

MEMORANDUM

TO: Warwick Arden
Executive Vice-Chancellor and Provost

FROM: Paul Lunn (co-chair), Fred Wright (co-chair), John Begeny, Jason Delborne, Sarah Desmarais, Owen Duckworth, Kevin FitzGerald, Amy Grunden, Peter Harries, David Hawley, Jonathan Horowitz, Blair Kelley, Bob Kelly, Jennifer Kuzma, Jane Lubischer, Mostakima Lubna, Chris McGahan, Ross Meentemeyer, Jorge Piedrahita, Joshua Pierce, Rob Smart, Bret Smith

CC: Kelly Wick
Margery Overton

SUBJECT: Strengthening University-Wide Interdisciplinarity Task Force Report

DATE: July 8th, 2020

This report represents the work of the appointed task force in response to the charge dated February 21st, 2020. Specifically, we were asked to address the following themes relevant to the task force:

- Describe the central challenges facing NC State that are key to our success in this area.
- Provide a brief overview of where we stand relative to facing those challenges, including initiatives that were started in the Pathway to the Future Strategic Plan including progress made.
- Propose and prioritize 2 to 5 themes to be addressed in the next strategic plan.
- Create initiatives or strategies that would make progress within those themes.

Task Force Report – EXECUTIVE SUMMARY

Strengthening University-Wide Interdisciplinarity

Many critical challenges facing society cannot be solved without the perspectives and competencies available only through interdisciplinarity. Expanding interdisciplinarity at NC State will better prepare our students for a changing world, and will enhance our ability to recruit the brightest minds. This report identifies the characteristics of successful interdisciplinary initiatives, highlighting the importance of: grass-roots faculty initiatives; building on our strengths; centralized support and coordination of resources; and tenure and promotion processes that recognize and reward interdisciplinarity.

Much has been accomplished under the Pathway to the Future Strategic Plan (2011-20), and the Chancellor's Faculty Excellence Program is an outstanding example of a successful interdisciplinary initiative. Our survey of faculty and staff identified several strategies that could increase interdisciplinary success, including increased seed funding, better opportunities for new interactions across groups, recognition of interdisciplinary work in reviews and promotion, and increased focus on interdisciplinary undergraduate programs.

We believe that NC State should strive to achieve **three major goals** during the next 5-10 years:

- 1 . We must be a world-class partner in interdisciplinary collaborations that address the most important challenges of our time.
- 2 . Students should seek us out as leaders in interdisciplinary training.
- 3 . Stakeholders should recognize us as problem solvers with an interdisciplinary brand.

Themes and Strategies

- Develop formal overarching structures to support and guide interdisciplinary activities at NC State. Strategies to achieve this include establishing an Office of Interdisciplinarity, developing Interdisciplinary Academies, and identifying space for interdisciplinary collaboration and teaching.
- Refine the tenure and promotion process to incorporate and actively promote interdisciplinarity. Strategies should assign value to activities outside of disciplinary frameworks and provide explicit guidance on fair realms of responsibility.
- Develop a comprehensive strategy to communicate, facilitate and extend interdisciplinary work across the university and to the outside community and stakeholders.
- Broaden and strengthen participation in interdisciplinary research initiatives at the graduate and undergraduate level, developing strategies to enable faculty and students across different disciplines and traditional discipline-based structures to connect and synergize within a research context
- Develop, fund, and provide support for new courses, curricula, and programs that transcend traditional disciplinary boundaries. Strategies should focus on removing disincentives to teaching across departments, making courses accessible to all students, and creating interdisciplinary paths to degree.

Task Force Report: Strengthening University-Wide Interdisciplinarity

Defining Interdisciplinarity

Given the many ways in which the term “interdisciplinary” can be used, the task force first developed the following definition:

“Interdisciplinarity involves working across traditional disciplinary boundaries. It is a process of answering questions, solving problems, and/or addressing complex topics that draws on different disciplines and integrates their insights through the development of more comprehensive approaches, perspectives, and understanding. Interdisciplinarity requires a willingness to challenge assumptions, an openness to other modes of thinking, and the ability to change structures that limit creativity.”

Context:

- 1 . Describe the central challenges facing NC State that are key to our success in this area.
- 2 . Provide a brief overview of where we stand relative to facing those challenges, including initiatives that were started in the Pathway to the Future Strategic Plan including progress made.

To address these questions the task force initially considered two questions:

Why interdisciplinarity, and what does it offer?

The critical challenges facing society frequently cannot be solved by a single discipline approach, but instead require the integration of perspectives and knowledge from many disciplines. Similarly, creative scholarship and discovery profit from approaches contributed from multiple disciplines, and it is increasingly clear that undergraduate and graduate training can benefit significantly from interdisciplinary perspectives. The mission statement of NC State promotes a transformative and “integrated approach to problem solving” that can be realized only if interdisciplinarity is recognized as part of the University’s core identity, combined with an effective structural foundation. At the same time, we must recognize that these endeavors

require the maintenance of disciplinary strengths as the building blocks from which to construct meaningful interdisciplinary approaches and programs.

NC State University, in keeping with its land-grant mission and “Think and Do” motto, has long held the highest standards for teaching, research, and engagement. The maintenance and evolution of this excellence is reliant on maintaining and fostering effective interdisciplinary efforts and ways of thinking and knowing. The advantages to interdisciplinary approaches in a university are numerous, and include:

- Training students to deal with the ambiguities and uncertainties that are revealed when examining problems from multiple perspectives.
- Developing and sustaining groups organized by interest area, rather than discipline, to enable the groups to better address complex issues of regional, national and global significance.
- Creating an environment to make the institution more competitive for large research and training initiatives.
- Creating an environment to be more welcoming and supportive of students interested in following an interdisciplinary path to degree.
- Providing a structure to support new interdisciplinary “grass-roots” efforts of students, faculty, and staff to address societal challenges.
- Broadening people’s worldview as well as the approaches that they take in understanding the world around them.
- Strengthening team building and collaborative efforts across all sectors of campus.
- Becoming more effective in the translation of our research efforts to a broader external community.

While the advantages to interdisciplinarity in research are well-recognized, the beneficial effects on teaching and in the training of the future generations of researchers are becoming increasingly apparent. Among undergraduate students, there is a hunger to develop an awareness and understanding of complex problems and intellectual frameworks that require the effective integration of disciplinary perspectives. As these students are not yet specialists, an undergraduate education must include both exposure to disciplinary training and the skills

necessary to integrate disciplines. Indeed, an understanding of the essentials of multiple disciplinary practices and standards is enhanced by comparing and contrasting two or more disciplines. Interdisciplinary education also addresses students' individual differences and helps to develop important, transferable skills, including critical thinking, communication, and data analysis.

For graduate education, the university must recognize that academia, industry, governmental and NGOs have been placing an ever-increasing emphasis on collaborative, interdisciplinary teams to tackle broader, more complex issues. In addition, our university culture and the future success of NC State trainees in academia is increasingly dependent on fostering academic communities that appreciate, respect, and integrate alternative ways of knowing. Similarly, non-academic professions are placing increasing emphasis on the complexity that defines most problems - complexity that often cannot be fully appreciated or understood through a single lens of expertise. An interdisciplinary knowledge base and experience in the application of different disciplines can lead to and is often required to produce greater creativity and translation of research to address societal challenges.

From a research perspective, funding agencies, such as NSF and NIH, have directly promoted and encouraged interdisciplinarity through their requirements for funding, especially in the realm of their larger funding opportunities. The ability to function effectively as an interdisciplinary campus is therefore critical to continue to grow the research productivity of NC State, which is uniquely equipped to tackle complex problems because it emphasizes the full research continuum - from basic discovery to real-world application. Furthermore, these efforts often are closely linked to the training of undergraduate and graduate students, pointing to the critical need to build an interdisciplinary ecosystem that is thoroughly integrated among the different elements, such as the ORI, DASA, the Provost's Office, and the Grad School, that are currently too siloed to effectively unleash their full interdisciplinary potential.

What models of interdisciplinarity can provide useful models for success?

The characteristics of successful interdisciplinary models are summarized, together with barriers or weaknesses that can limit their success and impact. Finally, where possible we have suggested solutions to overcome these issues.

Overall, the resounding theme of successful models is strong and stable central support, excellent administrative support staff, and reducing College and Departmental barriers that make administration of interdisciplinary units challenging to manage.

