faculty members felt that they were not respected for their knowledge, their insights were too often ignored, they did not have appropriate control over the mathematics education program, and the differences between their needs and those of the traditional mathematics faculty members were not adequately recognized.

Perhaps this is not completely surprising. Prior to the hiring of the two current mathematics education faculty members, oversight of the mathematics education program was in the hands of traditional mathematics faculty members who chose to focus on that program. These faculty members had a different background than the mathematics education faculty members have, and likely a different perspective on mathematics education as well. Adjusting to those differences, and the different nature of mathematics education research, is not trivial. Nonetheless, making those adjustments is essential. The feeling that one is not respected by one's colleagues, regardless of the extent to which it is perceived versus real (after all, in matters like this, perception can effectively become reality), hinders collaboration with those colleagues and makes the department less effective. Specific suggestions regarding this issue are an important part of our team's suggestions in the last section of this report.

Finally, there were a few reports of communication problems involving the department. For the most part these involved not receiving replies to emails asking questions or requesting information. The problems appear to involve only a small number of individuals (perhaps only one or two); still, they can hurt the department's effectiveness, and should be addressed.

## Qualifications of faculty

Based on the information in the faculty vitas provided with the self-study document, the qualifications of the faculty members are good, and appropriate for an institution of UNK's characteristics. The areas of expertise of the tenured and tenure-track faculty members cover only a moderate range of fields, and are weighted most heavily in the areas of mathematical analysis and applied mathematics. However, in a department of this size it is challenging to arrange for a broad and even distribution of areas of expertise. Furthermore, since nearly all courses the department teaches are undergraduate courses, the areas of expertise of the faculty members should not affect the quality of the teaching. Furthermore, as the list of student research projects in the SSD shows, students interested in doing research have been able to work on a wide variety of topics with department faculty members.

It is also worth mentioning that several faculty members and students currently majoring in the department described their colleagues/professors as passionate and talented, both in teaching and in research, and as caring about their students.

While the qualifications of its faculty are good, the department is short-handed, as noted in the SSD. The most serious need is to replace an instructor who retired recently and was not replaced due to a hiring freeze. Without a replacement the department has been forced to turn some students away in its introductory courses, despite increasing class sizes, and of course the latter move hurts student learning and has added to the stress the instructors are already under due to the pandemic. Note that tenured and tenure-track faculty do help teach these courses as well, although our team does not have data allowing it to determine how much they help. It is possible that more could be done in this respect, though probably not a lot, and in any case the need to replace the instructor who retired remains high.

Another hiring priority is for a tenure-track position in statistics or probability, replacing a faculty member who left for another institution in 2018. Even if this person is not able to generate enough student interest to justify resurrecting the statistics and/or actuarial science majors that were dropped a couple of decades ago, having someone who can develop and teach high quality courses in these areas and advise students on the opportunities that are available would be very helpful. One challenge in hiring for such a position is that competition is high, including competition from the private sector, which means it may be necessary to offer a higher salary in order to attract someone of sufficient quality. One of our team members asked whether setting up $2+2$ programs in statistics and actuarial science (similar to $3+2$ programs in engineering that many colleges have) might be an option. The response was that such a program might be possible, although one difficulty would be to find nearby undergraduate programs in these areas to pair up with, and a more realistic option is probably for students to earn an undergraduate degree in mathematics and then study statistics or actuarial science in graduate school.

## Quality of students, facilities, equipment, library and information technology

There was almost no information given to our team that would allow us to judge the quality of the students coming into the department's courses and majors. All we have is a comment by a faculty member that ACT scores are declining, and even then it was not clear whether they were referring to the scores of all students entering UNK or only students planning to major within the department. There is, of course, the well-known problem of weaker preparation among students entering college nationwide the past two years, due to disruptions to their schooling caused by the pandemic. How long this will persist and how much lost ground students will be able to make up once they enter college is not clear.

Facilities are a bright spot. The department recently moved into a new building, Discovery Hall, which has good facilities for faculty, students, and classes. The SSD lists a few facilities needs, and although all of them are legitimate, none of them indicates a major deficiency, which shows how good the current facilities are. One additional request brought up during the site visit was that a single classroom be designated for the mathematics for elementary teachers courses, so that the manipulatives used in those courses do not need to be moved from one room to another. This should be straightforward to implement, as it is really a facilities management issue.

The only equipment needs of the department that our team is aware of involves the manipulatives used in the mathematics for elementary teachers courses, and those needs appear to be well met. Similarly, the team is not aware of any concerns about the quality of the library resources available to the department. Finally, the information technology available to the department appears to be adequate, in terms of both
hardware and software. This is not surprising. Mathematics departments typically have only modest equipment and information technology needs, and although good library facilities have traditionally been essential to support faculty research, the recent development of online journal repositories means that even a modest library can now provide access to a wide range of journals. Furthermore, many researchers now post preprints of their work online, making them easily accessible to colleagues all over the world.

## Department budget

The team was not provided with any information about the department's budget, other than a passing comment from one individual that perhaps the department has been unnecessarily frugal with its spending recently. It is therefore difficult to draw any conclusions, although it appears likely that the budget is adequate.

## Evaluation of Department Effectiveness

## Student academic achievement and effective teaching

Because student achievement and effective teaching are closely connected, we have combined discussion of them into a single subsection.

On the basis of the data provided in the SSD, academic achievement among students who complete a major in the department appears to be good: Average scores on the department assessment (SSD page 42) have mostly been in the "very good" range (although the assessment has limitations, as discussed below). For students completing the MFE we also have average scores on the various components of the Charlotte Danielson Indicator assessment (SSD pages 43-44), which evaluate the students' performance as teachers at the end of their student teaching experience. These averages are mostly at the upper end of the "basic" range, near the "proficient" level. When considering the averages provided it is worth noting that the top level, "distinguished" is almost never achieved, so obtaining an average that reaches the "proficient" level is effectively only possible if all students reach that level. Consequently, averages that are only modestly below the "proficient" level are better than they might appear to be, since they mean most students are indeed achieving proficiency. Placement in teaching positions has been excellent among MFE students. Placement for students in other majors has been good, and several students have gone on to graduate school. Finally, the number of students engaged in undergraduate research projects is high (SSD pages 46-50), and a real strength of the department. All of these are indications of good academic achievement among students who complete a major in the department.

The conclusions of the previous paragraph do come with a caveat, however. As will be discussed in more detail below, the assessment tool the department uses for evaluating its majors is too narrow in scope and is used only at UNK, precluding the level of confidence in the results that would come from a more widely-used tool. The Charlotte Danielson Indicator assessment used with the MFE majors is a widely-used standard tool, which is good. However, with no guidance on what constitutes a good score, we can only make an educated guess, as we have done above, about what the data provided tell us regarding the achievement of the students.

No data on student performance in individual classes, such as grade distributions or even DFW rates, was provided to our team, so no conclusions can be reached about student academic achievement in general. However, we did hear that DFW rates have been high in some mathematics classes, primarily introductory courses, which is a potential cause for concern. However, without more information it is difficult to reach any conclusions.

Success in mathematics classes depends on many factors, some of which are outside of the instructors' control. One important factor that sometimes receives less attention than it deserves is course placement. Clearly students have a much higher chance of being successful if they are placed into appropriate courses. However, proper placement is a nontrivial problem. It is good to see that the department has been giving this issue serious attention lately, and is in the process of switching to use a new placement exam that was developed at UNL. A related problem worthy of attention is making sure that students earn a sufficiently high grade in a prerequisite course before going on.

