Exploring Organizational Strategies in Environmental Engineering Graduate Education: A Comparative Analysis of the Georgia Institute of Technology and the University of Georgia

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***Abstract*—The graduate education system for environmental engineering in the United States, particularly within the STEM fields, has been instrumental in supporting the nation's science and engineering sectors. This study focuses on the organizational strategies that foster the development of senior environmental engineering professionals in the southern United States, with a specific look at the Georgia higher education system. We perform a comparative organizational analysis between two leading institutions: the Georgia Institute of Technology and the University of Georgia. This research examines organizational culture, structure, and arrangements, aiming to uncover the dynamics that drive innovation and the cultivation of expertise within this field. The study reveals both institutions maintain stringent admission and graduation policies to ensure graduate quality, with Georgia Tech integrating its programs with interdisciplinary studies and UGA offering a deep dive into civil engineering knowledge.**

Keywords—graduate education, environmental engineering education, higher education organization, STEM education, higher education comparison

I. Introduction

Environmental engineering education, a subset of engineering education, is dedicated to cultivating specialized technical professionals in the field of environmental development. This profession leverages mathematical and scientific principles to address challenges related to environmental sanitation by using the properties of matter and energy sources [1]. Traditionally, environmental engineering has been integrated as a specialized branch within civil engineering [2]. Currently, it is an independent discipline but remains closely associated with civil engineering [3].

Graduate-level environmental engineering education should receive more academic concern. Optimizing STEM graduate education to better support students is a significant goal. This places a strong emphasis on forming professional skills on top of the foundation provided by undergraduate education. In an ideal STEM graduate education system, students would achieve a balance between acquiring a broad technical literacy and specializing deeply in their chosen area of interest [4]. Furthermore, they would have ample opportunities to effectively communicate the outcomes of their research and realize the broader implications of their work [5]. Students would engage in project-based learning, preferably as collaborative team members, departing from the conventional lecture-based approach [6]. Moreover, for the field of environmental engineering education and the profession, enhanced communication and productive partnerships are expected outcomes of graduate education [7]. However, there needs to be more academic attention directed toward assessing the present state of environmental engineering graduate education within American university systems. It is imperative to promptly evaluate the disparity between the current state of environmental engineering graduate education and the researchers' envisioned ideal.

This research intends to shed light on an exploration of organizational strategies employed in the cultivation of senior-level environmental engineering professionals. Our focus is primarily on the higher education system within the southern United States, with specific reference to the Georgia higher education system. **The major question is: what are the current organizational strategies in environmental engineering graduate education at selected universities?** The investigation centers on a comparative analysis of the organizational dynamics governing graduate education in environmental engineering within two prominent institutions: Georgia Institute of Technology (Georgia Tech) and the University of Georgia (UGA). According to the 2024 U.S. News ranking [8], the Georgia Institute of Technology secured a fifth position in environmental engineering graduate education, while the University of Georgia held the 112th position in the same category. The analysis would conduct the comparative analysis of environmental engineering graduate education through three dimensions, including organizational culture, structure, and arrangements.

II. Literature Review

Despite many proposed strategies aimed at improving environmental engineering education[59][60][61], it should be noted that the traditional organizational structure of engineering institutions, typically organized by discipline or department, is often perceived as a constraining factor for progress on environmental engineering education [9]. However, there is a significant void in academic research dedicated to conducting organizational analyses to promote innovation within environmental engineering education, especially graduate education. As a result, this literature review will serve as a foundational pillar, providing the necessary rationale and support for the subsequent in-depth examination of organizational strategies in environmental engineering graduate education.

Environmental engineering education, including graduate programs, stands to benefit from several avenues of improvement. The anticipated characteristics of leading engineering programs in the future have already been observed in worldwide universities identified as 'emerging leaders' in this domain [10]. These institutions showcase crucial elements such as (1) integrating resource-intensive learning methods within the university setting with a personalized online learning approach; (2) enriching engineering education by broadening options and increasing flexibility and diversity; (3) curriculum frameworks highlighting interdisciplinary knowledge and global human-centered engineering principles [11].