Research - Successful Models

- NC State has multiple successful models, and we see this diversity as a positive. It allows faculty and staff to creatively develop and implement innovative programs that address specific goals.
- All successful units we examined are faculty initiated, driven by faculty and staff, and supported by administrations that give faculty a high degree of freedom.
- In all cases we examined, successful units were led by either active successful investigators, or investigators with records of prior scientific or scholarly excellence.
- Strong college and/or central support is critical, and no unit we examined was entirely self-sufficient. Older units tended to have a larger funding base either through grants (training or center grants) or through educational fees (BIT, for example). Younger units (such as CMI) rely on central and college support with only minor funding from grants.
 - Sharing indirect cost returns with interdisciplinary units can lead to tensions with colleges, and could lead to Deans and department heads being less supportive of interdisciplinary programs.
 - Indirect costs can constitute an important source of funding but are not enough for a center or institute to survive even if multi-million dollar grants are administered through it
 - The evidence suggests that central support is needed, managed by a new interdisciplinary administrative unit reporting directly to the university cabinet.
- We need to maintain focus on areas of strength and to minimize overlaps between existing units. As additional interdisciplinary initiatives develop, there is a danger of duplication and overlap that can weaken existing successful units and create a competitive rather than a collaborative environment. A mechanism is needed to evaluate new proposed programs and utilize resource allocation as an incentive for mergers and collaboration with existing units.
- Shared space can contribute to success but is not required.
 - Existing successful interdisciplinary units range from fully virtual (CMI) to shared space, with most being a combination of the two. Units such as GES and CHHE have a central shared space that reaches out virtually to other areas of campus. However, that physical space is controlled by a single department/college. Examples of units that where colleges are co-housed are the Biomedical Partnership Center (BPC) (College of Engineering and College of Veterinary Medicine) and the Bioinformatics Research Center (housing faculty from four Colleges). This arrangement has resulted in a highly collaborative environment and has increased the success, especially of junior faculty.
 - These collaborative environments, like other interdisciplinary units, require leadership that sets the tone, encourages collaboration, and works with other

- faculty and staff to ensure that a collegial and collaborative environment is maintained.
 - If the university develops spaces to be shared by multiple colleges (the Plant Sciences Building is a current example), such spaces should be managed by the same central university unit that is also in charge of managing interdisciplinarity, to foster coordination focused on interdisciplinary goals.
- Talented support staff are key to the success of interdisciplinary programs. They are needed to manage grant finances, coordinate workshops, manage HR actions, and communicate across NC State and externally.
- Tenure and promotion (TP) of interdisciplinary faculty is key to the success of interdisciplinary programs.
 - While the university has created special tenure and promotion (TP) regulations for CFEP interdisciplinary faculty, few have used that option. Most chose to go through the traditional department TP process. Reasons vary, but include a lack of familiarity with the process and advice from departmental faculty.
 - Some faculty recruited to NC State with interdisciplinary backgrounds do not fit perfectly into any existing department. The University should consider special tenure processes or departmental homes for such interdisciplinary faculty. Units such as Interdisciplinary Studies (IDS) in CHASS serve such a role for some faculty, but we envision processes/homes that can extend across colleges.
- Successful programs address tensions between interdisciplinary faculty and staff and their home departments (i.e., “resource envy”, competition for resources, co-teaching and credit, RPT, views of “not really contributing to department”, etc.)

Undergraduate Education

Characteristics of successful models:

- Successful models create a separate cohort of students to build an identity outside of colleges and provide students with enhanced advising outside of a single focused major on day 1
- Successful programs have funding and buy-in from bottom to top at the University, and require a dedicated leader and advising staff
- The need for interdisciplinary programs is clear from the students, and existing programs target students interested in career paths that will benefit from having a broader, multi- or interdisciplinary undergraduate education
- Minor courses of study serve important and popular roles, but “ownership” can be problematic
- Active participation of undergraduate programs and coordinators is vital, but may be challenging if enrollment in majors is lost to new programs
- Faculty hired into interdisciplinary teaching roles may have greater comfort when this expectation is clear from the outset

Challenges to Successful Models

- Undergraduate program ownership can be a significant challenge within a siloed College structure, making success dependent on strong centralized support for program approval and continued function
- First-year students encounter many recruitment incentives from better-funded programs, such as scholarships, and invitations to discipline-based honors and other special programs
- Challenges exist around recruiting faculty to teach in interdisciplinary programs, even if the request is modest (representative issues include: wrong prefix, don't have permission from the department head, not my job, no time, not "our" students)
- Many existing programs on campus do not have the built-in flexibility to allow for students to explore classes before committing to a major, heavily limiting the students that can be involved
- Data-gathering on students that are part of multiple programs is quite challenging and OIRP is not well equipped to perform this role

Opportunities for Undergraduate Education

- Successful models are likely to have either a strong centralized program that avoids college interference
- Success requires a more flexible curriculum across relevant degree programs so that students can have flexibility required for an interdisciplinary program

Graduate Education - Successful Models

- The most successful programs enjoy strong centralized leadership, administrative and financial support, by either a college, department or central unit
- Faculty need to be willing to "donate" time to a program in pursuit of interdisciplinarity as they are often uncompensated or unrecognized in home-departments
- Committed students willing to take on extra efforts for interdisciplinary learning

Excellent student services support

- Availability of federally supported training grants for student support
- Excellent infrastructure to engage students in workshops and projects with stakeholders, research grants, weekly colloquium, etc.
- Improved research infrastructure and support programs to increase both research and professional development skills
- Support for grant writing
- Regular communications with students, advertising program and successes, bringing in outside stakeholders and speakers, and convening students regularly
- Cohort models - students progress through courses as a group, beginning with a "bonding" field course at start of the program
- Major advisors who are open-minded to students taking classes outside core discipline (sometimes at expense of lab work, etc.)
- Constant communication with students to check-in (biweekly to monthly)

- Outside evaluation for honest feedback from faculty outside the program
- Willingness to adjust curriculum in response to student and faculty feedback
- Supportive departments to cross list courses and share their faculty's time
- Full-time, dedicated coordinator supported by training grant throughout life of program
- Mentorship and senior support of early career faculty mentors. Collaborations with Medical School faculty members and NIH investigators offers unique co-mentorship opportunities.

Describe the central challenges facing NC State that are key to our success in this area.

NC State has declared a commitment to interdisciplinarity as one of its key strategies, and this practice was a fundamental pillar of the last strategic plan. This task force analyzed a survey of 432 faculty and staff respondents to determine the extent of interdisciplinary work at NC State, and opinions about the level of supported for this effort (Appendix I). The survey demonstrated that respondents generally felt the actual amount of interdisciplinarity within their area of effort was at or near their theoretical ideal. When queried on additional initiatives that could be implemented by NC State to facilitate interdisciplinarity, 7 themes emerged that were mentioned more than 10 times for both faculty and staff:

- Concerns over funding, grants, seed money, breaking down funding barriers, equity pay
- Ways to bring people together to form new cross-disciplinary collaboration: Lunch meetings, short meetings, interdisciplinary seminar series, interdepartmental meetings, message board, open proposal process for collaboration
- Recognition of interdisciplinarity in annual review process, promotion and tenure, publications, grants awarded
- Separate Center/Unit/College for interdisciplinary scholarship, engagement, organization structure
- Incentivization of interdisciplinary participation, a perceived lack of encouragement to participate in interdisciplinarity
- The need for interdisciplinary undergraduate programs, additional support/more programs
- The need for a searchable database for research emphasis, research strength

The task force identified additional factors, including the promotion and tenure process, college and department structures, and current systems of evaluation and their lack of recognition of interdisciplinarity. Many of these challenges are discussed above in depth in “What models of interdisciplinarity can provide useful models for success?”

Provide a brief overview of where we stand relative to facing those challenges, including initiatives that were started in the Pathway to the Future Strategic Plan including progress made

- Most consistently, members of the task force had high praise for the Chancellor’s Faculty Excellence Program as an outstanding example of successful interdisciplinarity
- The Multidisciplinary Bachelor of Arts degree in Biology and the Life Sciences First Year Program.
- Construction of the Biomedical Partnership Center, and the forthcoming Plant Sciences Building, both identified as examples of structures that facilitated interdisciplinarity
- Graduate programs such as Bioinformatics, Functional Genomics, Biomathematics, and Comparative Biomedical Sciences, which were examples providing “more flexible graduate fields of study”
- The Environmental Sciences Undergraduate program
- The Game-Changing Research Incentive Program (GRIP), and the Research and Innovation Seed Funding (RISF) programs, which were both identified as consistent with the goals of the last strategic plan.

Goals and Strategies

What should NC State strive to achieve in this area during the next 5-10 years?

- We must demonstrate that we are a world-class partner in interdisciplinary collaborations that address the most important challenges of our time
- Students should clearly identify NC State as leaders in interdisciplinary training and application across the arts and sciences, and seek us out as the world's leader in interdisciplinary training
- Stakeholders across the state, nation and world should recognize NC State as a problem solver of the first order, bringing an interdisciplinary brand that implements solutions to the thorniest societal challenges.

What broad, university-wide, multi-year strategies should we adopt that will be “game changers?”

The expansion of interdisciplinarity is of fundamental importance to the development of NC State as a forward-thinking university. This development will require that we rethink how we integrate interdisciplinarity into diverse areas of our university, building bridges among traditional disciplines, colleges, and units in ways that allow the University community to address larger, more complicated problems that require, complex solutions.

NC State must develop interdisciplinary approaches that promote flexibility, nimbleness, and responsiveness to a changing intellectual landscape. We must provide funding that can be allocated to drive innovation from the “ground-up,” and in balance with other University priorities. This effort could mirror the Chancellor’s Faculty Excellence Program’s cluster-hiring process, promoting competition for ideas and encouraging renewed creativity and vigor across the numerous intersections of interdisciplinarity.

Specific Recommendations

Strengthening Interdisciplinarity -- Themes

To reimagine interdisciplinarity at NC State, we encourage the following thematic ideas:

- Develop a formal overarching structure to support and guide interdisciplinary activities at NC State
- Refine the tenure and promotion process to incorporate and actively promote interdisciplinarity
- Develop a comprehensive strategy to communicate, facilitate and extend interdisciplinary work across the university and to the outside community and stakeholders
- Broaden and strengthen participation in interdisciplinary research initiatives at the graduate and undergraduate level by enabling faculty and students across different disciplines to connect and synergize within a research context
- Develop, fund, and support new courses, curricula, and programs that transcend traditional disciplinary boundaries.