Another obstacle to student success lies with the students themselves. No matter how effective the faculty members are in teaching, the students must put in the effort to learn the material being taught. In particular, low attendance and poor study habits hurt student achievement, and there are indications that both of these have become more of a problem lately. Of course, there is much that faculty members can do to help make class sessions and course material relevant, making students feel it is clearly worthwhile to attend class, and to encourage good study habits. On the other hand, it is also important that advisors and student support personnel remind students that they need to take responsibility for their own learning, and that the utility of course material sometimes does not become clear until later-perhaps much later.

Evaluating effective teaching can be difficult when grade distribution data and other data are available, and is even more challenging in the absence of such data. The evidence listed above concerning the achievement of students majoring in the department does suggest that the department's teaching is effective overall. Furthermore, several comments in the alumni survey (SSD pages 57-59) praise outstanding teaching by the department, as well as singling out a few faculty members for special mention. On the other hand, the high DFW rates mentioned above are a cause for concern, and the lack of good data means the department should work harder at determining how well it is doing.

There is one departmental project that is widely recognized as being highly successful: the College of Arts and Sciences Math Specialist office (SSD page 11). Using a combination of supplemental instruction and other sources of academic and personal support, this program helps students who are struggling in mathematics and statistics courses to complete those courses successfully, and to increase their confidence in their ability to learn and use mathematics. It would be desirable to expand this program so that it can serve more students. However, doing so will require additional expenditures. At the same time, the department should see what lessons can be learned from the success of the CAS Math Specialist office and consider applying them to restructuring the introductory mathematics courses, and perhaps even some of the troublesome major courses. Some more specific recommendations in this regard will be made below.

## Effective use of IT

The evidence for the effective use of information technology (IT) is indirect: The department has licenses for Mathematica (software for symbolic mathematical calculations) and Matlab (software for convenient numerical calculations, especially ones involving matrices). There is also explicit mention of faculty using Maxima (another software for symbolic calculations) and Matlab in some courses. An alumnus mentioned liking the use of online homework (because of its immediate feedback). Finally, there is the desire expressed by the department to reorient the projectors in the Discovery Hall classrooms so that faculty can use the projector and whiteboard simultaneously while teaching, which suggests that the faculty are using the projectors regularly in the classroom.

## Curriculum quality

The department's majors and minors are fairly typical, both in terms of their size (i.e., number of required courses and total number of credit hours) and the courses they consist of, except for the MFE major, which is significantly larger than comparable programs at most other schools, and larger than field
endorsements in other areas at UNK. Suggestions for reducing the size of the program are part of our team's recommendations listed below. It should be noted that the requirements for the MFE major were recently updated, in response to the observation that about half of students who initially choose the MFE major eventually switch to another major instead. An important part of the update consisted of adding teaching methods and field experience courses, as well as an interesting course on the role of inquiry and proof in the grades 9-12 curriculum, which were valuable additions, plus a few other courses. However, no courses were removed to compensate for the additional hours, which is an important reason why the major is now so large.

Similarly, the range of courses offered by the department and their content are also typical for a school of UNK's size that emphasizes undergraduate education. In particular, while there is nothing particularly innovative among the programs of study or course offerings (except perhaps for the course on the role of inquiry and proof in the grades $9-12$ curriculum mentioned above), neither are there any changes that would clearly be beneficial (other than reducing the size of the MFE). On the other hand, it is interesting to note that several alumni suggested adding more statistics to some of the programs and mentioning more potential applications of the topics taught in various courses. Both of these are worthy of consideration by the department.

It was mentioned above, and worth repeating here, that some other departments are considering creating their own versions of certain mathematics courses, due to the feeling that the current offerings from the Mathematics Department do not meet their students' needs. This is a serious concern, and the department is responding to it, which is a good sign. In particular, the duties of the department's Assessment and Academic Programs committees explicitly include assessing the effectiveness of courses that serve other departments and making adjustments as necessary. We encourage the department to continue to give this issue serious attention.

As reported in the SSD (pages 39-41), during the past decade the department has taught, on average, two graduate courses each year to support the STEM Education program, the Curriculum and Instruction Master of Arts in Teaching program, and a few non-degree seeking students. The exact courses taught vary from year to year, but all of them are reasonable courses for these programs.

Regarding the department's courses that will satisfy the LOPER 4 General Studies requirement, all of them are appropriate and there are no other courses the department teaches that would reasonably be added to the list. (In fact, the list is relatively generous in the quantity and variety of courses it contains.) Several faculty members noted that for many students MATH 106 (Mathematics for Liberal Arts) would be a better choice than MATH 102 (College Algebra) to satisfy this requirement, and yet the latter course is much more frequently chosen. The department is currently looking into ways to increase awareness among students and advisors of the option to take MATH 106 instead of MATH 102 to satisfy the LOPER 4 requirement.

Our team would also like to draw attention to the Math Club and Kappa Mu Epsilon chapter (Kappa Mu Epsilon is the national mathematics honorary society), even though they are co-curricular activities rather than part of the curriculum. Both of these groups have been active for many years, and although
participation has fallen during the pandemic, it is likely that it will bounce back now that conditions have improved, providing students with good opportunities for leadership, socializing, and learning.

## Faculty research, service, and development.

The faculty vitas provided with the SSD paint a picture of an active and engaged faculty. This is true for multiple areas, including publications and presentations, committee work (at the department, college, and university level), journal reviewing and professional society involvement, and curriculum development. When looking at the data, some observers from outside the department may feel that many tenured and tenure-track faculty have only modest numbers of publications. This is common. Because of the nature of mathematics and the traditional standards of publishing in the field, it is more difficult to produce publishable results in mathematics than in most other fields. Hence, it is common for mathematicians to have lower publication rates than their colleagues in other departments.

## Assessment plan, actions taken in response to assessment

The story here is a mixed bag, with a good foundation having been laid, but more work clearly needing to be done, and apparently even a bit of confusion over what is actually happening in one case.

On the positive side, the department has clearly been doing assessment for several years, and has a standing Assessment committee whose responsibility is to oversee and implement the department's assessment plan, which covers both evaluating courses and programs and recommending changes to improve them. The plan was revised in 2019 and assessment data submitted for the academic years 2019-2020 and 2020-2021. The use of the Charlotte Danielson Indicator scores for evaluating the teaching effectiveness of MFE majors during their student teaching is good, as this is a widely-used tool. Finally, the assessment tool used with students in three key major courses is clearly defined, uses a standard rubric for grading, and includes a scale telling what scores are considered acceptable, good, etc.

Nonetheless, there is clearly room for improvement. The following are specific concerns our team had:

- Other than the teaching effectiveness assessment for those in the MFE major, students majoring in the department are only assessed on their ability to write proofs. While proofs indeed play a central role in mathematics, there are other skills that are also important for these students to master, such as performing symbolic computations, converting real-world problems into mathematical problems and solving them, and using the correct notation (although this can be evaluated to some degree by having students write proofs). Furthermore, there are multiple concepts and standard procedures that they should be familiar with, such as continuity and how to find the eigenvalues of a matrix. We recommend that the department expand its assessment to cover some of these other skills, concepts, and procedures as well. One simple way to do this would be to have all students majoring in the department take the Major Field Test for Mathematics from ETS, although doing so would incur an additional expense that would have to be borne by the department or the students, which means the department should look into other options as well.
- The use of a locally-developed assessment tool has its advantages. However, one drawback is that with no external comparison available it becomes more difficult to determine what constitutes
good performance, and especially, to convince others (such as deans) that the determination is reasonable. This is another factor that argues in favor of at least partial use of an external tool that has widespread adoption.
- As noted above, the use of the Charlotte Danielson Indicator scores is good. However, they must be accompanied by a scale telling the ranges for acceptable performance, good performance, etc. Ideally this scale should be derived from data that is national in scope, to increase confidence that it is reasonable.
- It appears that the only courses currently being assessed are MATH 250, 350 , and 460 and student teaching, although we did hear from one of the non-tenured instructors that there are common questions on the MATH 102 final exam every semester and assessment data is collected every two or three years. While it may not be realistic to assess every course the department teaches, a sample of courses of each type should be assessed on a regular basis.
- It is not clear that assessment results are being used to improve programs or courses. (As noted above, the MFE major requirements have recently been updated, and some of the changes address concerns mentioned in alumni comments and remarks by current students who met with us. However, it is not clear those changes were motivated by assessment data.) With the recent changes to the assessment plan it may be too soon to expect useful suggestions for change to be derived from the data. Nonetheless, it is important to keep in mind that the goal of assessment is to help make the department better.


