

Teaching and Educational Method

Undergraduate Research Opportunities in an Applied Economics Program: Expanding Pathways for Economics Majors (and Beyond) at Land-Grant HBCUs

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Abstract

This article describes an intentionally designed two-pathway (in-class and out-of-class) framework for undergraduate students to gain research opportunities and analytical skills in an applied undergraduate economics degree program located in the Deese College of Business and Economics at North Carolina Agricultural and Technical State University (NC A&T), a high research activity Historically Black College and University (HBCU), 1890 land-grant university. This framework is being expanded across the Deese College, building on the success of past undergraduate research activities in the economics department. We summarize the design and pilot implementation of this framework that scaffolds hands-on research experiences and practical research skill development over multiple years, involving multiple stakeholders. The framework seeks to increase the number of underrepresented students engaged in applied research experiences and prepare students for a future that encompasses graduate studies and research-based employment.

1 Introduction

Undergraduate research prepares students with the skills, knowledge, and confidence needed for future academic and research-oriented opportunities (Russell, Hancock, and McCullough 2007). The National Academies of Sciences, Engineering, and Medicine Consensus Report, *Undergraduate Research Experiences for STEM Students: Successes, Challenges, and Opportunities* (National Academies of Sciences, Engineering, and Medicine 2017), provides a comprehensive summary of current knowledge regarding the impact of undergraduate research experiences (UREs) on science, technology, engineering, and mathematics (STEM) student learning, college success, career formation, and identity as researchers. As noted in the study, support for UREs in U.S. higher education has existed since the mid-1900s, but gained increased attention in recent decades as an important active-learning practice for improving undergraduate education. Specifically,

UREs have been proposed as an opportune way to actively engage students and may be a key strategy for broadening participation in STEM. Multiple reports have focused on the potential high impact of UREs and the often-limited availability of the experiences. These reports often call for an expansion in UREs to allow for greater access to a wider array of students. Current efforts are working to increase the number of students participating in UREs and to increase the diversity of those participants. (National Academies of Sciences, Engineering, and Medicine 2017, pp. 1–2)

Undergraduate research experiences often occur outside of traditional classroom instruction, but increasingly they are also being integrated into undergraduate courses as course-based undergraduate research experiences (CUREs). In this paper, we describe a unique,

intentionally designed undergraduate research framework that includes both elements of undergraduate research as complementary, intentional pathways for students to engage with authentic research throughout the undergraduate curriculum.¹

2 Responding to the Challenge: Expanding Undergraduate Research Experiences to a Broader and More Diverse Student Population

The setting for our undergraduate research framework is an applied undergraduate economics degree housed in the Deese College of Business and Economics (Deese College) at North Carolina Agricultural and Technical State University (NC A&T), an 1890 land-grant, doctoral, high research activity university, and currently the largest historically Black college or university (HBCU) in the United States.² The Deese College has more than 1,900 students, 87 percent of whom are Black, and 95 percent of whom come from underrepresented populations. Faculty in the Department of Economics are actively engaged in research across disciplines, often collaborating with scholars and stakeholders from different disciplines, local communities, and government agencies on research focused on local economic development, agriculture, land use, food safety and security, natural resources, and environmental economics. Due to both the nature of the program (an economics program in a business school at an HBCU) and strong alignment with applied economics topics, the pathways that we are developing are relevant to and can be applied to a wide range of applied economics programs.

The fact that this framework is being developed within an HBCU is particularly noteworthy given these institutions' track record of graduating Black students with STEM degrees and increasing Black representation in graduate education and STEM careers.³ We aim to build on that legacy, expanding UREs outside of traditional STEM disciplines. HBCUs are known for providing supportive environments for student development, engagement, advocacy, and career opportunities. They generally exhibit greater faculty and student diversity than predominantly White institutions (PWIs), promoting a stronger sense of belonging, a component known to support persistence and retention (Tinto 1975). Multi-year undergraduate research programs such as the one described below both benefit from and foster that sense of belonging, building a virtuous cycle of support that promotes overall student success.

Undergraduate research experiences are not new to economics, but most research on their impact on student success focuses on just one aspect of these experiences, such as capstone course design (Li and Simonson 2016) or faculty-mentored student research (Wagner 2015; Cebula 2017; Gitter 2021). A notable shortcoming of existing efforts in undergraduate economics programs is the absence of an intentional framework scaffolding the research process for undergraduate students over multiple years. A structured, yet flexible, program promoting and supporting undergraduate student research throughout the curriculum, especially for students outside of traditional STEM fields, is important for providing research experiences to a larger and more diverse group of students. This is particularly valuable for students studying at HBCUs, where the research experiences not only directly benefit students but also marginalized communities where HBCUs are often located. The economic and social challenges of these communities can be incorporated into undergraduate research projects. We

¹ The authors include both traditional faculty-apprentice undergraduate research experiences and course-embedded undergraduate research experiences (CUREs) that are a formal part of undergraduate curricula—for example, capstone courses—in this paper. We use the URE acronym throughout unless specifically discussing course-embedded research experiences.

