TO: Members of the Academic and Research Advancement Committee
of the Board of Visitors

Toykea S. Jones, Chair
Kay A. Kemper, Vice Chair
R. Bruce Bradley (ex-officio)
P. Murry Pitts (ex-officio)
Robert A. Broermann
Brian K. Holland
E.G. (Rudy) Middleton, III
Armistead D. Williams, Jr.
Nina W. Brown *(Faculty Representative)*

FROM: Augustine O. Agho
Provost

Morris Foster
Vice President for Research

DATE: December 3, 2022

The purpose of this memorandum is to provide you with background information for our meeting on Thursday, December 8, 2022. The meeting will be held in the Board Room of the Kate and John R. Broderick Dining Commons from 4:00-5:30 p.m.

I. Approval of Minutes of the September 15, 2022, Meeting

The minutes of the September 15, 2022, meeting will be presented for approval as previously distributed.

II. Motion to go into Closed Session

III. Closed Session

The members of the Academic and Research Advancement Committee will receive information related to the items to be discussed in closed session.

IV. Reconvene in Open Session

V. FOIA Certification Motion and Roll-Call Vote on Motion

VI. Motion and Vote on Closed Session Resolutions

VII. Consent Agenda

Included in the consent agenda materials are resolutions recommending four faculty appointments, 27 administrative appointments, and five emeritus/emerita appointments

VIII. Motion and Vote on Consent Agenda Resolutions

IX. Regular Agenda

Included in the regular agenda materials are recommendations to rename the Department of Women's Studies to Women's and Gender Studies, create the School of Kinesiology and Health Science and the School of Communication Sciences and Disorders within the College of Health Sciences, approve a Bachelor of Science degree in Data Science, and approve a Master of Science degree in Applied Behavior Analysis

X. Motion and Vote on Regular Agenda Resolutions

XI. Information Items

Information items include the report from the Vice President for Research. Vice President Foster will provide an update on the Strategic Plan and present the Regional Data Science Workforce Study. John Nunnery, Associate Vice President for Research, will give a presentation on Applied Research Trends

C: President Brian O. Hemphill
Ashley Schumaker
Morris Foster
Donna Meeks

OLD DOMINION UNIVERSITY
BOARD OF VISITORS
ACADEMIC AND RESEARCH ADVANCEMENT COMMITTEE
DECEMBER 8, 2022
AGENDA

I. APPROVAL OF THE MINUTES OF SEPTEMBER 15, 2022

II. MOTION TO GO INTO CLOSED SESSION

III. CLOSED SESSION AGENDA

IV. RECONVENE IN OPEN SESSION

V. FOIA CERTIFICATION MOTION AND ROLL-CALL VOTE ON MOTION

VI. MOTION AND VOTE ON CLOSED SESSION RESOLUTIONS

VII. CONSENT AGENDA

A. Faculty Appointments (p. 4)
B. Administrative Appointments (p. 5-10)
C. Emeritus/Emerita Appointments (p. 11-15)

VIII. MOTION AND VOTE ON CONSENT AGENDA RESOLUTIONS

IX. REGULAR AGENDA

A. Approval to Change the Name of the Women's Studies Department to Women's and Gender Studies (p. 16)
B. Approval to Create the School of Kinesiology and Health Science and the School of Communication Sciences and Disorders within the College of Health Sciences (p. 17-18)
C. Proposal for a Bachelor of Science Degree in Data Science (p. 19-63)
D. Proposal for a Master of Science Degree in Applied Behavior Analysis (p. 64-90)

X. MOTION AND VOTE ON REGULAR AGENDA RESOLUTIONS

XI. INFORMATION ITEMS

A. Report from the Vice President for Research
    1. Update on Strategic Plan
    2. Presentation on the Regional Data Science Workforce Study
    3. Presentation by John Nunnery, Associate Vice President for Research, on Applied Research Trends

December 8, 2022

FACULTY APPOINTMENTS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the following faculty appointments.

Name and Rank	Salary	Effective Date	Term
Dr. Peggy Galdini Clinical Assistant Professor School of Rehabilitation Sciences	$90,000	10/25/22	10 mos

Dr. Galdini received a Doctorate in Occupational Therapy (OTD) from St. Augustine University, and an M.S. in Occupational Therapy and a B.S. in Rehabilitation Science from the University of Pittsburgh. Previously she was an Adjunct Professor in Occupational Therapy at the University of St. Augustine and a member of the OTD Advisory Committee, Strategic Planning Committee and Admissions Council at Old Dominion University. (new position)

Dr. Claudia Muratori Visiting Assistant Professor Department of Electrical and Computer Engineering	$90,000	9/25/22	10 mos

Dr. Muratori received a Ph.D. in Human Biology and Genetics and an M.S. in Molecular Biology from the University of Rome "La Sapienza" Rome, Italy. Previously she was a Research Assistant Professor in the Frank Reidy Research Center for Bioelectrics at Old Dominion University.

Ms. Nisha Polawar Lecturer Department of Computer Science	$58,000	12/25/22	10 mos

Ms. Polawar received a Masters in Information Systems and a Bachelors in Computer Applications from Kakatiya University, India. Previously she was an Assistant Professor in the Computer Science Department at Nalanda College, India. (new position)

Dr. Michelle Thompson Assistant Professor School of Rehabilitation Sciences Tenure Track	$100,000	12/25/22	10 mos

Dr. Thompson received a Ph.D. in Special Education Disability Policy and an M.S. in Occupational Therapy from Virginia Commonwealth University and a B.A. in Spanish Literature from Indiana University. Previously she was the Lead Occupational Therapist and Assistive Technology Specialist at Richmond Public Schools. (new position)

December 8, 2022

ADMINISTRATIVE FACULTY APPOINTMENTS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the following administrative faculty appointments.

Name and Rank	Salary	Effective Date	Term
Dina Anderson Instructor of Early Care and Education and Assistant Instructor	$39,900	9/28/2022	12 mos

Ms. Anderson received a Bachelor of Arts in Communications from Stockton State College. Previously, she worked as a Teaching Assistant with the Chesapeake Montessori School.

Amanda Barrett Professional Counselor, Counseling Services and Instructor	$65,000	9/10/2022	12 mos

Ms. Barrett received a Master of Science in Mental Health Counseling from Longwood University and a Bachelor's degree in Psychology. Previously she worked as a Staff Counselor with Christopher Newport University.

SheAyre Bowles Coordinator, Sport and Youth Programs and Instructor	$42,000	11/10/2022	12 mos

Ms. Bowles received a Master's in Sports Management from Old Dominion University and a Bachelor's degree in Sports Management. She previously worked as a Group Sales Coordinator with the Norfolk Tides Baseball Club and was a Sports Clubs Graduate Assistant with Old Dominion University.

Katelyn Canady Outreach and Public Services Librarian/Archivist	$60,000	1/25/2023	12 mos

Ms. Canady received a Master of Library and Information Science from Simmons College and a Bachelor of Arts in History from Old Dominion University. Previously she was the Evening Reference Training and Technology Specialist at the Old Dominion University Perry Library.

Ron Chen Director of Athletic Marketing and Social Media and Assistant Instructor	$42,500	9/10/2022	12 mos

Mr. Chen received a B.A. in Sports Management from the University of Michigan Ann Arbor. He worked as a Social Media Assistant for the Detroit Tigers and also worked at the University of Michigan as the Head Social Media & Marketing Intern for football. (new position)

Richard Clark Executive Director of Housing & Residence Life and Instructor	$120,000	11/25/2022	12 mos

Mr. Clark received a Master of Business Administration in Business Management and Strategic Planning from the University of Illinois at Chicago, a Master of Arts in College Student Personnel from Eastern Michigan University and a Bachelor's degree in Speech Communications. Previously he served as the Interim Associate Vice President for Student Life at the University of Nevada Las Vegas. (new position)

Emma Gargan-Wark Professional Counselor, Counseling Services and Instructor	$60,000	10/25/2022	12 mos

Ms. Gargan-Wark received a Master's in Social Work from the University of Kentucky and a Bachelor of Social Work from the University of North Carolina Wilmington. Previously she worked as a Community Based Clinical Services Counselor for Tidewater Youth Services Commission. (new position)

Mallory Griest Assistant Director for Residence Education and Instructor	$54,000	10/25/2022	12 mos

Ms. Griest received a Master's in Counseling from Shippensburg University and a Bachelor's degree in Psychology from Messiah College. Previously she served as a Residence Hall Director with Old Dominion University.

Hannah Leopold Assistant Director, Undergraduate Admissions and Instructor	$51,000	11/10/2022	12 mos

Ms. Leopold received a Master of Education in Counselor Education from Virginia Commonwealth University and a Bachelor's degree in Early & Elementary Education. Previously, she worked as a Residence Hall Director in Housing and Residence Life at Old Dominion University.

David Hunt Director of Digital Marketing, Division of Digital Learning and Assistant Instructor	$120,000	10/3/2022	12 mos

Mr. Hunt received a Bachelor of Liberal Studies from the University of Wisconsin-Oshkosh. Previously he served as the Director of Strategic Digital Marketing and Communication at Miami University, Graphic Design Manager and Marketing/PR Strategist at Wake Forest University, Director of Communications for Alumni Relations at Virginia Tech, and Graphic Designer at Lawrence University. (new position)

Alisha Melton Student Success Advisor, Advising Administration and Academic Partnerships and Instructor	$48,510	11/10/2022	12 mos

Alisha Melton earned a Master of Arts and a graduate certificate in Student Affairs in Higher Education from East Carolina University and an undergraduate degree in Social Science from Chowan University. Previously she worked as an Academic Advisor at Tidewater Community College.

Tyler Miller-Gordon Senior Research Associate for Assessment and Instructor	$65,181	10/25/2022	12 mos

Mr. Miller-Gordon received a B.A. in Philosophy and a B.A. in French from Youngstown State University and an M.S.Ed. in Educational Leadership from Old Dominion University. Previously, he worked as a Senior Research Associate for Assessment and an Assessment and Data Assistant at Old Dominion University.

Samantha Palmucci Associate Director of Assessment and Instructor	$75,000	10/25/2022	12 mos

Ms. Palmucci received a Master of Science in Education in Educational Leadership in Higher Education from Old Dominion University and a Bachelor's degree in Communication. Previously, she worked as a Retention Coordinator in the Dean of Students Office at Old Dominion University.

Alysa Patti Professional Counselor, Counseling Services and Instructor	$60,000	10/25/2022	12 mos

Ms. Patti received a Master of Education in Clinical Mental Health Counseling from The College of William and Mary and a Bachelor of Science in Psychology from Christopher Newport University. She previously worked as Resident in Counseling at White Cloud Therapeutic

Services and as a Graduate Intern at The Arbor Behavioral Healthcare and The Flanagan Counselor Education Clinic.

Angela Pezzella Residence Hall Director and Instructor	$38,500	10/10/2022	12 mos

Ms. Pezzella received a B.S. in Psychology from the College of William and Mary, an M.A. and Ed.S. in Clinical Mental Health Counseling from James Madison University and is currently completing a Ph.D. in Counseling and Human Development at George Washington University. Previously, she worked as a Graduate Research Assistant at George Washington University and a Graduate Assistant in Website and Marketing at James Madison University.

Alexis Porterfield Athletic Trainer and Instructor	$38,500	10/10/2022	12 mos

Ms. Porterfield received a Master of Athletic Training and a Bachelor of Science in Applied Science from Youngstown State University. Previously, she worked as Athletic Trainer at Morgan State and Youngstown State University. (new position)

Paul Posener Director of Administrative Services, Housing and Residence Life and Instructor	$90,000	12/10/2022	12 mos

Mr. Posener received a Bachelor of Arts in Political Science from the State University of New York College at Fredonia and a Master of Science in Student Personnel Administration from the State University of New York College at Buffalo. Previously he was Director of the Office of Housing and Residence Life at the University of North Carolina, Pembroke.

Jaira Rahman-Bowman Admissions Counselor and Assistant Instructor	$41,350	11/10/2022	12 mos

Ms. Rahman-Bowman received a Master of Science in Education and a Bachelor of Science in Human Services from Old Dominion University. She previously worked as a Student Accounts Outreach Specialist in the Office of Finance at Old Dominion University.

JoAnna Reihner Assistant Director of Fitness and Wellness	$52,300	10/22/2022	12 mos

Ms. Reihner received an M.A. in Wellness and Lifestyle Management from Rowan University and a B.S. in Health Behavior Science from the University of Delaware. Previously she was a Site Director (Fit360) for OneLife Fitness, Head Trainer for RockBox Fitness, Fitness and Wellness Coordinator for Pennsylvania State University, and Fitness Coordinator for the University of Delaware Recreation.

Jennifer Renne Digital Shipbuilding Curriculum Coordinator, Office of Research and Instructor	$80,000	10/10/2022	12 mos

Ms. Renne received a B.S. in Technology Education from the State University of New York at Oswego and an M.A.Ed. in Integrative STEM Education from Virginia Tech. Previously she worked as a Technology Education teacher at Landstown High School Governor's STEM Academy and as a Technology Education teacher at Staunton High School.

Tahj Scott Athletic Academic Advisor and Instructor	$45,202	9/25/2022	12 mos

Mr. Scott received a Master of Business Administration from St. Andrews University and a Bachelor of Science in Psychology. Previously, he worked as Director of Athletic Academic Support/Life Skills at Hampton University.

Raychel Smithson Transfer Success Coordinator, Advising Administration and Academic Partnerships and Instructor	$49,641	9/10/2022	12 mos

Ms. Smithson received a Master of Arts in Human Services Counseling from Regent University and a Bachelor's degree in Human Services/English. Previously, she worked as an Academic Advisor with Tidewater Community College.

Tammy Speer Director, ODU Primary Care Clinic, School of Nursing and Assistant Professor	$125,000	9/10/2022	12 mos

Dr. Speer received a Bachelor of Science in Nursing from Virginia Commonwealth University, a Master of Science in Nursing from Duquesne University and a Doctor of Nursing Practice from the University of Alabama. Previously she was a Family Nurse Practitioner at Atlantic Shores Wellness and Director of Quality Improvement for CHKD Pediatric Urgent Care. She has served in the capacity of Family Nurse Practitioner, Manager of Quality Outcomes, Clinical Supervisor, and as a Registered Nurse.

Ivonee Thompson Professional Counselor, Counseling Services and Instructor	$60,000	10/25/2022	12 mos

Ms. Thompson received a Master of Arts in Clinical Mental Health Counseling from Regent University and a Bachelor of Science in Psychology from Radford University. Previously she worked as an Intern Counselor at Kempsville Center for Behavioral Health.

Tre'elle Tolbert Content Strategist, Division of Digital Learning and Instructor	$80,000	10/10/2022	12 mos

Ms. Tolbert received a Master's degree in Communications from Arizona State University and a Bachelor's degree in Clinical Psychology from Regent University. Previously, she was a Digital Marketing and Brand Strategist for TAG IT BRAND IT and worked in Interior Communications for the United States Navy.

Olivia Trumino Research Compliance Coordinator, Office of Research and Instructor	$58,000	9/19/2022	12 mos

Ms. Trumino received an M.S. in Exercise Science from the State University of New York (SUNY) College at Courtland and a Bachelor's degree in Exercise Science. She has held research program coordinator positions at SUNY Courtland and Johns Hopkins University and has been an Assistant Program Manager of the EVMS Wellness Centers.

Dongli Zhang Instructional Designer, Division of Digital Learning and Instructor	$71,500	9/10/2022	12 mos

Ms. Zhang received a Master of Science in Instructional Design and Technology and a Master of Arts in English from Emporia State University and a Bachelor of Arts in English from Wuhan Institute of Technology. Previously she was an Instructional Designer at Illinois State University and an Instructional Design Specialist at the University of Wisconsin-Madison.

December 8, 2022

EMERITUS/EMERITA APPOINTMENTS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves the title of emeritus/emerita for the following faculty members and administrators. A summary of their accomplishments is included.

Name and Rank	Effective Date
Jane H. Dané Associate Vice President Emerita for Enrollment Management	February 1, 2023
Kenneth Mopper Eminent Scholar Emeritus and Professor Emeritus of Chemistry and Biochemistry	January 1, 2023
Lytton J. Musselman Eminent Scholar Emeritus, Professor Emeritus of Biological Sciences and Mary Payne Hogan Distinguished Professor Emeritus of Botany	January 1, 2023
Kent Sandstrom Professor Emeritus of Sociology and Criminal Justice	January 1, 2023
Michael Tamburello Associate Professor Emeritus of Rehabilitation Sciences	January 1, 2023

JANE H. DANÉ

Jane H. Dané, Associate Vice President for Enrollment Management, joined Old Dominion University in 2011. She received her bachelor's degree from the University of Delaware and a master's degree in Education from Salisbury University.

Dané was the recipient of the President John R. Broderick Diversity Champion Award in 2020, and the Outstanding Enrollment Management Professional Award in 2019 by the Enrollment Management Knowledge Community of NASPA: Student Affairs Administrators in Higher Education. She was also the recipient of the 2011 American Association of Collegiate Registrars and Admissions Officers (AACRAO) Strategic Enrollment Management Award for Excellence that recognizes outstanding achievement and visionary leadership in strategic enrollment management. In 2018, Dané served as the conference chair for the Southern Association for College Student Affairs (SACSA). Additionally, she is active in national and regional enrollment and student affairs organizations and has presented recently at AACRAO, National Association for College Admission Counseling (NACAC), Student Affairs Administrators in Higher Education (NASPA), Higher Education Users Group, National Academic Advising Association (NACADA), and SACSA.

Dané co-authored "The Impact of Study Abroad on Academic Success: An Analysis of First-Time Students Entering Old Dominion University, Virginia, 2000-2004," which was published in Frontiers: The Interdisciplinary Journal of Study Abroad, Volume XXIII-Fall 2013. Her research article, "Keeping Our Options Open: Evaluating the Impact of a Pilot Test-Optional Admission Policy" was also published and presented at the American Education Research Association (AERA).

During her tenure, Dané's leadership has transformed enrollment management within the Division of Student Engagement and Enrollment Services at ODU. Her infusion of comprehensive, data-informed practices has consistently produced positive outcomes, contributing to the University's enrollment complexity. Beyond the work she's accomplished within enrollment, Jane has also served in many leadership positions that have impacted major decisions of the University, including her work leading Strategic Planning teams on three separate occasions.

A strong advocate for ODU Online, Dané has served on the Authority Board for the Online Virginia Network (OVN), which promotes degree completion for non-traditional students who have some college and no degree. She has also served as the Director of Old Dominion University's National Center for Social Mobility and worked to raise awareness among national peers about the value of supporting students and their successes, particularly those who are first-generation and low-income who may encounter greater challenges.

KENNETH MOPPER

Kenneth Mopper received a BA in Chemistry from the City University of New York at Queens, an MS in Chemistry from the Massachusetts Institute of Technology, and a PhD jointly from the Massachusetts Institute of Technology and the Woods Hole Oceanographic Institute (the MIT-WHOI Joint Program). He left Washington State University to join the Department of Chemistry and Biochemistry at Old Dominion University in 2001 as a full professor and was appointed as an Eminent Scholar in 2020. In recognition for his accomplishments, Mopper was elected as a Fellow of the American Geophysical Union in 2013 and a Sustaining Fellow to the Association for the Sciences of Limnology and Oceanography in 2019. He also won the 32nd Faculty Research Achievement Award from ODU in 2016.

While at ODU, Mopper has served as the advisor for nine PhD and two MS students. He was awarded visiting professorships and fellowships by the Chinese Academy of Sciences, the University of Oldenburg, and ETH Zurich and was appointed as an associate member of the Scientific Committee on Ocean Research in 2013.

Mopper's research focused on the composition and origin of dissolved organic matter in natural waters and the impact of photochemical processes on global carbon cycling.
He was consistently ranked in the top ten most highly cited researchers at ODU. He has published over 110 publications, 38 at ODU, which have garnered over 22,000 citations. In addition, Mopper was awarded over $3 million in external funding, primarily from the National Science Foundation, for a lifetime record of $8.5 million, and he presented his work in numerous conferences and colloquia worldwide.

LYTTON JOHN MUSSELMAN

Lytton John Musselman received a BA from Beloit College, an MS from the University of Wisconsin-Milwaukee, and a PhD from the University of North Carolina-Chapel Hill. In 1973 he joined ODU as an Assistant Professor of Biology, was designated an Eminent Scholar in 1993, and appointed the Mary Payne Hogan Professor of Botany in 1999. He established the Blackwater Ecologic Preserve near Zuni, Virginia in 1985 and served as Manager of the Preserve. Musselman also served as Department Chair from 2002-2008.

Musselman is the recipient of four Fulbright Awards (Sudan, West Bank, Jordan, Brunei Darussalam) and served as host to three Fulbright Scholars (Nigeria, Bahrain, Sri Lanka). He has also been a Visiting Professor at the American University of Beirut, the American University of Iraq-Suleimani, and a Visiting Scientist at the U. S. Forest Service Southern Research Laboratory, Weed Research Organization (Oxford), Royal Botanic Garden Edinburgh, Royal Society for the Conservation of Nature (Jordan), and Nature Iraq (Iraq). Among his funding sources are the National Science Foundation, National Geographic Society, USAID, and the U. S. Department of Agriculture.

Musselman's publications include 200 journal articles, numerous popular articles, 12 edited volumes and nine books. His most recent books are *Edible Wild Plants of the Carolinas: A Forager's Companion* (with P. Schafran) 2021, *Solomon Described Plants: A Botanical Guide to Plant Life in the Bible* 2022, and *Parasitic Plants in African Agriculture* (with J. Rodenburg). He is co-founder and currently co-editor of *Haustorium, The Newsletter of the International Parasitic Plants Society*, currently editor of Chinquapin, *The Newsletter of the Southern Appalachian Botanical Society*, and former editor of the botanical journal *Castanea*.