## Recommendations for the Future

## Recommendations from the self-study document

All of the plans listed in the last section of the SSD ("Future", pages 68-70) are reasonable, and are supported by our team. Some of them would require new funding, especially the hiring of a statistician or probabilist, and thus will need to be evaluated and planned for carefully, but most have no additional cost. (Note that, theoretically, filling the lecturer position that opened up due to a retirement does not require new funding, since the position was funded for many years prior to the person's retirement.)

## Recommendations from our team

As suggested in the APR guidelines, we divide our recommendations into two groups: those that can be implemented with existing resources and those that would require new investment. Also, although we have not tried to determine strict priorities, recommendations considered more important or more urgent are listed near the top.

First, the recommendations that should be capable of being implemented with existing resources.

- Consider further changes to the requirements for the MFE major. As noted above, this major is currently quite large, requiring 58 hours of coursework. In the oral reports at the end of the site visit our team suggested some changes that would reduce the number of hours to 52 , or even 49 . However, those suggestions must be modified, because a careful review of the state certification requirements in mathematics shows that if the original suggestions were implemented then the major would no longer meet those certification requirements. The modified suggestions are as follows:
- Remove MATH 365 (Complex Analysis) and replace the pair STAT 241 (Elementary Statistics) and STAT 441 (Probability and Statistics) with the single course STAT 345 (Applied Statistics I).
- Remove CSP 417 (Counseling Skills), perhaps asking that it be added to the Professional Sequence for Education Degrees instead. This course is not related to mathematics and thus does not logically belong in a Mathematics Department major. However, this should not be interpreted as an evaluation by our team of how useful the course is for secondary school teachers. Given the burgeoning mental health problems among secondary school students, the course may very well be a useful part of preparation to teach such students. It is just that if it is useful, then surely it is useful regardless of the subject being taught, and thus logically belongs among the Professional Sequence for Education Degrees requirements instead.
With these changes the major will still meet the state certification requirements, and the total number of hours will be reduced to 49 , which is more in line with comparable majors at other schools. Note, however, that if CSP 417 becomes part of the Professional Sequence for Education requirements then the overall number of hours that students need to take to complete the major will only be reduced by 6 .

It was pointed out to our team that many of the students who leave the MFE major switch to some other education program, suggesting that the impetus for leaving comes from struggles with the mathematics courses. The department may want to consider whether it can reduce the magnitude of this problem via the following two strategies (which would benefit all majors in the department, not just those in the MFE major):

- Looking carefully at how it schedules its upper-level courses, to see whether it might be possible to distribute the intensity of the coursework for majors more evenly across the various semesters.
- Provide more support to students in certain upper-level courses, especially MATH 350 (Abstract Algebra) and MATH 460 (Advanced Calculus). Part of this may be as simple as carefully arranging teaching assignments so that the faculty members teaching these courses have less intense assignments for the remainder of their teaching load that semester, helping them feel they can devote more time and energy to working with students in their upper-level classes.
- Address concerns about collegiality and department culture. As explained above in the discussion of department culture, during the site visit some concerns were raised about a lack of collegiality in the department, primarily between the mathematics education faculty and (some of) the traditional mathematics faculty. It is important that this be addressed, and that all of the department's faculty members respect one another for what they contribute to the department, so that the department works together smoothly as a single unit.
As is common in such situations, a satisfactory resolution will surely require compromise on both sides:
- The traditional mathematics faculty members must remember that the mathematics education programs are a key part of the department, providing just over half of their majors during the past decade, and that keeping everyone working together smoothly benefits them all. Or, to look at it the other way around, a lack of collegiality hurts everyone. Furthermore, it is to be expected that mathematics education faculty members and traditional mathematics faculty members will have different backgrounds and choose different types of research topics, but that does not mean either are better or worse; they are just different, and must be judged according to the standards of their respective areas. Also, because of their extensive knowledge about mathematics teaching, the mathematics education faculty members may have ideas that can help improve teaching and learning in the department's courses as well.
- The mathematics education faculty members must recognize that they are working in a mathematics department, and that most of their work with students concerns the teaching of mathematics, rather than education in general. Therefore, it is reasonable to expect that the bulk of their professional academic work should clearly involve mathematics in some way or other. It is likely that it will concern mathematics education, of course, but it is important that there be a clear connection with mathematics. Occasional work not connected to mathematics is okay, but it should be only a small part of their overall work. In particular, it is reasonable to expect that most of their research will be connected to mathematics, especially in the case of research projects undertaken with students majoring in the Mathematics Department.

Looking to the future, it is suggested that the department discuss and agree on some basic expectations for mathematics education faculty members that can be shared with candidates the next time such a position is filled. (We expect that such a search is not likely to occur for several years, but it is advisable that these expectations be worked out ahead of time so that there is sufficient time for thorough discussion.) Two key areas where expectations should be specified are mathematics background and research topics. It is up to the department to determine what the appropriate expectations are; however, we can suggest the following as starting points for the discussion:

- Regarding mathematics background, it would be reasonable to require that mathematics education faculty members have a background that is at least roughly equivalent to what graduates of their own MFE major would possess. Without such a background it seems it would be challenging for them to adequately oversee the MFE major and advise students in the major.
- Regarding research, it is important that faculty members be free to work on topics that they feel are important and interesting. Nonetheless, it would be reasonable, as mentioned above, to expect that most of the research done by mathematics education faculty members has a clear connection with mathematics, especially when supervising research projects for undergraduate mathematics majors.
Note that the expectations the department settles on are only meant to help guide the process of hiring new mathematics education faculty members and ensuring that they fit into the department well, and that it is not reasonable to apply them retroactively to current faculty members.
- Fill the lecturer position that is currently vacant. This is one of the department's high-priority goals already, but it deserves repeating here, because our team also believes it is important. Furthermore, in our oral reports at the end of the site visit we suggested that with changes to the MFE major it might be possible for tenured and tenure-track faculty members to help teach more sections of introductory courses and eliminate the urgency in filling this position. However, after further thought it has become clear that this is not realistic, and filling the position should be a high priority.
- Expand and revamp the department's assessment plan, as explained above in the discussion of assessment.
- Continue and enhance efforts to determine who the department's clients are and ensure you are serving them well. Good work in this direction is already under way and should be encouraged and expanded.
- Look into ways to apply lessons learned from the CAS Math Specialist program to improve success rates in other introductory courses, and perhaps in major courses as well.
- Revisit the department's goals sometime before the next APR, to see whether they need to be updated, and also to try to reorganize and consolidate them.

Now, for a couple of recommendations that would require new investment to implement:

- Expand the CAS Math Specialist program so it can serve more students. As noted above, this is a highly successful program; it would be wonderful if more students could benefit from it.
- Hire a new faculty member in statistics or probability. The benefits of this are already well explained in the SSD and above in this document.


## Memorandum

To: Dr. Charlie Bicak, Senior Vice Chancellor for Academic Affairs and Student Life
From: Dr. Ryan Teten, Dean, College of Arts and Sciences
Re: Mathematics and Statistics Academic Program Review

This memorandum is in response to the 2022 report of the Academic Program Review Team for the Department of Mathematics and Statistics.