Strengthening Interdisciplinarity – Strategies

1. Establish an Office of Interdisciplinarity

To strengthen new and existing interdisciplinary initiatives, we recommend the establishment of an Office of Interdisciplinarity with representation from engaged units across campus led by a University-level administrator (an Interdisciplinary Executive Officer) responsible for the promotion of interdisciplinary efforts at NC State. This office would be supported by permanent funding to ensure sufficient University-level support for campus-wide interdisciplinary activities. The central functions of the Interdisciplinarity Executive Officer would be to provide: (i) an overarching and continuing vision for interdisciplinary initiatives at NC State; ii) leadership to drive synergies between new and ongoing interdisciplinary programs and partnerships; (iii) assurance that promising or successful interdisciplinary initiatives are underpinned by sufficient University-level financial and infrastructure support.

The Interdisciplinary Executive Officer's decision making would be guided and advised by a Steering Committee, a council composed of NC State faculty and staff, from a broad range of successful interdisciplinary initiatives.

The Office of Interdisciplinarity will work to:

- Ensure the success of interdisciplinary initiatives by providing University-level funding, and the creation of new policies to remove barriers within interdisciplinary teams
- Broaden the participation of faculty, staff and students in interdisciplinary initiatives
- Strengthen new and existing interdisciplinarity initiatives by leveraging natural adjacencies
- Undertake campus-wide curriculum reviews, revisions, and reforms with a focus on enabling meaningful multidisciplinary and interdisciplinary scholarship
- Work with College faculties to update tenure and promotion processes to more effectively acknowledge and reward interdisciplinary engagement
- Provide funding for the creation and continuing support for new undergraduate and graduate umbrella programs that encourage a first-year focus on exploration across disciplines
- Provide funding for new courses that explicitly emphasizes a multidisciplinary or interdisciplinary focus
- Create a new Interdisciplinary Engagement team--professionals who will rethink extension for the 21st century and develop a University-wide strategy for effective interdisciplinary engagement.

2. Develop Interdisciplinary Academies

To advance interdisciplinary innovation at NC State we recommend the development of Interdisciplinary Academies. Each Academy would focus on a broad topic/theme that would cut across colleges and departments and encourage wide-spread interdisciplinary participation by faculty, staff and students. These academies would include participants from relevant existing Centers, Institutes, CFEP clusters and interdisciplinary graduate programs. These academies would not only formalize natural adjacencies of existing interdisciplinary programs at NC State but would nurture the development of new areas of exploration.

Each Academy, led by an elected Academy leader, would provide guidance to the Interdisciplinary Executive Officer by advocating for the appropriate resourcing of initiatives and assisting in the development of metrics for success. Interdisciplinary faculty teams will guide academy development, manage operations and interact with the Academy Leader who

would provide oversight and coordination of academy activities, as well as funding and supporting infrastructure. Such new structures will allow for the development of new interdisciplinary partnerships among faculty, staff, and students, enriching the network of sharing and collaboration at State.

Interdisciplinary Academies will serve as intellectual hubs that will attract, engage and enable faculty innovation, and serve as dynamic incubators for new interdisciplinary units and programs. Faculty-led initiatives involving education, research and/or engagement would be nurtured and “pressure-tested” by the academies, leveraging existing campus assets. Additionally, the academies would provide administrative support to help advance new initiatives, such as a pilot project programs, working groups, retreats, symposia, and seminars. Academy-led efforts should be right-sized, some small some large, and fill critical needs on the campus and or community.

In sum, academies will: (i) involve faculty, staff and students, (ii) be dynamic, evolving in concert with changing needs and opportunities, (iii) be right-sized efforts, and (iv) be subject to periodic review by the University.

3. Faculty Advancement

The new Office of Interdisciplinarity will work with the Provost’s office and the colleges to develop policies that will support the recognition of interdisciplinary teaching, research and service in the reappointment, promotion, and tenure process, signaling the university’s commitment to these efforts. This observation can also be applied to aspects of staff evaluation processes or appointments. Interdisciplinary faculty should not be placed at a disadvantage, given the disciplinary focus of the current process, but rather fairly evaluated for interdisciplinary efforts in research, teaching, and engagement.

The tenure and promotion framework must expand to provide mechanisms for rewarding interdisciplinarity, developing a framework to evaluate and assign value to activities outside of disciplinary frameworks. One key recommendation includes providing explicit guidance to departmental, college, and university tenure/promotion committees to identify fair realms of responsibility and to ensure that external evaluators are also informed of the value NC State places on interdisciplinary activities in the evaluation of our faculty and staff. Another element

to be explored is the furtherance of existing mechanisms to find appropriate “homes” for interdisciplinary faculty that may lie outside of traditional academic structures.

4. Interdisciplinary Education Coordination

A coordinated approach to interdisciplinarity must focus on removing disincentives to teaching across departments, specifically the current barriers due to existing funding models. This approach would promote strategies for undergraduate and graduate programs that remove constraints for students seeking to enroll in courses outside of their primary focus area. This would make courses accessible to all NC State students by removing deliberate and arbitrary barriers to enrollment, such as pre-requisites and restrictions designed to limit enrollment, rather than ensure students are prepared for the courses.

We must challenge the assumption that traditional disciplinary training is a required foundation for *all* students. The university should: (i) identify desired learning outcomes and potentially pre-test for pre-requisite knowledge or skills to effectively determine a given student’s readiness for a specific course and (ii) ensure that undergraduate curricula are more accessible to NC State students by removing arbitrary barriers to matriculation (e.g., a GPA of 3.0 when graduation requires a GPA of 2.0; denial of qualified students based on departmental limits on enrollment capacity). This open, cross-college and cross-disciplinary framework would include a course skill set and require strong and integrated academic and career advising support.

The Office of Interdisciplinarity would provide a framework for the selection and funding of interdisciplinary programs developed by “grass roots” efforts, driven by faculty/staff groups, and perhaps incubated in the open-framework degree space. This process must be sufficiently nimble to allow both the development and ‘sun-setting’ of interdisciplinary programs given the critical need to rapidly develop a program in response to changing needs.

An important element that has made interdisciplinary programs challenging, at both the graduate and undergraduate levels, is the lack of a model that provides funding to enable them to be independent of the largesse of individual departments and colleges. Therefore, there is a clear need to develop a new approach to funding streams and other forms of support, such as assistantships for graduate students, interdisciplinary advising, and project support, focused specifically on interdisciplinary programs to encourage their creation and to promote their sustainability so long as they remain relevant and vibrant.

5. Interdisciplinary Engagement

NC State aims to be a leader in engagement for its interdisciplinary programs by developing a multi-part strategy to communicate within the university and to the outside community.

Engagement with public and private partners is central to the mission of NC State and is a key aspect of the leadership that the university seeks to provide for social, economic, and technological development in the state and beyond. As a land-grant university, NC State has a long history of successful engagement and extension efforts, particularly in agriculture and commercialization activities. However, the level of engagement activities in other areas vary widely across the university, and there is considerable potential synergy yet to be realized. Interdisciplinarity often requires not only on-campus partnerships between faculty, staff, and students but also connections to the community, including citizen-scholars and organizations. Such connections not only enrich what can be discovered but also link transformational scholarship with partners throughout the state, region, country, and the world.

Building on the rich tradition of extension at our land-grant institution, we propose that the Office of Interdisciplinarity be charged to create an Interdisciplinary Engagement team, which would (i) develop a university-wide united strategy for interdisciplinary engagement, (ii) coordinate with University Communications, advancement, alumni, and developing a multi-step plan for interdisciplinary engagement, (iii) facilitate campus interdisciplinarity for faculty, staff, and students--both those who are in existing centers, units, and research clusters--and those interested in new partnership opportunities throughout the state and region, (iv) work with the Proposal Development Unit to facilitate grant writing support of those looking to do work outside of disciplinary boundaries, and (v) share news of interdisciplinary collaborations for audiences on campus and beyond, amplifying what interdisciplinary scholarship and teaching look like at NC State.

6. Developing Space for Interdisciplinary Collaboration

Interdisciplinarity can be nurtured and facilitated by providing spaces where the various groups can increase their contacts. Therefore, developing spaces to be shared by interdisciplinary groups and overseen the Interdisciplinary Office would help catalyze and support such efforts.

APPENDIX I

Interdisciplinarity Survey Results Summary

The survey questions sub-group members worked with NC State's Institutional Strategy and Analysis office on the survey. The survey was sent to all full-time faculty with an FTE of .75 or higher and to EHRA Non-Faculty staff via a list provided by the ISA office. The task force decided to not send the survey to graduate or undergraduate students as that was not the target audience for the survey.

The survey was open for 10 days from April 27 – May 6 and had a completed survey response rate of 10.4% (N = 432). The results of the survey could have a bias opinion as those who responded are most likely more in favor of interdisciplinarity. The following is a summary of the survey results.

DEMOGRAPHICS

What is your college affiliation? (Q1) What is your departmental affiliation? (Q42) and What is your position on campus? (Q2) How many years have you been at NC State? (Q7)

Respondents were from all 10 colleges as well as The Graduate School, University College and Other Affiliations (e.g., OIED, DASA, Athletics, Libraries, etc.)