Nevertheless, the traditional structure of engineering schools and universities, organized by discipline or department, has been perceived as limiting innovation in engineering education. Many advancements based on interdisciplinary knowledge may face constraints due to the existing structural divisions, both within and beyond engineering disciplines [12]. These divisions often hinder informal interactions, particularly in the context of teaching and learning [13]. From the perspective of teaching content, the description of three environmental systems - water resource management, air resource management, and solid waste management - follows a simplified pattern [14][15]. However, many significant environmental challenges transcend these simplified systems and are commonly referred to as multimedia pollution problems [16]. Additionally, integrating subjects such as management, marketing, business communications, critical thinking, employability skills, and sustainability approaches into engineering education is essential [17]. These topics are increasingly recognized as crucial components of a well-rounded engineering education that prepares graduates for the complexities of modern engineering challenges [18][19]. Therefore, the conventional organizational framework within engineering schools may hinder the effective resolution of issues pertaining to environmental systems and geographical discrepancies, potentially impeding further advancements and innovation.

Thus, there has been a methodical discussion regarding the promotion of innovation through an interdisciplinary approach, while still focusing on the importance of considering the formal aspects of organizations. While current research primarily examines organizational arrangements, particularly in terms of teaching content and methods, this study aims to broaden the scope of organizational analysis. Specifically, it will compare graduate education in environmental engineering at the two institutions, focusing on three key areas: organizational culture, structure, and arrangements.

Correspondingly, the research questions of this study are:

RQ1: What are the characteristics in organizational cultures of the Georgia Institute of Technology and the University of Georgia?

RQ2: What are the characteristics in organizational structures of the Georgia Institute of Technology and the University of Georgia?

RQ3: What are the characteristics in organizational arrangements of the Georgia Institute of Technology and the University of Georgia?

III. Methods

A. Research Design

This study employs a comparative case study design to explore and analyze the organizational strategies in environmental engineering graduate education at the Georgia Tech and the UGA. The research focuses on identifying key strategies employed by each institution, comparing their characteristics, and understanding the contextual factors that influence these strategies.

B. Data Collection

We collected and reviewed strategic plans, mission statements, academic program descriptions, and annual reports from both Georgia Tech and UGA. Additionally, we obtained program requirements from the environmental engineering departments at both institutions. By analyzing the data, we gained a basic understanding of the two institutions' strategies regarding environmental engineering graduate education. The data accurately represent the present status of these two organizations.

C. Data Analysis

1. Qualitative Data Analysis:

For the collected documents, we utilized thematic analysis to identify key themes and patterns from the document analysis. We employed coding techniques to categorize data into the framework of organizational culture, structure, and arrangements to compare organizational strategies between the two institutions.

2. Comparative Analysis:

Using the two cases, we compared the identified strategies between Georgia Tech and UGA. We discussed the similarities and differences in approaches of the two institutions and their implications for environmental engineering graduate education.

IV. Comparison Findings

A. Organizational culture

While the UGA concentrates more on increasing the cultural variety on campus, Georgia Tech prioritizes academic innovation. At Georgia Tech, the ethos is geared towards encouraging innovation intentionally [20]. This requires a supportive background of educational innovation adjusting to the rapid advancements in technology and societal changes. There is a general administrative agreement at Georgia Tech to use a comprehensive strategy to develop the university's potential for innovative teaching [21]. This strategy entails identifying the key elements of the Institute—its staffs and processes—that are necessary to sustain innovation, figuring out how to best utilize the interactions between these elements, and iteratively improving the innovation processes to attain better results [22]. Georgia Tech's achievements in educational innovation stem from two distinct cultures: grassroots (the bottom-up culture), and an institutional (the top-down culture) [23]. Georgia Tech could become stable in its risks of reform and improve its innovation with the two different cultures. Faculty members' ideas are generally the starting point for grassroots success stories [24]. At UGA, students are immersed in an environment that encourages an understanding of cultural variances throughout campus life [25], simultaneously emphasizing academic innovation and technological proficiency [26]. The ethos of the University of Georgia is grounded in the belief in human-centered development and growth, positing technology as a tool that should primarily serve humanity [27].