The program produced a Self-Study that reported clearly and thoroughly on the mission, goals, faculty, curriculum, resources, and current state of the program. During a site visit in the spring of 2022, the APR Review Team, led by Dr. Mark Hall, Professor of Mathematics at Hastings College, met with the department faculty, staff, students, Deans and the Director of Assessment. The APR made several observations and recommendations regarding the Mathematics and Statistics.

The Department of Mathematics and Statistics has made strides since its last Academic Program Review, but continues to have significant opportunities for improvement.

## APR Team and Advisory Council Recommendations

The Review Team organized their evaluation into several general categories. They provided commentary and feedback on: A) Evaluation of the Self Study, B) Evaluation of the Mission of the Department, C) Evaluation of Department Resources, D) Evaluation of Department Effectiveness, and E) Recommendations for the Future. I would like to touch on elements within these categories that set priorities for the department and for its continued and future successes.

In the first section of review, the review committee examines the Self-Study Document (referred to as the SSD) provided by the Department. The first sentence on page 3 does well to summarize the findings. "Overall, the self-study document...is well organized and provides considerable detail for some topics." However, they note the absence of faculty characteristics, student persistence and graduation rates, and time to degree are not well covered or provide no data. The committee lauds the data that is provided, as well as the detailed descriptions of the curriculum, the departmental organization, and the "well written and detailed description of the department's new recruitment and retention plan." That plan was something I required of all departments upon my entry into this position in 2019.

In addition to the strengths shown in the SSD, the review committee noted the weaknesses therein as well as provided suggestions for construction of the SSD the next time the department engages in another Academic Program Review. The biggest issue that they observed involved the provision of data and "few summaries or analysis of that data." Specifically, the department should work to obtain data on student retention within the department's majors, the graduation rate of its majors, the DFW's and grade distributions of the courses taught, and also provide specifics regarding the departmental budget in future reports.

The APR also suggests that departmental goals, last set or fully engaged in the 2012 APR, should be revisited, especially given the changing nature of the faculty of the department as well as the focus on Mathematics Education within the department. This would remedy the observation that the SSD "does not articulate and overall vision for the future of the department." I understand the challenge that can be associated with attempting to procure data, and especially detailed data here at UNK, but would encourage the departmental leadership to reach out in the future to the Dean's office in CAS, which may be able to help in this regard.

The next section of the APR looks at the evaluation of the Mission of the Department. According to the APR, "the department's mission statement is well balanced and broad." In addition, even though the APR notes that the goals of the department may not have been creatively engaged in the past ten years, they find that "all of them are relevant and there are none that we can think of that should appear but do not." The issue that the APR raises is that these numerous goals (31) should "be better organized" and "it should be possible to reduce their number without losing anything that is significant." Several of the goals are noted as similar or having overlap, and streamlining or combining them is key to being able to set reachable benchmarks and measure their achievement. Their recommendation that "grouping the goals based on the mission statement's bullet points is worth considering" has value, and I would suggest they do the same moving forward. This will simplify both the purpose and identity of the department.

The next section of the APR examines the available departmental resources and the role they have played in student education in Mathematics and Statistics. The APR committee found that the size of the department as well as administrative support and committee structures all are appropriate. However, they provided several observations as to concerns as well. The first is the unease that the department has regarding cheating of the students in its classes. The review team notes that this is an issue across the country, largely because of innovation in technology that makes cheating easier and more accessible. I too understand the challenges that in-class and online proctoring present, but suggest that the online presence of curriculum will expand as opposed to contract in the future. Therefore, staying abreast of best teaching and disciplinary practices and discovering the best ways to work against plagiarism and cheating, especially in the online realm, will be key moving forward.

Another observation in the APR was a concern regarding "other departments considering creating their own versions of certain mathematics courses, because they do not feel their students' needs are being met by the courses taught by the Mathematics Department." Stemming from general studies reorganization as well as previous engagements on the subject with the Math department, I believe that this possible redundancy would be more than problematic should it occur; it would mean the end of the Math department. All of the colleges and departments here at UNK should look to Mathematics and Statistics to help develop discipline-specific or tailored classes for students. The department has been actively engaging this issue and has recently developed statistics for Social Work and has begun reevaluating classes and curriculum to prevent emigration of our math majors or students seeking the coursework to a community college or institution elsewhere that guarantees an "easy A." Continued effort at discovering roadblocks to our transfer students, our first generation students, our non-traditional students, as well as those from other UNK colleges is paramount moving forward. I would encourage that this subject be approached in a meaningful and significant way.

This section also includes evaluation of departmental culture, and this is where a major issue within the department is noted. In their discussions, they were informed that "the mathematics education faculty members were treated differently, and not respected, by the traditional mathematics faculty members." I have observed this pseudo division within the department since my arrival as well. Originating largely from when the department did not have math education faculty within it, this disparity needs to be remedied immediately. The review team notes that "the feeling that one is not respected by one's colleagues...hinders collaboration with those colleagues and makes the department less effective." This is an issue with which I expect the new chair, Dr. Derek Boeckner, will need to deal immediately after his entry into the chair's position. Apart from mathematics education providing the lion's share of the majors to the department, this kind of prioritization of discipline or individual study over a peer's is not conducive to departmental cohesiveness, nor to the students that are served. I expect this issue, as well as the notes on problematic communication, to be resolved immediately by the new chair and the department as a whole.

The final note in this section is regarding the faculty of the department. The APR finds that the "qualifications of the faculty members are good, and appropriate for an institution of UNK's characteristics." They suggest an additional hire in statistics or probability in the future, but also realize that it would not be easy to secure. As such, they recommend increasing the possible $2+2$ programs with which Mathematics participates. Increasing our connection to community colleges and transfer students is important to the institution, and I support the recommendation to continue to find ways to better serve the actual and potential student population. Lastly regarding this section, the APR also finds the facilities, library support, and IT support as appropriate for the department and its classes.

The fourth section of the APR reviews Department Effectiveness and details student achievement and effective teaching within the department of Mathematics and Statistics. There are several observations as well as critiques for the future, but the primary observation
of the review team was that "academic achievement among students who complete a major in the department appears to be good." However, they note that the measures that are used to assess students' success need re-evaluation and improvement. The APR advises that the "assessment tool the department uses for evaluating its majors is too narrow in scope and is used only at UNK." The report notes that this issue, as well as the importance of correctly placing students into the appropriate course, have been noted and engaged by the department recently. The high DFW rates are a cause for concern, but the contemporary examination of the issues above as well as the addition of the College of Arts and Sciences Math Specialists Office are all good steps towards ensuring student success. The committee also suggested altering the senior assessment tool from a proof to "at least partial use of an external tool that has widespread adoption." This is consistent with recommendations that the department adopt testing, assessments, and evaluations that may be more generalizable than the current methods being used. I think staying abreast of these types of tests and best practices are key for the department moving forward.

The final section of the Academic Program Review is entitled "Recommendations for the Future" and provides a summary of the points previously discussed as well as important suggestions for the future of the department of Mathematics and Statistics. The first recommendation is a decrease in the number of hours required for the major. Currently, "this major is currently quite large, requiring 58 hours of coursework." The APR proposes several curricular modifications and reorganizations to succeed in this goal. By lowering the required number of hours, the department would "be more in line with comparable majors at other schools." This would also help the outflow of students from the MFE major that originates "from struggles with the mathematics courses." They would like additional support for the upper level math students as well as examining the existing curriculum map to determine if "it might be possible to distribute the intensity of the coursework for majors more evenly across the various semesters." These are both worthy exercises and may help students to succeed in the varying courses as well as to remain within the MFE major, which are both clearly in the interest of the department.