Among Musselman's awards are the ODU Outstanding Researcher Award, Meritorious Teaching Award from the Association of Southeastern Biologists, inaugural Fellow of the International Parasitic Plant Society, Elizabeth Bartholomew Award from the Southern Appalachian Botanical Society, and the True Longleaf Champion Award by the Longleaf Alliance. He sponsored and participated in regional national, and international meetings often

with his undergraduate and graduate students and had numerous consultancies for parasitic plants and plants of the Bible and Qur'an.

During his fifty years at ODU, Musselman taught mainly field courses, taking advantage of the mosaic of plant communities in Southeastern Virginia. Approximately 35 MS students were trained under him as well as seven PhD students, one of whom received a student Fulbright for Namibia.

KENT SANDSTROM

Kent Sandstrom, Professor of Sociology, joined ODU as Dean of the College of Arts & Letters in 2017 and joined the Department of Sociology and Criminal Justice in 2021. He has served in a variety of leadership and administrative roles over the course of his 30-year academic career at ODU, North Dakota State University, the Midwest Sociological Society, and the University of Northern Iowa. Sandstrom has received numerous awards for his contributions as a leader, teacher, and scholar including the Outstanding Service Award from ODU's College of Arts and Letters. While serving as dean at ODU, he played a central role in establishing the F. Ludwig Diehn School of Music. Sandstrom also oversaw and facilitated significant increases in college enrollments, fundraising, alumni engagement, sponsored research, scholarly productivity, the number of women and people of color serving in leadership roles, and the implementation of a variety of diversity initiatives.

Sandstrom has maintained an active record of scholarship throughout his career. He is the author of six books and more than 40 other publications; his work has been published in flagship journals, multiple languages, and been among the top-selling anthologies. Overall, Sandstrom's publications have made notable contributions to social theory as well as to qualitative methodology, social psychology, the sociology of deviance, and the sociology of health and illness. His ethnographic analyses have provided an incisive chronicle of the biographical disruptions and identity dilemmas encountered by persons living with HIV disease and, more generally, by chronically ill people. Sandstrom's analyses have also revealed how seriously ill people reconstruct their identities, interactions, and goals for self as they come to terms with the changes that emerge in their bodies, routines, and intimate relationships, pushing sociologists to focus greater attention on the final stages of chronic illness and its implications for self-conception and identity work.

Sandstrom has a deep commitment to teaching, and he uses a variety of innovative pedagogical strategies to engage his students in the classroom and move students beyond narrow preoccupation with the contents of a specific topic, theory, or class. Instead, he has stressed the process of learning and the ethical challenges and responsibilities that accompany the gathering of knowledge.

MICHAEL TAMBURELLO

Michael Tamburello received his PhD in Sports Medicine from the University of Virginia, an MS in Orthopedic & Sports Physical Therapy from the Medical College of Virginia/VCU, and a BS in

Physical Therapy from the University of Florida. He is both a physical therapist and an athletic trainer, having been a certified by the American Board of Physical Therapy Specialists as a Sports Physical Therapist and Electrophysiologic Specialist. He is also certified by the National Strength and Conditioning Association as a Strength and Conditioning Specialist and is a Certified Athletic Trainer in Virginia.

Tamburello has been an integral member of the Physical Therapy program at Old Dominion for nearly 30 years, serving as an adjunct faculty member from 1993-1998 and then joining the faculty full-time as an Associate Professor in 1999. More recently, he has served as the Graduate Program Director of the Doctor of Physical Therapy program, successfully guiding the program back to full accreditation status. Previously, Tamburello served in the US Navy as the Director of Physical Therapy and consultant to the US Navy SEAL teams at Naval Medical Center Portsmouth. He retired from the US Navy as a Captain in 1999. He has also served as an adjunct faculty member for the University of St. Augustine (1997-2004), Rocky Mountain University for the Health Professions (1992-2001), and Medical College of Virginia/VCU (1983-1986).

Tamburello is widely regarded within the College as an exceptional and inspiring teacher within the Doctor of Physical Therapy program. His teaching accomplishments include being awarded the Excellence in Teaching Award by the American Academy of Sports Physical Therapy in 2019 and the College of Health Sciences Excellence in Teaching Award in 2003 and 2015. He was also awarded the Lindsay Rettie Best Faculty Research award. Since joining ODU, he has 30 presentations, both platform and poster, 23 of them peer-reviewed, at local, state, and professional association conferences in the areas of electrophysiologic testing, sports medicine, and sports injuries.

December 8, 2022

APPROVAL TO RENAME THE DEPARTMENT OF WOMEN'S STUDIES THE DEPARTMENT OF WOMEN'S AND GENDER STUDIES

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves renaming the Department of Women's Studies the Department of Women's and Gender Studies effective July 1, 2023.

Rationale: The addition of Gender Studies to the department's name will more accurately reflect the range of research areas of the department's faculty members, as well as the department's course offerings. The department courses include Gender Studies, but this aspect of the undergraduate and graduate programs is not visible under the department's current name. The name change will allow the department to attract more students and faculty who are interested in working in Gender Studies, but who may not be aware that this work is part of the department's active research and teaching agendas.

The proposed name also reflects the wider work that is currently occurring in the disciplinary field. As Women's Studies has developed to encompass analyses of femininities and masculinities, many departments across the United States and Canada have shifted to the name "Women's and Gender Studies." The name "Women's Studies" has become uncommon. In this sense, the proposed name brings the department into alignment with the disciplinary norms now shaping the field.

December 8, 2022

APPROVAL TO CREATE THE SCHOOL OF KINESIOLOGY AND HEALTH SCIENCE AND THE SCHOOL OF COMMUNICATION SCIENCES AND DISORDERS

RESOLVED that, upon the recommendation of the Academic and Research Advancement Committee, the Board of Visitors approves creating the School of Kinesiology and Health Science and the School of Communication Sciences and Disorders within the College of Health Sciences effective for the 2023-2024 academic year.

Rationale: The Program Prioritization Initiative (PPI) report was completed in 2022 by the Office of Academic Affairs and included actions to improve the overall viability of academic programs and the effectiveness and efficiency of key academic support areas. One of the actions included the opportunity to examine whether some academic programs would be more appropriate in other colleges. Through discussions with associated program faculty, it was determined that the following programs would migrate into the College of Health Sciences effective for the 2023-2024 academic year.

Bachelor of Science in Exercise Science
Master of Science in Exercise Science
Bachelor of Science in Speech-Language Pathology & Audiology
Master of Science in Speech-Language Pathology
Undergraduate Major in Recreation Therapy

The shifting of the programs into the College of Health Sciences allows for streamlined pathways for students interested in health-related disciplines. Additionally, the College will be better prepared to advise students and create linked programs, which will decrease overall time to degree completion and serve as a mechanism to keep the best and brightest at the University.

As part of that migration, several faculty forums and meetings have taken place to determine the best fit for these programs within the College of Health Sciences. Faculty were able to vote for their preferred structural model, and the College of Health Sciences Dean's Office used this information to formulate the final model consisting of the development of two new Schools.

School of Communication Sciences and Disorders
School of Kinesiology and Health Science

The School of Communication Sciences and Disorders will consist of faculty from

Speech-Language Pathology, and the School of Kinesiology and Health Science will consist of faculty associated with exercise science related disciplines. The formation of these individual Schools with the associated names will allow for future growth with additional programmatic areas, such as nutrition, physiology, and audiology. Each School will contain the requisite faculty to align with the College's institutional processes for tenure and promotion. Budgets for each of the Schools will be reallocated from existing resources in the Darden College of Education and Professional Studies (College in which the programs were previously aligned).

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
Program Proposal Cover Sheet

1. Institution Old Dominion University	2. Academic Program (Check one): New program proposal ☒ Certificate document ☐
3. Name of proposed program Data Science	4. CIP code 30.7001
5. Degree/certificate designation Bachelor of Science	6. Semester and year of initiation Fall 2023
7. Semester and year of first graduates Fall 2024	8. Date approved by Board of Visitors
9. For community colleges: date approved by local board date approved by State Board for Community Colleges	
10. If collaborative or joint program, identify collaborating institution(s) and attach letter(s) of intent/support from corresponding chief academic officers(s)	
11. Location of program within institution (complete for every level, as appropriate and specify the unit from the choices). Department(s) or division of _____ School(s) or college(s) of ?? _____ Campus(es) or off-campus site(s) _____	
12. Mode(s) of delivery: Face-to-face, traditional ☒ Hybrid (both face-to-face and distance) ☐ Distance (100% web-based) ☐	
13. Name, title, and telephone number(s) of person(s) other than the institution's chief academic officer who may be contacted by or may be expected to contact Council staff regarding the modified program. Sierra Croker, Academic Program Development Coordinator and SCHEV Liaison, 757-683-3154 or scroker@odu.edu	

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Description of Proposed Program

Program Background

Old Dominion University (ODU) in Norfolk, Virginia seeks approval for Bachelor of Science (BS) degree in Data Science. The proposed program will reside in ODU's new School of Data Science. The target date of the proposed program's initiation is Fall 2023.

The purpose of the BS in Data Science program is to provide students foundational knowledge in the core competency areas of data science. The proposed program will provide skills in computer science, mathematics and statistics, and data analytics. Students will learn to use data for identifying trends and patterns, solving problems, communicating results, and recommending solutions. Additionally, it will provide opportunities for students to practice these skills across application areas from different domains. The program will provide project-based learning and students will discover how to use data to solve real-world problems. Graduates will be knowledgeable and skilled at developing statistical models to detect trends and lead teams in organizing, managing, and modeling data. The program will prepare graduates to work in public or private settings that require data-driven solutions to gain insights, make decisions, and communicate solutions.

The proposed BS in Data Science will offer three concentrations initially. The concentrations will prepare students to focus on different aspects of data science and gain deeper knowledge in these sub-areas. Students who choose the artificial intelligence and machine learning concentration will take courses that address topics such as object-oriented programming, algorithms and data structures, and information retrieval. Students will learn computational data analysis and natural language processing. Graduates who choose this concentration will be prepared to enter rapidly emerging science and statistical fields. Students who choose the visualization concentration will take courses in data visualization, data structures**,** and computer graphics. Students will gain skills for data modeling, simulation, and rendering results. Graduates of this concentration will be prepared to select and apply appropriate techniques for data visualization to support analyses from different domains. Finally, students who choose the geospatial analysis concentration will take courses in geographic information systems, spatial analysis, and remote sensing. The concentration provides the skills for spatial predictive modeling, geostatistics, and object detection. Graduates from this concentration will be prepared to uncover spatial patterns to enhance cartography analytics and communications.

The increased amount of available data has escalated the demand for data science professionals. As data science continues to grow, more and more colleges and universities are working to equip undergraduate and graduate students with the skills that will be required to perform data science-related tasks in a variety of industries and positions. "Higher education needs to be nimble and responsive, and its bachelor's, graduate, certificate, and executive-level programs have to be responsive to workforce needs". [1]

Organizations seek to take advantage of the vast amount of data they collect day in and day out.

[1] Burning Glass Technologies. ·'The Quant Crunch. How The Demand for Data Science Skills Is Disrupting the Job Market." https://www.burning-glass.com/wp-content/uploads/The Quant Crunch.pdf pg. 3

"They want to use that data to make more insightful, forward-looking decisions: This requires a new generation of advanced analytics, high-level diagnostic and predictive, and the employees who have the skill sets to use them."[2] Virginia houses the third-largest tech industry workforce in the nation, and the need for qualified data science professionals is considerable. "The Commonwealth currently has one of the highest concentrations of data scientist and mathematical science employment, according to 2020 research".[3]

The proposed BS degree program in Data Science will help provide the next generation of data scientists. Graduates of this program will have the skills to lead data-driven activities and manage data science resources supporting a range of applications. This program will meet workforce needs by providing students with the skills necessary for the data focused roles as scientists and analysts. Students educated in computational and statistical data science techniques have the potential to become future leaders in data-centric industry, government, and academia careers. ODU is fully committed to offering the proposed degree program to ensure professionals are prepared and trained to meet industry needs.

Institutional Mission

The mission statement of Old Dominion University is: "Old Dominion University, located in the City of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a dynamic public research institution that serves its students and enriches the Commonwealth of Virginia, the nation, and the world through rigorous academic programs, strategic partnerships, and active civic engagement."

The proposed BS in Data Science supports ODU's mission by providing a rigorous academic program in data science that will supply qualified graduates to regional and national industry partners to enrich Virginia's workforce and address the growing need for data science professionals. As part of ODU's strategic plan (2014-2019), the university committed investments in data science to support ODU's reputation for research excellence by putting forward a data science initiative.[4] Additionally, the Colleges of Sciences, Engineering, and Business have all built capability in data analytics and data-intensive research.

Admission Criteria

Students applying to the BS program in Data Science should meet the minimum university admission requirements for Undergraduate Admission. Because the curriculum requires a number of computer science and mathematics courses, it is highly recommended that prospective students feel confident in their high school math and science skills. Required criteria for freshman applicants include:

- A completed online application and associated application fee
- Official High School Transcript (or GED Transcript)
- SAT/ACT Scores, Self-reported Scores, or Test Optional

[2] Jachimski, S. & Delurey, M. (2019). Predictive Analytics Handbook for National Defense, Booz Allen Hamilton
[3] https://issuu.com/vedpvirginia/docs/vedp_q421_issuu/62
[4] https://www.odu.edu/about/planning/strategic-plan-14-19

- Optional Items: Activity Resume, Letter(s) of Recommendation and/or Personal Statement

Applications will be evaluated for both fall and spring admission. Students must have a 3.3 or higher GPA to get the minimal merit scholarship. For students who chose to test, the average SAT is 1000-1210 (reading and math only) and average ACT is 19-26.

Curriculum

The proposed BS in Data Science will require 120 credit hours to complete the degree. Along with the core coursework, the curriculum includes three concentrations: artificial intelligence and machine learning, visualization, and geographic information systems. It also includes the general education requirements and undesignated electives. The program requires a capstone course for graduation.

The focus of the curriculum is on the foundational data science areas of statistics, computer science, and information technology. Students will learn programming to develop statistical models and how to use data for identifying trends and patterns, communicating results, and recommending optimal solutions. Through the core curriculum, students will gain knowledge about using data in various ways to solve problems.

Students will choose a concentration area to gain knowledge, skills, and abilities that are more specific to an interest area. Coursework for the artificial intelligence and machine learning concentration focuses on topics such as object-oriented programming, algorithms and data structures, and information retrieval. Coursework for the visualization concentration focuses on data visualization, data structures, computer graphics and visual design. Coursework for the geospatial analysis concentration focuses on geographic information systems, spatial analysis, and remote sensing.

Students will be exposed to various application domains through problem-based learning that uses data to solve real-world problems. Students will have opportunities to participate in faculty lead research and industry internships. The capstone project will provide an opportunity for students to synthesize knowledge from their coursework and apply it to solve real-world data analytics problems.

New courses are denoted with an asterisk.

Program Requirements

General Education Requirements (38 credit hours)

Written Communication (6 cr)
Oral Communication (3 cr)
Mathematics (MATH 162M required) (3 cr)
Language and Culture (Anticipated met through High School credits, otherwise 6 credits)
Information Literacy and Research (3 cr)

Human Creativity (3 cr)
Interpreting the Past (3 cr)
Literature (3 cr)
Philosophy and Ethics (3 cr)
Impact of Technology (0 cr – met through BDA 200T)
The Nature of Science (8 cr)
Human Behavior (3 cr)

Prerequisite Core Courses (14 credit hours)

MATH 163. Precalculus II (3 cr)
STAT 130M. Elementary Statistics (3 cr)
CS 150. Problem Solving and Programming I (4 cr)
CS 250. Problem Solving and Programming II (4 cr)

Core Courses (27 credit hours)

*DASC 150 Data Science, Technology, and Society (3 cr)
BDA 200T Elements of Data (3 cr)
*DASC 300. Foundations of Data Science (3 cr)
*DASC/PHIL 357 Ethics and Data (3 cr)
STAT 310. Introduction to Data Analysis (3 cr)
IT 360T. Principles of Information Technology (3 cr)
IT 450. Database Concepts (3 cr)
*DASC 434 Data Science Research Methods (3 cr)
*DASC 435W Capstone in Data Science (3 cr)

Elective Courses (12-14 credit hours)

Students can take the electives from any discipline at ODU and/or complete courses for other concentrations, as needed, to complete the required 120 credit hours.

Concentration Areas (27-29 credit hours):

Students pick one concentration area. Note that the typical credit total per concentration is 27, however, the visualization concentration requires 29. Each concentration area consists of math prerequisites, course prerequisites, and concentration courses.

<u>Artificial Intelligence & Machine Learning Concentration (27 credit hours)</u>
The purpose of this concentration is to provide students skills in computational data analysis, object-oriented programming, and natural language processing. Students will take courses to learn topics such as machine learning and artificial intelligence.

<u>Math Prerequisites</u>
MATH 211. Calculus I (4 cr)
MATH 212. Calculus II (4 cr)

Course Prerequisites

CS 252. Introduction to Unix for Programmers (1 cr)
CS 361. Data Structures and Algorithms (3 cr)

Concentration Courses

Pick One:

BDA 411 Introduction to Machine Learning (3 cr)
CS 422/522. Introduction to Machine Learning (3 cr)

Pick One:

CS 480/580. Introduction to Artificial Intelligence (3 cr)
MSIM 480/580. Introduction to Artificial Intelligence (3 cr)

Pick Three: *

CS 330. Object-Oriented Programming and Design (3 cr)
CS 432/532. Web Science (3 cr)
ECE 407/507. Introduction to Game Development (3 cr)
CYSE 420 Applied Machine Learning in Cybersecurity (3 cr)
ECE 450/550. Introduction to Machine Learning for Data Analytics Engineering. (3 cr)

Visualization Concentration (29 credit hours)

The purpose of this concentration is to give students skills in data modeling, simulation, and results rendering. Students who choose the visualization concentration will take courses in data visualization, data structures, and computer graphics.

Math Prerequisites

MATH 212. Calculus II (4 cr)

Course Prerequisites

BNAL 206. Business Analytics I (3 cr)
BNAL 306. Business Analytics II (3 cr)
CS 252. Introduction to Unix for Programmers (1 cr)
GAME 201T Introduction to Game Studies (3 cr)

Concentration Courses

BNAL 403/503. Data Visualization and Exploration (3 cr)
CS 361. Data Structures and Algorithms (3 cr)
ECE 406/506. Computer Graphics and Visualization (3 cr)
GAME 340. Visual Design and Digital Graphics for Games (3 cr)

Pick Two: *

ARTH 320W. History of Graphic Design (3 cr)
CRJS 344 Social Science and Crime Mapping (3 cr)
ECE 475 Transportation Data Analytics (3 cr)
ECE 407 Introduction to Game Development (3 cr)
GAME 440. Advanced Visual Design and Digital Graphics for Games (3 cr)
IT 325. Web Site and Web Page Design (3 cr)

Geographic Information Systems Concentration (27 Credit Hours)
The purpose of this concentration is to provide the skills for spatial predictive modeling, geostatistics, and space-time pattern mining and object detection. Students will take courses in courses in geographic information systems, spatial analysis, and remote sensing.

General Prerequisites

GEOG 102T. Digital Earth Geospatial Technology and Society (3 cr)

Course Prerequisites

GEOG 402/502. Geographic Information Systems (3 cr)
GEOG 404/504. Digital Techniques for Remote Sensing (3 cr)

Concentration Courses

GEOG 419/519. Spatial Analysis of Coastal Environments (3 cr)
GEOG 425/525. Internet Geographic Information Systems (3 cr)
GEOG 432/532. Advanced GIS (3 cr)
GEOG 462/562. Advanced Spatial Analysis (3 cr)
GEOG 463/563. GIS Programming (3 credit)
GEOG 473/573. GIS for Emergency Management (3 cr)

*Courses from the controlled electives list have different prerequisites. Students should consult the course description and address any questions to their advisor.

Total Credits - 120

SCHEV Baccalaureate Requirements

The BS in Data Science, with any of the concentrations, will require 120 credit hours. The program is achievable in a traditional, four-year graduation plan.

Appendix A provides a sample plan of study by year and semester for full-time students. Appendix B provides course descriptions for new and existing program courses.

Faculty Resources

The proposed BS in Data Science degree will be administrated by the newly proposed School of Data Science. The faculty teaching the courses are from the Departments of Computer Science and the Department of Mathematics and Statistics in the College of Sciences, as well as the Department of Philosophy and Religious Studies and the Department of Political Science and Geography in the College of Arts and Letters and the Department of Information Technology and Decision Sciences in the Strome College of Business. Additionally, courses will also be taught by faculty from the Electrical and Computer Engineering from the College of Engineering.

The nature of the program is interdisciplinary involving faculty from math, statistics, physics,

computer science, engineering and information technology. The faculty chosen to teach in this program are currently actively teaching and performing research in this area. ODU currently has more than 200 faculty teaching and conducting research in data science or related areas, including business, computer science, engineering, geography, mathematics and statistics, and ocean and earth sciences. This includes 22 new data science hires during the last 5 years.[5] Appendix C provides a list of the undergraduate data science curriculum committee.