² The institution serves more than 13,000 students, 80 percent of whom are Black, 89 percent of whom have racial identities underrepresented in science, technology, engineering, and mathematics (STEM). The institution has a STEM focus and is the largest producer of Black undergraduates in both engineering and agriculture in the United States.

³ For example, of the top eight institutions that graduate Black undergraduate students who ultimately go on to earn doctorate degrees, seven are HBCUs (U.S. National Science Foundation, https://www.nsf.gov/news/special_reports/announcements/081920.jsp).

have not found any similarly structured undergraduate research initiative in economics programs at other HBCUs.⁴ The undergraduate research initiative described here addresses this gap and responds to the National Academies' call for expanding undergraduate research experiences to a broader and more diverse student population.

To be successful in meeting this challenge, we believe that it is essential to design a comprehensive and systematic undergraduate research framework that integrates multiple research opportunities into the undergraduate curriculum. Below we highlight a framework that includes two complementary “pathways” one in-class and the other out-of-class, that provide opportunities for undergraduate students to build research skills in a variety of areas (e.g., literature review, data cleaning, data analysis, scientific writing, and professional presentations) at increasingly higher levels within their undergraduate curriculum and engage in meaningful research experiences in partnership with faculty. The two pathways are complementary and together can expand the capacity of an undergraduate research program, engaging more students in authentic research. One goal of the program is to stimulate student interest in and preparation for graduate school and research-based or advanced employment. The latter is particularly important as stakeholders confront the shortage of diverse STEM workers to meet labor market demands (Wong et al. 2022). While our framework focuses on an economics department at a large-sized HBCU in the southeast United States, we believe the design can be readily adapted to other disciplines and schools. In fact, our previous departmental experience supporting undergraduate research (in a more ad hoc manner) is helping to inform a college-wide undergraduate research experience initiative that will not only increase economics department undergraduate research opportunities, but as discussed below, also expand those opportunities to all disciplines within the Deese College, with the potential for greater cross-disciplinary research collaboration.

3 The Importance of Undergraduate Research Experiences for Historically Underserved Students

While UREs are often discussed in terms of STEM education, Kuh (2008) highlighted the value of UREs as a research-supported “high impact educational practice” that has positive impacts for all students, not just those in STEM disciplines. More recent research supports Kuh’s earlier findings and suggests that participation in UREs has multiple positive impacts on students: increased participation and retention in the major, higher rates of graduation, increased disciplinary knowledge, and deeper understanding of disciplinary culture. For historically underrepresented students, studies indicate that UREs have a disproportionate positive impact on degree completion, persistence in the discipline, and personal traits such as self-efficacy, sense of belonging, and identity in the discipline (National Academies of Sciences, Engineering, and Medicine 2017, Chapter 3). These results echo one of Kuh’s (2008) key findings: “historically underserved students tend to benefit *more* from engaging in educational purposeful activities than majority students” (p. 17). However, “some groups of historically underserved students are less likely to participate in high-impact activities—those first in their family to attend college and African American students in particular” (p. 17). As noted above, efforts to expand these experiences (such as UREs) for underrepresented minorities has increased in recent years. The development of our complementary in-class and out-of-class URE “pathways” approach is designed to support this ongoing call to expand the availability of high-impact teaching/learning practices to underrepresented minorities and to students outside of traditional STEM fields.

The finding that UREs are particularly beneficial for African American students, especially those attending HBCUs, is not surprising. A key mechanism for creating impactful UREs is meaningful and

⁴According to <https://hbcu-colleges.com/economics>, there were 26 HBCUs offering economics bachelor’s degrees at HBCUs in 2024.

effective faculty mentoring, a hallmark of HBCU learning environments. Emerson, McGoldrick, and Simkins (2023), summarizing research on the disproportionate impact HBCUs have on Black STEM majors and PhD production, highlight a variety of practices identified as helping HBCUs create “a safe, supportive, and nurturing environment for Black students to succeed” (p. 3). Such an environment is ideal for creating, implementing, and sustaining impactful URE programs.