The last set of recommendations revolve around the APR discussion on departmental culture. The finding of disparity between the treatment of math faculty and math education faculty has been mentioned previously, but is reiterated yet again by the committee. "It is important that this be addressed, and that all of the department's faculty members respect one another for what they contribute to the department." Though they are linked by the discipline itself, the difference between math comprehensive and math education has been substantial in the past. This is something that requires immediate engagement and support for those faculty. In addition to being crucial members of the math department, "the mathematics education faculty members may have ideas that can help improve teaching and learning in the department's courses as well." This expertise in content delivery is critical in a subject like math, where students can sometimes feel overwhelmed and intimidated. Fully engaging the subjects of content, coursework, the curriculum map, and improvements in teaching and assessment will help the department to unify and, indeed, flourish. The Mathematics and Statistics program is an important part of the essential curriculum for a liberal arts tradition,
and is most certainly an important part of UNK's College of Arts and Sciences. I think the review makes several important observations and actionable points which are important to address moving forward. Incorporating these themes, I look forward to the continued success of the Mathematics and Statistics program as well exploring the exciting initiatives with which they are currently involved.

# Response of the Department of Mathematics and Statistics 

to the<br>Report of the Academic Program Review Team

Report Date: May 26, 2022
Response Date: June 24, 2022

In this response, we consider the specific recommendations of the APR team report (which will be referred to as the APRT report) which start on page 15 of the report. There are seven bullet-pointed recommendations capable of being implemented with existing resources and two which would require new investment to implement. We number these BP 1 - 9. As BP 1, 2 and part of 5 deal with the education of future mathematics 6-12 teachers, concerns of mathematics education department faculty, and the Department of Teacher Education and COE, we treat these together. The APR guidelines ask for statements* relating changes (given in responses to recommendations) to the program, college and UNK strategic plans. The department at this time does not have a strategic plan, per se, but does have a Recruitment and Retention Plan which concerns students. This will be used when applicable. CAS, being a relatively new college, does not yet have a strategic plan. For the UNK Strategic Plan, we will use the 2021 Update. All statements of responsibilities of Dr. Boeckner should be interpreted as reading "Dr. Boeckner or his delegated person(s) or committees."

The following is a chronology of the writing of this response. The APRT report was sent to Dr. Kime and Dr. Beth Hinga on $5 / 26 / 22$, forwarded to Dr. Boeckner for reading on $6 / 8$, drafts of the response written by Dr. Kime shared with Dr. Boeckner for comment on 6/15 (partial) and 6/19 (full), draft(full) shared with department faculty for comment on $6 / 20$, and the final version sent to the CAS, COE, and Graduate Deans and Dr. Hinga on 6/24.

## BP 1,2, and BP 5 (TE and COE)

The department has been invested in the education of future K-12 teachers and the disciplines of mathematics and statistics from at least the time of Kearney State College. We start by summarizing courses given by the department which will be taken by students who are planning to be teachers in pK-12. There are currently three main groups of such courses.
1)Courses which are required by the Elementary Education Early Childhood Inclusive and Special Education field and subject endorsements. These are B.A. Ed. and B.S. Ed degree programs in the Department of Teacher Education in COE. Most of the endorsements require Math 230 and Math 330, Mathematics for Elementary Teachers I and II. The catalog description of Math 230 states "In this course, preservice teachers develop knowledge of mathematics important for the effective teaching of PK-6 students," and Math 330 has the same statement modified by the word "further." These courses and other courses below whose catalog descriptions refer to preservice teachers will be referred to as preservice courses.
*It appears the first part of item 1), pg. 17 of the Guidelines and item 6) are the same

The Department of Teacher Education is a client department of the Dept. of Math/Stat for these endorsements. Note that the Dept. of Teacher Ed has TE 311, 312 and 313 which concern teaching methods in elementary classroom settings, so that Math 230 and Math 330 are free to focus on the mathematics that will be taught at the early grade levels.

Further, there is a Mathematics (Elementary Education) Minor consisting of 20 hours including Math 230, Math 330 and Math 430, Middle School Mathematics. The Minor is a degree program in the Dept. of Math/Stat.
2)Courses required by the Middle Level 5-9 Teaching Subject Endorsement, B.S. Ed., Mathematics Concentration, a program in the Dept. of Teacher Ed. The central courses are Math 230 and 330, Math 430, and Math 270/271 and 470/471. The latter two pairs are methods/field experience pairs. In addition to Math 230 and 330 , Math 430, 270/271 and $470 / 471$ are preservice courses (Math 430 will be so considered by its title). Further, students choose another 9-11 hours of allowed MATH courses for the endorsement. The Dept. of Teacher Ed is a client department of the Dept. of Math/Stat for this endorsement.
3)Courses required for the Mathematics 6-12 Teaching Field Endorsement, B.S. Ed., referred to as the MFE in the APRT report. Math 430, 270/271, and 470/471 are required preservice courses, as are the additional Math 251 and Math 465.

The MFE is considered a mathematics major in the UNK Factbook, with CIP 27.0101, the same as other math majors. Recent clarification from the Office of Academic Resources \& Inst Research says that the Dept. of Math/Stat owns the program, although the Registrar grants degrees. The department structures "what math teachers need to master in their subject." Also, the "Education piece of the degree (the "ED" part) is constructed by COE for the purpose of having students complete credentials for a teaching certificate. It functions almost like a second General Studies program, though it is more directly linked to their degree program."

The MFE is apparently viewed as a program in COE for purposes of accreditation of the program by the CAEP, the Council for the Accreditation of Educator Preparation. Drs. Chandra Diaz and Scott Unruh, Associate and Assistant Deans of COE, have conducted Curriculum Mapping and Quality Assurance Workshops in the past year needed for the accreditation, for which Drs. Amy Nebesniak, Ted Rupnow and Jacob Weiss have served as representatives from the Dept. of Math/Stat.

Remark: A methods course is required for the MFE, by either COE or the Nebraska Department of Education, and it is required that the instructor teaching the course has experience in some part of K-12 teaching. That course has been MATH 470 for at least 20 years.

Now we turn to BP 1, which recommends considering further changes to the MFE. This program is currently large, with 58 hours plus Calculus 1 ( 5 hours) and PHYS 275/275L ( 5 hours) required as Loper 4 and Loper 8 in General Studies. The program was recently changed and the new program went into effect in Fall 2021. The recommendations are to remove Math 365, Complex Analysis, replace Stat 241 and 441 by Stat 345, and remove CSP 417. The APRT report remarks that If a course such as CSP 417 is useful for secondary school teachers, it is useful regardless of the subject being taught. It would then logically belong in the Professional Sequence for Education Degrees requirements.

These suggestions would reduce the hours in the endorsement from 58 to 49 , although possibly add 3 hours to the Professional Sequence. What would make up this 49 hours? It would include the 5 credit Calc 2 and the 5 credit Calc 3, and eight 3 credit mathematics courses at the 200-400 level: MATH 250, $280,310,350,400,460,404$, and 413 . All together these would constitute a total of 34 hours. The MFE would also include 3 hours of Statistics, and 12 hours of preservice courses. This gives $34+3+12=49$.

The B.S. program also requires Calc 2 and 3 , and eight 3 credit mathematics or statistics courses for a total of 34 hours: MATH 250, 280, 305, 350, 365, and 460 and 6 hours of electives consisting of 300-400 level mathematics or statistics classes. Thus, the 34 hours in the MFE would remain roughly equivalent to the 34 hours of the B.S. and the MFE would have an additional statistics course plus the preservice courses.