Student Learning Assessment

Students who complete the proposed BS in Data Science degree will possess the appropriate knowledge, skills, and abilities needed to work in a wide variety of data science positions. Student learning will be assessed throughout the proposed program through a variety of formative and summative measures. Assessment measures include, but are not limited to assigned papers, quizzes, tests, and projects assigned during classroom instruction. Students will be evaluated on their ability to synthesize knowledge from their coursework and apply it to solve real-world data analytics programs. Additionally, students will be required to complete a capstone project. This project will require students work in teams to solve a data science/analytics problem in a real-world business, industry, or government setting using established techniques and methods within the field.

Learning Outcomes

Student learning outcomes cover many of the technical competencies that are required for the area data science. Specifically, graduates will be able to:

- Use statistics to represent data and test hypotheses
- Apply descriptive and predictive statistics to perform data analysis
- Use modern programming languages to develop data science tools
- Employ program design for computer-based algorithm development
- Identify information technology to support organizational decision making
- Demonstrate knowledge of databases and data management
- Apply data analytics to inform policy, product development, and social issues
- Demonstrate expertise in application of data science concepts to real life problem sets

Each concentration area provides additional learning experiences to support and enhance learning outcomes. The concentration areas provide more detailed employment skills as identified in the next section. The curriculum map shown in the table below provides the core coursework that supports the learning outcome and the formative (process) and summative (outcome) evaluation activities.

Curriculum map for BS in Data Science

Learning Outcomes	**Courses**	**Assessment Methods**
Use statistics to represent	STAT 130M**.** Elementary	Formative: Chapter tests,

[5] Old Dominion University: Educating Data Scientists for the Digital Future, 2021 Langley Research Center Data Science Expo, July 15, 2021. Lesley Greene, PhD, Associate Dean of Graduate Studies, College of Sciences.

data and test hypotheses	Statistics DASC 357. Ethics and Data	homework assignments, use of statistical software Summative: Final Exam
Apply descriptive and predictive statistics to perform data analysis	STAT 310**.** Introductory Data Analysis DASC 434 Data Science Research Methods	Formative: Chapter tests, weekly data analysis homework using Microsoft EXCEL, written interpretation of results Summative: Final Exam
Use modern programming languages to develop data science tools	CS 150**.** Problem Solving and Programming I	Formative: Quizzes, weekly laboratory, programming assignments and exercises Summative: Midterm Exam, Laboratory Midterm Exam, Final Exam, Laboratory Final Exam
Employ program design for computer-based algorithm development	CS 250**.** Problem Solving and Programming II**.**	Formative: Laboratory work including ungraded activities that introduce techniques, Assignments that include graded activities that practice programming Summative: Midterm Exam, Final Exam, Final Project that applies the techniques of design, coding, testing, and debugging
Identify information technology to support organizational decision making	IT 360T. Principles of Information Technology. BDA 200T Elements of Data	Formative: Class exercises, discussions, presentations, homework, ethics assignment. Summative: Three Exams
Demonstrate knowledge of databases and data management	IT 450**.** Database Concepts**.** BDA 200T Elements of Data	Formative: In class discussions, homework, quizzes, exams Summative: Team project, Final Exam
Apply data analytics to inform policy, product development, and social issues	DASC 300. Foundations of Data Science. DASC 435W. Data Science Capstone Project.	Formative: Class discussions; quizzes, homework assignments, small group work Summative: Midterm Exam, Final Exam
Demonstrate expertise in application of data science concepts to real life problem sets	DASC 434 Data Science Research Methods DASC 436W. Data Science Capstone Project.	Summative: Students work individually or in groups to plan, design, and carry out a research project assessed with program level rubric

The student learning outcomes for the core program and the concentration areas were developed by reviewing the SCHEV requirements for the program and the desired skill sets based on job listings. Program faculty will maintain awareness of the learning outcomes and their relevance through professional development activities such as conference attendance, workshop training,

and keeping abreast of the professional literature.

Employment Skills

The ODU BS in Data Science degree will provide skills that graduates need to pursue careers as data-focused professionals, such as data scientists and data analysts. The proposed education program ensures they are well-qualified to transition to the workforce by meeting the requirements identified by both the Department of Defense and industry.[6] Additionally, the concentration areas ensure graduates of the program will have the skills, abilities, and workplace competencies needed for employment in a variety of domains.

All graduates of the proposed program will be able to:

- Develop and implement analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software.
- Apply data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets.
- Analyze data to identify trends or relationships among variables and to inform operational decisions or activities.
- Determine appropriate methods for data analysis and apply mathematical principles or statistical approaches to solve problems in scientific or applied fields.
- Prepare graphics or other representations of information that aids in visualizing and interpreting data findings
- Prepare analytical reports and present results to others.[7]

Additionally, graduates in each concentration will demonstrate the additional workplace competencies.

Artificial Intelligence & Machine Learning Concentration

The Machine Learning & Artificial Intelligence concentration prepares students to enter rapidly emerging fields related to big data applications. Graduates in this concentration will be able to:

- Produce software code using object-oriented programming
- Apply different learning techniques for machine learning algorithms
- Understand the concepts and challenges of artificial intelligence

Visualization Concentration

The Visualization concentration prepares students to apply modeling and simulation methods to a variety of data science visualization scenarios. Graduates in this concentration will be able to:

- Model a variety of systems from different domains
- Design appropriate software architectures for visualization in modeling and simulation
- Employ data visualization to enhance organizational decision making

Geographic Information Systems Concentration

[6] https://datascience.ucsd.edu/wp-content/uploads/2019/04/DataScience_Brochure_11APR2019_v2.pdf
[7] https://www.onetonline.org/link/summary/15-2051.00

The Geospatial Information Systems (GIS) concentration enables students to develop advanced skills and expertise in geospatial science and technology. Graduates in this concentration will be able to:

- Use GIS as a tool for manipulating spatial information
- Design spatial database structures for analytical operations
- Apply methods, standards, and policies for use of GIS on the Internet

Relation to Existing Old Dominion University Degree Programs

Current academic programs at Old Dominion University in data science and related fields are spread across numerous departments, several colleges, and the recently created School of Cybersecurity. This causes some fields of study to be difficult to locate under their present titles. This proposal advocates for the creation of an undergraduate bachelor's degree in data science that draws from applicable coursework across university programs but provides a single home for undergraduate data science students. It provides a consistent curriculum for data science students.

The Department of Information Technology & Decision Sciences in the Strome College of Business offers the Business Analytics and Intelligence major that develop skills in the use of the computer as a decision-making tool. The BS in Data Science degree leverages some of this coursework in the Visualization concentration. The proposed program does not overlap with the BSBA in Information Technology degree, also offered by this department. The Batten College of Engineering and Technology offers a Data Analytics Engineering concentration for the BS ECE and BS COME degrees. Some of these courses are optional courses in the Visualization concentration. Finally, the Department of Computer Science within the College of Sciences allows students to choose electives from a range of data science topics; these courses will be used to form the Artificial Intelligence & Machine Learning concentration. The Department of Mathematics and Statistics offers a BS Mathematics with a Big Data Analytics major. This is a math-intensive major and there is no coursework from this curriculum used in the proposed program.

The proposed BS in Data Science program will utilize the existing data science course resources currently available at ODU. However, the curriculum was purposely designed to ensure that students are prepared with the correct course prerequisites to take the available data science courses offered across departments as they progress through the program. The program provides an educational pathway starting at the freshman level for students to obtain a data science degree by identifying the appropriate math, prerequisite, core and concentration course sequences. Without this program, many students find that they cannot access data science courses, as most of these courses are at the upper undergraduate level and they are not prepared with the prerequisite courses.

The proposed BS in Data Science program is not an expansion of an existing program, and will not compromise any existing degree programs at Old Dominion University. No degree programs will close as a result of the initiation and operation of the proposed degree program.

Justification of the Proposed Program

Response to Current Needs (Specific Demand)

Data Science is a rapidly growing field of study. The magnitude of data that are being generated and stored every day is overwhelming. Data science makes it possible to uncover important information that would otherwise remain hidden.[8] With the growth of data mining techniques and the need for more data-driven decisions, more data science and analytical skills are needed in the workforce. Industry, government, health care and other organizations need graduates trained with skills to manipulate data, analyze information and determine solutions to complex problems. Nationally, in 2020 there were 2.7 million open jobs in data analysis, data science and related careers, which represents a 39% growth in employer demand for both data scientists and data engineers. Additionally, the recruitment platform Zippier ranked Virginia in 2022 as one of the top 15 locations where companies were actively looking for data scientists.[9]

The proposed BS in Data Science responds to current needs in both Virginia and the nation as a whole and prepares students to work in a variety of industries. The identified specific demand includes 1) private sector demand for trained data scientist and data analysts to address the rapidly growing sources of data; 2) Department of Defense demand to exploit data collection and analysis for predictive analytics; 3) demand specific to the Hampton Roads area, which has one of the highest needs for qualified data science professionals[10]; and 4) addressing the gap for highly trained analysts by providing a data science educated workforce.

Private Sector

Data science touches nearly every industry through the application of advanced data analytics. Among the new job opportunities for data scientists and data analysts, IBM predicts 59% of jobs will be in finance, information technology (IT), insurance and professional services careers, with 61% of data scientists and advanced analysis positions available to bachelor's degree holders.[11] Generating and maintaining a skilled talent base represents one of the key competitive advantages that enables long term success in industries that leverage applications of data science. The data science workforce consists of both subject matter experts who advance fundamental data sciences innovation and applications, as well as workers who leverage data sciences as a part of their job functions.[12]

Data science represents an increasingly important source of competitive advantage in the private sector. Businesses recognize that their internal databases provide exploitable information about their customers, markets, supply chains, and more. Likewise, increasingly robust data sources have created opportunities for firms to compete in or transform traditional markets by offering

[8] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://www.rand.org/pubs/research_reports/RR1582.html
[9] https://www.zippia.com/data-scientist-jobs/best-states/
[10] https://issuu.com/vedpvirginia/docs/vedp_q421_issuu/62
[11] IBID.
[12] TEConomy Partners, LLC., Situational Assessment Scan for Advancing Data Sciences in Hampton Roads Initial Quantitative Analysis of Demand Drivers April 2022

new products and services.[13] The ability to merge private, internally held data with external data sources has placed data science and data scientists on the front line of market competition across an ever-expanding frontier of domains. Three specific areas in which data science applications have developed are (1) improving the reliability and quality of products and services, (2) increasing organizational efficiency and agility to better respond to changes in the marketplace, and (3) anticipating new threats and opportunities based on competitive trends and risk management.[14] Predictive analytics, targeted customer engagements, and autonomous, interconnected systems can be used to improve products and processes; companies such as Google and Microsoft have used prediction markets to estimate the demand for new products and services and the completion time and release of complex software development projects. In these cases, data scientists work with data generated by market participants responding to specific statements about the future.[15]

Department of Defense

Department of Defense (DoD) organizations are utilizing high level diagnostic and predictive analytics to take full advantage of the vast amount of data they collect. They are using data to make more insightful decisions about readiness, logistics, manpower, and intelligence. Data science allows them to drill into cause and effect and determine the mathematical probability of future occurrences, rather than just looking back at data to make projections.[16] In 2013, the Defense Intelligence Agency (DIA) Directorate for Analysis initiated a program seeking to modernize defense intelligence analysis, seeking to address the big data problem from the military intelligence perspective and focusing on the inadequacy of existing personnel, tradecraft, and methodologies to manage big data analysis. Technology and the ability to gather and manipulate vast quantities of data have fundamentally altered the way that intelligence organizations collect, process, analyze, and disseminate information.[17] Data science professionals' impact defense business, operational, and mission outcomes with insights gained from analyzing large data sets. Careers in the DoD include data analysts, who extract knowledge, communicate insights, and inform decision making using visualizations; data scientists, who create methods, processes, and mathematical solutions to extract knowledge and answer questions; and data engineers, who discover ways to design, integrate, and acquire data systems, architectures, and data models. [18]

Hampton Roads Area

There is a high demand for workers with data science expertise in the Hampton Roads area of Virginia from national labs, finance, industry, health care providers, military centers, and maritime related industry. NASA Langley Research Center and the National Institute of

[13] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://www.rand.org/pubs/research_reports/RR1582.html
[14] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://www.rand.org/pubs/research_reports/RR1582.html
[15] IBID.
[16] Jachimski, S. & Delurey, M. (2019). Predictive Analytics Handbook for National Defense, Booz Allen Hamilton
[17] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://www.rand.org/pubs/research_reports/RR1582.html
[18] https://datascience.ucsd.edu/wp-content/uploads/2019/04/DataScience_Brochure_11APR2019_v2.pdf

Aeronautics are in Hampton, Virginia, and Jefferson Laboratory is located nearby in Newport News. Norfolk, where Old Dominion University is located, is home to major command centers from every branch of the military, including the largest naval base in the world, Norfolk Naval Station. The Norfolk/Virginia Beach area includes health care providers Sentara Medical Group and Eastern Virginia Medical School (EVMS). The Port of Virginia—which includes Newport News Marine Terminal, Norfolk International Terminals, Portsmouth Marine Terminal and Virginia International Gateway in Portsmouth, Virginia— is the only U.S. East Coast port with Congressional authorization of 55-ft depth channels and currently stands as the third largest container port on the East Coast. Moreover, Amazon, with its existing workforce of more than 10,000 full-time employees in the state of Virginia, is building two operations facilities in Hampton Roads, creating 1,500 additional jobs. Furthermore, Norfolk and Virginia Beach host several financial and insurance data centers.[19]

Data Science jobs grew by 10% in Hampton Roads from 2015-2021.[20] Key areas of high growth were found in cybersecurity, marine engineering, and logistics occupations. Hiring consistently outpacing separations, indicating a stable regional demand for data sciences talent over time and consistently growing workforce.[21] In Hampton Roads, federal workforce, defense, and maritime industries were by far the leading employers. However, demand was not limited to just one industry sector, but cross-cutting industry demand with over 15,552 unique postings for jobs with Data Science-related skill sets in the Hampton Roads region over the 5-year period.[22]

Providing a Data Science Educated Workforce

The consulting firm, PricewaterhouseCoopers published a report that makes a case for investing in America's data science talent.[23] A similar report published by the McKinsey Global Institute predicts that data-driven technologies will bring an additional $300 billion of value to the U.S. healthcare sector alone, and more "data-savvy managers" will be needed to capitalize on the potential of data. [24] This report goes on to warn that in spite of a strong push in the U.S. at the federal, state, and local levels for more STEM graduates, more programs are needed to educate the needed data science workforce.

To help meet Virginia's growing tech talent needs, the Commonwealth has committed $1.1 billion toward more than doubling the number of bachelor's and master's graduates in computer science, computer software engineering, and computer engineering in the next two decades. As data science continues to grow, more of Virginia's colleges and universities are needed to equip undergraduate and graduate students with the skills that will be required to perform data science-

[19] Xu, Y. et al. (2021). Collaborative Research: HDR DSC: Southeastern Virginia Data Science Education Consortium, Proposal to the national Science Foundation, NSF 21-523, Harnessing the Data Revolution.
[20] TEConomy Partners, LLC. Situational Assessment Scan for Advancing Data Sciences in Hampton Roads Initial Quantitative Analysis of Demand Drivers April 2022
[21] IBID.
[22] TEConomy analysis of job postings data from Emsi (Emsi Release 2022.1)
[23] Business-Higher Education Forum. (2017). Investing in America's data science and analytics talent. The case for action. https://www.pwc.com/us/en/publications/assets/investing-in-america-s-dsa-talent-bhef-and-
[24] McKinsey Global Institute (2011). Big data: The next frontier for innovation, competition, and productivity, https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/0ur%20lnsights/Big%20data%20The%20next%20frontier%20for%20innovation/MG1 big data exec summary.ashx, p. 10.

related tasks in a variety of industries and positions.[25]

Graduates of the proposed BS in Data Science program will be qualified to work in a variety of industries including private and public businesses, health organizations, and government agencies. The knowledge and skills learned through the curriculum will be applicable to meet organizations' needs for professionals who can develop statistical models, perform analytics on complex data and use data science and analytics to solve problems and create new strategies for success. The BS in Data Science provides students broad exposure to concepts, methods, and tools that data science professionals should be familiar with prior to entering the workforce: computer science, statistics, and data visualization.[26] ODU's program is "proactively responding to the rising demand for analytics skills with programs that prepare students for the analytics-related roles of today and tomorrow."[27]

Employment Demand

Graduates of the proposed BS in Data Science degree program will be qualified to work as data-focused professionals, such as data scientists and data analysts, along with a wide variety of related fields. Graduates will be prepared to work in a variety of domains, such as finance, health care, logistics, defense, among others. O*Net Online, the Department of Labor website that allows users access to occupational information, describes the work of Data Scientists as "develop and implement a set of techniques or analytics applications to transform raw data into meaningful information using data-oriented programming languages and visualization software." [28] They apply tools including data mining, data modeling, natural language processing, and machine learning to extract and analyze information from large structured and unstructured datasets, which they then visualize, interpret, and report data findings.

The Bureau of Labor Statistics (BLS) and the Virginia Employment Commission (VEC) do not have data or a job category for data scientists or data analysts. The closest occupations on which there are some data are operations research analysts. The BLS indicates that operations research analysts "use advanced mathematical and analytical methods to help organizations solve problems and make better decisions." Moreover, operations research analysts "use statistical analysis, simulations, predictive modeling, or other methods to analyze information and develop practical solutions to business problems ... and, advise managers and other decision makers on the effects of various courses of action to take in order to address a problem."[29] Graduates of the BS in Data Science will possess the same skill set and be able to use mathematical and analytical methods to solve problems and make decisions.

The BLS indicates that between from 2020 to 2030, employment of operations research analysts is "projected to grow 25 percent, much faster than the average for all occupations." The BLS

[25] https://issuu.com/vedpvirginia/docs/vedp_q421_issuu/62
[26] Knopp, B. et al., 2016. Defining the Roles, Responsibilities, and Functions for Data Science, The RAND Corporation https://www.rand.org/pubs/research_reports/RR1582.html
[27] Burning Glass Technologies. ·'The Quant Crunch. How The Demand for Data Science Skills Is Disrupting the Job Market." https://www.burning-glass.com/wp-content/uploads/The Quant Crunch.pdf pg. 3
[28] National Center for O*NET Development. 15-2051.00 - Data Scientists. *O*NET Online*. Retrieved June 30, 2022, from https://www.onetonline.org/link/summary/15-2051.00
[29] https://www.bls.gov/ooh/math/operations-research-analysts.htm

notes that " About 10,200 openings for operations research analysts are projected each year, on average, over the decade. As technology advances and companies seek efficiency and cost savings, demand for operations research analysis should continue to grow. In addition, increasing demand should occur for these workers in the field of analytics to improve business planning and decision making.[30] Operations research analysts will continue to be needed to provide support for the Armed Forces and to assist in developing and implementing policies and programs in other areas of government.

Graduates of the proposed program will be prepared to serve businesses in Virginia. The Virginia Employment Commission, Labor Market Index shows strong demand in Virginia for operations research analysts and mathematicians and statisticians. Virginia is one of the states with the highest concentration of jobs and location quotients in Data Scientists and Mathematical Science Occupations, which is projected to grow 22 percent from 2020 to 2030, much faster than the average for all occupations. About 7,200 openings for computer and information research scientists are projected each year, over the decade.[31] At this point in time there are over 300 job openings in the state of Virginia (July 2022).

Labor Market Information: Bureau of Labor Statistics, 2018-2028 (10-Yr)

Occupation Title	Base Year Employment	Projected Employment	Total % Change and #'s	Typical Entry Level Education
Operations research analysts	104,100	129,700	25%, 25,600	Bachelor's Degree

Labor Market Information: Virginia Employment Commission, 2018-28 (10-Yr)

Occupation Title	Base Year Employment	Projected Employment	Total % change and #'s	Annual Change	Education
Operations research analysts	9,324	12,036	29%, 2,712	271	Bachelor's Degree

Appendix D provides employment announcements.

Duplication

Three public four-year institutions in Virginia offer a comparable degree program: College of William and Mary, George Mason University and Virginia Tech. Each offers BS degrees in Data Science or a related field.

College of William and Mary

The College of Arts and Sciences offers a BS Degree in Data Science.[32] The focus of the core curriculum is to provide students with a solid foundation in data science through learning the

[30] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Operations Research Analysts, at https://www.bls.gov/ooh/math/operations-research-analysts.htm (visited June 21, 2022).
[31] Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, May 2020 State Occupational Employment and Wage Estimates Virginia on the Internet at https://www.bls.gov/oes/current /oes_va.htm (visited 9/9/21).
[32] https://www.wm.edu/as/data-science/ds_degrees/data_science_bs/index.php

basics of programing, modeling, machine learning, data visualization, database structures, and ethics in data science.

Similarities
The BS in Data Science requires a minimum of 40 credits of identified data science coursework. The program consists of 21 credits of core courses including a capstone, and nine credits of mathematics. The remaining credits are fulfilled by selecting one of the required tracks

Differences
The concentrations, data applications, algorithms, or spatial data analysis, are different than those offered by the proposed ODU program. This program emphasizes the ethical, moral, and societal implications of data science and students are encouraged to work with faculty to conduct research, while the ODU capstone is project-based, focused on real-world applications.

George Mason University (GMU)
The College of Science, Computational and Data Sciences Department offers a BS in Computational and Data Science.[33] As an interdisciplinary STEM-designated program, this degree addresses the role of computation in the areas of big data, modeling, and simulation and combines real-world computer science skills, data acquisition and analysis, scientific modeling, applied mathematics, and simulation.

Similarities
This program requires 120 credit hours including 16 credits from core coursework and 18 credits from courses selected from the extended core that support the major. These courses are augmented with 11 credits from math courses and six credits from statistics courses.