In terms of structuring environmental engineering education, Georgia Tech boasts a dedicated school for this subject. Established in 1896 primarily through Lyman Hall's efforts, a mathematician, the School of Civil Engineering has grown from producing its first graduate in 1902 to becoming one of the largest of its kind in the United States [28]. Reflecting the broadening field, in 1995, it was renamed the School of Civil and Environmental Engineering, now offering a full range of undergraduate, master's, and doctoral programs [29]. Meanwhile, the University of Georgia's School of Environmental, Civil, Agricultural, and Mechanical Engineering (ECAM) is committed to achieving global recognition and excellence in engineering education, research, and service [30]. Located within a top twenty national land-grant and liberal arts university, ECAM encourages collaboration across various engineering fields and beyond, acknowledging the integration of technology within a wider social science and natural science framework [31]. ECAM is dedicated to cultivating versatile students equipped with the necessary skills and interdisciplinary insights to address major societal challenges [32].

B. *Organizational structure*

At Georgia Tech, the School of Civil and Environmental Engineering awards master's, and doctoral degrees in Environmental Engineering. While the Atlanta campus presents both master's and doctoral programs, the Shenzhen campus in China provides only the master's program in Environmental Engineering [33]. The doctoral program is exclusive to the Atlanta campus [34]. This discipline has two main research areas: Environmental Engineering itself and Water Resources Engineering [35]. The Environmental Engineering program at Georgia Tech is supported by 14 faculty members and includes 9 significant areas of research, operating within 5 specialized facilities and 2 dedicated research centers [36]. On the other hand, the UGA offers a master's degree in civil and environmental engineering with an emphasis on Environmental Engineering, as well as a Ph.D. degree with a focus on Environment and Water [37]. UGA's program is backed by 13 faculty members and explores 7 principal research areas, utilizing 5 facilities and 2 research centers for its operations [38].

TABLE I. THE COMPARISON OF ORGANIZATION STRUCTURE IN GEORGIA TECH AND UGA

	Georgia Tech	**UGA**
Key Research Areas	1. Air pollution: emissions, formation, transport, and deposition of aerosols 2. Chemical and environmental multiphase transport processes 3. Environmental and analytical chemistry 4. Environmental biotechnology for bioremediation of contaminated soil, sediments and waters 5. Hazardous substances in sediments, soils, waters and residues 6. Nanotechnology in the environment 7. Physical, chemical and biological processes influencing subsurface fate and transport of contaminants 8. Physicochemical processes for water and wastewater treatment 9. Sustainable technology and development	1. Sustainable Infrastructure and Ecological Engineering and Ecosystem Restoration 2. Solid and Hazardous Waste and Marine Debris 3. Atmospheric Particulate Matter (aerosols) 4. Wind and Solar Energy Resource Assessment 5. Coastal Oceanography and Environmental Fluid Mechanics 6. The Sustainability and Resilience of the Water and Energy Systems 7. Air quality, environmental health and justice
Facilities	1. Ford Environmental Science and Technology 2. Daniel Laboratory 3. Sustainable Education Building 4. Multimedia Environmental Simulations Laboratory 5. Collaborations in Atlanta with units at Emory University and the U.S. Centers for Disease Control and Prevention.	1. Coastal Ocean Analysis and Simulation Team 2. Environmental Modelling Lab 3. Solid Waste Management Lab 4. Integrated Hydrologic Systems Lab 5. Air Quality and Climate Research Laboratory 6. Compound Inundation Team for Resilient Applications
Research Centers	1. Brook Byers Institute for Sustainable Systems 2. Southeastern Center for Air Pollution & Epidemiology	1. New Materials Institute 2. Institute for Resilient Infrastructure Systems