Keeping in mind the readers across campus who will review this response, as well as students, we address an issue that arises at times. This is the question of the importance of the upper (200-400) level mathematics courses, including Calc 2, Calc 3 and the eight 3 credit courses that MFE students would take (the 34 hours above). These are courses in the discipline that a BS (or BS-Comp) major would be required to take or could take as an elective, and are not preservice courses.

We observe that the MFE shares with Field (and Subject) Endorsements in other disciplines the requirement of upper level courses in the discipline. For example, English Language Arts requires a course in each of American, British and World Literature; Music Education requires four courses in Music Theory, courses in Instrumental and Choral Conduction and Literature; History (Subject) requires at least four advanced history courses-US, Nebraska, European, and Latin American, Asian, or African. Other departments view upper level courses in their discipline as an important part of the subject matter future teachers need to study, and Math does also.

That said, there is a distinction between the MFE, and endorsements in most other fields with the main exception of Physics. Whether or not the subject matter in an upper level literature, music or history course is commonly taught as part of the high school curriculum (and some of it may be), the subject matter could be mentioned in high school classes with at least partial understanding by the majority of the students. It could be brought in as an enhancement. Neophytes of all ages will not in general have a deeper understanding of a piece of literature or music, but they can read or hear such a work and have some appreciation of it.

This is not the case for most of the topics in upper level mathematics courses. A common curriculum in high schools is Algebra I, Geometry, Algebra 2, and a senior level math class which could be pre-Calculus, Trigonometry, or AP Calculus for the AB exam, which roughly covers Calc 1. A smaller number of high schools also offer an AP Calculus course for the BC exam, which is on parts of Calc 2 and a small part of Calc 3. A small percentage of students will take the equivalent of Calc 2 or possibly Calc 3, if they are offered. Most high school math teachers will rarely teach Calc 2 or Calc 3, if at all.

Almost all of what is taught in Math 350, Abstract Algebra, Math 460, Advanced Calculus and the latter parts of Math 404, Theory of Numbers, will not be taught in high school and could not be meaningfully discussed except with a rare student. For example, some of Math 460 could be approached with students who have passed the AP BC exam. Parts of Math 280, Linear Algebra and Math 413, Discrete Mathematics could be discussed with some students, probably after Algebra 2, but are not part of standard curricula. Also, most of what is taught in Math 365, Complex Analysis, which we include
because it currently is part of the MFE, will not be taught in high school (see below for its contributions). Math 310, College Geometry, has the most overlap with what will be taught in high school. It also contains advanced topics which may or may not come up in school. The early parts of Math 404 (e.g. "mods") will come up at different points in the school curriculum.

Part of the need for prerequisites is that one must have learned specific symbols and concepts in order to learn those in the next step up. Part is the need to have had enough experience with problem solving that one can deal with the newness of certain mathematical topics with sufficient confidence to progress.

Further, It would not be surprising if an $11^{\text {th }}$ grader found a literature book, heard a symphony, or saw a history documentary, became curious and asked their teacher about it after class. It would be a rare occurrence for an $11^{\text {th }}$ grader to find a book or internet site concerning groups, rings and fields (Math 350) and bring it to their teacher, and then the teacher could not satisfactorily explain as the student would almost surely not have the background.

Thus, It is natural for some to ask: Why should MFE students take upper level mathematics courses with subject matter that they will not teach as part of the regular school curriculum, include in class as an enhancement or likely even discuss with a curious student? Why are the courses important? Here are some reasons why.

- Upper level mathematics courses which require prerequisites often draw directly on the subject matter of the prerequisites and bring a better and deeper understanding of the prerequisites. An MFE student who took Calc 3 simultaneously got better at Calc 1 and Calc 2, and better at their algebra. An MFE student who took Math 460 understands limits, the derivative and the integral at a higher level and can thus teach Calc 1 and if asked, Calc 2 and 3 better. Trigonometry is incorporated in Calc 2 and Calc 3 as well as Math 365. Limits, derivatives and integrals of complex functions are seen in Math 365, which deepens understanding of the real variable versions.
- The way in which upper level mathematics courses are taught develops "mathematical maturity," a somewhat elusive characteristic which means a certain familiarity with the way mathematics will be presented and built up, and a certain comfort level with abstraction.
- Upper level mathematics courses confront everyone with the challenge of difficult problems and theorems. Even students who had little difficulty with the calculus sequence will find problems in Advanced Calculus that they cannot solve. Struggling with harder problems, learning to get unstuck once one is stuck, over and over, makes easier problems seem easier and builds confidence for the classroom. An MFE student who studied the advanced theorems in Math 404 will have seen the complexity of modular arithmetic and find that the beginning ideas of "mods" needed in 6-12 come easy. Further, most students will encounter a topic they "just never got" during a course, and come to appreciate what it takes to understand advanced topics. They will be pushed to the edge of their capabilities and thereby over time increase those capabilities. Concentration and mental focus are improved.
- Thinking about higher level ideas and solving higher level problems develops a more complex mind. This sense of complexity, an intangible, is imparted in teaching.
- Math 310, 350 and 460, and to a lesser extent Math 280, 365, 404, and 413 require the writing of proofs. Math 250 prepares students to write proofs in these courses. Proofs establish
mathematical facts, of which the substantial are called theorems. Mathematicians do not rely on a theorem until proven. Many proofs result from insight, many convey beauty and harmony.
- Upper level mathematics courses bring awareness of the expanse of the mathematical universe, the fact that there are many different subfields of mathematics, and that different subfields appeal to different people. They educate students about the nature of the discipline of mathematics. Topics that have been found to be important within the discipline are included.
- Along with the last point, there are topics that are included in more than one upper level mathematics class, thus demonstrating commonalities and/or connections between different subfields. For example, matrices are introduced in Math 280 and certain subsets of matrices form groups in Math 350. Permutations come up in Math 413 and form groups in Math 350. Equivalence relations, in particular congruence, are central in Math 350 and Math 404 ("mods").
- The different approaches, predilections, enthusiasms, flows, the ways of confronting difficulty that individual professors have are further brought out in the upper level mathematics classes. They have taken graduate level mathematics courses which have forced them to grapple with even higher level ideas and degrees of complexity. They exhibit their unique ways of thinking about mathematics and bring its richness to life. They model the variety of affinities for the subject and inspire future teachers to find their own. Students are exposed to a scholar of mathematics.
- An MFE student has taken roughly the same mathematics courses as a student who got a B.S. and thus has great career flexibility. Students can tell future employers that they took the same courses B.S. students take or ones on different topics at a similar level.


## Response to BP 1:

1) In Fall 2023, the chair, Dr. Derek Boeckner, will assign to a department committee or other subset of the faculty the task of reviewing the suggestions and their implications. The committee will summarize its review and give it to Dr. Boeckner. The committee may also make its own suggestions.
2) Dr. Boeckner will ask the College of Education their view on requiring a counseling class as part of the Professional Sequence for Education.
3) Dr. Boeckner will clarify the exact nature of the endorsement, including answers to the questions: What oversight does COE have over the endorsement? What does the endorsement need to have in order to be certified by the Council for the Accreditation of Educator Preparations, CAEP? What does the NDE require of the endorsement? What are the requirements concerning the methods class(es)?
4) Dr. Boeckner will present items 1, 2) and 3) to the faculty for discussion. A decision will be made on the suggestions of the APRT report. If the committee in 1) makes other suggestions, those will be considered as will any other suggestions made by department faculty.
5) Dr. Boeckner will consider the proposed scheduling ideas suggested on page 17 of the APRT report, to spread the intensity of the upper level courses and increase support of students. The APRT team would not have known that Math 350 and Math 460 were both Writing Intensive courses when that classification existed. In those courses, students were allowed to resubmit proofs. While some did not like the extra work, for many students this method was very helpful and might be in part revived.