Differences
While the program provides the full data science skill set, it does not allow students to choose a specific concentration area for their studies, as is offered in the proposed ODU program.

Virginia Tech (VT):
The College of Sciences offers the Computational Modeling and Data Analytics (CMDA) program that draws on expertise from three primary departments: Mathematics, Statistics, and Computer Science.[34] The program focuses on extracting information from large data sets, as well as analyzing and solving problems by modeling, simulation, and optimization and emphasizes techniques of applied computation.

Similarities
This program requires 120 credit hours consisting of 36 credits from core coursework and 12 credits of restricted electives.

Differences
Students in this program choose one of the following concentrations: Biological Sciences, Cryptography & Cybersecurity, Economics, Geosciences or Physics. Except for Geosciences,

[33] https://science.gmu.edu/academics/departments-units/computational-data-sciences/computational-and-data-science-bs
[34] https://vt.edu/academics/majors/computational-modeling-and-data-analytics.html

these options are very different from the ODU proposed program concentrations.

Location

Old Dominion University is located in coastal Virginia. The proposed degree program will be the only undergraduate degree program in data science in the area.

Enrollment and Degrees Awarded at Comparable Programs in Virginia

Enrollment	**Fall 17**	**Fall 18**	**Fall 19**	**Fall 20**	**Fall 21**
College of William & Mary	NA	NA	NA	38	72
George Mason University	29	81	117	159	195
Virginia Tech	NA	NA	NA	NA	593
Degrees Awarded	**2016- 17**	**2017- 18**	**2018- 19**	**2019- 20**	**2020- 21**
College of William & Mary	NA	NA	NA	NA	8
George Mason University	NA	3	10	30	31
Virginia Tech	NA	NA	NA	NA	NA

Student Demand

Old Dominion University evaluated student demand for the proposed BS in Data Science from 1) a student survey and 2) enrollment trends for similar programs.

Student Survey

To be conducted later in accordance with SCHEV guidelines.

Enrollment in Existing Relevant Fields

Enrollment trends for four ODU data science relevant programs (Computer Engineering, Computer Science, Mathematics, and Information Systems) at the bachelor's level indicate sustained interest in this degree field.[35]

Enrollment Trends at ODU

Combined Enrollment Similar Fields	**2018**	**2019**	**2020**	**2021**
BS in Computer Engineering, Computer Science, Mathematics, and Information System	891	953	1071	956

[35] R. Wojtowicz (2021) "Data Science Initiative"

Summary of Projected Enrollments in Proposed Program

Year 1		Year 2		Year 3		Year 4			**Year 5 Target Year**		
2023 - 2024		2024 - 2025		2025 - 2026		2026 - 2027			2027 - 2028		
HDC 75	FTES 50	HDCT 100	FTES 70	HDC 150	FTES 100	HDCT 200	FTES 140	GRAD 50	HDCT 250	FTES 200	GRAD 70

Assumptions:
Retention percentage: 80%
Full-time students: 100% Part-time students: 0%
Full-time students credit hours per semester: 15
Full-time students graduate in 4 years

Projected Resource Needs for the Proposed Program

Resource Needs

Old Dominion University has all of the faculty, classified support, equipment, space, library, and other resources necessary to launch the proposed BS in Data Science. This program will be housed in the newly formed School of Data Science. The following subsections detail the resources required to operate the proposed program for its initiation in Fall semester 2023 through the target year 2026-27. Assessments of need for full-time, part-time, and adjunct faculty are based on a ratio of 1.0 FTE of instructional effort for every 20 FTE students in lower division courses and 14 FTE students in upper division courses The proposed program will require a total of 4 FTE of instructional effort in Fall 2023, rising to 12 FTE faculty by the target year of 2027-2028.

Full-Time Faculty
Two faculty members in the School of Data Science and one (1) faculty member in the Department of Computer Sciences , one (1) in the Department of Information Technology and Decision Sciences, and one (1) in the Department of Mathematics and Statistics will dedicate 50% of their time teaching the required courses in the proposed degree. In the initiation semester (Fall 2023) through the target year (2027-28), each faculty member will dedicate 0.5 FTE to the proposed program. One (1) faculty member in the School of Data Science and one faculty member in the Department of Philosophy and Religious Studies will dedicate 50% of their time teaching required courses starting in the second year of the program (Fall 2024) through the target year (2027-28), each faculty will dedicate 0.5 FTE to the proposed program.

Part-Time Faculty
The proposed degree program will require part-time faculty effort from the School of Data Science and different colleges and departments to support the concentration courses starting in the third year of the program (Fall 2025). Depending on concentration selections, the following commitments are anticipated:

The School of Data Science will provide 4 part-time faculty, resulting in 2.0 part-time

instructional effort in the initiation semester through the target year in 2027-28.

The Department of Computer Science will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort in the initiation semester through the target year in 2027-28.

The Department of Information Technology and Decision Sciences will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort in the initiation semester through the target year in 2027-28.

The Department of Mathematics and Statistics will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Philosophy and Religious Studies will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Electrical and Computer Engineering will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

The Department of Political Science and Geography will provide 1 part-time faculty, resulting in 0.50 part-time instructional effort through the target year in 2027-28.

Adjunct Faculty
No adjunct faculty are required to launch and sustain the proposed degree program.

Graduate Assistants
No graduate assistants are required to launch and sustain the proposed degree program.

Classified Positions
The administrative assistant employed by the School of Data Science will support the proposed degree program. The program will require .5 FTE of classified support to launch the program and sustain the level of effort will remain constant through the target year. Salary for the administrative assistant will be $25,000 in salary and $11,812 in benefits.

Equipment (including computers)
No new equipment, including computers is necessary to launch and sustain the proposed degree program.

Library
No additional library resources are required to launch and sustain the proposed degree program. The University Libraries has resources to include journals, magazines, electronic materials, and other publications for data science and analytics. As a member of the Virtual Library of Virginia (VIVA), online access to journals is available.

Telecommunications
No new telecommunications resources are required to launch and sustain the proposed degree program.

Space
No new space is required to launch and sustain the proposed degree program.

Targeted Financial Aid
No targeted financial aid is required to launch and sustain the proposed degree program.

Other Resources (specify)
No other resources are needed to initiate or sustain the proposed degree program.

Funds to Initiate and Operate the Degree Program

Note: Institutions must use the recommended student-faculty ratio when estimating FTE enrollments and required faculty FTEs.

Cost and Funding Sources to Initiate and Operate the Program			
Informational Category		**Program Initiation Year 2023 - 2024**	**Program Full Enrollment Year[36] 2026 - 2027**
1.	Projected Enrollment (Headcount)	75	250
2.	Projected Enrollment (FTE)	50	200
3.	Projected Enrollment Headcount of In-State Students	60	210
4.	Projected Enrollment Headcount of Out-of-State Students	15	40
5.	Estimated Annual Tuition and E&G Fees for In-state Students in the Proposed Program	$11,630	$12,793
6.	Estimated Annual Tuition and E&G Fees for Out-of-State Students in the Proposed Program	$31,586	$34,745
7.	Projected Total Revenue from Tuition and E&G Fees Due to the Proposed Program	$1,171,590	$4,076,330
8.	Other Funding Sources Dedicated to the Proposed Program (e.g., grant, business entity, private sources)	$	$

Appendices E through H provide additional details about the School of Data Science, the faculty developing new courses for the curriculum, and the process used to develop this proposal.

[36] For the "Full Enrollment Year" use: for associate degrees, initiation year plus 1; for baccalaureate degrees, initiation plus 3; for master's degrees, initiation plus 2; for doctoral degrees, initiation plus 3.

Appendices

Appendix A – Sample Plan of Study
Full Time Student

Year	Fall Semester	Spring Semester
Freshman	ENGL 110C (Written Comm) (3)	ENGL 211C or ENGL 221C or ENGL 2 31C (Written Comm) (3)
	MATH 162M Precalculus I (Math) (3)	Interpreting the Past (See Advisor for Course Options) (3)
	COMM 101R or COMM 103R or Comm 112R or DANC/THEA 152R (Oral Comm) (3)	Human Behavior (See Advisor for Course Options)
	COMM 272G or CS 120G or CS 121G or STEM 251G (Information Literacy and Research) (3)	MATH 163. Precalculus II -> For CS 150 (3)
	DASC 150 – Data Science, Technology, and Society (3)	BDA 200T Elements of Data (3)
Sophomore	Nature of Science I (See Advisor for Course Options) (4)	Nature of Science II (See Advisor for Course Options) (4)
	STAT 130M – Elementary Statistics (3)	STAT 310 – Introduction to Data Analysis (3)
	CS 150. Problem Solving and Programming I (4)	CS 250. Problem Solving and Programming II. (4)
	Concentration Math Pre-Requisite #1 (3)	Concentration Math Pre-Requisite #2 (3)
	Ethics Requirement	
Junior	DASC 300 – Foundations of Data Science (3)	DASC 357 Ethics and Data (3)
	IT 360T. Principles of Information Technology (3)	IT 450. Database Concepts (3)
	Concentration Pre-Requisite #1 (3)	Concentration Course #1 (3)
	Concentration Pre-Requisite #2 (3)	Concentration Course #2 (3)
	Approved program or minor elective (4)	Approved program or minor elective (4)
Senior	ENGL 112L or ENGL 114L or WCS 100L (Literature) (3)	Human Creativity (See Advisor for Course Options) (3)
	DASC 434 Data Science Research Methods (3)	DASC 435 Data Science Capstone Project (3)
	Concentration Course #3 (3)	Concentration Course #4 (3)
	Concentration Course Option (3)	Approved program or minor elective (3)
	Approved program or minor elective (3)	Approved program or minor elective (3)

Credit Hours – Freshman – Fall Semester – 15
Credit Hours – Freshman – Spring Semester – 15
Credit Hours – Sophomore – Fall Semester – 14
Credit Hours – Sophomore – Spring Semester – 14
Credit Hours – Junior – Fall Semester – 16
Credit Hours – Junior – Spring Semester – 16
Credit Hours – Senior – Fall Semester – 15
Credit Hours – Senior – Spring Semester – 15

Total Credit Hours 120

Appendix B – Course Descriptions

New courses are denoted with an asterisk.

Core Courses

BDA 200T. Elements of Data Science. 3 Credits.
This course offers a non-technical introduction to the emerging and interdisciplinary area of data science. Students will be introduced to the development, fundamental tools, and the impact of data science in a wide range of disciplines such as business, the sciences and engineering. Fundamental data visualization techniques and basic concepts of machine learning will be applied through real-life data science projects. Moreover, students will explore the general framework for ethical thinking and practicing data science, the current challenges, the benefits, the potential harms and risks posed by developing data science models and technology. Prerequisites: MATH 102M or MATH 103M.

CS 150. Problem Solving and Programming I. 4 Credits.
Laboratory work required. Introduction to computer-based problem solving and programming in C++. Topics include problem solving methodologies, program design, algorithm development, and testing. C++ language concepts include variables, data types and expressions, assignment, control-flow statements, functions, arrays, pointers, structs, and classes. Pre- or corequisite: MATH 163.

CS 250. Problem Solving and Programming II. 4 Credits.
Laboratory work required. Design issues arising in software systems and C++ programming techniques aiding in their solution. Topics include the software life cycle, methods of functional decomposition, design documentation, abstract data types and classes, common data structures, dynamic data structures, algorithmic patterns, and testing and debugging techniques. Term project required. Prerequisites: CS 150 or ENGN 150 with a grade of C or better. Pre- or corequisite: CS 252 and MATH 211.

***DASC 150. Data Science, Technology, and Society.** 3 Credits
This course addresses the technological, political, legal, psychological, sociological, criminological, and economic dimensions of data science through an interdisciplinary framework. Students are introduced to the social dynamics associated with data science applications. Attention is given to the way that big data applications have impacted social behavior.

***DASC 300. Foundations of Data Science.** 3 credits**.** This course provides an interdisciplinary overview of data sciences drawing on key elementary topics related to data analytics. A specific focus is given to the way that decisions made about data from those disciplinary pursuits inform policy, product development, and humanity.

***DASC 357 Ethics and Data.** 3 Credits This course explores, from a philosophical perspective, ethical questions arising from collecting, drawing inferences from, and acting on data, especially when these activities are automated and on a large scale. This course will provide students a

framework for considering the ethical implications of data usage. Emphasis will be placed on discussing how historic and contemporary examples of potentially unethical practice could be altered to reduce harm and increase equity. Topics to be covered may include, but are not limited to, systematic approaches to assessing ethical issues; privacy and confidentiality; defining research and the responsibilities associated with conducting ethical research; implicit and structural biases in data collection and analysis; freedom of speech; consent to data collection.

***DASC 434 Data Science Research Methods.** An overview of the scientific approach to the study of phenomena through large scale quantitative approaches. The course includes the development of a research proposal that will be carried out in the Data Science Capstone Project course.

***DASC 435W Data Science Capstone Project.** 3 Credits. Students work individually or in groups to plan, design, and carry out a research project demonstrating expertise with data science. Final papers which report the results for the study are presented in a formal research seminar. The projects reflect knowledge gained from undergraduate work and training received in discipline-specific research methods and statistics courses. Senior standing.
DASC 434.

IT 360T. Principles of Information Technology. 3 Credits.
A survey of computer hardware, software, procedures, applications, and management information concepts. Provides an understanding of the application of the computer to the support of managerial decision making. Information Systems majors may not use this course for credit toward the B.S.B.A. degree. Prerequisites: completion of general education information literacy and research requirement and junior standing; and a declared major in the University or permission of the Dean's Office.

IT 450. Database Concepts. 3 Credits.
Introduction to database concepts. Historical development, data models, database analysis, design and implementation, query languages, data security, and introduction to business transaction systems. Prerequisites: IT 201 with a C or better or IT 360T for non-IT major students and a declared major in the university or waiver approved through the Strome College of Business Undergraduate Advising; permission of the instructor is required for non-IT major students.

MATH 163. Precalculus II. 3 Credits.
The second course in a two-course sequence designed to provide strong preparation for calculus. Topics include exponential and logarithmic functions/equations, trigonometric functions/equations, trigonometric identities, laws of sines and cosines, vectors, polar representation of complex numbers, binomial theorem, and conic sections. Prerequisite: A grade of C or better in MATH 162M.

STAT 130M. Elementary Statistics. 3 Credits.
Topics include data description, elementary probability, binomial and normal distributions, interval estimation, hypothesis testing, and correlation. The role of probability in inference is emphasized. Prerequisites: qualifying score on a placement test administered by the University

Testing Center, qualifying SAT or ACT score, MATH 100 or a C or better in MATH 101M, or a higher level math course.

STAT 310. Introductory Data Analysis. 3 Credits.
Topics include measures of location, dispersion, and strength of relationship; parametric and nonparametric tests of location; one-way analysis of variance; complete block designs; simple and multiple regression; correlation; measures of association for categorical data. Microsoft EXCEL will be used extensively as an aid in data analysis. Written interpretation of results will be a routine component of daily assignments. Prerequisites: A grade of C or better in STAT 130M or MATH 211.

Concentration Courses

1. Artificial Intelligence & Machine Learning

Math Prerequisites

MATH 211. Calculus I. 4 Credits.
A first course in calculus and analytic geometry. Topics include differentiation and integration of algebraic and transcendental functions of one variable and applications. Prerequisites: A grade of C or better in MATH 163 or MATH 166.

MATH 212. Calculus II. 4 Credits.
A second course in calculus and analytic geometry. Topics include techniques of integration, polar coordinates, infinite series, solid geometry, vectors, lines and planes. Prerequisite: A grade of C or better in MATH 211.

Course Prerequisites

CS 252. Introduction to Unix for Programmers. 1 Credit.
Laboratory work required. Available for pass/fail grading only. An introduction to Unix with emphasis on the skills necessary to be a productive programmer in Unix, Linux, and related environments. Topics include command line shells, files and directories, editing, compiling and common command line utilities. Prerequisites: A grade of C or better in CS 150, ENGN 150 or IT 205.

CS 361. Data Structures and Algorithms. 3 Credits.
Laboratory work required. Common abstract data types, including vectors, lists, stacks, queues, sets, maps, heaps, and graphs. Standard C++ interfaces for these ADTs. Generic programming via iterators and templates. Choosing data structures and algorithms to implement ADTs, via analysis of their time and space complexity. Prerequisites: CS 252 and a grade of C or better in CS 250. Pre- or corequisite: MATH 212.

Courses

CS 330. Object-Oriented Programming and Design. 3 Credits.
Laboratory work required. The techniques and idioms of object-oriented programming in C++ and Java. Methods of object-oriented analysis and design with the Unified Modeling Language. Multi-thread programs, synchronization, and graphic user interfaces. Prerequisites: CS 252 and a grade of C or better in CS 250. Pre- or corequisite: MATH 211.

CS 432/532. Web Science. 3 Credits.
Provides an overview of the World Wide Web and associated decentralized information structures, focusing mainly on the computing aspects of the Web: how it works, how it is used, and how it can be analyzed. Students will examine a number of topics including web architecture, web characterization and analysis, web archiving, Web 2.0, social networks, collective intelligence, search engines, web mining, information diffusion on the web, and the Semantic Web. Prerequisites: A grade of C or better in CS 361 and CS 330.

CS 422/522. Introduction to Machine Learning. 3 Credits.
Laboratory work required. An introduction to machine learning with a focus on practical aspects of various learning techniques. Topics include supervised learning (linear models, probabilistic models, support vector machine, decision trees, neural networks, etc.), unsupervised learning (scaling, dimension reduction, clustering, etc.), reinforcement learning, and model evaluation. The course will also discuss applications on image analysis, text processing, and biomedical informatics. Prerequisites: MATH 316 and CS 150 (or equivalent programming experience).

CS 480/580. Introduction to Artificial Intelligence. 3 Credits.
Laboratory work required. Introduction to concepts, principles, challenges, and research in major areas of AI. Areas of discussion include natural language and vision processing, machine learning, machine logic and reasoning, robotics, expert and mundane systems. Prerequisites: A grade of C or better in CS 361.

BDA 411/511. Introduction to Machine Learning. 3 Credits.
An introductory course on machine learning. Machine Learning is the science of discovering pattern and structure and making predictions in data sets. It lies at the interface of mathematics, statistics and computer science. The course gives an elementary summary of modern machine learning tools. Topics include regression, classification, regularization, resampling methods, and unsupervised learning. Students enrolled are expected to have some ability to write computer programs, some knowledge of probability, statistics and linear algebra.
Prerequisites: MATH 312, MATH 316, and STAT 330 or STAT 331.

MSIM 480/580. Introduction to Artificial Intelligence. 3 Credits.
Introduction to concepts, principles, challenges, and research in major areas of artificial intelligence. Areas of discussion include natural language and vision processing, machine learning, machine logic and reasoning, robotics, expert and mundane systems. Laboratory work required. Prerequisite: Instructor approval.

ECE 407/507. Introduction to Game Development. 3 Credits.
An introductory course focused on game development theory and modern practices with emphasis on educational game development. Topics include game architecture, computer

graphics theory, user interaction, audio, high level shading language, animation, physics, and artificial intelligence. The developed games can run on a variety of computer, mobile, and gaming platforms. (Cross listed with MSIM 408.) (Offered spring)
Prerequisites: CS 361 or MSIM 331.

CYSE 420/520. Applied Machine Learning in Cybersecurity. 3 Credits.
This course introduces the concepts and technologies of machine learning with a focus on applications related to cybersecurity. The objectives are to learn fundamental knowledge and practical experience and identify the use case of machine learning techniques in cybersecurity. The course will discuss traditional and advanced machine learning techniques, e.g., neural network, deep convolutional neural network, generative adversarial network, and transfer learning algorithms. Students will engage in oral and written communication by reporting and presenting the materials of the course project. Prerequisites: CYSE 250 or permission of the instructor.

ECE 450/550. Introduction to Machine Learning for Data Analytics Engineering. 3 Credits.
Machine Learning provides a practical treatment of design, analysis and implementation of algorithms, which learn from examples. Topics include multiple machine learning models: linear regression, logistic regression, neural networks, support vector machines, deep learning, Bayesian learning and unsupervised learning. Students are expected to use popular machine learning tools and algorithms to solve real data engineering problems. (Offered spring)
Prerequisites: A grade of C or better in ENGN 150 or CS 150. Pre- or corequisite: ECE 350.

2. Visualization

Math Prerequisites

MATH 212. Calculus II. 4 Credits.
A second course in calculus and analytic geometry. Topics include techniques of integration, polar coordinates, infinite series, solid geometry, vectors, lines and planes. Prerequisite: A grade of C or better in MATH 211.

Course Prerequisites

BNAL 206. Business Analytics I. 3 Credits.
An introduction to methods of business analytics. Topics are concentrated in descriptive analytics, which include descriptive statistics, normal and binomial distributions, decision making under uncertainty and under risk, decision analysis incorporating sample information, sampling distributions and Central Limit Theorem, interval estimation, and hypothesis testing. Business and economic applications are emphasized. Computer software, as a tool for problem solving, is utilized where appropriate. Prerequisites: A grade of C or better in MATH 162M or placement into a higher level math course.

BNAL 306. Business Analytics II. 3 Credits.
Advanced descriptive and predictive analytics topics include advanced hypothesis testing,

analysis of frequency data, correlation analysis, simple and multiple regression, and time series forecasting. Prescriptive analytics topics include linear programming formulation and managerial analysis, and distribution models. PERT/CPM models are also covered. Computer software is utilized throughout the course. Emphasis is on the interpretation of the various outcomes of the application of business analytics tools. Prerequisites: MATH 200, BNAL 206 and a declared major in the University or permission of the Dean's Office.