- 57.41% faculty (N = 248)
- 42.59% staff (N = 184).

Years worked varied from more than 15 years to less than a year.

- 7.07% (N = 28) <1 year.
- 28.03% (N = 111) 1 – 5 years,
- 22.98% (N = 91) 6 – 10 years,
- 14.65% (N = 58) 11 – 15 years
- 27.27% (N = 108) >15 years,

College / Unit Affiliation	%	Count
Agriculture and Life Sciences	18.52%	80
Design	1.62%	7
Education	3.01%	13
Engineering	9.72%	42
Humanities and Social Sciences	12.96%	56
Natural Resources	3.47%	15
Poole College of Management	3.24%	14
Sciences	11.34%	49

Wilson College of Textiles	2.08%	9
Veterinary Medicine	7.41%	32
The Graduate School	0.69%	3
University College	4.40%	19
Other Affiliation	21.53%	93
Total	100%	432

What is your faculty rank (regardless of track)? (Q3) and If you hold a senior administrative appointment (Chancellor/Provost office, Dean, Associate/Assistant Dean, Department Head, etc.), select the type of unit below? (select all that apply) (Q4).

Faculty (N = 248) were asked about their faculty rank, regardless of track.

- 40.57% (N = 99) professor,
- 24.18% (N = 59) associate professor,
- 19.68% (N = 48) assistant professor,
- 3.69% (N = 9) senior lecturer,
- 2.46% (N = 6) lecturer
- 9.43% (N = 23) other (extension associate, research scholar, librarian, teaching associate)

Faculty were asked if they hold a senior administrative appointment and at what levels. Respondents could select all that applied:

- 47.83% (N = 22) department,
- 26.09% (N = 12) interdisciplinary undergraduate/graduate program,
- 21.74% (N = 10) center/institute and 4.35% (N = 2) college.
- University administrators was not selected.

In which unit is your staff appointment? (select all that apply) (Q5)

Respondents who selected “**staff**” (N = 184) were asked their unit affiliation:

- 44.27% (N = 85) department,
- 20.31% (N = 39) university,
- 18.75% (N = 36) center/institute
- 15.1% (N = 29) college
- 1.56% (N = 3) interdisciplinary undergraduate/graduate program.

Are you a member of an interdisciplinary Center or Institute at NC State? (Q6) and Please select your Center or Institute affiliation(s).(Select all that apply) (Q43)

Faculty and **staff** were asked if they are a member of an interdisciplinary Center or Institute. Only 22.06% (N = 90) of the 408 who responded said they were a member of an interdisciplinary Center or Institute. The chart below shows all the affiliations with at least one response.

Center or Institute Affiliation	%	Count
Comparative Medicine Institute	23%	23
Center for Human Health and the Environment	14%	14
Bioinformatics Research Center	8%	8
Genetic Engineering and Society Center	7%	7
Center for Integrated Fungal Research	6%	6
Center for Geospatial Analytics	5%	5
Golden Leaf Biomanufacturing Training and Education Center	4%	4
Center for Family And Community Engagement	3%	3
Animal and Poultry Waste Management Center	2%	2
Center for Environmental and Resource Economic Policy	2%	2
Center for Marine Sciences and Technology	2%	2
Institute for Nonprofit Research, Education and Engagement	2%	2
Institute for Transportation Research and Education	2%	2
Kenan Institute for Engineering, Technology and Science	2%	2
Nonwovens Institute	2%	2
North Carolina Sea Grant College Program	2%	2
Advanced Self Powered Systems of Sensors and Technologies Center	1%	1
Center for Additive Manufacturing and Logistics	1%	1
Center for Dielectrics and Piezoelectrics	1%	1
Center for Research in Scientific Computation	1%	1
Center for Turfgrass Environmental Research and Education	1%	1
General H. Hugh Shelton Leadership Center	1%	1
Institute for Advanced Analytics	1%	1
North Carolina Institute for Climate Studies	1%	1

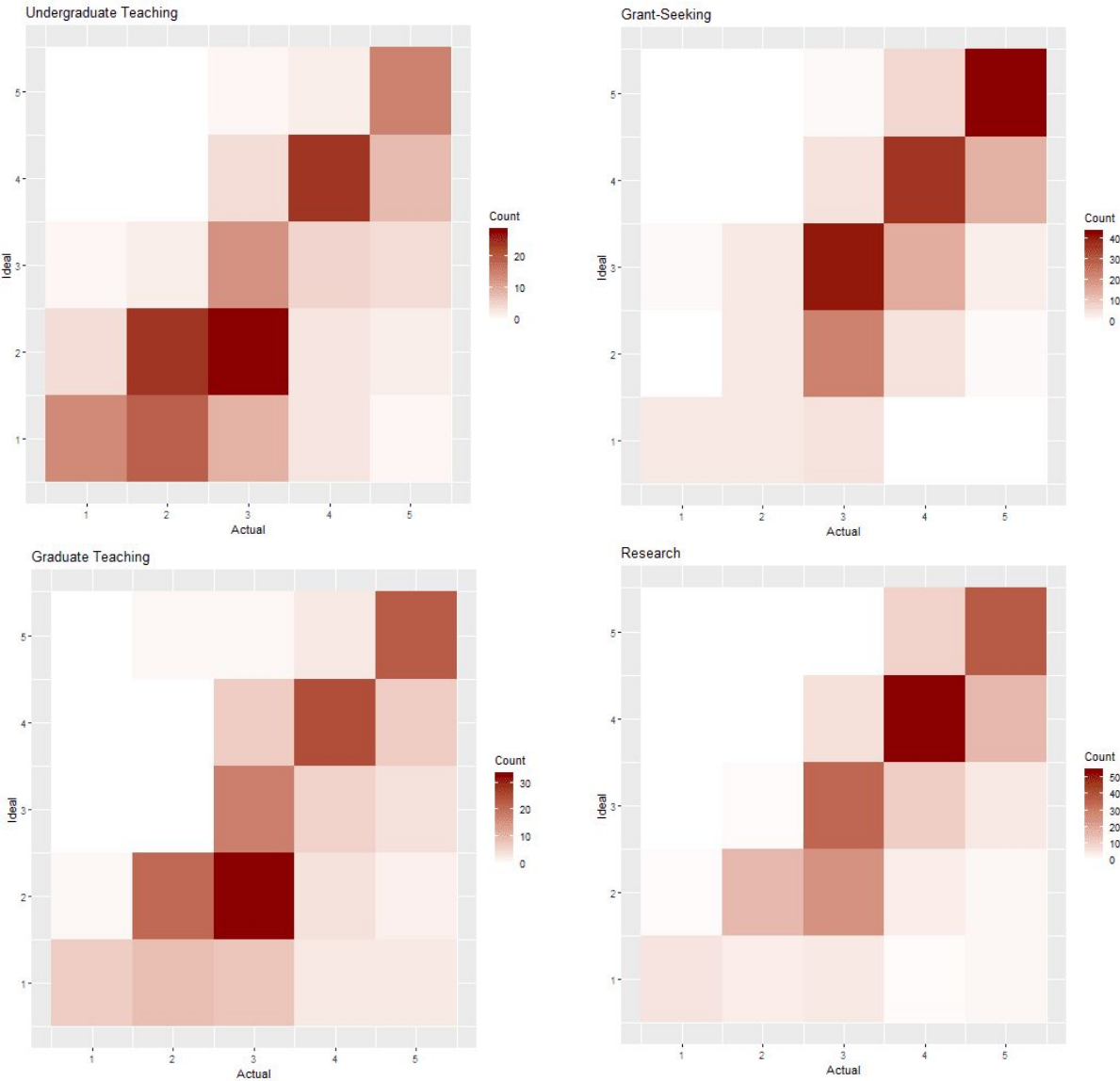
Small Business and Technology Development Center	1%	1
Southeast Dairy Foods Research Center	1%	1
W. M. Keck Center for Behavioral Biology (The)	1%	1
Water Resources Research Institute	1%	1
William and Ida Friday Institute for Educational Innovation	1%	1
Total	100%	99

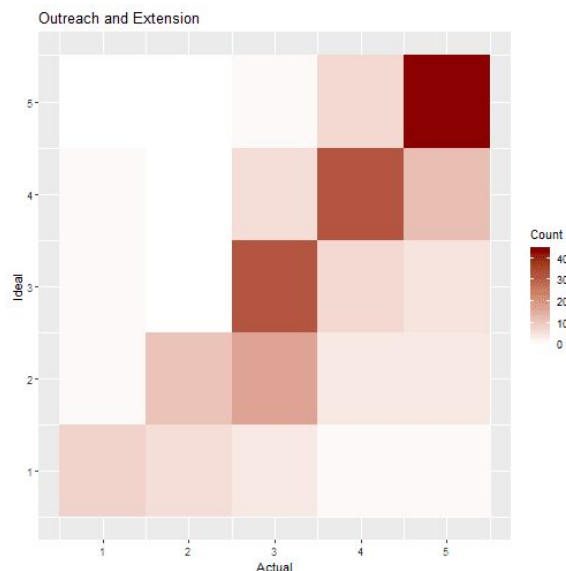
CROSS TABULATION OF RESULTS

The general scale being used is that higher numbers indicate greater interdisciplinarity (5 on a 1-5 scale, +2 on a -2 to +2 scale). In the case of disparity figures, positive numbers indicate a desire for greater interdisciplinarity.