The timeline will be for completion during AY 2022-2023, the responsible person Dr. Boeckner and no additional resources will be required. Success in 1) - 4) will be measured by the outcome of a final department vote on the suggested changes or others that may reduce the hours of the MFE, and ultimate passage through the university approval process should changes be approved. Success in 5) will be shown by Dr. Boeckner reporting on 5) by the end of the AY.

The responses relate to Item 5 in the department's R\&R Plan, "Maintain efforts developed in prior years," especially the points

- Continue to collect data regarding retention of majors and minors
- Continue examining data exploring trends in courses which are difficult/roadblocks to students in completion of their degrees to determine where and when support for students is needed

They relate to statements in the UNK Strategic Plan of "meeting citizens' educational needs," and "a curriculum that provides solid grounding for students in the liberal arts and sciences while also enabling them to specialize and prepare for careers."

BP 2 describes concerns expressed by mathematics education faculty about collegiality. Both CAS and the department have recently proposed collegiality statements in promotion and tenure documents which are passing through administrative evaluation. Interestingly, these are similar as both are very close to a proposed collegiality statement of the Department of Political Science. The proposed documents will be placed in a file available on our department's Sharepoint site. The mathematics education faculty are Dr. Nebesniak and Dr. Rupnow, who hold the doctorates Ed.D. in Teaching, Learning, and Teacher Education and Ph.D. in Mathematics Education, respectively (see SSD, file "all CVS").

Page 7 of the APRT report says that "the two current mathematics education faculty members felt that they were not respected for their knowledge, their insights were too often ignored, they did not have appropriate control over the mathematics education program, and the differences between their needs and those of the traditional mathematics faculty members were not adequately recognized." BP 2 suggests what faculty members should bear in mind, which speak especially to the types of contributions made by mathematics education faculty. It also makes a concrete recommendation for planning for the hiring of a mathematics education faculty member in the future.

## Response to BP 2:

1) The mathematics education faculty make many important contributions which may not have been appropriately communicated to the whole department, and what they have done may not be sufficiently visible. Part of the issue is that some of these contributions are made via interactions with the Department of Teacher Education (TE) and with COE, and the department's faculty do not cross paths frequently with those faculty members. Related to this is that the knowledge and insights of the mathematics education faculty may not yet be seen in the context of certain major influences on them, namely the academic milieux in which they were educated and the philosophies of education they learned there, with which other faculty may not be familiar. Another aspect is that the mathematics education faculty teach preservice courses and the nature of these is not discussed to a large extent with other members of the faculty. The new preservice course Math 251, which the APRT report considers valuable and
innovative, and which was created by the mathematics education faculty, may be a change in this regard as the instructors of Math 250 and Math 251 will have some interaction.
A) The department will learn of previous, current and future contributions and perspectives of the mathematics education faculty through presentations, at seminars or possibly at department meetings.
i) Dr. Nebesniak contributed to the middle school portion of the current draft of the new Nebraska standards in mathematics. Dr. Jane Strawhecker remarked on this at a recent Zoom meeting with NU faculty and NDE staff, which was organized by Dr. Steven Duke, Associate Vice President for P-16 Initiatives, University of Nebraska System. Dr. Nebesniak will be invited to present her work and, if Dr. Nebesniak would like, Dr. Strawhecker will be invited to place it in the context of past and current standards.
ii) Dr. Nebesniak and Dr. Rupnow participated in the workshops on Curriculum Mapping and Quality Assurance described above. They will be invited to give a presentation about the workshops. If Drs. Nebesniak and Rupnow would like, Dr. Chandra Diaz and Dr. Scott Unruh will be invited to discuss with the department the accreditation process with which the workshops deal.
iii) Appropriate members of the Dept. of Teacher Ed and COE, including some suggested by Dr. Nebesniak and Dr. Rupnow, will be invited to meet with the department and give their perspectives on the preservice courses the department offers. This will include any overlaps or interplays between educational philosophies of COE and those which are part of the preservice courses. A discussion of TE 311, 312 and 313 would be helpful to the department.
iv) Dr. Nebesniak and Dr. Rupnow are encouraged to give presentations in the Undergraduate Research Symposiums which have now been revived.
v) Dr. Nebesniak and Dr. Rupnow will be given the opportunity to communicate other previous or current contributions not mentioned above, and are asked to let the Chair know of future contributions they wish to communicate.
vi) Dr. Nebesniak and Dr. Rupnow will be given funding to invite at least three speakers of their choice to the department to educate the department about their academic milieux.
B) The issue of "control of the math education program" has started to be clarified for the MFE, see the remarks of AR \& IR above. Also, the purpose of 3) in the Response to BP 1 is to continue this clarification. The remarks of AR \& IR say that it is the Dept. of Mathematics and Statistics which controls the MFE, but it is also the case that we want the MFE to qualify students for certification to teach and that requires working with COE. It is clear that the math education programs for Elementary, Special, Early Childhood Inc and Middle School are controlled by the Dept. of Teacher Ed, but perhaps Drs. Nebesniak and Rupnow would like further clarification of their roles in MATH 230, 330, 430, 270/271 and 470/471 (the latter 5 are also part of the MFE). This should also be better understood from item iii) above.
C) Any needs that the mathematics education faculty believe are not being met should be communicated as such to the Chair of the department.
2) The department will meet to "discuss and agree on some basic expectations for mathematics education faculty members that can be shared with candidates the next time such a position is filled." The starting points suggested by the APRT report, concerning background and research, will be taken up. Dr. Boeckner may start by assigning this to a department committee of his choice.

This task will be completed during AY 2022-2024, the responsible person Dr. Boeckner and the department should have enough in the budget to fund the speakers. Success will be measured by carrying out the above items. Two years is given because it looks unlikely that all could be accomplished in one year.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," "Design and implement programs to recognize employee contributions, performance, and accomplishments," (ours would be a departmental version of that statement) and "recruiting and mentoring qualified diverse faculty and staff."

BP 5 recommends that the department "Continue and enhance efforts to determine who the department's clients are and ensure you are serving them well."

## Response to BP 5 (TE and COE)

Items 2 and 3 in the response to BP 1 and A)iii) in the response to BP 2 ask for input and clarification from some faculty in the Dept. of Teacher Ed and administrators in COE. In addition, Dr. Boeckner will organize a meeting which includes at least 2 members of the Dept. of Teacher Ed and/or COE who have not previously been invited, to hear of any additional curricular or organizational matters concerning the department; briefly, any further needs that they have. These tasks will be completed during AY 20222024, the responsible person is Dr. Boeckner. Success will be measured by carrying out the above items.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," "a curriculum that provides solid grounding for students in the liberal arts and sciences while also enabling them to specialize and prepare for careers," and "renewing curriculum, pedagogy, and activities with advice from internal and external constituencies."

## BP 3

The recommendation is to "Fill the lecturer position that is currently vacant." The need to fill this position has been discussed in the SSD and is corroborated by the APRT report.

## Response to BP 3

Dr. Boeckner will make a request to fill the position. If approved, he will form a search committee according to his judgement and carry out the search. He will identify courses that the new faculty will teach. Ms. Michener taught Math 90, 101 and 106 and others. The tasks will be completed during AY 2022-2023, the responsible person Dr. Boeckner. Success will be measured by making a hire if approved.

The responses relate to Item 4 in the department's R\&R Plan: "Focus on increasing general studies student credit hours," including the points

- Determine if there is a new general studies math course that we could offer that would draw students back to campus from community colleges/dual credit and still meet most program requirements across campus.
- Examine trends in the data on student credit loss and see the distribution of loss attributed to dual credit, transfer in with credit, here and go elsewhere for credit

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs" and "recruiting and mentoring qualified diverse faculty and staff."