Source: [52][53][54]

C. *Organizational arrangements*

Georgia Tech offers graduate degrees in environmental engineering with distinctive requirements for master's and doctoral programs. The Master of Science (M.S.) program in environmental engineering at Georgia Tech is not only focused on the discipline itself but also plays a crucial role in broader interdisciplinary initiatives that span bioengineering, nanotechnology, sustainable development, and energy systems, among others [39]. Students pursuing the M.S. can choose between a thesis and a non-thesis option. For both pathways, a significant portion of coursework must be at the advanced level, with core courses specifically in Environmental Engineering [40]. Those opting for the non-thesis route can take more elective courses, whereas thesis students split their electives between specific classes and research credits linked to their thesis work [41]. For the Doctor of Philosophy (Ph.D.) program, candidates are expected to create a personalized course plan that includes a significant number of credits involving a minor field, focused on their area of specialization [42]. The Ph.D. journey includes passing comprehensive exams, presenting a thesis proposal, and defending their thesis [43]. The doctoral thesis is expected to be an original work that contributes to the field of Civil and Environmental Engineering [44]. Full-time doctoral students working on their thesis should typically enroll in a full course load of research credits, but this is subject to their advisor's and department's discretion [45]. These summaries encapsulate the academic structure and requirements of Georgia Tech's graduate programs in environmental engineering, highlighting the institution's commitment to advanced, specialized education in this critical field.

At the UGA, the M.S. in Civil and Environmental Engineering program allows students to concentrate on Civil, Environmental, or a combination of both disciplines through their coursework and either a master's thesis or project [57]. Since Fall 2019, the program previously known as Environmental Engineering has been updated to the Civil and Environmental Engineering Program, with enrolled students being transitioned to the new program automatically [46]. This master's degree offers specialized knowledge in civil engineering through an intensive curriculum and innovative research in key areas such as structural and geotechnical engineering, transportation and pavement engineering, as well as environment and water [47]. Research opportunities available to students include cutting-edge work in various subfields such as pavement technology, bridge engineering, structural modeling, hydrology, and water resources management [48]. For the Ph.D. in Engineering with an Environment and Water Emphasis, there is an emphasis on greater academic research flexibility with a reduced coursework requirement compared to the master's program [58]. This allows doctoral candidates more opportunity to engage in extensive research activities.

TABLE II. CURRICULUM ARRANGMETNS OF M.S. PROGRAM AT UGA

Energy Systems	*Environment and Water*	*Sustainable Coastal Engineering*
ENGR 6490, Renewable Energy Engineering	BCHE(ENVE) 6490, Environmental Engineering Remediation Design	CVLE 8130, Mechanics of Jets and Plumes
ENGR 8103, Computational Engineering	CRSS(GEOL) 8710, Watershed-Scale Modeling	CVLE 8140, Transport and Mixing in Natural Flows
ENVE 6230, Energy in Nature, Civilization, and Engineering	CVLE(MCHE)(LAND) 6660, Sustainable Building Design	CVLE(MCHE) 8160, Advanced Fluid Mechanics
ENVE 6250, Energy Systems and the Environment	CVLE 8110, Environmental River Mechanics	ENGR 8103, Computational Engineering: Fundamentals, Elliptic, and Parabolic Differential equations
ENVE 6530, Energy and Environmental Policy Analysis	CVLE 8130, Mechanics of Jets and Plumes	ENGR 8220, Microfluidic Transport Phenomena
ENVE 8110, Ecological Energetics	CVLE 8140, Transport and Mixing in Natural Flows	ENVE 6435, Natural Resources Engineering
MIST 6550, Energy Informatics	CVLE(MCHE) 8160, Advanced Fluid Mechanics	MARS 8030, General Physical Oceanography
	ENGR 8103, Computational Engineering: Fundamentals, Elliptic, and Parabolic Differential Equations	MARS 8100, Estuarine and Coastal Oceanography
	ENGR 8220, Microfluidic Transport Phenomena	MARS 7380, Quantitative Methods in Marine Science
	ENVE 6430, Advanced Open Channel Design	MARS 8150, Ocean Waves
	ENVE 6435, Natural Resources Engineering	MARS 8510, Modeling Marine Systems
	ENVE 6440, Computer Modeling in Water Resources	MCHE 6590, Fluid Mechanics II
	ENVE 6450, Engineering Hydrology and Hydraulics	
	ENVE 6460, Groundwater Hydrology for Engineers	
	ENVE 6470, Environmental Engineering Unit Operations	
	ENVE 6550, Environmental Life Cycle Analysis	
	GEOL(WASR) 8740, Hydrologic Flow and Transport Modeling	
	MCHE 6590, Fluid Mechanics II	
	STAT 6315, Statistical Methods for Researchers	
	WASR 8200, Hillslope Hydrology Seminar	