CS 252. Introduction to Unix for Programmers. 1 Credit.
Laboratory work required. Available for pass/fail grading only. An introduction to Unix with emphasis on the skills necessary to be a productive programmer in Unix, Linux, and related environments. Topics include command line shells, files and directories, editing, compiling and common command line utilities. Prerequisites: A grade of C or better in CS 150, ENGN 150 or IT 205.

GAME 201T. Introduction to Game Studies. 3 Credits.
An introduction to the core concepts and methodologies that inform game design, development, and criticism. This course will provide students with a critical overview of each of these content areas and will demonstrate how their specific concerns intersect in the design, production, and reception of contemporary games. It will also teach students hands-on methodologies through which to translate these concepts into creative and critical praxis.

Courses

BNAL 403/503. Data Visualization and Exploration. 3 Credits.
This course introduces students to concepts and processes, technologies, and methodologies that are commonly used in data visualization that an organization may use to enhance its descriptive, predictive, and prescriptive methods for making fact-based decisions. Prerequisite: A grade of C or better in BNAL 306 or permission of the instructor.

CS 361. Data Structures and Algorithms. 3 Credits.
Laboratory work required. Common abstract data types, including vectors, lists, stacks, queues, sets, maps, heaps, and graphs. Standard C++ interfaces for these ADTs. Generic programming via iterators and templates. Choosing data structures and algorithms to implement ADTs, via analysis of their time and space complexity. Prerequisites: CS 252 and a grade of C or better in CS 250. Pre- or corequisite: MATH 212.

ECE 406/506. Computer Graphics and Visualization. 3 Credits.
The course provides a practical treatment of computer graphics and visualization with emphasis on modeling and simulation applications. It covers digital image and signal processing basics such as sampling and discrete Fourier transform, computer graphics fundamentals, visualization principles, and software architecture for visualization in modeling and simulation. Written communication and information literacy skills are stressed in this course. (Cross listed with MSIM 441.) (Offered fall) Prerequisites: ECE 348 or CS 361.

GAME 340. Visual Design and Digital Graphics for Games. 3 Credits.
This course focuses on visual design and digital graphics for game-based applications. Designed

to help students make the transition from traditional 2D drawing and illustration techniques to the types of 2D and 3D digital asset creation privileged by games and game-based applications, it provides students with hands-on experience with using industry standard software to generate sprites, UI components, textures, and other common 2D elements. It also introduces students to 3D modeling and texturing techniques, including but limited to optimization, texture mapping, and basic rigging and animation techniques. Prerequisites: GAME 201T.

ARTH 320W. History of Graphic Design. 3 Credits.
A critical study of the formal, cultural, and intellectual developments of the graphic design discipline, including related activity in fine art, illustration, and industrial design. This is a writing intensive course. Prerequisites: Grade of C or better
in ENGL 211C or ENGL 221C or ENGL 231C.

CRJS 344. Social Science and Crime Mapping. 3 Credits.
A critical exploration of applying geographic information system (GIS) to view, understand, question, interpret, and visualize social science and crime data that reveal relationships, patterns, and trends. Students will learn to 1) frame a research question or hypothesis from a location-based perspective; 2) collect, create and examine geographically referenced demographic, social, and criminological data; 3) learn to use GIS mapping software to visualize, manage and analyze this data in order to investigate the relationship between geographic, demographic, social and criminological variables; and 4) arrive upon decisions and conclusions and communicate these via the creation of publishable maps. Prerequisites: SOC 201S or CRJS 215S or permission of the instructor.

ECE 475/575. Transportation Data Analytics. 3 Credits.
This course presents the basic techniques for transportation data analytics. It will discuss statistical modeling, prominent algorithms, and visualization approaches to analyze both small- and large-scale data sets generated from transportation systems. Practices of using different data for various real-world traffic/transportation applications and decision making will also be discussed. Prerequisites: Basic probability and statistics (e.g., STAT 330 or ECE 304); any programming language such as C, Python or Java is beneficial but not required.

ECE 407/507. Introduction to Game Development. 3 Credits.
An introductory course focused on game development theory and modern practices with emphasis on educational game development. Topics include game architecture, computer graphics theory, user interaction, audio, high level shading language, animation, physics, and artificial intelligence. The developed games can run on a variety of computer, mobile, and gaming platforms. (Cross listed with MSIM 408.) (Offered spring)
Prerequisites: CS 361 or MSIM 331.

ECE 441/541. Advanced Digital Design and Field Programmable Gate Arrays. 3 Credits.
Course will present FPGA technologies and methods using CAD design tools for implementation of digital systems using FPGAs. Topics include advanced methods of digital circuit design including specification, synthesis, implementation and prototyping; managing multiple clock domains, static timing analysis, timing closure, system reset design, simulation, and optimization; troubleshooting using embedded logic analyzers and integrated development

environments (IDEs). Practical system design examples include general purpose data processing, system on a chip (SOC) prototyping, hardware accelerators, and an introduction to domain specific architectures. (Offered spring) Prerequisites: ECE 341.

GAME 440. Advanced Visual Design and Digital Graphics for Games. 3 Credits.
This course focuses on advanced visual design and digital graphics for game-based applications, including but not limited to topics such as 3D modeling, texturing, texture mapping, animation, optimization, shaders, and particle systems. Conceived as a studio course, it provides students with hands-on experience working with a variety of digital software applications to create and optimize graphical assets for games and similar applications. Prerequisites: GAME 201T.

IT 325. Web Site and Web Page Design. 3 Credits.
Advanced design and hands-on implementation skills in designing and creating dynamic web sites. Key topics include web page design, usability principles, HTML, XHTML, Cascading Style Sheets (CSS), JavaScript and Internet security. Prerequisites: IT 150G.

3. Geospatial Analysis

General Prerequisites

GEOG 102T. Digital Earth: Geospatial Technology and Society. 3 Credits.
This course provides an overview and exploration of 1) the digital representation of the Earth and 2) geospatial science and technology. The course investigates geospatial technological innovations affecting the environment, resources, and society, including satellite global positioning systems, geographic information systems, and earth observations. Students develop hands-on skills as well as critical-thinking skills concerning the role of increasingly ubiquitous geospatial technology and their influences on social, economic, and human-environment interactions.

Course Prerequisites

GEOG 402/502. Geographic Information Systems. 3 Credits.
A study of the conceptual basis of GIS as a tool for manipulating spatial information. The course focuses on how geographic information can be input and organized within the framework of a GIS. Students will work on a computer-based GIS to gain a greater understanding of spatial database structures and analytical operations. Prerequisites: Junior standing or permission of instructor.

GEOG 404/504. Digital Techniques for Remote Sensing. 3 Credits.
Study of the theory and application of remote sensing, emphasizing environmental applications and aerial and satellite imagery. Covers the fundamentals of multispectral digital image processing, including sensors pre-processing, enhancement, classification, accuracy assessment, and GIS data integration. Prerequisites: Junior standing or permission of instructor.

Courses

GEOG 419/519. Spatial Analysis of Coastal Environments. 3 Credits.
The course integrates remotely sensed and field techniques for scientific investigation and practical management of coastal environmental systems. Spatial modeling of coastal processes and management tools using Geographic Information System (GIS). Prerequisites: GEOG 404 or permission of the instructor.

GEOG 425/525. Internet Geographic Information Systems. 3 Credits.
Theoretical and practical exploration of methods, standards, and policies related to the development and utilization of geographic information systems on the Internet. Students will create and utilize distributed geospatial data and analytical systems using the WWW and the Internet to address geographical problems. Prerequisites: GEOG 402.

GEOG 432/532. Advanced GIS. 3 Credits.
The study of a series of advanced topics in the field of geographic information systems/science. Focus is placed on the development of projects/models and a survey of several advanced techniques. Students will work on a computer-based GIS to implement topics from lectures. Prerequisites: GEOG 402.

GEOG 462/562. Advanced Spatial Analysis. 3 Credits.
This course introduces the essential theoretical concepts and analytical tools for analyzing spatial process, spatial autocorrelation, spatial patterns, techniques for spatial interpolation, network connectivity, big data, and landscape patterns. The course culminates with students carrying out their own spatial analysis projects. This course assumes that students understand the basic concepts in GIS with some experience in software operation of ArcGIS.
Prerequisite: GEOG 402 or permission of the instructor.

GEOG 463/563. GIS Programming. 3 Credits.
This course develops students' GIS programming skills. Focus is placed on Python programming in ArcGIS and JavaScript in Web GIS development. Prerequisites: GEOG 402.

GEOG 473/573. Geographic Information Systems for Emergency Management. 3 Credits.
Students will demonstrate advanced skills and techniques using spatial data to prevent, mitigate, respond to, and recover from intentional, natural, and accidental homeland security threats and emergencies. This course demonstrates the importance of rapidly disseminating spatial information towards the prevention and response of various organizations to homeland security events. This course will provide students with the tools and experience required to collect, prepare and manage spatial data and enable students to be prepared to map and analyze the data to quickly and effectively create a coordinated response to real homeland security events.
Prerequisites: GEOG 100S, GEOG 101S, or permission of the instructor.

Appendix C – Undergraduate Curriculum Committee

Dr. Sampath Jayarathna, Department of Computer Science
Dr. Randy Gainey, Department of Sociology and Criminal Justice
Dr. Holly Handley, Department of Engineering Management and Systems Engineering
Dr. Guohui Song, Department of Mathematics and Statistics
Dr. Weiyong Yang, Department of Information Technology and Decision Sciences
Dr. Joshua Zingher, Department of Political Science and Geography

Appendix D - Employee Demand Job Announcements

Number	Date Retrieved	Position, Company, Location
1	9/8/22	Data Scientist Jefferson Lab Newport News, VA
2	9/8/2022	Cybersecurity Data Scientist (Hybrid) The MITRE Corporation Hampton, VA
3	9/8/2022	Data Scientist Systems Planning and Analysis, Inc. Norfolk, VA
4	9/8/2022	Data Engineer CTG Norfolk, VA
5	9/8/2022	DATA SCIENTIST Military Sealift Command Virginia
6	9/8/2022	Data Scientist, Lead - 39092 Huntington Ingalls Industries Norfolk, VA
7	9/8/2022	Data Scientist Booz Allen Hamilton Norfolk, VA
8	9/8/2022	Python Data Scientist Latitude, Inc. Norfolk, VA
9	9/8/2022	Data Scientist / Data Analytics SkyePoint Decisions Virginia Beach, VA
10	9/8/2022	Data Analyst BigBear.ai, Inc. Norfolk, VA

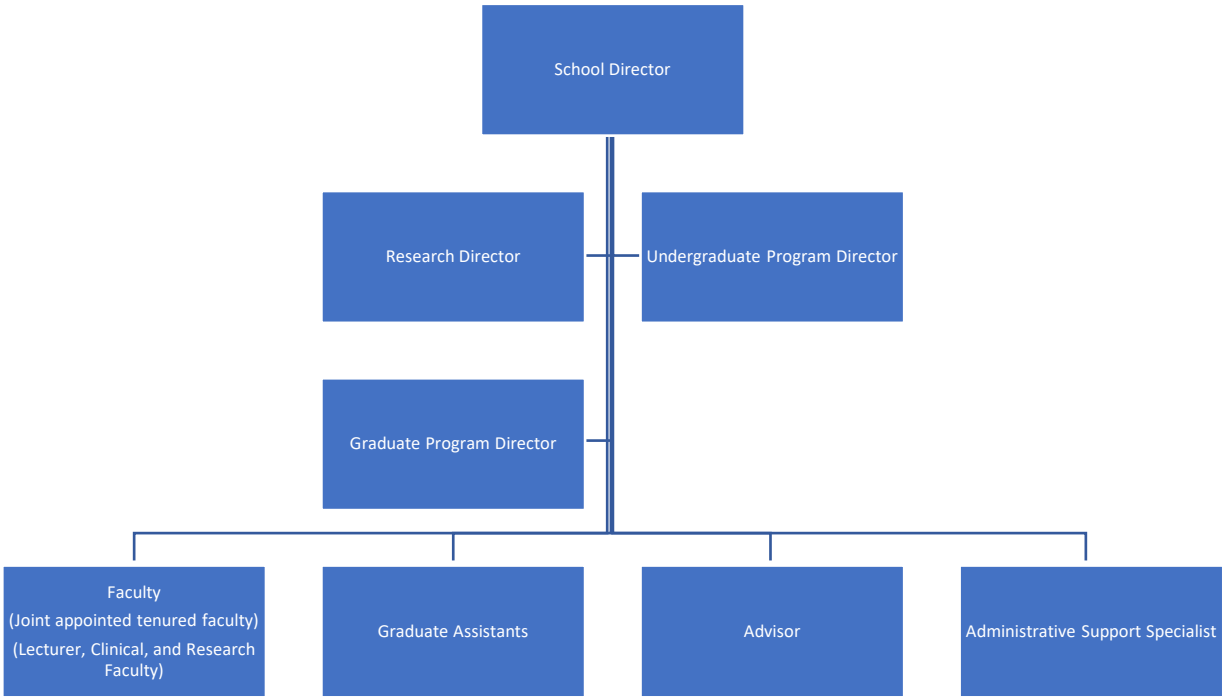
Appendix E. – Curriculum Developers for New Data Science Classes

Dr. Charles Gray, Department of Sociology and Criminal Justice
Dr. Holly Handley, Department of Engineering Management and Systems Engineering
Dr. Faryaneh Poursardar, Department of Computer Science
Dr. Sampath Jayarathna, Department of Computer Science
Dr. Teresa Kissell, Department of Philosophy and Religious Studies
Dr. Joshua Zingher, Department of Political Science and Geography
Dr. Weiyong Zhang, Department of Information Technology and Decision Sciences

Appendix F. School of Data Science Infrastructure

Like the School of Cybersecurity and the School of Continuing Education, the School of Data Science will report to the Vice Provost for Academic Affairs. Interdisciplinary degree programs reaching across the academic colleges will be offered through the School.

The Figure below shows the organizational structure for the School of Data Science.



The School will be led by a director and include an undergraduate program director, graduate program director, and research director. Dr. Michael Nelson, professor of computer science, is serving as interim director of the School. Going forward, the director and program directors will be tenured faculty members from one of the academic colleges. The School will not tenure faculty members. To promote interdisciplinary work, tenure-track and tenured faculty members who are affiliated with the School will hold joint appointments between the School and their tenure home (where they will have their primary appointment). The aim is to develop joint appointments in a way that complements existing faculty strengths and workloads. Similar to the School of Cybersecurity, non-tenured faculty (lecturers, clinical faculty, and research faculty) may be appointed to the School of Data Science. The NTT faculty may hold joint appointments with other academic units following existing policies for joint appointments. All evaluations for faculty holding joint appointments will follow the policies outline in the faculty handbook.

A specific objective of the School is to build an infrastructure that promotes collaborative research projects and expands opportunities for joint research projects. To build a framework for cross-disciplinary data science research, an effort currently underway provided internal funding for data science projects involving researchers from different disciplines. Faculty enthusiasm for the topic resulted in a wide range of multidisciplinary data science research proposals. The internally funded projects represented eight different disciplines: computer science, electrical

engineering, computer engineering, engineering management, finance, mathematics, modeling and simulation, and community and environmental health. These disciplines exist across six academic departments, four academic colleges, and two vice presidential divisions. The director of the proposed school will use this model to coordinate internal research partnerships. The School will foster cross-institutional partnerships by bringing interested university researchers together and offering support for their collaborative projects.

A search is currently underway for the permanent director and six data science faculty who will work with existing ODU faculty to develop the academic and research infrastructure for the School. Additional data science faculty will be hired in subsequent years. The departmental tenure homes of the faculty will be open and determined through the search process. All searches will be for senior faculty members. Support positions will be filled by reallocating positions within Academic Affairs.

The School of Data Science was approved by the ODU Board of Visitors in April 2022. The State Council for Higher Education of Virginia is considering a proposal to approve the School. If the nomenclature of "School of Data Science" is approved by SCHEV, that name will become effective upon approval. If SCHEV does not approve that nomenclature, the organizational structure will be identified as the "Institute of Data Science." SCHEV approval is not required to name structures "institutes."

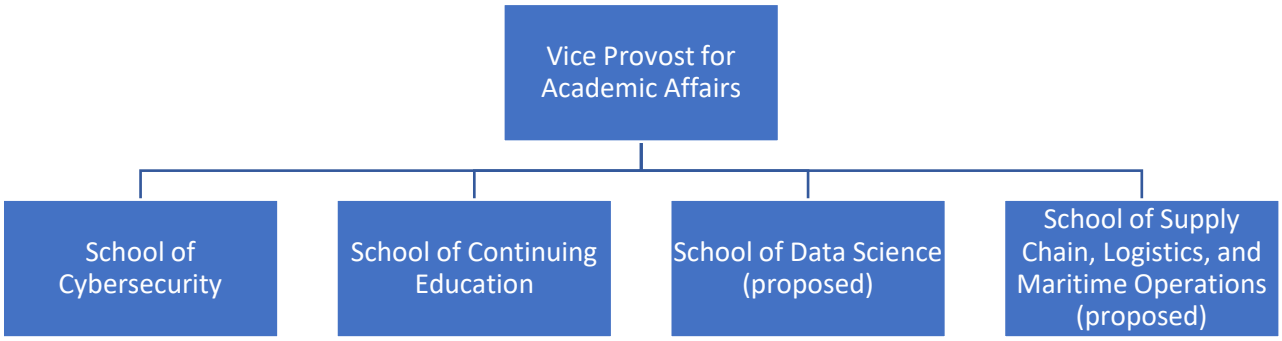
Appendix G. Description of Proposal Development Process

The proposal development followed a series of specific steps. These included the following:

1. Holly Handley, provost's fellow for data science and associate professor of engineering management and system's engineering, conducted an exhaustive review of data science programming and data science organizational structures. Her review included interviews with stakeholders, reviews of existing curricula, and labor demand reviews.
2. An interdisciplinary undergraduate data science committee including faculty from four different colleges and six different academic departments met to discuss existing undergraduate academic programming and opportunities for undergraduate data science programming.
3. Based on those discussions and her review, Dr. Handley drafted the proposal and shared it with the undergraduate committee. The undergraduate committee provided specific feedback about the curriculum. Changes were made to the curriculum to address the feedback.
4. The vice provost for academic affairs circulated the proposed curriculum with department chairs and deans whose departments or colleges had courses included in the curriculum and asked for feedback.
5. Department chairs and deans provided feedback about the curriculum and requested specific changes. In two cases, requests were made to make the concentrations more interdisciplinary and less focused on specific disciplines.
6. Changes were made to the curriculum based on the feedback received. The undergraduate data science committee reviewed and approved the changes.
7. The interim director of the School of Data Science approved the proposal.
8. The proposal was submitted to the faculty senate for review.
9. Committee A provided feedback about the proposal and approved the proposal based on changes designed to clarify the curriculum, proposal development process, and School infrastructure.
10. The proposal was revised and resubmitted to Committee A.

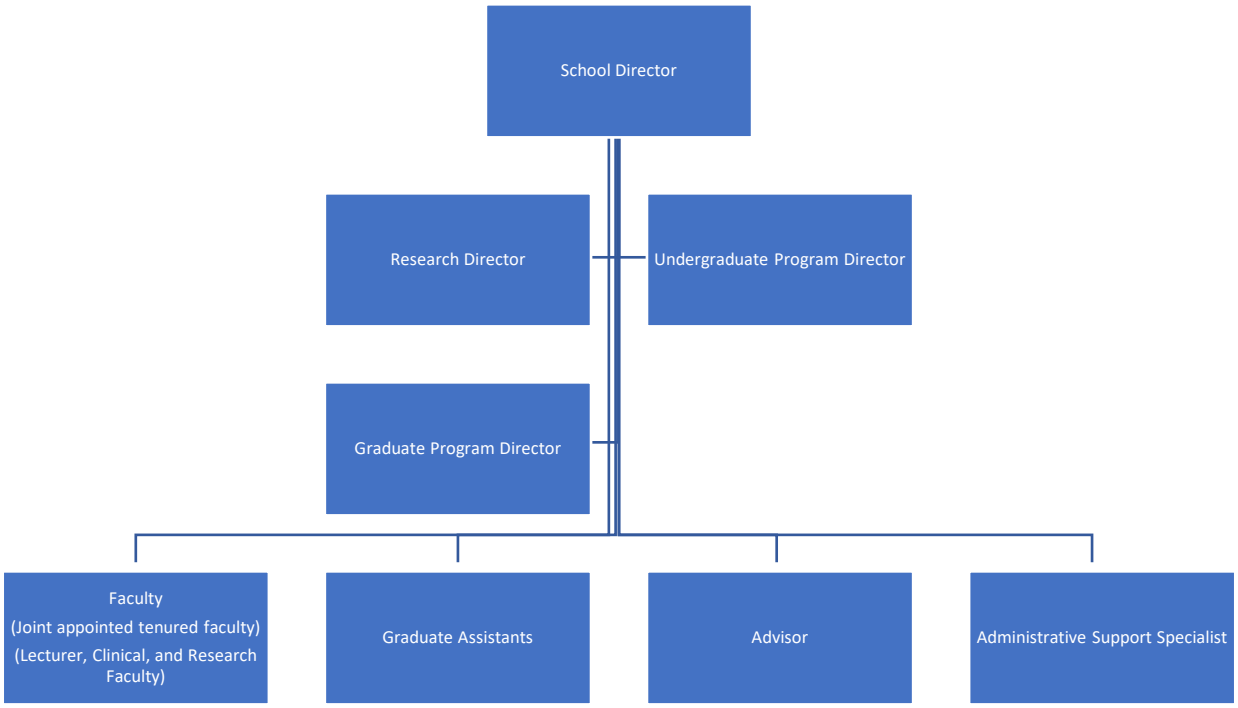
Appendix H. Frequently Asked Questions about Interdisciplinary Schools at ODU

Q: What is the structure for the interdisciplinary schools within the university?