Actual interdisciplinarity (Q10) v. ideal interdisciplinarity (Q12) in 4 areas of activity

The distribution for high scores from bottom left to top right would mean that the actual (current) amount of interdisciplinarity is the same as that which different groups think is ideal. Generally we are not far from this, although there is a trend in several categories that we have less interdisciplinarity than ideal.





What is your distribution of effort in the following categories? (Q8)

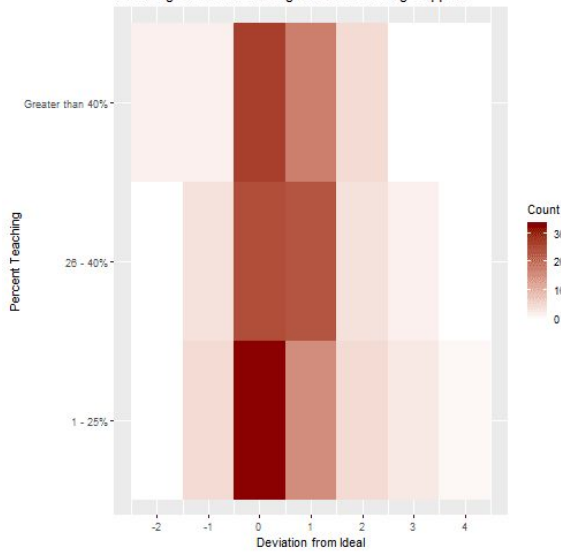
Question	1 - 25%	26 - 40%	Greater than 40%
Teaching	41%	32%	28%
Research	25%	27%	47%
Outreach and Extension	57%	13%	30%

Percentage effort (Q8) and disparity between current and ideal interdisciplinarity emphases (Q10/Q12)

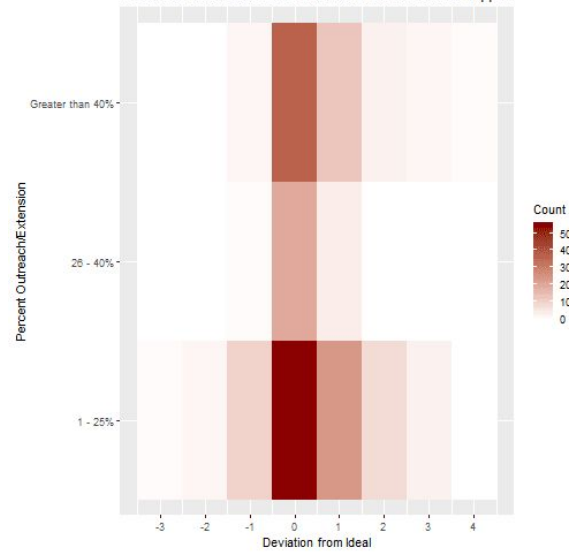
The following plots show responses for people with different amounts of activity in effort areas (Teaching, Research etc). X-axis shows **Deviation from Ideal** (a positive number means they want more interdisciplinarity, a 0 means it is ideal, a negative number means they want less interdisciplinarity).

No relationship was found between percentage effort and any **Deviation from Ideal**. The overwhelming majority in all cases either were already working at their ideal level of interdisciplinarity or would like to change it by one point on the Likert scale.

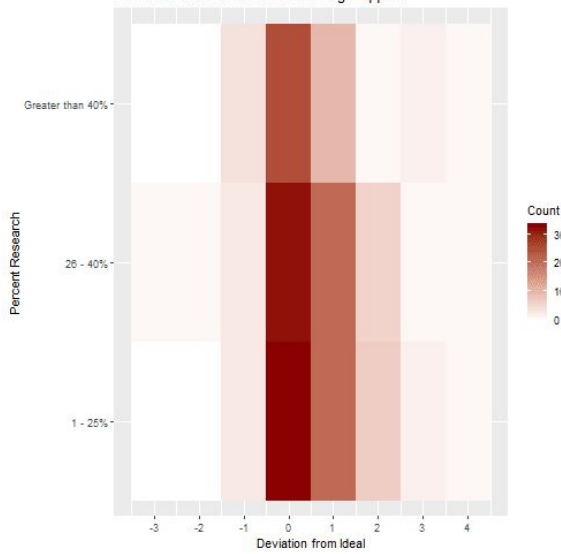
Teaching Effort and Undergraduate Teaching Support



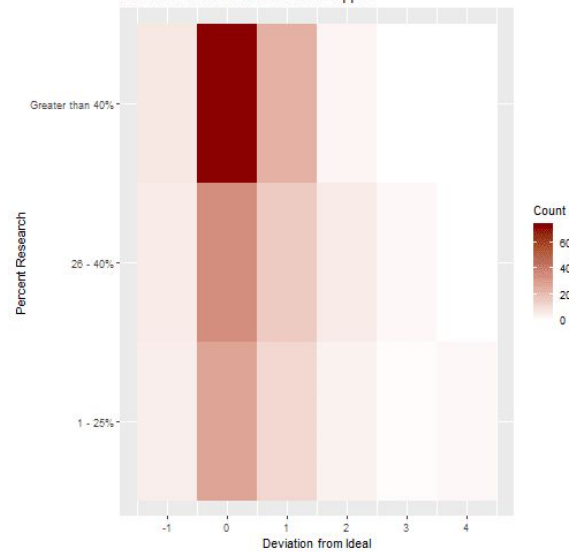
Outreach/Extension Effort and Outreach/Extension Support

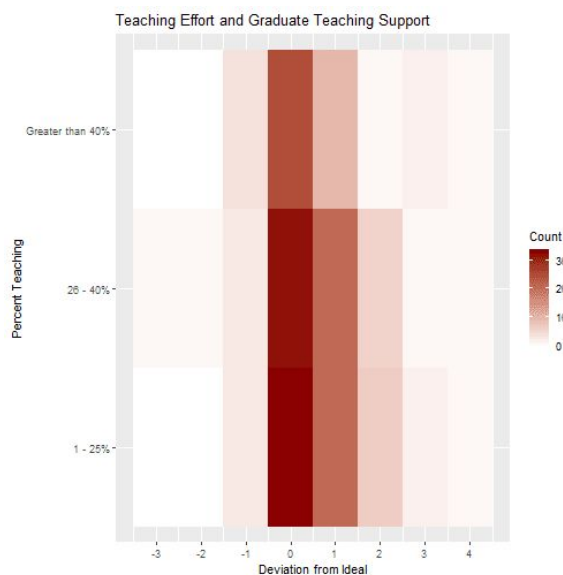


Research Effort and Grant-Seeking Support



Research Effort and Research Support





Rate the degree of interdisciplinarity in your current work for each area.

Question	Almost all disciplinary	Mostly disciplinary	Evenly split disciplinary and interdisciplinary	Mostly interdisciplinary	Almost all interdisciplinary
Teaching (undergraduate)	25%	32%	14%	19%	9%
Teaching (graduate)	16%	33%	15%	21%	15%
Research	8%	20%	21%	33%	19%
Grant seeking	6%	15%	30%	26%	23%
Outreach and Extension	10%	18%	22%	25%	25%

Does NC State support interdisciplinarity?

Question	Far too little	Slightly too little	Neither too much nor too little	Slightly too much	Far too much
Teaching (undergraduate)	29%	36%	31%	3%	1%
Teaching (graduate)	24%	35%	40%	1%	1%
Research	10%	34%	50%	5%	2%
Grant seeking	10%	34%	50%	3%	2%

Outreach and Extension	16%	27%	55%	1%	1%
-------------------------------	-----	-----	-----	----	----

Given current interdisciplinarity, do you feel NC State's supports interdisciplinarity?