UREs offer an opportunity to challenge academically high-performing HBCU students to put “classroom” knowledge to use developing novel solutions to complex problems while also drawing in students less enthusiastic about traditional “classroom” learning. UREs provide opportunities to engage in research on real-world problems that create a “need to know” foundational statistical, analytical, and communication skills—and motivate students to learn those skills. More generally, undergraduate research programs at HBCUs provide a critical opportunity for students to apply knowledge to problems and issues of interest to them, their communities, and society. We also believe minority student researchers are uniquely positioned to bring fresh perspectives to the research process that comes from their lived experiences, perspectives that can address shortcomings sometimes associated with research conducted by non-minority researchers. For example, a minority-oriented research lens brings heightened awareness to the determination of research samples and testing cohorts across demographic groups.⁵ In addition, expanding undergraduate research programs at HBCUs across a wide-range of disciplines (including non-STEM disciplines) not only deepens the critical thinking and research skills of students but also aims to increase the number of minority graduates who go on to pursue research-grounded careers.

While UREs tend to be more prevalent in STEM disciplines, they are increasingly being incorporated in a wide variety of non-STEM disciplines, including business (Stöblein and Kanet 2016).⁶ In economics, interest in developing undergraduate research skills dates to the early 2000s, with emphasis (as noted earlier) on CUREs and capstone experiences in the discipline. Opportunities for undergraduate economics students to present their research at regional and national economics conferences has increased in recent years (Deloach 2023), further increasing interest in UREs in the discipline. The *Starting Point: Teaching and Learning Economics* online pedagogic portal (<https://serc.carleton.edu/econ/studentresearch/>; see also Maier, McGoldrick, and Simkins 2012) includes a comprehensive set of resources promoting UREs in economics as an evidence-based pedagogy, including ways to engage undergraduates in research and examples of a wide range of UREs in economics. Since 2010, several articles have been published on the role and structure of effective UREs in economics (see, for example, Deloach, Perry-Sizemore, and Borg 2012; Hoyt and McGoldrick 2017a), including a multi-paper symposium in the *Journal of Economic Education* (Hoyt and McGoldrick 2017b).

To summarize, UREs are a demonstrated “high impact practice” for improving a variety of student outcomes across a wide variety of disciplines, including economics. Research consistently illustrates that UREs are particularly impactful for underrepresented minorities, promoting higher graduation rates, persistence in the discipline, and increased learning of skills and practices in their fields, along with improved self-efficacy and identity as researchers. Ultimately, this personal and academic success leads to greater representation of historically underserved populations in research-based jobs and graduate programs. The development of our two-track URE program in economics is both motivated by and

⁵ These types of issues are often important in STEM research; for example, face recognition technology related to artificial intelligence and machine learning (Buolamwini and Gebru 2018), pharmaceutical drug testing (Boyle 2021), and social science research anchored in “appropriate” research questions and populations for study (Sue 1999).

⁶ In a series of articles, the *Journal of the Scholarship of Teaching and Learning* published a special issue on undergraduate research in May 2021 (Vol. 21, No. 1; see <https://scholarworks.iu.edu/journals/index.php/josotl/issue/view/2101>), highlighting the transformative power of undergraduate research across a wide variety disciplines. In that issue, Fischer et al. (2021) provides a comprehensive taxonomy for developing high-impact undergraduate research experiences, regardless of discipline.

grounded in these research findings. Benefits accrue not only to the students involved, but also to society.

4 Undergraduate Research Experiences: A Two-Pathway Framework

The integration of research skill development and undergraduate research experiences within the economics curriculum plays a vital role in preparing the next generation of economists, scholars, and decision-makers. These research experiences bridge the gap between economic theory and real-world challenges, allowing students to apply economic concepts learned in a traditional classroom setting to practical problems in the world. Many departments of economics and applied economics have incorporated various research opportunities for their undergraduate students. It is especially prevalent in programs that emphasize applied economic research, where students may have opportunities to engage in research through faculty-mentored research projects (often as paid undergraduate researchers funded through faculty grants from the U.S. National Science Foundation (NSF), U.S. Department of Agriculture (USDA), or other federal agencies), credit-based independent study courses, or undergraduate Honors theses.⁷ In the past two decades, CUREs have also increasingly been used to engage undergraduate students in semester-long applied research projects completed within a course. CUREs developed to expand the benefits of more traditional faculty-mentored undergraduate research experiences to a broader group of students.

In the sections that follow, we describe an intentionally designed framework that innovatively combines the two methods in one framework, including in-class and out-of-class pathways. The framework is illustrated in Figure 1, which highlights the complementary and mutually reinforcing nature of the two pathways. Each year students participate in multiple activities from each pathway, typically including a standard economics course, a faculty-led project, and a university research workshop. The course and university research workshops are strategically designed to support the faculty-led projects. Because of this design, a particular strength of the framework is that there is a robust, built-in retention mechanism: once students engage in the two pathways, they experience spiraling growth in their research capabilities, which increases the likelihood that they will continue to follow through with the faculty-mentored project over multiple semesters, at increasingly higher levels of complexity. One expected outcome from this approach is that students will ultimately be able to independently carry out high-level research, supported by faculty mentoring, and use these research experiences to successfully compete for corporate, governmental, and non-profit research-related positions, as well as graduate school admission in economics, public policy, and related programs.