Q: How are each of the interdisciplinary schools structured?

Sample School Organizational Chart



Q: Have the schools been approved?

The ODU Board of Visitors approved each of the schools in Spring 2022. As of October 15, 2022, the School of Data Science and School of Supply Chain, Logistics, and Maritime Operations are pending approval by the State Council of Higher Education for Virginia.

Q: What if SCHEV doesn't approve the new schools?

The Board of Visitors has approved the development of the independent structures. If SCHEV does not approve the nomenclature of "School of Data Science" or "School of Supply Chain, Logistics, and Maritime Operations," the independent structures will still be formed. Should approval be delayed or denied by SCHEV, the independent structures will be named "Institutes" or a comparable name which does not require SCHEV approval.

Q: How do faculty appointments work in the schools?

Tenure-track and tenured faculty would hold joint appointments between their tenure home and the School. Non-tenure track teaching and research faculty may be hired directly into the school with or without joint appointments.

Q: In which unit do faculty receive tenure?

Faculty are tenured in academic departments housed in Colleges.

Q: What is the relationship between the Department of Interdisciplinary Studies and the interdisciplinary schools?

The Department of Interdisciplinary Studies is not structurally connected to the interdisciplinary schools. Because the courses offered in interdisciplinary studies are so valuable to interdisciplinary curricula, a few of them are required in curricula offered in the interdisciplinary schools. Also, the leadership major is coordinated through the School of Continuing Education. However, it needs to be stressed that the leadership major is part of the Bachelor of Science in Interdisciplinary Studies offered in the College of Arts and Letters. All students graduating with a leadership major are, then, graduates of the College of Arts and Letters.

Q: Is the Department of Interdisciplinary Studies going to be moved out of the College of Arts and Letters?

No.

Q: Will faculty be forced to participate in the schools?

No.

Q: Will the programs in the schools hurt enrollment or my department's budget?

No. Course enrollment is the variable most important when considering the budget and tuition revenue. Tech fee distribution is connected to the courses offered in programs. Budget allocation decisions connected to the schools will be partly driven by the courses in the interdisciplinary programs. This means that academic departments benefit from having courses included in interdisciplinary programs.

Q: How will the directors of the schools be selected?

A: Initial appointment will be done through national searches. The search committees include faculty members from several disciplines involved in the specific topical areas.

Q: Were faculty involved in discussions to create the new schools and programming in the schools?

Yes. Regarding the School of Supply Chain, Logistics, and Maritime Operations, two separate groups of faculty members have been involved in discussions about maritime programming over the past two years. The first, the Maritime Initiative Workgroup, included faculty from each college, researchers studying maritime topics, and administrators charged with developing cross-collaboration efforts. After meeting for one academic year, the group recommended the creation of the Maritime Consortium. They also recommended the creation of an interdisciplinary School of Maritime Studies. The second, the Maritime Advisory Council Strategic Planning Group, brought together three maritime faculty from the ITDS department with industry representatives to create a strategic plan for maritime. The plan included a recommendation to separate Maritime out of the current structure. In addition, prior to submitting the recommendation for a School of Supply Chain, Logistics, and Maritime Operations to SCHEV, a draft proposal was shared with maritime faculty and their feedback was incorporated into the proposal.

Regarding data science, four different committees have been involved in proposing the school, building the undergraduate program, promoting collaborative research, and administering an existing Master's degree program. These four committees include an executive committee, undergraduate committee, graduate committee, and research convergence committee. The executive committee includes the Deans of Arts and Letters, Business, Engineering and Technology, Graduate Studies, Interdisciplinary Studies, and Sciences as well as the associate vice president for research. The executive committee was convened to identify the most appropriate structure to coordinate data science programming at the university. They reviewed enrollment data, labor demand data, and reports created by Dr. Holly Handley, associate professor of engineering management and systems engineering and provost's fellow for data science. After several meetings, the committee recommended that ODU create an independent

structure to administer and coordinate interdisciplinary data science programming. On March 31, Provost and Vice President for Academic Affairs Austin Agho hosted a meeting with more than 100 faculty with data science expertise and shared his decision to recommend the creation of School of Data Science.

The research convergence committee includes faculty members from the Colleges of Arts and Letters, Business, Engineering and Technology, and Sciences. Chaired by the Dean of Sciences and the Associate Vice President for Research, the research convergence committee developed an internal research funding program to promote collaborative data science research projects that extend across vice president divisions and colleges. The funding program has been shown to be effective. Faculty enthusiasm for the topic resulted in a wide range of multidisciplinary data science research proposals. The internally funded projects represented eight different disciplines: computer science, electrical engineering, computer engineering, engineering management, finance, mathematics, modeling and simulation, and community and environmental health. These disciplines exist across six academic departments, four academic colleges, and two vice presidential divisions. The director of the proposed school will use this model to coordinate internal research partnerships. The school will foster cross-institutional partnerships by bringing interested university researchers together and offering support for their collaborative projects.

An undergraduate data science committee was created in Spring 2022. The undergraduate committee includes faculty from four colleges and six disciplines. They met in the Spring and over the Summer to discuss the development of undergraduate courses and curricula in data science. The committee will oversee, administer, and assess the undergraduate data science curricula.

The graduate committee for data science is an interdisciplinary group of faculty members. It has existed for three years and has overseen the MS in Data Science and Analytics, a program that has been housed in the graduate school.

Q: What is the value of joint appointments.

Joint appointments can benefit departments and students alike. For departments, when interdisciplinary programs are built, the very foundation of the programs will rest in the home departments representing the interdisciplinary program. Courses offered in the home departments will enroll students from interdisciplinary programs. The more students there are in the courses offered by the home departments, the higher the FTE and subsequent resources given to the department. As well, a large amount of research shows great value for students in interdisciplinary programming.

Q: Why do we have interdisciplinary schools?

Interdisciplinary academic and research programming brings significant benefits to students, faculty, departments, and the institution. For students, interdisciplinary curricula provide exposure to a wide range of topics within a systematic framework. This broader orientation has great potential to bring together liberal arts and STEM perspectives. The interdisciplinary cybersecurity major, for example, integrates coursework from philosophy, English, political

science, criminal justice, computer science, information technology, computer engineering, finance, and psychology. The breadth of interdisciplinary curricula prepare students for life as well as careers.

Faculty also benefit from participating in interdisciplinary schools. The opportunity to form connections with colleagues from other departments and colleges with similar interests is but one example. Access to resources provided through the interdisciplinary schools is another benefit. In addition, faculty working in interdisciplinary environments are able to expand their scientific pursuits. Commonly, faculty who are looking for something different to do in their research are able to reignite the enthusiasm for scholarship that they had when they were in graduate school. In other words, interdisciplinary pursuits can provide meaning and purpose to faculty members engaging in them. Because such value for faculty can emanate from participating in interdisciplinary pursuits, inclusion will serve as a primary value for ODU's interdisciplinary schools. In other words, participation in school activities will be open to anyone interested in making meaningful contributions to the schools.

Departments also benefit from interdisciplinary structure. A persistent myth exists that interdisciplinary programs compete with disciplinary programs. This myth is unfortunate. When done correctly, interdisciplinary programs not only complement disciplinary programs, they also help to make them stronger. On a simple level, when students from interdisciplinary programs enroll in courses offered in academic departments, enrollments in the departments produce certain types of revenue that return to the department. In many cases, students from interdisciplinary programs may decide to either double major or change their major to the disciplinary major after being exposed to the disciplinary coursework offered in the interdisciplinary major. On another level, because the interdisciplinary structures foster joint appointments, departments are in a better position to secure future lines when they help to support interdisciplinary structures. On still another level, it is hoped that departments that offer courses in interdisciplinary programs gain a sense of "ownership" over the interdisciplinary structures. Returning to cybersecurity as an example, the program would not exist without the contributions of computer science, computer engineering, information technology, philosophy, criminal justice, political science, and interdisciplinary studies, among others. The School of Cybersecurity has been celebrated for its successes. Make no mistake about it -- it is important to emphasize that the school actually encompasses each of these disciplines. So when interdisciplinary schools receive accolades, it is important to remember that home departments are the source of that success.

The institution benefits from interdisciplinary structures in many different ways. It is certain that interdisciplinary structures enhance an institution's research profile. Research collaborations tend to be within colleges and only rarely extend across research centers. While research collaboration remains primarily a bottom-up activity, many of the large and crosscutting programs applicable to data science, such as NSF INCLUDES and CyberTraining, have limits on proposals per institution and require the central coordination and planning that a School would provide. Part of the mission of the schools will be to foster partnerships between existing and new faculty members.

Third, as ODU approaches its centennial anniversary, the development of interdisciplinary schools affords an opportunity for the university to become national and international leader in these interdisciplinary areas. Some have noted that disciplines are born out of interdisciplinary efforts. What this means is that Old Dominion University has the potential to become a trailblazer that helps to create future disciplines out of its interdisciplinary efforts.

The community also benefits from interdisciplinary pursuits – particularly those being addressed at Old Dominion University. Indeed, feedback from community members has identified cybersecurity, maritime, and data science as key growth areas in our region. The graduates produced by our interdisciplinary programs and research conducted by our interdisciplinary scholars will help to shape the future of Coastal Virginia. In other words, our interdisciplinary efforts impact not just our students, but our community – today and in the future.

Q: How can I learn more about these initiatives?

Contact Vice Provost Brian K. Payne at bpayne@odu.edu.

STATE COUNCIL OF HIGHER EDUCATION FOR VIRGINIA
Program Proposal Cover Sheet

1. Institution Old Dominion University	2. Academic Program (Check one): New program proposal ☒ Certificate document ☐
3. Name of proposed program Applied Behavior Analysis	4. CIP code 42.2814
5. Degree/certificate designation Master of Science in Applied Behavior Analysis	6. Semester and year of initiation Fall 2023
7. Semester and year of first graduates Spring 2025	8. Date approved by Board of Visitors
9. For community colleges: date approved by local board date approved by State Board for Community Colleges	
10. If collaborative or joint program, identify collaborating institution(s) and attach letter(s) of intent/support from corresponding chief academic officers(s)	
11. Location of program within institution (complete for every level, as appropriate and specify the unit from the choices). Department(s) or division of Department of Communication Disorders and Special Education School(s) or college(s) of Darden College of Education and Professional Studies Campus(es) or off-campus site(s) Norfolk Campus	
12. Mode(s) of delivery: Face-to-face, traditional ☐ Hybrid (both face-to-face and distance) ☒ Distance (100% web-based) ☐	
13. Name, title, and telephone number(s) of person(s) other than the institution's chief academic officer who may be contacted by or may be expected to contact Council staff regarding the modified program. Sierra Crocker, SCHEV Liaison, 757-683-3154, scroker@odu.edu	

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Description of the Proposed Program

Program Background

Old Dominion University (ODU) in Norfolk, Virginia, seeks approval to offer a Master of Science (MS) in Applied Behavior Analysis, CIP Code 42.2814, to begin in Fall 2023. The proposed program will be offered through the Department of Communication Disorders and Special Education in the Darden College of Education and Professional Studies.

The purpose of the proposed MS in Applied Behavior Analysis is to train master-level students to become eligible for the national examination required for certification by the Behavior Analyst Certification Board and for state licensure. The program will emphasize the identification, selection, and implementation of evidence-based practices to promote positive outcomes and improve quality of life for clients who need behavior-analytic services. Students will gain skills in behavioral assessment, selection and implementation of behavior-change, data collection and evaluation of behavior-change programs within the context of professional and ethical conduct. Such skills are greatly values by educational agencies, behavior-analytic providers, and community organizations. Students will also learn to collaborate with clients, caregivers, and other professionals. Furthermore, students will gain skills in mentoring and supervision lower level behavior analysts.

The program will provide a foundation in the study of human behavior that will allow graduates to design and implement high-quality and effective behavior-change programs with fidelity within the context of ongoing assessment and data-based decision making. Graduates will be prepared to use a decision-making process encompassing professional and ethical judgement, research evidence, and client individual and contextual variables for identifying, selecting, and evaluating behavior-change programs to address the academic, behavioral, and social needs of clients who need behavior-analytic services in Virginia and nationwide.

The proposed master's degree program is aligned with the Behavior Analyst Certification Board Coursework and Experience Standards for graduate-level certification in behavior analysis (see Appendix A for coursework standards and Appendix B for experience standards requirements). Furthermore, in the Commonwealth of Virginia the license to practice as a behavior analyst is issued by the Virginia Department of Health Professions, Board of Medicine regardless of the work setting: school, medical, residential, or clinical.[1] Consistent with national certification standards and with state licensure, the title of the program – MS in Applied Behavior Analysis – is intended to accurately reflect the breath of training provided in the proposed program.

The proposed program responds to current needs in the Commonwealth of Virginia and in the nation. A need exists for highly qualified behavior analysts due to the increased prevalence of individuals with autism spectrum disorder and other developmental disabilities, changes in state and federal legislation that require the implementation of scientifically based interventions to address behaviors of social significance, and economic changes. Graduates of the program will be knowledgeable about the principles of human behavior and prepared to implement effective

[1] https://www.dhp.virginia.gov/Boards/Medicine/AbouttheBoard/RegulatedProfessions/BehaviorAnalyst/

and scientifically based behavior-change programs to address the needs of clients in the settings listed previously.

See Appendix A for Behavior Analyst Certification Board coursework standards.
See Appendix B for Behavior Analyst Certification Board fieldwork experience standards.

Institutional Mission

The mission of ODU states: "Old Dominion University, located in the city of Norfolk in the metropolitan Hampton Roads region of coastal Virginia, is a public research institution that serves its students and enriches the Commonwealth of Virginia, the nation, and the world through rigorous academic programs, strategic partnerships, and active civic engagement."

The proposed MS in Applied Behavior Analysis program will align with the mission of the university by offering a rigorous academic program that (a) equips students with the knowledge, skills, and dispositions to become highly qualified professionals in the field of behavior analysis, (b) engages students with their communities by requiring fieldwork experiences in community settings, and (c) connects and engages students with the field of behavior analysis at local, state, and national levels. Therefore, the proposed program addresses the ongoing needs of well-trained and highly skilled professionals who meet certification and licensing requirements.

Students in the proposed degree program are encouraged to participate with professional organizations, such as the Virginia Association for Behavior Analysis (VABA)[2] and the Association for Behavior Analysis International (ABAI)[3] to advocate at the state and national levels for the legislation and policies that promote access to education and treatment resources.

Delivery Format

The proposed MS in Applied Behavior Analysis will be offered in a hybrid format consisting of online academic courses and in-person supervised fieldwork experience courses. All academic courses will be offered online with web-based synchronous and asynchronous offerings as the delivery method. For synchronous courses and weekly office hours, students and faculty will connect via Zoom. Zoom is a cloud-based web-conference tool that permits users from various locations to meet, collaborate, share content, and engage in discussions. For asynchronous courses and course content management, faculty and students will utilize Canvas. Canvas is a web-based course management tool that allows faculty to administrate and manage course content while accommodating the needs of students through a variety of electronic media, such as Microsoft Word, Power Point or Prezi, Excel, and video and audio recordings. The supervised fieldwork experience courses will be offered in-person on campus and in professional clinical sites throughout the southeastern Virginia region.

ODU has a well-developed and effective distance learning support network that assists faculty in web-based course development and delivery and has been a pioneer in technology-delivered learning since 1980s. Faculty who teach in the program are trained in the course development

[2] https://virginiaaba.org/
[3] https://www.abainternational.org/welcome.aspx

and delivery through the Center for Learning and Teaching (CLT). The instructional designers, technologists, and other staff work with faculty to assist in implementing technology into courses, to disseminate the latest in course development strategies, and to provide ongoing support throughout the semester. Furthermore, online students have access to a multitude of resources and services to support their academic learning, including 24/7 technical support for accessing university services and online courses, training on how to access online courses, free software (e.g., Zoom, Microsoft One Drive, Microsoft Office 365), and resources on how to succeed as an online ODU student.

Admission Criteria

Admission criteria for the proposed MS in Applied Behavior Analysis consist of:

- A completed online application and admission fee;
- Official transcripts indicating evidence of a completed bachelor's degree from an accredited US institution or an equivalent degree from a foreign institution;
- Cumulative GPA of 3.0 or higher (on a 4.0 scale) in the undergraduate degree;
- For international students, Test of English as a Foreign Language (TOEFL) score of 550 on the paper-based test (or 79-80 on the IBT) for non-native English speakers;
- Resume or CV;
- Two letters of recommendation from current or former faculty or employers describing the applicant's previous performance in academic or professional settings, individual characteristics, and strengths that make the applicant a good candidate for a master's degree program;
- A 500-word essay describing the applicant's interest in applied behavior analysis and their career goals.

Admission as a graduate student at ODU does not imply acceptance into the MS in Applied Behavior Analysis program. A faculty committee will determine which students are accepted to the program.

Students with previous graduate work completed in a Verified Course Sequence (VCS) approved by the ABAI and offered at an accredited institution of higher education in the US may submit a request for a maximum of nine credit hours to be transferred toward the core courses. Transferred hour requests will be submitted to the program director, and if approved, added to the transcript. A VCS is a sequence of academic courses in applied behavior analysis that has been reviewed and approved by the ABAI as meeting the coursework standards required by the Behavior Analyst Certification Board, the content hours in each content domain included in the standards, and the faculty qualifications to teach the content. A maximum of nine transferred hours is allowed based on the coursework standards and content hour allocation required by the Behavior Analyst Certification Board. Specifically, the Behavior Analyst Certification Board requires that all VCS nationwide provide three credit hours in "Measurement, Data Display, and Interpretation; Experimental Design" in one freestanding course, three credit hours in "Philosophical Underpinnings; Concepts and Principles" in one freestanding course, and three credit hours in "Ethics and Professional Conduct" in one freestanding course. These nine credits can be transferred toward the core courses because they address the same content regardless of

the institution where the courses were offered. However, the remaining required credits will vary from institution to institution and, if transferred, may lead to ineligibility for national certification examination.

Curriculum

The proposed MS in Applied Behavior Analysis will require 36 credit hours of graduate-level instruction: 24 academic credits, 12 clinical (or fieldwork experience) credits, and a Capstone research project.

The structure of the curriculum provided through the proposed master's program is guided by the standards put forth by the Behavior Analyst Certification Board. These standards require that students have knowledge and skills in the following nine areas (See Appendix D for course content allocation):

1. knowledge of philosophical underpinnings guiding the field of behavior analysis;
2. knowledge of basic concepts and principles pertaining to human behavior;
3. knowledge and skills related to measurement, data display, and interpretation of behavior changes;
4. knowledge of experimental research designs as applied to evidence-based practices;
5. knowledge of professional ethics;
6. knowledge and skills regarding behavioral assessment to identify behavior excesses and deficits;
7. knowledge and skills pertaining to behavior-change procedures to address behavior excesses and deficits;
8. knowledge and skills regarding the selection and implementation of specific interventions to change behavior;
9. knowledge and skills in providing personnel supervision and management.

Guided by those standards, the curriculum includes seven 3-credit academic courses in applied behavior analysis (21 credits) and an elective 3-credit academic course. The focus of these courses is to equip students with the knowledge and skills required across the nine content areas.

Students also will complete 12 credit hours in four semesters of fieldwork experience in various settings providing behavior-analytic services. In the fieldwork experience courses, students will accrue a total of 1,500 hours of fieldwork experience with no more than 600 hours working directly with children and adults who need behavior-analytic services.

Program Requirements

New courses are indicated with an asterisk (*).

Academic Core Courses (18 credit hours required)

SPED 640 Applied Behavior Analysis: Concepts and Principles (3 credits)
SPED 642 Applied Behavior Analysis: Ethics and Professional Conduct for Behavior Analysts (3 credits)
SPED 643 Applied Behavior Analysis: Assessments and Interventions (3 credits)

SPED 644 Applied Behavior Analysis: Applications (3 credits)
SPED 645 Applied Behavior Analysis: Verbal Behavior (3 credits)
SPED 646 Applied Behavior Analysis: Personnel Supervision and Management (3 credits)

Research Core Course (3 credit hours required)
SPED 641 Applied Behavior Analysis: Empirical Bases (3 credits)

Restricted Electives (3 credit hours required)
Students will select from a prescribed list of courses. The restricted electives have been divided into three categories. Selected coursework must pe approved by the program director.

Autism Spectrum Disorder
SPED 625 Characteristics of Students with Autism Spectrum Disorder (3 credits)
SPED 627 Instructional Strategies for Students with Autism Spectrum Disorder (3 credits)

Educational Research
FOUN 611 Introduction to Research Methods in Education (3 credits)
FOUN 612 Applied Research Methods in Education (3 credits)

Psychology Special Interests
PSYC 661 Psychopathology (3 credits)
PSYC 750 Organizational Psychology (3 credits)
PSYC 763 Personnel Psychology (3 credits)

Clinical Courses (12 credit hours required)
CDSE 769* Applied Behavior Analysis: Concentrated Supervised Fieldwork (4 times at 3 credits each = 12 credits)

Capstone Project and Fieldwork Experience
Across four semesters throughout the program, students will accrue a total of 1,500 hours of fieldwork experience with no more than 600 hours working directly with children and adults who need behavior-analytic services. During the fieldwork experience, students will develop and demonstrate mastery in clinical skills of assessment, data collection, implementation of behavior-change procedures, and evaluation of behavior-analytic interventions. All fieldwork experience will take place in professional clinical sites throughout the southeastern Virginia region (see Appendix C for list of practicum sites). In clinical sites, students will be supervised by a BCBA. As part of the fieldwork experience, students will be required to identify a problem of practice in the clinical placement and to propose and conduct a Capstone research project under the supervision of a faculty member.