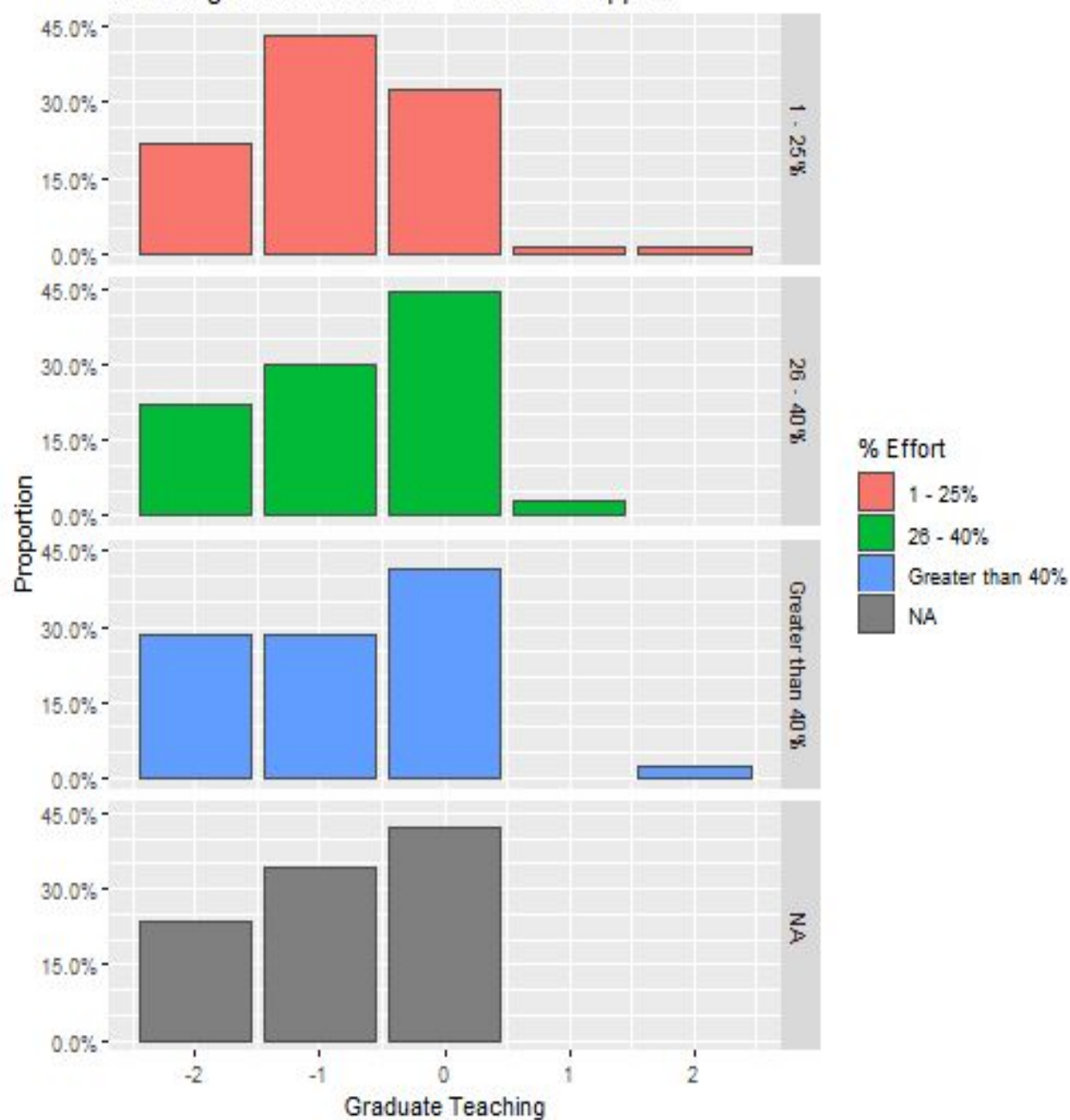
Differences were not seen in the perception of NC State's support based on one's own interdisciplinary involvement in teaching or extension, but in the cases of research and grant-seeking, some differences were seen. In research, those focusing more toward the disciplinary side felt NC State provided excessive support to interdisciplinary research. In grant-seeking, those focusing more toward the disciplinary side again felt that NC State provided excessive support to the interdisciplinary, but in this case we also see that those heavily involved in interdisciplinary grant-seeking felt there was not enough support for interdisciplinary grant-seeking.

This was determined via chi-squared testing. The chi-squared (nominal v. nominal/ordering-agnostic) was chosen due to not expecting the linear trend (or even monotonic) that ordered tests look for. (In case the questioner wants a justification/explanation)

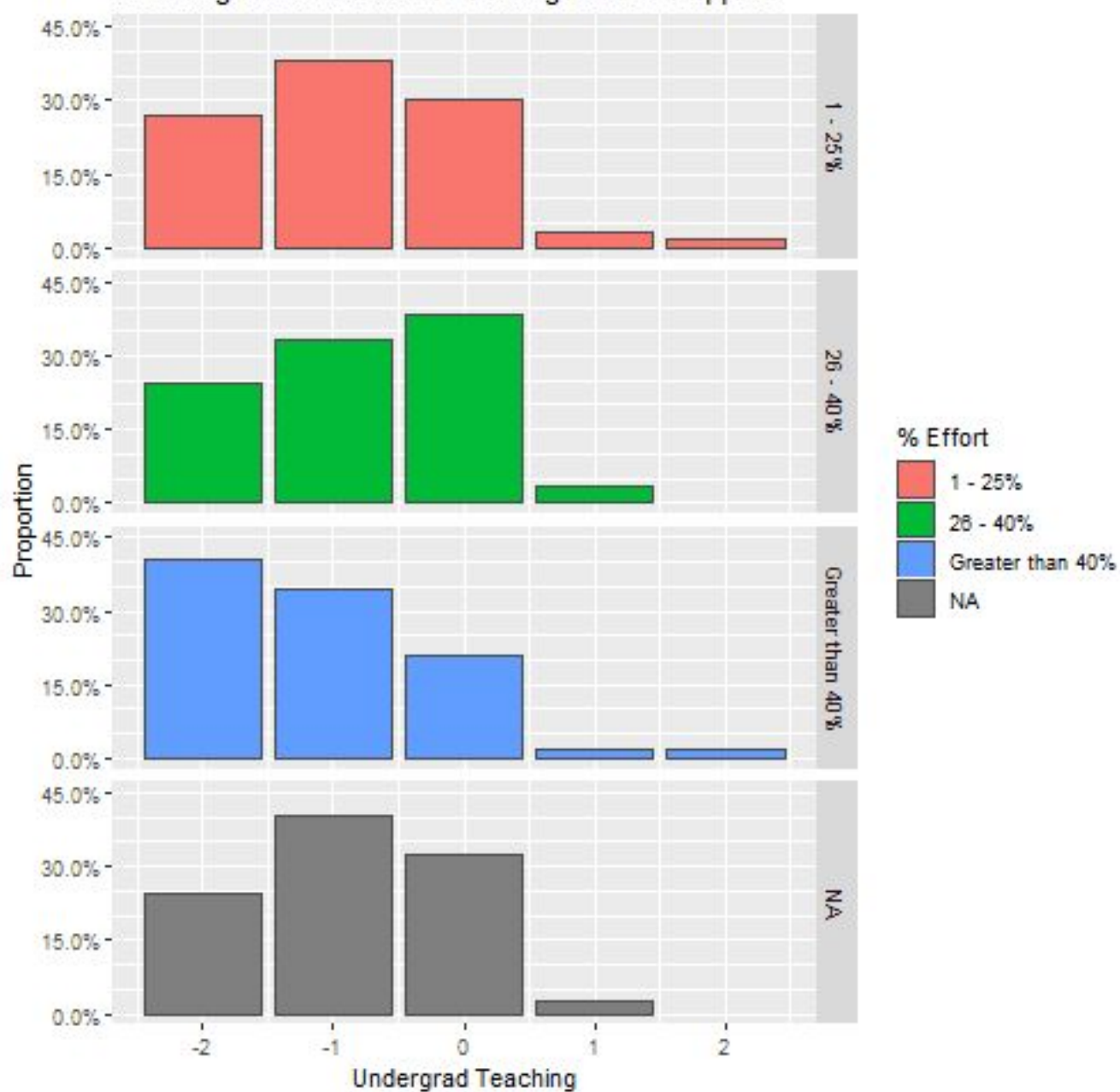
Given your effort distribution (Q8), does NC State support interdisciplinarity (Q13)?

The only difference found in perception of NC State's support for interdisciplinarity based on one's own effort in that same area was a difference in perception of extension support between those devoting 1-25% of their time to extension and those devoting 26-40% of their effort to extension with those devoting less time to extension perceiving there to be less support for interdisciplinary extension.

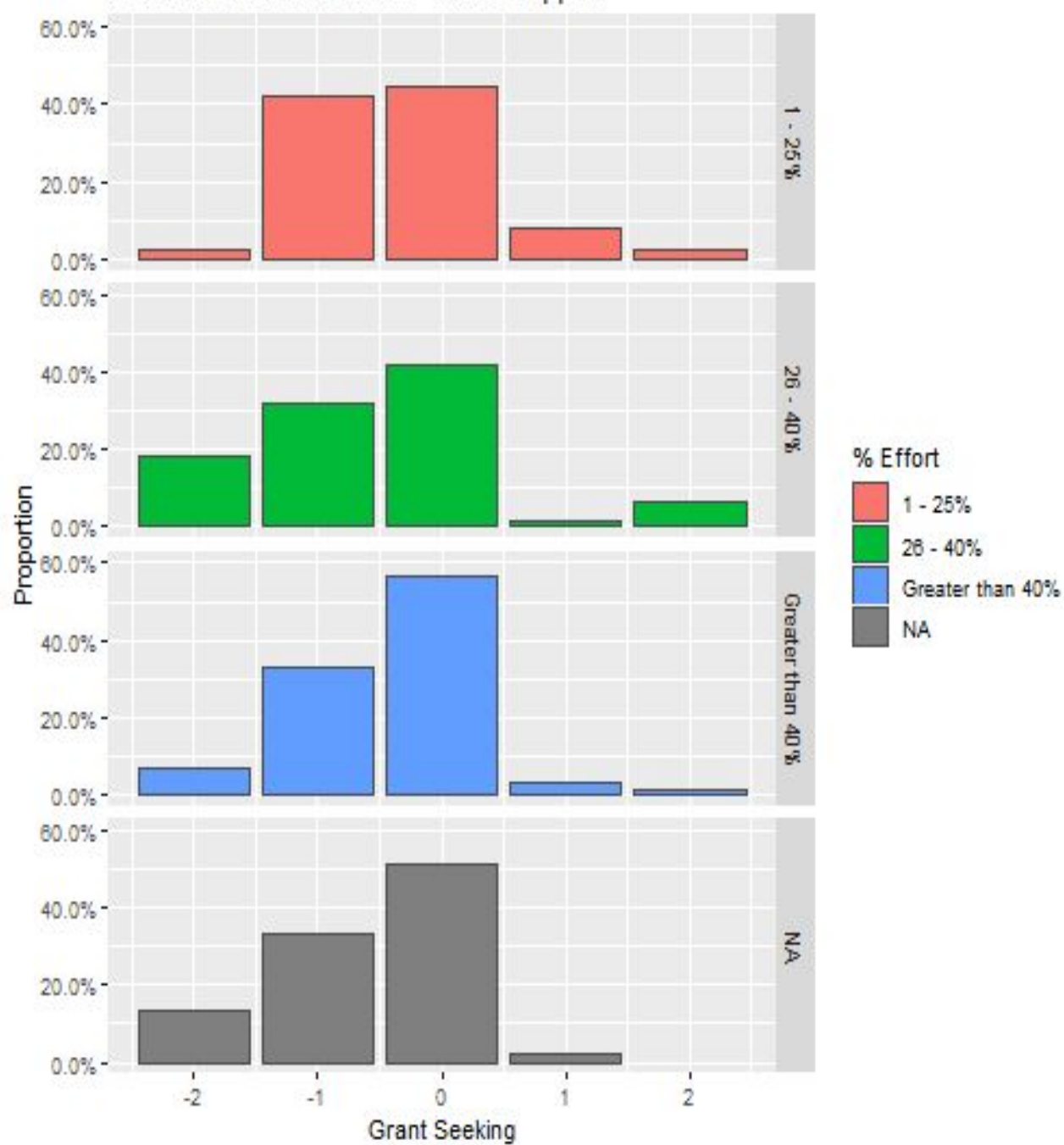
Teaching Effort and NCSU Graduate Support