5 The In-class Pathway—An Intentionally Aligned Program Curriculum

The *in-class pathway* illustrated in Figure 1 serves as the foundation of our undergraduate research framework, with an intentionally designed core series of courses that introduce, reinforce, and apply statistical analysis and data visualization in the context of applied economics research. In addition to standard introductory and intermediate-level micro- and macroeconomic theory courses and applied electives, our current economics curriculum includes three statistical methodology courses and culminates in a senior capstone course where students are tasked with undertaking a data-driven research project. As part of the intentional college-wide undergraduate research framework we are building, we also plan to add a first-year seminar course that will serve as an introduction to the major and economic research. Our curriculum is aimed at developing students' statistical, research, and communication skills to prepare them to independently and effectively conduct applied economic

⁷ The National Science Foundation has developed a specific program to promote undergraduate research, the Undergraduate Research Experience (NSF-URE) program, which aims to provide research opportunities for undergraduate students, typically during the summer months between academic years.

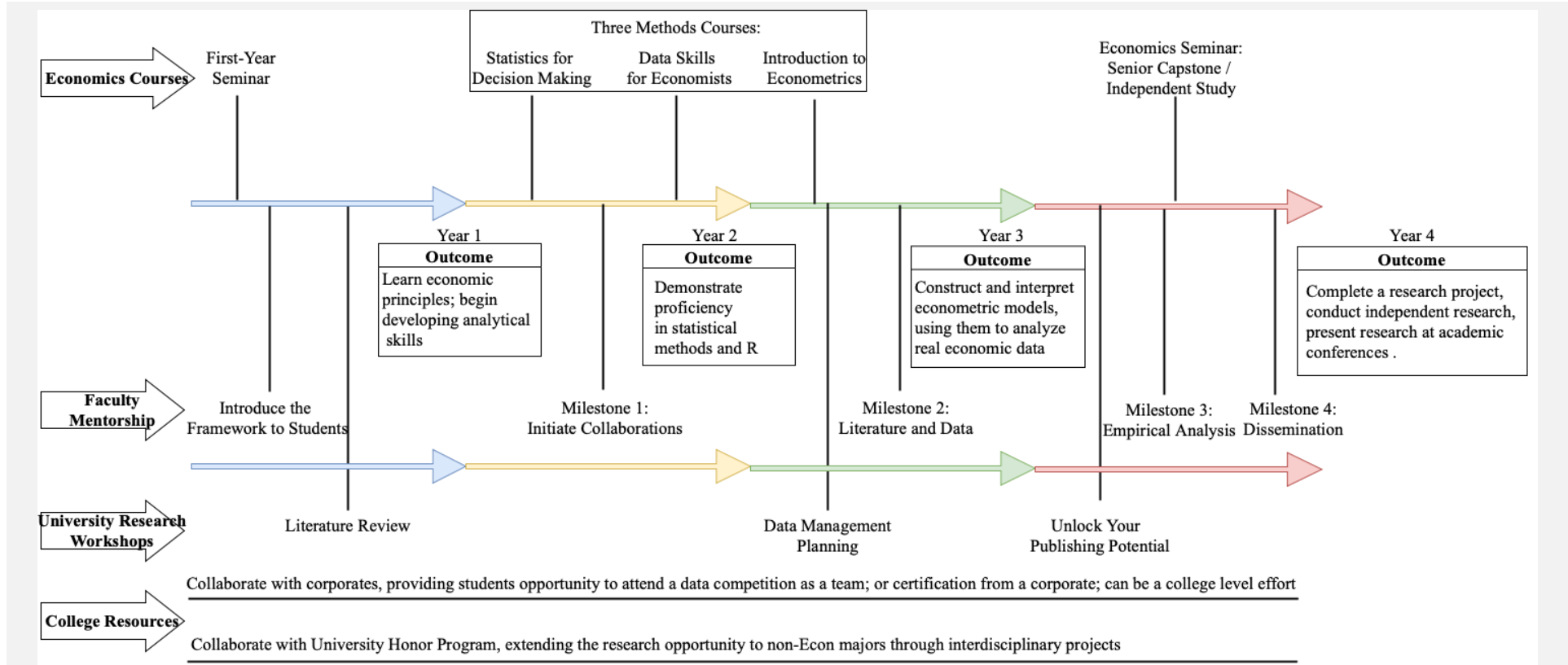


Figure 1: The Two-Pathway Framework.

research and communicate the results to an appropriate audience. The key components of our in-class undergraduate research pathway are described in more detail below.