Source: [55]

TABLE III. CURRICULUM ARRANGMETNS OF PH.D PROGRAM AT UGA

ENVE 8450 Design for Rapid Change: Food, Energy, and Water
ENGR 8103 Computational Engineering
CVLE 8110 Environmental River Mechanics
CRSS(GEOL) 8710Watershed-Scale Modeling
CVLE 8140 Mixing & Transport
ENGR 8103 Computational Engineering
CVLE(MCHE) 8160 Advanced Fluid Mechanics
GEOL(WASR) 8740 Hydrologic Flow and Transport Modeling
MARS 8030 Physical Oceanography
MARS 8100 Estuarine and Coastal Oceanography
MARS 8150 Ocean Waves
MARS 8510 Modeling Marine System
WASR 8200 Hillslope Hydrology
CHEM 8880 Nanomaterials: Engineering and Characterization

Source:[56]

V. CONCLUSION

UGA emphasizes promoting academic performance and cultural diversity on its campus, while Georgia Tech channels its efforts into academic creativity and innovation. this innovation culture at Georgia Tech is propelled by the need to keep pace with swift technological advancements and societal shifts. Georgia Tech has a specialized school dedicated to environmental engineering [49][50], reflecting its commitment to this discipline. conversely, the university of Georgia's school of environmental, civil, agricultural, and mechanical engineering is a total institution of environmental engineering education, civil engineering education, agricultural engineering education, and mechanical engineering education [51]. Georgia tech's environmental engineering graduate programs are designed with unique requirements for master's and doctoral degrees, integrating the field with interdisciplinary studies like bioengineering and sustainable technology. UGA's master's program in this field provides in-depth civil engineering knowledge through rigorous coursework and cutting-edge research. as for administrative procedures, both institutions have clear admission and graduation policies for their graduate programs, designed to ensure the quality and competence of their graduates.

VI. Implications

Given the comparative analysis of environmental engineering graduate education at both Georgia Tech and the University of Georgia, several implications can be drawn to guide future educational strategies and enhancements in environmental engineering graduate education and beyond:

1. Personalized Learning Approaches: The integration of resource-intensive learning methods with personalized online learning approaches, as mentioned for the University of Georgia's curriculum arrangements, highlights the importance of flexible and adaptive education models. This approach can cater to diverse learning preferences and schedules, enhancing student engagement and mastery of complex subjects.

2. Interdisciplinary Focus: Georgia Tech's broader engagement in interdisciplinary programs across bioengineering, nanotechnology, sustainability, and energy systems suggests a model where collaboration and cross-pollination of ideas are highly valued. Universities should consider how interdisciplinary studies can be more systematically incorporated into their curriculum to address complex global challenges, drawing from Georgia Tech's model.

3. Human-Centered Engineering: The emphasis on human-centered engineering principles at the UGA points to the significance of designing solutions and technologies with a focus on human needs and well-being. This approach can be a differentiator and should be more deeply integrated into engineering education to prepare graduates for creating more inclusive and socially responsible technologies.