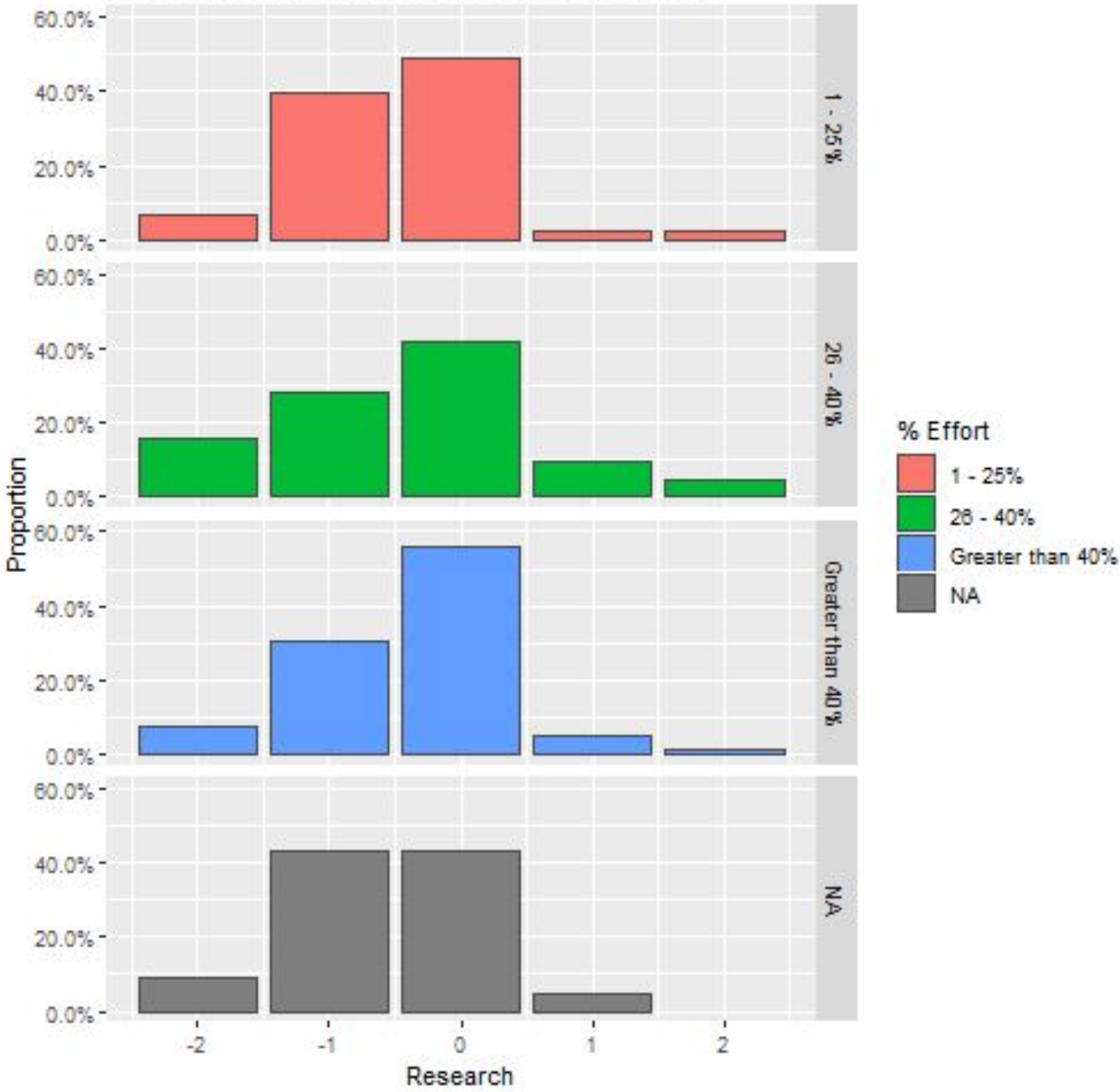
Teaching Effort and NCSU Undergraduate Support