5.1 First-Year Seminar

This seminar, *Introduction to Economics: Principles and Applications*, part of the broader college-wide initiative to promote undergraduate research, is being designed as a one-credit course for incoming first-year students and will be co-taught by multiple economics faculty members. The objectives of this course are to provide a high-level overview of how economists apply economic theory and models to real-world issues, identify common student-faculty research interests, and establish potential student-faculty mentorship relationships. Faculty members in the department will introduce their ongoing research projects and discuss the research tools economists use to analyze real-world economic problems. By the end of the course, students will be encouraged to identify and connect with a faculty member whose research interests align with their own. The ultimate goal is to create opportunities for faculty mentoring and student collaboration on a research project that can grow in breadth and complexity over the student's undergraduate career.

5.2 Statistical Methodology Courses (Skill-Building and Reinforcement)

The economics curriculum includes three statistical methodology courses central to undergraduate research proficiency:

- *Statistics for Decision Making* is an introductory level statistics course, typically taken in students' first semester of their sophomore year. Statistics plays a foundational role for undergraduate students conducting research in economics. In the realm of applied economics, data-driven analysis is fundamental; proficiency in statistics allows students to use the necessary tools to analyze, interpret, and draw meaningful conclusions from real-world complex data sets.
- The second course, *Data Skills for Economics*, immediately follows the introductory statistics course and introduces R programming skills necessary for statistical analysis, data visualization, and econometric modeling. The course reinforces basic statistical skills while building R programming competency. Proficiency in R has become a critical skill for undergraduate students doing research in economics and serves as a tool that links theoretical concepts in economics to empirical, data-driven analysis.
- The third course, *Introduction to Econometrics*, is designed for junior economics majors, requiring both *Statistics for Decision Making* and *Data Skills for Economics* as prerequisite courses. This R-based course teaches students to build econometric models to analyze real economic research questions using actual applied economics data sets.

These three statistical methodology courses intentionally scaffold students' statistical, programming, and research skills over three years, building their statistical research capabilities and developing methodological rigor, both of which are key to applied economic research. These courses serve as the foundation for the capstone course in the major, which requires students to carry out a real-world data-based research project.

5.3 Course-based Research Projects (Applied Research on Real-World Issues, Capstone Course in the Major and Independent Study Course)

Previous study focusing on undergraduate research has documented the importance of CUREs (Siegfried 2001; Santos and Lavin 2004). In our framework, we introduce two course-based opportunities for students to conduct authentic research: (1) the required senior *Economic Seminar* course, which serves as a capstone course in the major (see Li and Simonson (2016) for the value of having a capstone course

in an economics curriculum), and (2) a major-based *Independent Study* course, which can be used as an economics elective course in the major.

The *Economic Seminar* course is taught as an economic research seminar. At the beginning of the semester, students are given assignments on a common research topic, such as analyzing land use implications from changing crop prices, and are provided with data sets enabling the analysis of the research topic for one geographic region per student. Relevant data analytics and research methodology topics are reviewed and/or introduced and mastered in lectures and classwork and are assessed in two midterm exams. Data manipulations, calculations, and analyses needed for the research projects are carried out as graded homework assignments. The individual research projects culminate in the development of student posters presented at the end of the course, with the posters and presentations contributing a significant portion to the overall course grade. Assessment data from the course, drawn from exams and the research posters, also contribute to the Southern Association of Colleges and Schools (SACS; a regional accreditation) economics program assessment.

In addition to the Senior Economics course, we also offer a three-credit *Independent Study* economics course that can be arranged between a faculty member and a student. While this course has not been widely used in the past, it provides students with a flexible mechanism to conduct research on faculty-led projects that align with the student's research interests and career goals. With the successful completion of the foundational in-class pathway of courses, students are well-prepared to conduct faculty-mentored research in the *Independent Study* course. We anticipate greater use of this course as an economics elective course (two are required in our current degree program) as the Deese College begins to fully implement a college-wide undergraduate research program.

6 The Out-of-Class Pathway—Faculty-Mentored Student Research Experiences

The *out-of-class pathway* in Figure 1 emphasizes students working collaboratively with faculty on research projects funded either through external grants or through a new Deese College Undergraduate Research Experience (DCURE) initiative, now in its initial pilot phase. The DCURE facilitates faculty-mentored and mutually agreed-upon undergraduate research projects. The DCURE program plays a key role in the out-of-class undergraduate research pathway presented here and complements, rather than replaces, traditional external grant-funded UREs, which have played a central role in the economics department in the past. As illustrated in Figure 1, the program incorporates not only faculty-mentored undergraduate research projects but also student research skills workshops led by University Library staff. The success of the program relies on several interacting layers that involve corporate partners, faculty, students, administrators, and other units on campus. In the paragraphs below, we describe key elements of this program, which is currently in its early stages of implementation.