Fieldwork experience competence will be rated across semesters with a Clinical Skills Competencies rating scale. The extensive scale lists professional behaviors pertaining to oral and written communication skills, assessment and data collection, intervention skills, and personal and interaction skills. The scale is rated as: 0 (dependent), 1 (emerging), 2 (present), 3 (developed), and 4 (exceptional). The scale is completed in each fieldwork experience course by the student's primary supervisor at midterm and end of semester. At the completion of the first

year of fieldwork experience, students are expected to perform at the level of 2-3 across criteria. At the completion of the second year, students are expected to perform at a level 3 or greater across all criteria. Students will be evaluated by both a faculty member and their primary supervisor at the practicum site. Grades for the fieldwork experience courses will be based on a pass/fail option. Students who do not meet expected levels of competency in a given semester and fail the course will be required to re-enroll in the course in the following semester. Failure to meet competency after the second opportunity leads to dismissal from the degree program.

Comprehensive Exam

The culmination of the academic and fieldwork experience training will be a written comprehensive examination. All students must pass a comprehensive exam that consists of multiple-choice questions simulating the Behavior Analyst Certification Board examination at the BCBA level and covers topics from all behavior-analytic courses taught in the program. In the semester of the comprehensive examination, students will be given guided study questions for each topic area to facilitate their preparation for the exam. The final examination will be administered toward the end of the student's final semester in the program.

Students will take the comprehensive examination in one three-hour setting proctored by program faculty. A grade of 80% or greater will be required to pass the comprehensive exam. Students who fail the examination on the first attempt will have the opportunity to meet with the faculty member to receive feedback to assure preparation for the exam prior to re-taking the exam. By university policy, failure to pass the exam on the second attempt will result in dismissal from the program.

See Appendix A for Behavior Analyst Certification Board coursework
See Appendix B for Behavior Analysts Certification Board fieldwork experience standards
See Appendix C for practicum sites
See Appendix D for course content allocation
See Appendix E for a sample plan of study for full-time and part-time students
See Appendix F for course descriptions.

Time to Degree

Full-time students will complete the program in two academic years (4 semesters – fall and spring). Part-time students will complete the program in approximatively 3 years, depending on their course load each semester. Students must complete their master's degree at ODU within 8 years. Summer enrollment is not required.

Faculty Resources

Two full-time faculty members and five adjunct clinical supervisors in the Department of Communication Disorders and Special Education have experience teaching and supervising students in clinical sites to initiate and operate the proposed program. All full-time faculty and adjunct clinical supervisors maintain their certification in behavior analysis and will devote their time to the program.

The full-time faculty includes one associate professor and one tenure-track assistant professor who have terminal degrees in education and are certified as behavior analysts at doctoral level (BCBA-D). The full-time faculty members will teach the required academic and research core courses in the program. Collectively, the academic faculty have 19 years of teaching experience in the field of behavior analysis and education. In addition, the full-time faculty members have provided behavior-analytic services to students and clients in school and residential settings. Therefore, the two full-time faculty members have expertise in behavior analysis and are qualified to deliver relevant course content that allows students to learn from those who are knowledgeable and engaged in topics relevant to the courses they are teaching. Faculty members have expertise in autism spectrum disorders, significant cognitive disabilities, behavior support, language and communication interventions, single-case experimental research designs, and training and supervision.

Adjunct clinical supervisors have a master's degree from an accredited institution of higher education in the US and are certified as BCBAs. They will provide supervision to students at clinical sites. The adjunct clinical supervisors have a combined 57 years of clinical experience working in educational and clinical settings and providing supervision to students and implementing behavior-analytic procedures with clients. All adjunct clinical supervisors have previously provided supervision to students enrolled in the Applied Behavior Analysis Certificate program at ODU. Individual adjunct clinical supervisors hold special credentials including, speech-language pathology and teaching certifications. They have broad experiences with specialized interests to assure high-quality training to students.

See Appendix G for abbreviated CVs of the applied behavior analysis faculty

Student Learning Assessment

The proposed MS in Applied Behavior Analysis program will use ongoing formative assessments across the curriculum to determine if students met the objectives targeted in each academic course. Students will be assessed in each academic course using a variety of assessment methods consisting of quizzes, exams, homework assignments, projects, and presentations that are aligned with the standards of the field of behavior analysis. During fieldwork experience training, students will be evaluated on their performance on the implementation of specific assessment and behavior-change interventions, and personal and interaction skills. Students will be assessed by the primary supervisor at the clinical practicum site as well as by a faculty member. Each of these professionals will monitor students' performance during direct observations and supervisory meetings with the students.

The proposed MS in Applied Behavior Analysis will also use summative assessments to evaluate student mastery of knowledge and skills. First, all students will complete a written comprehensive examination consisting of multiple-choice questions simulating the Behavior Analyst Certification Board examination at the BCBA level and covering topics from all courses taught in the program. Second, the culminating summative assessment of fieldwork experience training will consist of a Capstone research project where students will demonstrate the mastery of clinical skills by designing and implementing a behavior-change intervention to address a

socially-significant behavior of one or multiple clients or by researching a problem of clinical significance through a review of the behavior-analytic literature.

Student Learning Outcomes

The student learning outcomes (SLOs) for the proposed degree program are specific to graduate-level knowledge and skills that students should acquire by the end of the program. Faculty worked with staff members in the ODU's Office of Institutional Effectiveness and Assessment to develop learning outcomes and select appropriate measures. In addition, faculty identified SLOs aligned with the academic coursework standards put forth by the national certification organization (i.e., Behavior Analyst Certification Board). The following SLOs were identified:

1. Utilize techniques of measurement, data display, and interpretation to investigate questions relevant to research and practice.
2. Apply ethical and professional guidelines to dilemmas in applied behavior analysis.
3. Implement techniques of assessment, behavior-change procedures, and interventions to promote socially appropriate behaviors and language acquisition.
4. Analyze individual and contextual variables to facilitate the implementation of effective interventions targeting socially significant behaviors.
5. Integrate behavior-analytic principles, procedures, and ethical guidelines to provide effective supervision and enhance personnel performance.
6. Collaborate with colleagues, other professionals, and parents to develop, implement, and evaluate behavior-analytic programs.
7. Use communication skills for professional roles and practice.

Data related to the SLOs will be collected on an annual basis and reported on the university' assessment database. Evidence of student achievement of learning objectives will be assessed during the program through assessments embedded in coursework, including written exams, quizzes, projects, case studies, and clinically related assignments. Each course has objectives that must be met for the student to successfully pass the course, and those objectives are aligned with the program's SLOs.

Below is a map of the SLOs for the proposed MS in Applied Behavior Analysis program, as well as the courses where assessment takes place to address each outcome. Multiple courses throughout the curriculum help students develop and master the knowledge and skills needed for professional practice. At the completion of the curriculum, each student will demonstrate mastery of each SLO. The program director will summarize the results of student achievement in a cumulative tracking sheet.

Curriculum Map: Master of Science in Applied Behavior Analysis

Student Learning Outcome	Course	Assessment Method
Utilize techniques of measurement, data display, and interpretation to investigate questions	SPED 641 Applied Behavior Analysis: Empirical Bases	Formative: scenario-based assignments; article critique; oral presentations; fieldwork experiences

relevant to research and practice.	CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Summative: experiment project assessed with a program-level rubric; final exam on techniques of measurement, data display, and interpretation; Capstone research project assessed with a program-level rubric; subset of questions on the supervised fieldwork evaluation form; subset of questions on the comprehensive exam
Apply ethical and professional guidelines to dilemmas in applied behavior analysis.	SPED 642 Applied Behavior Analysis: Ethics and Professional Conduct for Behavior Analysts CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Formative: quizzes; case studies; fieldwork experiences Summative: final exam on ethical and professional guidelines; Capstone research project assessed with a program-level rubric; subset of questions on the supervised fieldwork evaluation form; subset of questions on the comprehensive exam
Implement techniques of assessment, behavior-change procedures, and interventions to promote socially appropriate behaviors and language acquisition.	SPED 643 Applied Behavior Analysis: Assessments and Interventions SPED 645 Applied Behavior Analysis: Verbal Behavior CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Formative: scenario-based assignments; quizzes; discussion board forums; case studies; fieldwork experiences Summative: function-based intervention project assessed with a program-level rubric; verbal behavior instructional project assessed with a program-level rubric; supervised fieldwork evaluation; subset of questions on the comprehensive exam
Analyze individual and contextual variables to facilitate the implementation of effective interventions targeting socially significant behaviors.	SPED 643 Applied Behavior Analysis: Assessments and Interventions SPED 644 Applied Behavior Analysis: Applications	Formative: scenario-based assignments; discussion board forums; quizzes; case studies Summative: function-based intervention project assessed with a program-level rubric; final exam on effective interventions; complex case study analysis assessed with a program-level rubric

Integrate behavior-analytic principles and procedures and ethical guidelines to provide effective supervision and enhance personnel performance.	SPED 646 Applied Behavior Analysis: Personnel Supervision and Management CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Formative: oral presentation; performance-evaluation assignment; quizzes; fieldwork experiences Summative: training program assessed with a program-level rubric; subset of questions on the supervised fieldwork evaluation form; subset of questions on the comprehensive exam
Collaborate with colleagues, other professionals, and parents to develop, implement, and evaluate behavior-analytic programs.	SPED 643 Applied Behavior Analysis: Assessments and Interventions SPED 646 Applied Behavior Analysis: Personnel Supervision and Management CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Formative: scenario-based assignments; discussion board forums; group case studies; fieldwork experiences Summative: function-based intervention project assessed with a program-level rubric; peer assessment with rubric; subset of questions on the supervised fieldwork evaluation form
Use communication skills for professional roles and practice.	SPED 646 Applied Behavior Analysis: Personnel Supervision and Management CDSE 769 Applied Behavior Analysis: Concentrated Supervised Fieldwork	Formative: written assignments; oral presentation; fieldwork experiences Summative: training program assessed with a program-level rubric; subset of questions on the supervised fieldwork evaluation form; Capstone research project assessed with a program-level rubric

Employment Skills

Upon completion of the MS in Applied Behavior Analysis program, students will be able to engage in professional practice as expected of an entry level BCBA and be able to do:

- Conduct behavioral assessments to determine current level of performance, including behavioral deficits and excesses.

- Develop, monitor, and evaluate the effects of behavior-change interventions to promote skill acquisition and reduce problem behavior.
- Train, supervise, and mentor staff and supervisees in the implementation of assessments, data collection, and behavior-change procedures.
- Identify, select, and use human, material, and technological resources needed to perform professional roles and keep abreast of the field's changing knowledge base.
- Engage in collaboration with clients, parents, caregivers, colleagues, and other professionals through communication and shared decision-making.
- Adhere to legal, professional, and ethical guidelines and advocate for sound professional practices and public policies to enhance outcomes of all clients.
- Disseminate behavior analysis by educating and training clients, parents, caregivers, and professionals on the use of behavior-change interventions.

Relation to Existing Programs

Expansion of Existing Certificate Program
The proposed MS in Applied Behavior Analysis is an expansion of the existing Applied Behavior Analysis Certificate program. The Applied Behavior Analysis Certificate program targets students who already hold a master's degree or complete their master's degree concurrent with the certificate program. The Applied Behavior Analysis Certificate program does not result in a degree and most of the students enrolled in the certificate program are full-time professionals who intend to obtain a certificate in behavior analysis.

The proposed degree program will expand the certificate by offering students with a bachelor's degree the opportunity to complete their graduate-level education and become eligible for national certification as behavior analysts within the same master's degree program. It will also expand the options for those interested in BCBAs jobs outside the K-12 settings.

If the proposed MS in Applied Behavior Analysis is approved, the Applied Behavior Analysis Certificate program will continue to be offered to eligible students who seek national certification in behavior analysis. The certificate program will not be altered or discontinued because it targets a different student population.

Relation to Existing ODU Degree Programs
The proposed MS in Applied Behavior Analysis has no relationship with or similarity to other master's programs at ODU.

Justification for the Proposed Program

Response to Current Needs (Specific Demand)

The field of behavior analysis uses the principles of behavior to identify and design comprehensive programs that promote independent and effective functioning in the natural environment and enhances quality of life. Professionals with graduate-level degrees in behavior analysis work with clients, caregivers, and other professionals to identify biological and

environmental factors the influence one's behavior and use a decision-making process to design comprehensive programs that facilitate socially appropriate behaviors. Graduate-level behavior analysts also work collaboratively with clients, caregivers, and advocates in the field of autism to influence policy at local, state, and national levels.

The proposal MS in ABA responds to current needs in the Commonwealth of Virginia and nationwide and prepares students to work within areas that need professionals with a master's degree in behavior analysis. The current needs include (1) a market demand for more highly trained behavior analysts due to the significant increase in the number of children diagnosed with autism spectrum disorder, (2) the focus on providing scientifically based interventions and enhancing the quality of services provided to individuals with autism spectrum disorder to promote positive outcomes and an enhanced quality of life, and (3) preparing highly qualified professionals to implement behavior-analytic interventions.

Increase in the Number of Children Diagnosed with Autism Spectrum Disorder

One of the factors contributing to the high demand for BCBAs is the rapid growth in the number of children diagnosed with autism spectrum disorder. Current prevalence estimates of autism spectrum disorder in the US suggest that 1 in 54 children, or about 1.9%, have been identified with autism spectrum disorder (Maenner et al., 2020).[4] The prevalence of autism spectrum disorder has steadily increased over time. In 2000, the reported prevalence of autism spectrum disorder was 1 in 149 children, and by 2010, it had risen to 1 in 68 children (Maenner et al., 2020). The increase in the number of children with autism spectrum disorder has also been documented in Virginia. According to the Commonwealth of Virginia data published in 2022, the number of individuals ages 3 to 21 receiving special education services under the category of autism spectrum disorder increased from 22,704 in 2018 to 25,373 in 2022.[5] Individuals with autism spectrum disorder present unique characteristics, including deficits in social interaction, communication, and behavior (American Psychiatric Association, 2013).[6] Without effective and scientifically based interventions, these deficits become more prominent during transition to adulthood when the complexity of social situations increases and, thus, leading to social isolation, limited or no friendships, depression, and problem behavior (Laugeson et al., 2012).[7]

The proposed MS in ABA provides advanced coursework in the science of human behavior that will allow students to understand the main characteristics of autism spectrum disorder, their impact on the academic, social, and behavioral development of individuals with autism spectrum disorder, and the influence of biological and environmental factors on their behavior. Graduates will acquire knowledge and skills to understand the purpose of one's behavior and to manipulate environmental events to facilitate appropriate behavior and reduce the likelihood of problem

[4] Maenner, M. J., Shaw, K. A., & Baio, J. (2020). Prevalence of autism spectrum disorder among children aged 8 years—autism and developmental disabilities monitoring network, 11 sites, United States, 2016. *MMWR Surveillance Summaries*, *69*(4), 1. https://doi.org/10.15585/mmwr.ss6904a1

[5] https://p1pe.doe.virginia.gov/apex/f?p=260:1:::::p_session_id,p_application_name:-3875887330272364168,december1

[6] American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing.

[7] Laugeson, E. A., Frankel, F., Gantman, A., Dillon, A. R., & Mogil, C. (2012). Evidence-based social skills training for adolescents with autism spectrum disorder: The UCLA PEERS program. *Journal of Autism and Developmental Disorders, 42,* 1025-1036. https://doi.org/10.1007/s10803-011-1339-1

behavior and, consequently, minimize the impact of biological and environmental events on one's functioning in the natural environment.

Focus on Providing Scientifically Based Interventions

Applied behavior analysis (i.e., the application of the science of human behavior to address socially significant behavior and improve the quality of life of individuals) has been documented as one of the most effective instructional approaches for individuals with autism spectrum disorder (Cooper et al., 2020[8]; Shook et al., 2002[9]). Researchers have shown that intensive early intervention services rooted in applied behavior analysis led to positive outcomes in the areas of cognitive, social-communication, and independent living functioning (Lovaas, 1987[10]). Applied behavior analysis interventions are provided by professionals certified as behavior analysts who have the knowledge, skills, and training to design, implement, and evaluate interventions leading to positive outcomes for the clients with whom they work. Graduates of the proposed MS in Applied Behavior Analysis program will possess the academic and clinical training to address the behavioral needs of individuals with autism spectrum disorder and other disabilities across the life span.

The proposed MS in ABA provides extensive training in selecting, implementing, and evaluating scientifically based interventions within the context of a decision-making model. This model will allow graduates to identify and implement behavior-change programs based on empirical evidence while considering the client's individual characteristics, values, and preferences withing the context of professional and ethical practice. Graduates will learn how to conduct assessments, develop data-based scientific interventions that match the unique characteristics of clients, monitor the effectiveness of interventions and their implementation with fidelity, and make data-based decisions to revise and adjust interventions to maximize their effectiveness.

Preparing Highly Qualified Professionals

In response to the increase in the number of children with autism spectrum disorder and the need to respond to the growing demands for early diagnostic and scientifically based treatment, numerous efforts have been undertaken to facilitate the provision of behavior-analytic services by qualified professionals both at the national and at the state level. At the national level, numerous parent groups have advocated for the provision of applied behavior analysis for children with autism spectrum disorder and for insurance coverage of these services (Baller et al., 2016[11]; Guercio & Murray, 2014[12]). Most often, BCBAs working with children and adults with autism spectrum disorder are paid by Medicaid or private insurance companies. Second, the Behavior Analyst Certification Board has raised the training and competency requirements to

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[8] Cooper, J. O., Heron, T. E., & Heward, W. L. (2020). *Applied Behavior Analysis* (3rd ed.). Pearson Prentice Hall.

[9] Shook, G. L., Ala'I-Rosales, S., & Glenn, S. S. (2002). Training and certified behavior analysts. *Behavior Modification, 26,* 27-48. https://doi.org/10.1177/0145445502026001003

[10] Lovaas, I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55,* 3-9. https://doi.org/10.1037/0022-006X.55.1.3

[11] Baller, J. B., Barry, C. L., Shea, K., Walker, M. M., Ouellette, R., & Mandell, D. S. (2016). Assessing early implementation of state autism insurance mandates. *Autism, 20,* 796-807. https://doi.org/10.1177/1362361315605972

[12] Guercio, J. M., & Murray, W. J. (2014). Licensure for behavior analysts: The path to responsible and cooperative action. *Behavior Interventions, 29,* 225-240. https://doi.org/10.1002/bin.1388

ensure that professionals have the knowledge and skills needed to provide high-quality interventions while following the ethical and professional guidelines for behavior analysts. Beginning with January 1, 2022, the eligibility criteria to obtain a national certification in behavior analysis at the master's level are: (a) master's degree from an accredited institution in U.S.; (b) 315 hours of graduate-level instruction in a VCS program, and (c) 1,500 – 2,000 hours of fieldwork experience. Graduates of the proposed MS in Applied Behavior Analysis program will meet the eligibility criteria to apply for the national certification examination at the master's level.

At the state level, the Governor Robert McDonnell signed H.B. 2467 into law requiring that health plans provide coverage for the diagnosis and treatment of autism spectrum disorder in children ages 2 to 6 years old. One of the treatments covered by health plans is applied behavior analysis. In 2015, Governor Terry McAuliffe extended the coverage to children ages 2 to 10 years old (H.B. 1940) which was then expanded to cover the diagnosis and treatment of individuals with autism spectrum disorder ages 2 to 14 years old (H.B. 984). The law also requires that applied behavior analysis must be provided or supervised by a BCBA who is licensed by the Board of Medicine. In Virginia, licensure is overseen by the Virginia Department of Health Profession, Board of Medicine. To practice as a behavior analyst in Virginia, an individual must be licensed by the Board of Medicine. The Regulations Governing the Practice of Behavior Analysis state that to receive a license as a behavior analyst, "an applicant for a license to practice as a behavior analyst shall hold current certification as a BCBA® obtained by meeting qualifications and passage of the examination required for certification as a BCBA® by the BACB." (Virginia Regulations Covering the Practice of Behavior Analysis, p. 4).

The proposed MS in ABA will provide advanced coursework to prepare students with knowledge and skills in behavior analysis and behavior-analytic research that would allow students to design comprehensive and effective programs and provide high quality behavior-analytic services. Graduates of the proposed program will learn to identify and critically evaluate behavior-analytic research to stay updated with the most recent developments in the field of behavior analysis and, consequently, implement effective interventions. Furthermore, graduates of the proposed program will be eligible to take the national examination to obtain certification as BCBAs and then apply for licensure as a behavior analyst in Virginia.