4. Resource Mobilization and Connection: While Georgia Tech mobilizes resources across disciplines more broadly, the University of Georgia's approach is described as more connected to the cultural level and traditional disciplines. This difference underlines the need for universities to strategically choose how they connect and mobilize resources, aligning with their educational goals and strengths. Building bridges between disciplines, whether through formal structures or cultural initiatives, can enhance the richness and applicability of engineering education.

In summary, these implications suggest a shift towards more personalized, interdisciplinary, and human-centered educational models in environmental engineering graduate education. By adopting these approaches, universities can better prepare graduates to tackle the complex and evolving challenges of the 21st century.

References

[1][3] M. L. Davis and D. A. Cornwell, *Introduction to Environmental Engineering*, McGraw-Hill, 2013.

[2] J. R. Rogers and A. J. Fredrich, Eds., *Environmental and Water Resources History: Proceedings and Invited Papers for the ASCE 150th Anniversary (1852-2002): November 3-7, 2002, Washington, DC*. Sponsored by Environmental and Water Resources Institute of the American Society of Civil Engineering, EWRI National History and Heritage Committee, 2003. [Online]. Available: https://archive.org/details/environmentalwat0000unse/page/n3/mode/2up. [Accessed: Aug. 5, 2024].

[4][5][6] A. Leshner and L. Scherer, *Graduate STEM Education for the 21st Century*, National Academies Press, 2018.

[7][61] R. G. Luthy et al., Future concerns in environmental engineering graduate education, J. Prof. *Issues Eng. Educ. Pract., vol. 118*, no. 4, pp. 361-380, 1992.

[8] "National Universities Rankings," U.S. News & World Report. [Online]. Available: https://www.usnews.com/best-colleges/rankings/national-universities. [Accessed: Feb. 6, 2024].

[9] [14] H. Chen, S. Wang, and Y. Li, "Aligning Engineering Education for Sustainable Development through Governance: The Case of the International Center for Engineering Education in China," *Sustainability*, vol. 14, no. 21, p. 14643, Nov. 2022, doi: 10.3390/su142114643.

[10] [15] National Academies of Sciences, Engineering, and Medicine, "The Ultimate Challenge for Environmental Engineering: Preparing the Field to Address a New Future," *Environmental Engineering for the 21st Century: Addressing Grand Challenges*. Washington, DC: The National Academies Press, 2019. doi: 10.17226/25121.

[11][12][13] R. Graham, The global state of the art in engineering education, *Massachusetts Institute of Technology (MIT) Report*, Massachusetts, USA, 2018.

[16] M. L. Davis and D. A. Cornwell, *Introduction to Environmental Engineering*, McGraw-Hill, 2013.

[17] K. Drage, "Modernizing Career and Technical Education Programs," *Techniques: Connecting Education and Careers*, vol. 84, no. 5, pp. 32-34, May 2009.

[18] A. Kolmos, R. G. Hadgraft, and J. E. Holgaard, "Response strategies for curriculum change in engineering," *International Journal of Technology and Design Education*, vol. 26, pp. 391-411, 2016, doi: 10.1007/s10798-015-9319-y.

[19] A. Solodikhina and M. Solodikhina, "Developing an innovator's thinking in engineering education," *Education and Information Technologies*, vol. 27, pp. 2569-2584, 2022, doi: 10.1007/s10639-021-10709-7.

[20][21][22][23][24] Georgia Institute of Technology, "Culture," 2021. [Online]. Available: https://provost.gatech.edu/cne/culture. [Accessed: Feb. 6, 2024].

[25][26][27][54] University of Georgia, "School of Environmental, Civil, Agricultural and Mechanical Engineering," 2021. [Online]. Available: https://engineering.uga.edu/schools/ecam/. [Accessed: Feb. 6, 2024].