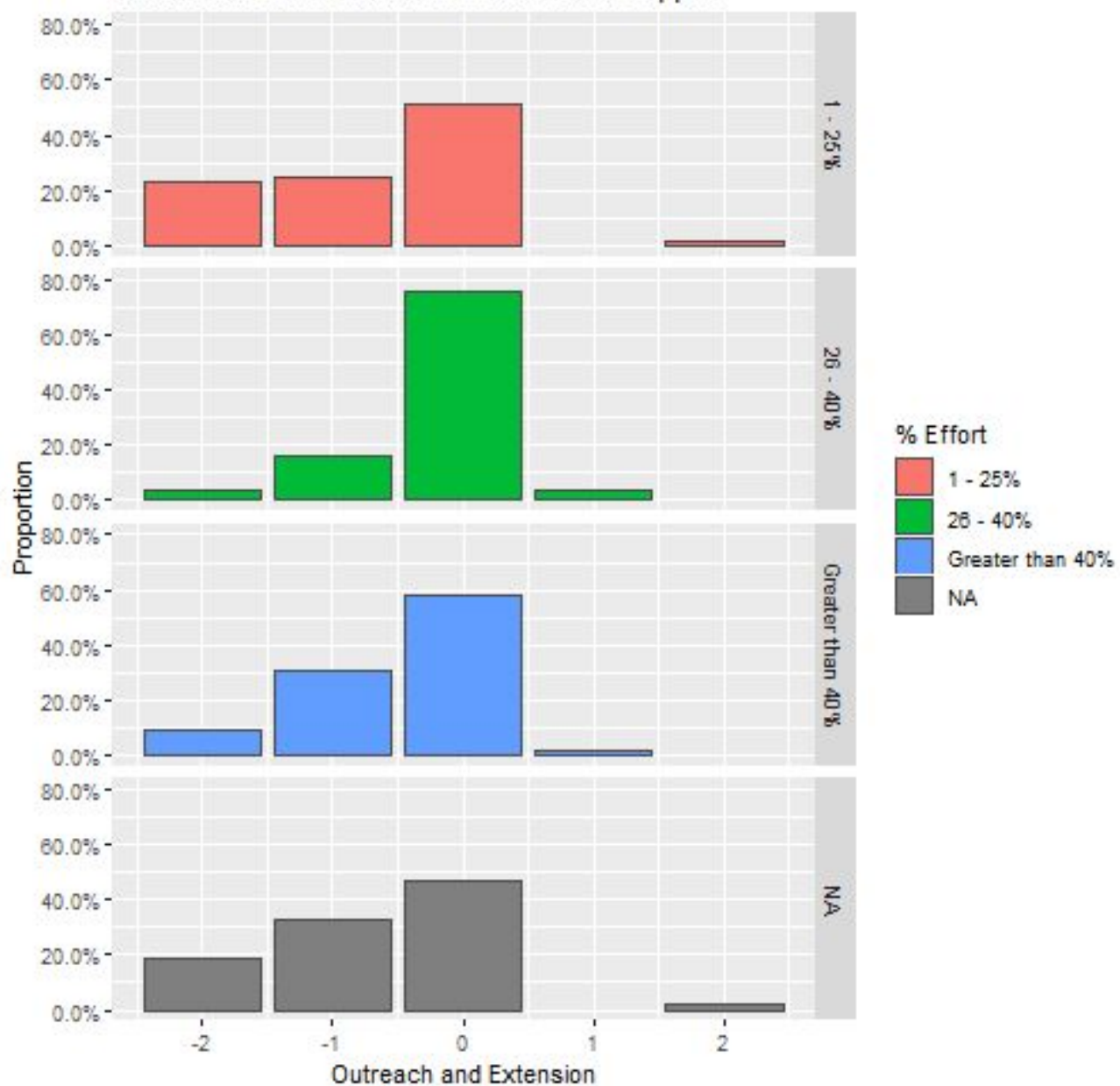
Percent Effort and NCSU Grant Support



Research Effort and NCSU Research Support



Extension Effort and NCSU Extension Support

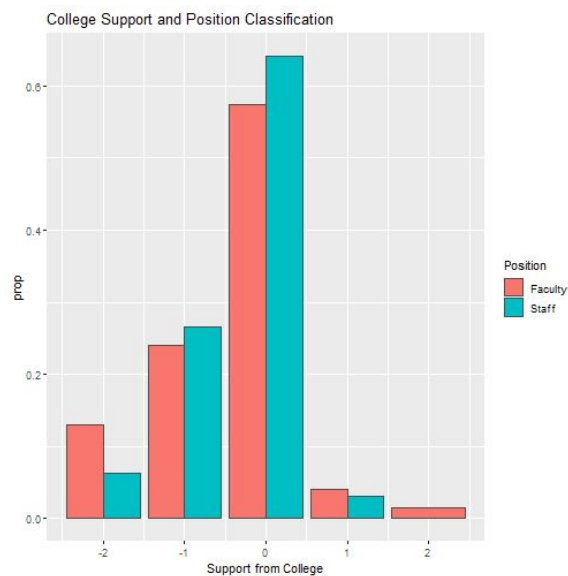
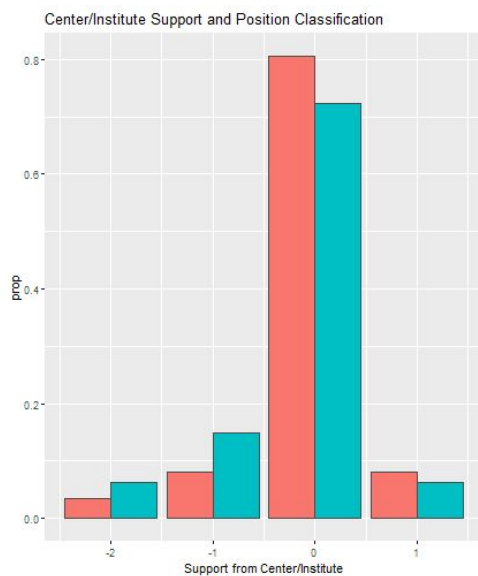


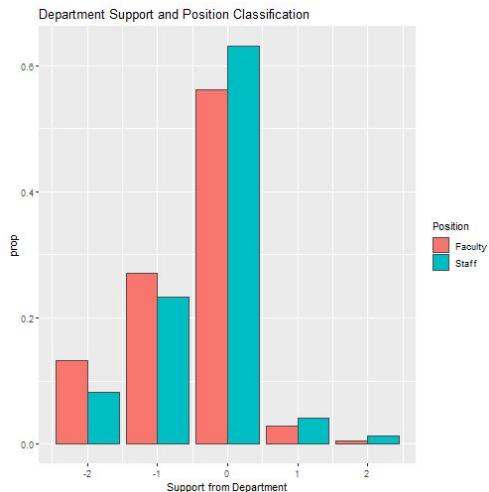
To what extent does your unit support interdisciplinarity? (Q14)

Question	Far too little	Slightly too little	Neither too much nor too little	Slightly too much	Far too much
My College	11%	25%	59%	4%	1%
My Department	12%	26%	58%	3%	1%
My Center/Institute	4%	10%	78%	7%	0%
The promotion process	28%	37%	32%	2%	0%

Differences in perception of unit support for interdisciplinarity between faculty and staff

We do not see any difference in perception of support for interdisciplinarity based on faculty/staff classification.





Promotion support (Q14) and personal interdisciplinary emphasis (Q10)

We did not find any association between one's perception of the promotion system's emphasis on interdisciplinarity and one's own emphasis on interdisciplinarity. Using the Spearman correlation, the correlation coefficient is 0.03.

Division support (Q14) and actual and ideal interdisciplinary emphasis (Q10 and Q12)

We do not find any meaningful association between support offered at various levels (department, college, college/institute) and one's own interdisciplinary emphasis. We find some weak associations, though, between support at various levels and one's own interdisciplinary emphasis often showing that those who perceive lower support would prefer a split favoring interdisciplinary activities, though few are what would be deemed significant and those claims of significance are weak enough to be erased by any level of correction for false-discovery.

Years at NC State (Q7) and dissatisfaction with level of interdisciplinarity (Q10 and Q12)

We find no association between one's years at NC State and their perception of how interdisciplinarity should change.

Level of staff appointment (Q5) and perception of the support at that level (Q14)

The number of respondents with staff appointments at any given level were low enough that drawing meaningful conclusion is not possible at this time. As a general trend, though, people thought that the support for interdisciplinarity from the level of their staff appointment was either adequate (neither too much nor too little) or slightly too little.

CODING OF QUALITATIVE QUESTIONS

If you are involved, or have recently been involved, with interdisciplinary activity, give one specific example that you would like to share with the Task Force. Include what disciplines were involved in the development and/or delivery of interdisciplinary teaching, research or extension and outreach collaboration. (Q17), What went well? (Q18) What was challenging? (Q19)

Respondents were asked to give a specific example, including what disciplines were involved, in the development and/or delivery of interdisciplinary teaching, research or extension and outreach collaboration. The next two questions asked what went well and what was challenging with the

collaboration example described in the previous question. There were 124 specific examples. While there were common themes, these were not coded as each example, what went well and what was challenging were unique. The responses to this are available in the Excel file.

What additional initiatives could NC State implement to facilitate interdisciplinary collaboration?

The table below is the coding of the themes faculty (f) and staff (s) mentioned when asked about additional initiatives NC State could implement to facilitate interdisciplinary collaboration. The first column is the number of times a theme was mentioned in the qualitative answers.

#	Themes	Category
46	Funding, grants, seed money, break down funding barriers, equity pay	F, S
31	Way to bring people together to form new cross-disciplinary collaboration: Lunch meetings, short meetings, ID seminar series, interdepartmental meetings, message board, open proposal process for collaboration	F, S
29	Recognize ID in annual review process, promotion and tenure, publications, grants awarded	F, S
24	Separate Center/Unit/College for ID scholarship, engagement, organization structure	F, S
20	Incentivize ID participation, lack of encouragement to participate in ID	F, S
13	ID undergraduate programs, additional support/more programs	F, S
13	Searchable database for research emphasis, research strength	F, S
9	Commitment from all departments on ID	F, S
9	Eliminate bureaucracy, barriers and red tape	F, S
8	Effort buyouts to focus on ID	F, S
8	More ID inclusion of humanities and social sciences	F, S
7	Administrative support	F, S
7	Tap into resources already available at NC State; Cluster program success; Centers	F, S
6	ID graduate student programs, additional support/more programs	F, S
5	ID postdoctoral programs, additional support/more programs	F, S
5	ID teaching and mentoring needs more attention	F, S
5	Regular communication (e.g., ID hiring, opportunities, etc.)	F, S
4	Count students twice (e.g., allow multiple departments to get credit)	F
4	ID grant submissions, evaluation	F
4	ID is a good idea	F
3	Support/recognition of external ID collaborations with other institutions/organizations	F, S
2	Associate Dean position to develop/oversee ID	F
2	Disciplines are still important	F, S

2	Express bus between Bell Tower and Pullen Drive that runs every five minutes	F
2	ID needs a clear definition	F
2	New faculty integration in ID	F
2	Quality of administration impacts ID success	F
2	Teaching Assistants that work across departments	F
1	Center for faculty to apply for one-year ID residencies	F
1	Invest in ID of current faculty rather than clusters	F
1	More ID around Global Health	F
1	More women/minority administrators	F
1	Policies that dis-incentivize competitiveness and rewards collaboration	F
1	Provost fellow slot for ID	F
1	Split campuses is a huge barrier	F

What outcomes of interdisciplinary teaching, research and/or extension and outreach are indicators of success? (Q22)

The table below is the coding of the themes faculty (f) and staff (s) mentioned when asked about what outcomes of interdisciplinary teaching, research and/or extension and outreach are indicators of success. The first column is the number of times a theme was mentioned in the qualitative answers.

#	Themes	Category
51	Co-authored published research	F, S
47	Grant collaboration and funding	F, S
32	Teaching outcomes: student attendance, joy, depth of learning, ideas, positivity, growth, mixed majors, enrollment in ID, retention in programs	F, S
23	Creation of diverse ID teams, collaborations, partnerships, including natural science with social science and humanities	F, S
15	Innovative ideas, solving complex problems from multiple perspectives/disciplines	F, S
13	Demand for ID graduates by workforce	F, S
12	NC State being recognized globally as an ID leader through research, teaching and extension	F, S
9	Program development (classes from multiple departments, events, new partnerships)	F, S
5	Communication of ID efforts, successes, collaborations	F, S
3	ID presentations at conferences	F
2	Organizational unit on campus for ID	S
2	Professional growth opportunity	S
2	Increase in graduate enrollment	F, S
1	Awards across disciplines	S
1	ID thesis and dissertation committees	S
1	Better faculty recruitment	F, S