6.1 Corporate Partner Support

The DCURE program is being piloted college-wide, supported by financial investment of corporate partners, with the goal of significantly expanding undergraduate research opportunities both within and beyond the economics department. Corporate funding will be used to fund student researchers and faculty mentors. The Deese College has an extensive list of corporate partners who provide ongoing financial and in-kind support for students, faculty, and programs through formal multi-year agreements. One or more corporate partners will be responsible for providing direct financial support for this program. Why would corporate partners agree to fund this program? The DCURE program is an opportunity for the corporate partner to increase brand recognition and to gain early access to student researchers from a diverse talent pool. The skills learned in this program are transferable across a wide variety of jobs and business types and corporate partners will be able to see the results of their investment directly via Deese College research symposia.

Successful students in the program, designated as Company-Branded Scholars, will have inside access to corporate internships and job placements. In the best-case scenarios, corporate partners will provide real-world data that allow the student researchers to create value-added solutions to corporate challenges or explore potential profitable business opportunities. Student researchers will be paid the university's hourly work-study rate and faculty mentors receive a nominal mentoring stipend; the initiative will also provide student and faculty support for software, equipment, technical training, conference travel, and publication fees, as well as professional certifications (e.g., business analytics).

6.2 Matching Student and Faculty Researchers

A key component of our approach is the process of matching undergraduate researchers with faculty projects. This process relies in part on a catalog of faculty-developed research topics tailored to align with various career paths in the college (and faculty research interests). This approach not only ensures that students are engaged in projects of personal interest but also promotes the development of relevant skills for in-demand jobs related to students' majors and provides a broad array of research opportunities for undergraduate research scholars in the Deese College. We view the DCURE program as a valuable avenue for expanding economics UREs beyond traditional faculty grant-funded opportunities.

There are multiple ways to match faculty with students for a URE (Fenn et al. 2010). Siegfried and Walstad (2014) and Hoyt and McGoldrick (2017a) emphasize that Honors programs have become an increasingly common way to promote undergraduate research. The Deese College is in active discussion with the Honors College to develop a formal partnership promoting undergraduate research opportunities for Honors students outside of traditional STEM fields (in particular, students in the Deese College). Honors students currently have the ability to do additional work in traditional undergraduate courses to receive Honors course credit. However, while some faculty have been able to create meaningful course-based research projects for students, it is challenging given the one-off nature of these experiences and the lack of an external administrative structure to support this practice. The DCURE program is intended to address these challenges by providing a comprehensive out-of-class framework promoting and supporting faculty-mentored undergraduate research in a variety of disciplines, including economics.

Faculty Participation. Faculty are asked to denote their interest in participating in undergraduate research via a survey link. Consideration is given to faculty who have established research projects and share the overall goals of the DCURE program. Program goals account for the needs of students, faculty, administrators, as well as corporate partners. Faculty-student research teams willing to apply their research training and expertise to problems that align with the corporate sponsor's mission are desired, but not required. The mentorship aspect of the faculty advisor is heavily emphasized in the solicitation announcement to signal the priority on nurturing student research development.

Student Participation. Similarly, students are given the opportunity to express their interest to participate via a survey link. Students that meet a threshold cumulative GPA (3.3 or higher) are sent the survey application requesting their contact information, major, classification, a description of previous research experience if applicable, their research interests, and reasons for wanting to be in the program. The program is designed to recruit students early in their undergraduate careers (e.g., just prior to sophomore year) and create support structures to encourage their persistence in the program. Students can take a newly created college-based one-credit hour undergraduate research course (repeatable up to three-credit hours) or a department-based three-credit independent study course, if available. These choices are decided in consultation with the faculty advisor.

Faculty-Student Matching. The college leadership team (department chairs, associate and assistant deans, and dean) provides input on faculty applicants to help with the selection. Once faculty are identified, they are provided the opportunity to review student applications and identify and rank their student selections. Faculty members selecting the same student can agree to co-mentor the students or determine the best faculty match for the student's major, background, and expressed interests. Faculty mentors take part in mentorship training to learn effective mentoring strategies that help students learn more successfully.