See Appendix H for Regulations Governing the Practice of Behavior Analysis in Virginia

Employment Demand

Over the past two decades, the field of applied behavior analysis has grown significantly as suggested by the increase in the number of professionals certified by the Behavior Analyst Certification Board (Deochand & Fuqua, 2016[13]). For example, the total number of BCBAs in 2021 was 54,223 compared to 37,859 in 2019 (BACB, 2021[14]). Despite the increase in the number of BCBAs, this credential is not listed as a specific job title in the Occupational Outlook Handbook published by the US Bureau of Labor Statistics (BLS). The closest specific job title to

[13] Deochand, N., & Fuqua, R. W. (2016). BACB certification trends: State of the states (1999 to 2014). *Behavior Analysis in Practice, 8,* 176-189. https://doi.org/10.1007/s40617-016-0118-z

[14] BACB (2021). https://www.bacb.com/bacb-certificant-annual-report-data/

BCBA listed in the Occupational Outlook Handbook is substance abuse, behavioral disorder, and mental health counselor. According to the US BLS, "Employment of substance abuse, behavioral disorder, and mental health counselors is projected to grow 23 percent from 2020 to 2030, much faster than the average for all occupations."[15] The occupational outlook for substance abuse, behavioral disorder, and mental health counselor positions from 2020 to 2030[16] is presented below:

Labor Market Information: Bureau of Labor Statistics, 2020-2030 (10-Yr)

Occupation Title	Base Year Employment	Projected Employment	Total % Change	Typical Entry Level Education
Substance abuse, behavioral disorder, and mental health counselors	327,500	402,600	23	Bachelor's degree

Additional data pertaining specifically to the ODU region of the country can be found in the Virginia Employment Commission statistics. Data for Virginia show that demand for mental health and substance abuse workers will be robust. The Virginia Employment Commission, Labor Market Information data projects growth between 2018 and 2028.

Labor Market Information: Virginia Employment Commission, 2018-2028 (10-Yr)[17]

Occupation Title	Base Year Employment	Projected Employment	Total % Change	Annual Change	Education
Mental health and substance abuse worker	4943	5545	12.17	60	Bachelor's degree

Furthermore, a recent market analysis conducted by Burning Glass Technologies (2021) revealed that "over the past 11 years, demand for behavior analysts holding BCBA or BCBA-D certification has increased by 4,209%. Annual demand for individuals holding BCBA/BCBA-D certification has increased each year since 2010, with a 17% increase from 2019 to 2020 (Burning Glass Technologies, 2021, p. 1). For example, the annual number of job postings has increased from 789 in 2010 to 33,996 in 2020. Furthermore, in Virginia the number of job postings has increased from 866 in 2019 to 1,134 in 2020 suggesting an increase of 31% in just one year (Behavior Analyst Certification Board, 2021[18]).

The proposed degree program prepares students to become BCBAs which is a national credential required to provide behavioral interventions and supports to children and adults with autism spectrum disorder and other developmental disabilities. BCBAs provide services that are

[15] https://www.bls.gov/ooh/community-and-social-service/substance-abuse-behavioral-disorder-and-mental-health-counselors.htm

[16] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Substance Abuse, Behavioral Disorder, and Mental Health Counselors, at https://www.bls.gov/ooh/community-and-social-service/substance-abuse-behavioral-disorder-and-mental-health-counselors.htm

[17] https://virginiaworks.com/occupational-projections

[18] Behavior Analyst Certification Board. (2021). *US employment demand for behavior analysts: 2010-2020*. Author

reimbursed through Medicaid and private insurance and the average entry salary is between $47,700 and $74,000 for full employment.[19]

The employability of BCBAs is difficult to capture because they are often self-employed. Similar to other professions who bill private insurance or Medicaid for services (e.g., physicians), BCBAs often establish their own companies upon obtaining their credential. Consequently, the employment data in the table below underestimates the opportunities for individuals with this credential. Furthermore, BCBAs can work in a variety of settings and with a variety of populations, but the current state of services for children with autism spectrum disorder in Virginia can provide an indicator of employment opportunities for BCBAs in the state.

In Virginia, there are 24,202 individuals with autism spectrum disorder between the ages of 2 and 21 years old. There are currently 1,450 BCBAs in Virginia. Not all of them are practicing, nor do they all work with individuals with autism spectrum disorder ages 2 to 21 years old – many of them work with adults and other populations. The credentialing board provides guidance that a BCBA working with individuals with autism spectrum disorder should have no more than 6-12 clients at one time.[20] Thus, even if all the BCBAs in Virginia were actively providing services to individuals with autism spectrum disorder, they could serve between 8,700 and 17,400 individuals. Considering that not all of BCBAs are practicing (i.e., they may be university faculty) and not all of those practicing work with individuals with autism spectrum disorder ages 2 to 22 years old (i.e., they may work with adults with other disabilities), there is clear documentation of a high demand in the state for professionals with this credential to serve this population.

Additionally, this analysis represents just one employment opportunity for BCBAs. These professionals may also work with children with autism spectrum disorder and receive payment through private insurance, or they may work in school settings, mental health clinics, or hospitals, or as independent behavior support providers with adults with intellectual and developmental disabilities.

See Appendix I for the US Behavior Analyst Workforce: Understanding the National Demand for Behavior Analysts (Burning Glass Technologies Report, 2021)
See Appendix J for employment announcements
See Appendix K for employment letters of support

Duplication

Three other public institutions in Virginia offer similar or related degree programs to the proposed MS in Applied Behavior Analysis at ODU:

1. James Madison University: Master of Arts in Psychological Sciences with a Concentration in Behavior Analysis (36 credits; CIP code 42.9999)
2. Mary Baldwin University: Master of Science in Applied Behavior Analysis (35 credits; CIP code 42.2814)
3. Shenandoah University: Master of Science in Applied Behavior Analysis (37 credits; CIP code 42.2814)

[19] https://www.payscale.com/mypayscale.aspx?pid=68a738a2-00a9-46cc-a9ca-09d273e6285c&wizardid=7&s=1&ft=0&surveyId=fff9825d-dca9-4341-99da-1b0da7927026
[20] https://casproviders.org/asd-guidelines/

Similarities
The three universities (James Madison University, Mary Baldwin University, and Shenandoah University) and ODU offer a VCS that is approved by the ABAI under the 5th Edition Task List (i.e., academic coursework standards put forth by the national credentialing organization that consist of 315 hours of graduate-level instruction in behavior analysis).[21] A VCS is a sequence of academic courses in applied behavior analysis that has been reviewed and approved by the ABAI as meeting the coursework standards required by the Behavior Analyst Certification Board, the content hours in each domain included in the standards, and the faculty qualifications to teach the content. Therefore, the programs are similar in the course content and the distribution of hours across content domains to address curriculum requirements.

Differences
There are differences between the proposed ODU master's program, and the existing programs offered at the other three universities in Virginia. The differences can be noted in how the curricula are structured to meet the certification requirements, the fieldwork experience courses, and the culminating requirement to complete the degree. The geographic location of ODU differs from the other three programs. The location of ODU in southeastern Virginia in a large urban metropolitan community provides a breadth of fieldwork experiences working with children and adults with autism spectrum disorder and other disabilities and has a large concentration of military students. The three programs (James Madison University, Mary Baldwin University, and Shenandoah University) are located west and northwest of Richmond. The geography of the locations of ODU and the other universities differ and, thus, appealing to different students. Specific differences for each program are described below.

James Madison University (JMU) Master of Arts with a Concentration in Behavior Analysis (36 credits)
The program offered at JMU is housed in the Department of Graduate Psychology, whereas the program at ODU is offered in the Department of Communication Disorders and Special Education in the Darden College of Education and Professional Studies. JMU's curriculum for graduate students interested in behavior analysis is structured differently from the proposed program at ODU. JMU's program is intended for students interested in pursuing a doctoral degree in behavior analysis or a related field (e.g., behavioral pharmacology, behavioral neuroscience, exceptional education) and focuses on experimental behavior analysis compared to the proposed program at ODU intended for students interested in working with children and adults with autism spectrum disorder and other disabilities and focuses on applied behavior analysis. JMU's program consists of 5 methods and research core courses (15 credits), 3 content courses (9 credits), and 4 concentration and elective courses (12 credits). ODU will have the same number of courses but will include 6 core courses (18 credits), 1 research course (3 credits), 1 elective (3 credits), and 4 fieldwork experience courses (12 credits).

Although both the JMU program and the proposed ODU program are verified and approved by ABAI under the 5th Edition Task List requirements, the content covered in the courses included in the program is different. JMU's program includes topics such as, experimental analysis of behavior, neuroscience, human neuropsychology, systematic behavioral interventions, and special topics in psychology. These topics are not offered in the proposed program at ODU.

[21] https://www.abainternational.org/vcs/directory.aspx

Another difference between JMU and ODU program consists of the number of credits required to complete the fieldwork experience requirements. JMU offers 1 and 6 credit hours courses, while the fieldwork experience courses at ODU consist of 3 credit hours for a total of 12 credits. The culminating projects for the JMU's degree program differ as well. Students at JMU must complete a thesis consisting of an experimental study while enrolling in 3 or 6 thesis credits. ODU's culminating experience includes a comprehensive exam and a Capstone research project.

Mary Baldwin University Master of Science in Applied Behavior Analysis (35 credits)
Mary Baldwin University has structured its MS in Applied Behavior Analysis in a different format than the ODU format. Mary Baldwin University has 14 academic courses: two 4-credit courses, seven 3-credit courses, one 2-credit course, and four 1-credit courses. ODU will have eight 3-credit academic courses. Mary Baldwin University has several 3- and 4-credit courses on topics not offered in the ODU proposed program (e.g., exceptionality, professional inquiry, legal and professional processes of exceptionality). Another difference is that Mary Baldwin University does not offer fieldwork experience courses to meet the eligibility criteria to sit for the national certification examination. Students are required to complete this requirement independent of the university. The proposed program at ODU requires students to complete fieldwork experience courses for a total of 12 credits and, thus, graduates will meet all three requirements for national certification, including a master's degree, 315 hours of graduate instruction in behavior analysis, and 1500 hours of fieldwork experience. We could not locate any information on the culminating experience for the Mary Baldwin University program. ODU's culminating experience includes a comprehensive examination and a Capstone research project.

Shenandoah University Master of Science in Applied Behavior Analysis (33 credits)
Shenandoah University has structured its master's curriculum for behavior analysis students in a format that differs from the ODU format. Shenandoah University has seven 3-credit academic courses. In addition, it offers six credit hours of electives, and six credit hours for a Capstone project. The proposed program at ODU requires eight 3-credit academic courses and 12 credit hours of fieldwork experience (four 3-credit courses). Although both the Shenandoah University program and the ODU proposed program are approved under the 5th Edition Task List put forth by the BACB, Shenandoah University offers two courses (PSY 571: Special Populations and Applied Behavior Analysis and PSY 580: The Organization Context for Applied Behavior Analysis [OBM] that are not offered at ODU. Similarly, ODU offers two courses (SPED 644: Applied Behavior Analysis: Applications and SPED 646: Applied Behavior Analysis: Personnel Management and Supervision) that are not offered in the Shenandoah University program. In addition, the program at Shenandoah University does not offer students the possibility of accruing fieldwork experience hours during enrollment in the program to meet the eligibility for national certification. Thus, students must complete this requirement independent of the degree program. The proposed degree program at ODU will offer fieldwork experience hours during enrollment in the program. Furthermore, the program at Shenandoah University is offered in the Department of Psychology, whereas the proposed program at ODU will be offered in the Department of Communication Disorders and Special Education. The culminating experience for the Shenandoah University program consists of a Capstone research project, while the culminating experience for the proposed program at ODU consists both of a comprehensive examination and of a Capstone research project.

Data from the SCHEV research unit, retrieved on February 10, 2022, in the form of enrollment[22] and degrees awarded[23] for the three other Virginia public universities offering a master's degree program similar to the proposed ODU program are provided in the table below.

Enrollment and Degrees Awarded at Comparable Programs in Virginia

Enrollment	**Fall 2017**	**Fall 2018**	**Fall 2019**	**Fall 2020**	**Fall 2021**
JMU	Not reported	Not reported	Not reported	Not reported	Not reported
Mary Baldwin University	Not reported	5	27	81	93
Shenandoah University	Not reported	23	18	16	19
Degrees Awarded	**2017**	**2018**	**2019**	**2020**	**2021**
JMU	Not reported	Not reported	Not reported	Not reported	Not reported
Mary Baldwin University	Not reported	Not reported	Not reported	3	14
Shenandoah University	7	11	11	9	8

Student Demand

Evidence of student demand for the proposed MS in Applied Behavior Analysis is based on two sets of data: enrollment numbers in the Applied Behavior Analysis Certificate program and a survey of current undergraduate students.

Enrollment in the Applied Behavior Analysis Certificate Program

Over the past 7 years, the coursework and fieldwork experience required to sit for the national certification exam has been offered in the Applied Behavior Analysis Certificate program to students who had a master's degree or were in the process of completing a master's degree while enrolled in the certificate program. The number of students enrolled in the program suggest a strong interest for obtaining the BCBA credential. The overall numbers of students enrolled in the Applied Behavior Analysis Certificate program are displayed in the table below.

Year	Fall 2016	Fall 2017	Fall 2018	Fall 2019	Fall 2020	Fall 2021
Enrollment	10	19	17	10	17	17

[22] http://research.schev.edu//enrollment/E16_Report.asp
[23] http://research.schev.edu//Completions/C1Level2_Report.asp

Survey
In Spring 2022, the program director of the Applied Behavior Analysis Certificate program conducted a survey of undergraduate students at Old Dominion University. The survey was sent to junior and senior undergraduate students taking courses in psychology, speech-language pathology, and special education to evaluate their interest for the proposed program. Responses were received from 136 students (91 students in psychology, 17 students in speech-language pathology, and 26 students in special education).

Undergraduate students were asked about their interest in pursuing graduate education in general. Among the undergraduate respondents, 86 (63.2%) "strongly agreed" and 41 (30.15%) "agreed" that they were interested in pursuing a graduate degree in general. When asked about their interest in pursuing a graduate degree in applied behavior analysis, specifically, 40 (29.41%) "strongly agreed," 45 (33.09%) "agreed," 39 (28.68%) were "neutral," and 2 (1.47%) "strongly disagreed." When asked about their level of interest in pursuing a graduate degree in applied behavior analysis at ODU, 46 (33.82%) "strongly agreed" and 42 (30.88%) "agreed." Furthermore, when asked about the need to offer a graduate degree in applied behavior analysis in southeastern Virginia, 74 (54.41%) "strongly agreed" and 40 (29.41%) "agreed" that this program would be important.

See Appendix L for Student Demand Survey.

Summary of Projected Student Enrollment

Projected Student Enrollment

Year 1		Year 2		Year 3		Year 4 **Target Year (2-year institutions)**			Year 5 **Target Year (4-year institutions)**		
2023 - 2024		2024 - 2025		2025 - 2026		2026 - 2027			2027 - 2028		
HDCT 8	FTES 6	HDCT 15	FTES 12	HDCT 17	FTES 14	HDCT 19	FTES 15	GRAD 19	HDCT 19	FTES 15	GRAD 19

The table above indicates projections of eight new students starting each year as a cohort in the fall semester in the first two years of the program, but also growth of 2 new students in additional years with 10 new students starting each fall in Years 3, 4, and 5. One of the factors contributing to the limited number of students accepted into the program each year is based on the intensity of fieldwork experience requirements. Specifically, the Behavior Analyst Certification Board has very specific requirements related to the number of fieldwork experience hours and the type of activities that can be counted toward experience. For example, a student who completes 25 hours of independent fieldwork experience hours per week must spend 2.1 hours with a supervisor. A supervisor who works with 3 students must spend a total of 6.3 hours

weekly providing supervision to students (see Appendix B for Experience Standards requirements).

As it is expected with any program, we have accounted for potential attrition. Specifically, we anticipate that one student may not continue to the second year of the program for each cohort. Also, cohorts would graduate in the spring semesters and the new cohorts would begin in the fall semesters.

Assumptions
Retention percentage: 90%
Percentage of full-time students: 80%; Percentage of part-time students: 20%
Full-time student credit hours per semester: 9
Part-time student credit hours per semester: 6
Full-time students graduate in 2 years
Part-time students graduate in 3 years
Projected Resource Needs for the Proposed Program

Narrative Description of Resources to Initiate and Operate the Degree Program

Old Dominion University and the Department of Communication Disorders and Special Education have sufficient resources to initiate and sustain the proposed MS in Applied Behavior Analysis program. The department has the faculty, staff, equipment, space, and library resources to launch and maintain the proposed program. Existing resources from the Applied Behavior Analysis Certificate program are available for the proposed degree program.

The proposed program allocates 2 FTE of instructional effort for every 5 FTE of enrollment. The proposed program will, therefore, require a total of 2 FTE of instructional effort in Years 1 and 2 when the proposed program is launched. In Years 3, 4, and 5, the program will require a total of 3.5 FTE. Resources used for this program will not negatively impact any other program at ODU.

Full-time Faculty
Two full-time faculty in the Department of Communication Disorders and Special Education will teach academic coursework in the MS in Applied Behavior Analysis. Both faculty members will dedicate 100% of their teaching load (2 FTE) to the program. One faculty member, the program director will also serve as the VCS Director and the liaison with the Behavior Analyst Certification Board, communicate with current and prospective students and with the credentialing board, identify and train adjunct clinical supervisors, and perform additional administrative responsibilities. Her additional responsibility involved with the new degree will be related to the assessment and evaluation of the new degree program and to the communication with the clinical sites where the students will complete fieldwork experience hours. Combined, the two full-time faculty will contribute 2 FTE when the proposed program is launched and into the target year.

Part-time Faculty
No part-time faculty are needed to launch and sustain the proposed program.

Adjunct Clinical Supervisors
Two adjunct clinical supervisors will supervise students in the fieldwork experience courses and are needed to launch the proposed program in Year 1. As the number of students increases every year, additional adjunct clinical supervisors will be involved in supervising students so that an adjunct clinical supervisor does not work with more than 3 or 4 students in a semester (Year 2 – three adjunct clinical faculty; Year 3 – five adjunct clinical faculty; Years 4 and 5 – six adjunct clinical faculty). The limited number of students assigned to a supervisor is based on the intensive nature of the fieldwork experience requirements. For example, a student who completes 100 of independent fieldwork experience hours per month must be supervised for at least 10% of the total supervised and independent hours accrued in a month (i.e., 11 hours with the supervisor). Thus, an adjunct clinical faculty supervising 3 students will spend a minimum of 33 monthly hours providing supervision. The proposed degree program will require 5 FTE of adjunct effort by the target year 2027-28. All adjunct faculty will be paid at the same rate of $1200 per 3-credit hours per student. Adjunct faculty members are not paid benefits.

Graduate Assistants
No graduate assistants are required to launch and sustain the proposed program.

Classified Positions
An administrative assistant currently employed by the Department of Communication Disorders and Special Education will support the proposed program. The program will require .25 FTE of classified support to initiate, and this level of support will remain constant through the target year of 2027-28. The salary for the administrative assistant is $ xxx plus fringe benefits in the amount of $ xxx.

Equipment (including computers)
No new equipment is necessary to launch and sustain the proposed program.

Library
No new library resources are required to launch and sustain the proposed program. The University Libraries will be able to fully support the MS in Applied Behavior Analysis. Print and digital journal collections are available for a variety of primary journals in the field, including Journal of Applied Behavior Analysis, the Journal of the Experimental Analysis of Behavior, the Journal of Positive Behavior Interventions, Behavior Modification, Behavior Analysis in Practice, and the Journal of Behavioral Education. Several prominent databases (ERIC, PsychINFO, JSTORE, APA PsycNet) and Interlibrary Loan are available to assist students and faculty to identify and readily access necessary articles to support teaching and research.

Telecommunications
No new telecommunication resources are required to launch and sustain the proposed program.

Space
No new space is required to launch and sustain the proposed program.

Targeted Financial Aid

No targeted financial aid is required or designated to launch and sustain the proposed degree program.

Special Tuition or Fee Charges
No special tuition or fee charges will be utilized or instituted to initiate and sustain the proposed degree program.

Other resources (specify)
No additional resources, other than those described above, are required to launch and sustain the proposed degree program.

Funds to Initiate and Operate the Degree Program
Figures provided in the table below will be compared to SCHEV funding estimates using the current base adequacy model. The comparison will serve as a reference for the estimated costs. If there are large discrepancies, SCHEV may request additional clarification to ensure the institution's assumptions are correct or require modifications as a condition of approval.

Note: Institutions must use the recommended student-faculty ratio when estimating FTE enrollments and required faculty FTEs.

Cost and Funding Sources to Initiate and Operate the Program			
Informational Category		**Program Initiation Year 2023-2024**	**Program Full Enrollment Year 2025-2026**
1.	Projected Enrollment (Headcount)	8	17
2.	Projected Enrollment (FTE)	6	14
3.	Projected Enrollment Headcount of In-State Students	7	12
4.	Projected Enrollment Headcount of Out-of-State Students	1	5
5.	Estimated Annual Tuition and E&G Fees for In-State Students in the Proposed Program	$14,114	$14,970
6.	Estimated Annual Tuition and E&G Fees for Out-of-State Students in the Proposed Program	$33,866	$35,920
7.	Projected Total Revenue from Tuition and E&G Fees Due to the Proposed Program	$132,664	$359,240
8.	Other Funding Sources Dedicated to the Proposed Program (e.g., grant, business entity, private sources)	$0	$0

Part V: Certification Statements

1. A request of any kind will be submitted to the General Assembly for funds to initiate and/or maintain the proposed degree program.

   Yes ☐
   No ☐

   If "Yes" is checked, include narrative text to describe: when the request will be made, how much will be requested, what the funds will be used for, and what will be done if the request is not fulfilled.

2. The proposed degree program is included in the institution's most recent six-year plan.

   Yes ☐
   No ☐

   If "No" is checked, include narrative text to explain why the program is being advanced at the present time despite not being included in the six-year plan.

3. The institution's governing board has been provided information regarding duplication (if applicable) and labor market projections as part of its approval action.

   Yes ☐
   No ☐

   If "No" is checked, include narrative text to explain why the governing board has not been provided the information.

The institution's Chief Academic Officer attests to the accuracy of the above statements

Name (Printed)

Signature Date