## BP 4

The recommendation is to "Expand and revamp the department's assessment plan, as explained above in the discussion of assessment."

## Response to BP 4

All of the items in the APRT report on pages 13 and 14 should be considered during AY 2022-2024. In particular, identifying other concepts and procedures that we would like to assess should be taken up relatively soon. Attention should be paid to what is required by the HLC, what (if different) is required by Dr. Hinga's office, and what the department itself values. We note that General Studies assessments of all sections of GS courses have been initiated and were carried out for the first time in S2022. The Assessment Committee may wish to incorporate some of the GS courses into the department assessments.

Dr. Boeckner will be responsible for assigning this to the Assessment Committee.
The responses relate to the statements in the UNK Strategic Plan: "a curriculum that provides solid grounding for students in the liberal arts and sciences while also enabling them to specialize and prepare for careers," and "processes to assess student learning and to adjust programs in light of that appraisal."

## BP 5

As stated earlier, the recommendation is to "Continue and enhance efforts to determine who the department's clients are and ensure you are serving them well." The fact that good work is already underway and should be expanded upon is noted.

## Response to BP 5

In addition to the Dept. of Teacher Ed and COE, already discussed, the department's known client departments include Chemistry, Cyber Systems, Physics and Health Sciences. Further, the SSD revealed that Business Administration has a significant number of double majors and minors in our department. As all students must take General Studies, and many but not all will take a mathematics or statistics course for Loper 4, the General Studies program itself is a direct client and most if not all departments are indirect clients through General Studies.

In interacting with client departments, it is necessary to remember that many of our courses transfer to other universities and colleges, and we accept many transfers. We must maintain truth in advertising and teach the topics that those outside the university expect to be taught in, say, Calc 1,2 , and 3 , Linear Algebra, etc. There is an informal but broadly accepted meaning of the title of many of our courses that exists across the country and perhaps the world. The department also needs to consider its own values and beliefs about what the topics of different courses should be, when there is some freedom to choose.

That said, we need to also be fully aware of what other departments on campus want a math or statistics course to impart to their majors. Some of our courses are meant to treat applications of interest to other departments---Math 120, Math 123, and Stat 235, for example.

Dr. Boeckner will determine a way to best obtain input from direct and indirect client departments. That input will be shared with the department. Specific ideas-e.g. for new courses-will be assigned to the committees of his choice for review. The timeline will be completion during AY 2022-2024, the responsible person Dr. Boeckner. Success will be measured by sharing the input with the department and following up on the examination of any suggested changes.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," "a curriculum that provides solid grounding for students in the liberal arts and sciences while also enabling them to specialize and prepare for careers," and "renewing curriculum, pedagogy, and activities with advice from internal and external constituencies."

## BP 6

The recommendation is to "apply lessons learned from the CAS Math Specialist program to improve success rates" in other introductory, and perhaps major, courses.

## Response to BP 6

Dr. Boeckner will meet with Dr. Sorensen, who is the head of the Math Specialist program. They will discuss her approaches and results with the students who come to her program. After this,

1. Dr. Sorensen and Dr. Boeckner will meet at least twice a semester so that Dr. Sorensen can keep Dr. Boeckner updated.
2. Dr. Sorensen will create a definitive procedure by which faculty members can refer a student to her. Right now, she is only meeting with students who are retaking a course. She will discuss this procedure with Dr. Boeckner and they will communicate it to faculty.
3. Dr. Sorensen will inform the faculty, to the extent possible regarding student privacy, about how the program went, its bright spots, during the previous semester. This can be done at a department meeting or with another format.
4. The department as a whole or a committee will review lessons learned and to what extent they might apply to other courses, although this will ultimately include action in BP 8.

The timeline for item 1 will be that the first two meetings will be held in F2022. The timeline for item 2 will be completion by the end of F2022. The timeline for item 3 will be completion by the end of the six weeks of a semester, starting F2022. The timeline for item 4 will be completion by the end of AY 2022-
2023. The responsible people will be Dr. Boeckner and Dr. Sorensen. Success will be measured by accomplishing the above.

The responses relate to Item 4 in the department's R\&R plan, "Focus on increasing general studies credit hour production," especially the points

- Determine if there is a new general studies math course that we could offer that would draw students back to campus from community colleges/dual credit and still meet most program requirements across campus.
- Examine trends in the data on student credit loss and see the distribution of loss attributed to dual credit, transfer in with credit, here and go elsewhere for credit
- Look at data about success rates for GS math freshman/sophomore year vs Jr. /Sr. year and look at distribution to advisors across campus.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," "recruiting, challenging, nurturing, and retaining a diverse student body," and "student services that foster academic success, involvement in campus life, and progress toward graduation."

## BP 7

The recommendation is to "Revisit the department's goals sometime before the next APR," as elaborated.

## Response to BP 7

Dr. Boeckner will assign a committee or committees of his choice, or possibly other subsets of the department, to look at the goals, make suggestions and present to the faculty. This item should be done by the end of AY 2025-2026. Dr. Boeckner is the responsible person and success will be measured by a final decision as to what, if any, changes should be made to the goals.

The response relates to the statements in the UNK Strategic Plan: " a curriculum that provides solid grounding for students in the liberal arts and sciences while also enabling them to specialize and prepare for careers," and "Provide appropriate and reasonable support for faculty to pursue a meaningful agenda of scholarly activity; one of professional satisfaction and distinct benefit to students and society." Others may apply as the goals are revisited.

## BP 8

The recommendation is to " Expand the CAS Math Specialist program so it can serve more students."

## Response to BP 8

After the items in BP 6 have been completed, in particular Item 4, Dr. Boeckner and Dr. Sorensen will make a preliminary plan speaking to the expansion of the CAS Math Specialist. The plan will identify possible funding sources including any departmental funding contributions. They will identify courses that would be prioritized for inclusion in the program, and conditions that students could satisfy to be taken into the program. Right now, students are taken into the program if they are taking a course for at least the second time. It might be possible to identify students during the first month they are taking courses as being in need of a specialist, and refer them at that point. The preliminary plan will be
presented to the department for approval or modification. After that, Dr. Boeckner will seek funding and approval for a hire.

The task will be completed by the end of AY 2023-2024. The responsible people will be Dr. Boeckner and Dr. Sorensen. Success will be measured by accomplishing the above.

The responses relate to Item 4 in the department's R\&R plan, "Focus on increasing general studies credit hour production," especially the points

- Determine if there is a new general studies math course that we could offer that would draw students back to campus from community colleges/dual credit and still meet most program requirements across campus.
- Examine trends in the data on student credit loss and see the distribution of loss attributed to dual credit, transfer in with credit, here and go elsewhere for credit
- Look at data about success rates for GS math freshman/sophomore year vs Jr. /Sr. year and look at distribution to advisors across campus.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," "recruiting, challenging, nurturing, and retaining a diverse student body," and "student services that foster academic success, involvement in campus life, and progress toward graduation."

## BP 9

The recommendation is to "Hire a new faculty member in statistics or probability."

## Response to BP 9

The rationale has been given in the SSD and the APRT report. Dr. Boeckner will ask a committee to draw up an advertisement which will serve as a starting point for faculty discussion. If the department votes to proceed with this or a modified advertisement, Dr. Boeckner will request permission to hire and commence a search if approved.

This process will begin in F2023 or 2024, depending on how the other responses in this document are going. Hiring a statistician is of long-term but not immediate importance and there is already a great deal to accomplish. Dr. Boeckner will be the responsible person. Additional resources will be required. It may be that there are line positions from past years that have been unfilled.

The responses relate to the statements in the UNK Strategic Plan: "meeting citizens' educational needs," and "recruiting and mentoring qualified diverse faculty and staff."