6.3 University Library Collaboration—Undergraduate Research Workshops

The economics department, in conjunction with the Deese College of Business and Economics, will also collaborate with the University Library to create and implement a series of research-focused workshops for students. These workshops are designed to target the undergraduate students who have started or are interested in working on faculty-mentored research projects, aiming to enhance basic research skills such as conducting literature reviews, sourcing and obtaining data, preparing for conference presentations, and writing for publication in peer-reviewed journals.

6.4 Expanding Dissemination of Student Research

In their senior year, students will be encouraged to showcase their work publicly, both internally and externally. In the recent past, economics students have presented both their senior capstone course research and out-of-class research projects at the university's annual Undergraduate Research Symposium and the state-level Undergraduate Research and Creativity Symposium. Both venues expose participating students to peer research in economics and other disciplines. Undergraduate research assistants that have worked on externally funded research projects in the economics department have also attended and/or presented at regional or national research meetings and conferences, but such opportunities have been limited by lack of adequate financial support. The DCURE program will provide additional funds to send a larger number of students to external meetings and conferences. The department is also currently exploring collaboration with regional universities to create more low-cost dissemination opportunities for undergraduate economics research with minimal travel.

6.5 Summary—Out-of-Class Pathway

Given the complexity of nurturing student research skills, the two-pathway framework described above is designed to both expand and deepen undergraduate student research experiences in the economics department and college-wide in an intentional and systematic way. The in-class portion of the program takes advantage of intentionally designed courses to introduce and solidify foundational research skills with students. The out-of-class portion utilizes faculty mentorship, along with college, university, and corporate partner-level assets that provide additional focused training and support for students. This scaffolded approach is most effective when students are integrated into the program and introduced to a faculty mentor early in their undergraduate career. Sustained support over time is required to help students develop a robust set of research skills and competencies that can define knowledge gaps, identify and summarize background information and literature, formulate a hypothesis or scientific question, create and implement a research design, collect and analyze data, and then write and present study findings for appropriate audiences. This process requires ongoing, intentional mentorship, resources, and stakeholder commitment, central to the design of the two-pathway undergraduate research framework we are initiating.

7 Motivating Student and Faculty Participation in UREs

Implementing this undergraduate research framework demands considerable effort and resources, but the potential benefits to students and the institution are considerable. Building in effective strategies to

motivate ongoing faculty and student participation and engagement, with respect to out-of-class research opportunities, is key to its long-term success. This occurs in multiple ways. For example, the exposure of students to the broader applications of economics helps them develop interest in graduate school and/or employment that they may not have previously considered. We have an example of two undergraduate research assistants in the economics department, who after participating in a computationally intensive research project, chose to complete a master's of science in data analytics degree and are now successfully employed in computationally intensive roles in the private industry. In another case, an undergraduate research assistant who was considering several career options after completing his undergraduate economics degree successfully competed for a highly competitive Research Assistant position at a regional Federal Reserve Bank and two years later entered a graduate program focusing on economic policy.

To motivate student participation, we initially emphasize the benefit that research opportunities can offer, both academically and professionally, in the *First Year Seminar*. In addition, we provide training and workshops focused on enhancing empirical and analytical skills, communication skills (including data visualization and professional writing skills), and presentation skills, making the research and dissemination process less intimidating (and broadly transferable) for students. We also offer a platform for sharing student research with a broad audience, where students can showcase their work and skills in ways that can be highlighted in job interviews and graduate school applications—and direct contact with corporate partners funding their research experiences. Finally, as a financial incentive, the DCURE program offers a monetary stipend to students who are paired with a faculty member on a research project.

As we have done in the past, we strongly encourage faculty members to include undergraduate researchers in research grants from foundations and governmental agencies such as the NSF, National Institutes of Health, USDA, Department of Energy, Department of Defense, U.S. Forest Service, and others. Our experience so far from faculty grant-funded undergraduate research experiences is that this combination of incentives is enough to motivate a small but dedicated set of students to engage with faculty on mentored research. A challenge in expanding this in the past has been the lack of financial resources to support student stipends and travel to conferences more broadly. With the expansion of these opportunities through the DCURE program, we anticipate scaling-up faculty-led UREs, both in the economics department and across the college. We are currently in the early phases of piloting this program.

A particularly promising, but initially challenging, extension of the out-of-class pathway is to incorporate undergraduate research assistants as part of a broader research team, including faculty members, postdocs, and graduate students, following a common STEM model, especially in the sciences. The integration of undergraduate researchers in such collaborative teams provides extended and lasting benefits to the students and reduces the individual time commitment of a mentoring faculty mentor. In addition to gaining expertise from the faculty member overseeing the team, undergraduate researchers gain valuable knowledge from graduate students and/or postdocs on the team, both in terms of direct research skills and on-the-ground experience with graduate-level research activities. Our experience has shown that purposeful orientation of undergraduate research assistants, maintenance of open communication, and developing a clear understanding of attribution of credit are imperative for success. All of these occur more regularly when undergraduate researchers regularly interact in an “apprenticeship” role as part of a broader, multi-level research team. Our previous interactions with interdisciplinary research teams also demonstrate the advantages of shared physical spaces (e.g., chemistry labs in STEM fields) for nurturing productive within-team connections. Such shared spaces allow for day-to-day interactions between researchers and help undergraduate students better understand and integrate into the research environment. The Deese College is planning for the development of such a multidisciplinary research-dedicated space as a key component of the DCURES program.