[28][29] School of Civil and Environmental Engineering – Georgia Tech, "Graduate Handbook," 2021-22 Academic Year. [Online]. Available: URL if available. [Accessed: Feb. 6, 2024].

[30][31][32] University of Georgia, "School of Environmental, Civil, Agricultural and Mechanical Engineering," 2021. [Online]. Available: https://engineering.uga.edu/schools/ecam/. [Accessed: Feb. 6, 2024].

[33][34] Georgia Tech Graduate Studies, "Degree Programs - Environmental Engineering," 2021. [Online]. Available: https://grad.gatech.edu/degree-programs/environmental-engineering. [Accessed: Feb. 6, 2024].

[35][36][52]Georgia Institute of Technology, "Environmental Engineering - Academic Groups," 2021. [Online]. Available: https://ce.gatech.edu/academics/groups/environmental. [Accessed: Feb. 6, 2024].

[37][38] University of Georgia, "School of Environmental, Civil, Agricultural and Mechanical Engineering," 2021. [Online]. Available: https://engineering.uga.edu/schools/ecam/. [Accessed: Feb. 6, 2024].

[39][40] Georgia Tech School of Civil and Environmental Engineering, "M.S. in Environmental Engineering," 2021. [Online]. Available: https://ce.gatech.edu/ms-environmental. [Accessed: Feb. 6, 2024].

[41] [49] Georgia Tech Catalog, "Environmental Engineering MS," 2021. [Online]. Available: https://catalog.gatech.edu/programs/environmental-engineering-ms/#requirementstext. [Accessed: Feb. 6, 2024].

[42] [43] [44] Georgia Tech Catalog, "Environmental Engineering PhD," 2021. [Online]. Available: https://catalog.gatech.edu/programs/environmental-engineering-phd/#requirementstext. [Accessed: Feb. 6, 2024].

[45] Georgia Institute of Technology, "Doctoral Degree Information," 2021. [Online]. Available:

https://catalog.gatech.edu/academics/graduate/doctoral-degree-info/. [Accessed: Feb. 6, 2024].

[46][47][48][55][57] University of Georgia, "M.S. in Civil and Environmental Engineering," 2021. [Online]. Available: https://engineering.uga.edu/degree/ms-civil-environmental-engineering/. [Accessed: Feb. 6, 2024].

[50] Georgia Institute of Technology, "Environmental Engineering PhD Program," 2021. [Online]. Available: https://catalog.gatech.edu/programs/environmental-engineering-phd/#text. [Accessed: Feb. 6, 2024].

[51] University of Georgia, "School of Environmental, Civil, Agricultural and Mechanical Engineering," 2021. [Online]. Available: https://engineering.uga.edu/schools/ecam/. [Accessed: Feb. 6, 2024].

[53] School of Civil and Environmental Engineering, "Water resources engineering," Georgia Institute of Technology. [Online]. Available: https://ce.gatech.edu/academics/groups/water. [Accessed: 16-Aug-2024].

[56][58] College of Engineering, "Ph.D. in Engineering - Environment and Water Emphasis," University of Georgia. [Online]. Available: https://engineering.uga.edu/degree/phd-engineering-environment-water-emphasis/. [Accessed: 20-Aug-2024].

[59] S. Farrell, T. R. Forin, K. Jahan, R. A. Dusseau, P. Bhavsar, and B. Sukumaran, "Developing multiple strategies for an inclusive curriculum in civil engineering," 2017. [Online]. Available: https://rdw.rowan.edu/engineering_facpub/14/. [Accessed: 23-Aug-2024].

[60] C. da Rocha Brito, M. M. Ciampi, R. M. Vasconcelos, L. A. Amaral, and V. F. Barros, "Environmental engineering program preparing engineers to tackle new challenges," in *2013 International Conference on Interactive Collaborative Learning (ICL)*, Kazan, Russia, Sep. 2013, pp. 17-21. doi: 10.1109/ICL.2013.6644527.