Why are faculty members motivated to participate? After all, the need to manage individual undergraduate researchers or larger research teams can be challenging. Faculty mentors need to devote focused effort to creating a welcoming and productive environment for undergraduate research assistants who will likely be new to formal research experiences and require training in both general research practices and specific skills (such as coding for statistical tools such as R). Collaboration in interdisciplinary teams requires even stronger team-building skills from faculty mentors, including establishing common, standardized vocabulary and understanding the scope, limitations, and assumptions of economic modeling (Liang et al. 2021). Despite these challenges, the economics department in the Deese College has a history of supporting a limited number of undergraduate researchers through government-sponsored faculty grants, both during the academic year and in summer, as noted above. Faculty members who have led these efforts pride themselves in mentoring future researchers and seeing students grow their skills beyond their classroom training. More pragmatically, these students provide essential research support to faculty members, assisting with literature reviews, data cleaning, and statistical analysis. Mentoring undergraduate student researchers takes time and effort, but in our experience, faculty mentors have found a significant return on that investment in the form of additional professional presentations and publications.

In the best cases, undergraduate researchers work alongside graduate students, just as in more traditional STEM lab environments. While we do not have a graduate program in our economics department, some of our faculty serve as dissertation advisors or committee members for students in related interdisciplinary fields. Incorporating undergraduate researchers into this work provides another opportunity for undergraduate researchers to gain valuable direct as well as indirect research skills and values in an organic way, further diffusing the impact of the faculty member across multiple academic levels. Using the positive economics department experience with undergraduate research as a guide, the DCURES program aims to scale these faculty experiences college-wide to promote research grant funding (that incorporates undergraduate research experiences), increase research publications, and increase the graduate school pipeline of underrepresented students.

7 Summary

Undergraduate research experiences in applied economics play an essential role in developing students' analytical skills. They promote and advance students' abilities to think critically, carefully analyze relevant data, draw evidence-based conclusions, and effectively communicate results to relevant audiences, valuable skills that reinforce and synthesize classroom learning. Furthermore, these analytical skills are transferable, benefiting students in various career paths, including industry-focused research, policy analysis, and business consulting to name just a few.

This paper describes the development and pilot implementation of a systematic, intentional, and complementary two-pathway undergraduate research framework aimed at providing students in a College of Business and Economics in a large, research-intensive, land-grant HBCU with expanded research opportunities spanning a variety of disciplines, including applied economics. The college-wide DCURES program builds on the experience of the economics department in providing UREs to a limited number of students via grant-funded faculty research projects in recent years, as well as the department's course-embedded research in the senior economics capstone course. These experiences, jointly, have been valuable for the students involved, leading to nationally competitive research-based job placements and graduate school admission (and completion). More generally, the two-pathway DCURES program also responds to the National Academies' call for expanding undergraduate research experiences to a broader and more diverse student population.

The DCURES program is an attempt to expand the scope and impact of undergraduate research experiences both within the department and across the college through a framework grounded in two complementary—in-class and out-of-class—pathways and the collaborative efforts of the faculty,

students, college, and corporate partners. The program has been designed to meet the diverse needs of undergraduate students, enhance their research capabilities, and prepare them for future academic and professional careers in applied economics and related fields while advancing the strategic goal of the university and college to expand undergraduate research opportunities as a high-impact student learning practice.

The implementation of this systematic framework through the DCURES program is expected to play a transformative role in the college, and particularly in our economics department, by institutionalizing, expanding, and financially and administratively supporting what the department has been doing previously in an ad hoc manner. The integration of UREs in undergraduate education has been shown to positively impact student learning and success; the impact is disproportionately positive for underrepresented minorities. Increasing undergraduate research experiences at HBCUs outside of traditional STEM areas, as this initiative aims to do, has the potential to significantly impact the number of underrepresented minorities involved in applied economics research, along with the type of research carried out by these researchers. A well-structured, college-wide undergraduate research program not only enhances economics students' understanding of economic theory and builds key career skills, it also leads to a richer, multidisciplinary understanding of economic and social issues affecting underrepresented communities and the development of research-informed solutions that can address those issues.

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