Engineering Beyond the Classroom - Navigating Crisis and Compassion During Brazil's Historic Flood

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Abstract

The Exploration of Energy and Electrification in Brazil program, offered by the University of Pittsburgh's Swanson School of Engineering, is designed to provide students with a comprehensive understanding of Brazil's energy systems, focusing on renewable energy sources such as hydropower and the country's efforts toward clean, renewable electrification. The global experience course typically includes site visits to energy facilities, discussions on policy and infrastructure, and a comparison between Brazilian and American energy strategies. Additionally, students are exposed to Brazilian culture and collaborate with local universities to enrich their academic experience.

However, during the spring 2024 program Brazil was hit with its worst flooding in 80 years. The catastrophic effects from the flooding struck southern Brazil, displacing over 700,000 residents and transforming the intended focus of the course. Faced with a natural disaster of this magnitude, students and faculty pivoted from their planned activities to join humanitarian relief efforts, partnering with UNISINOS University to support local communities. With scheduled site visits canceled and critical infrastructure in crisis, the group assisted over 1300 displaced refugees by organizing supplies, distributing bedding, and providing support. This experience offered profound lessons for students, faculty and administrators, highlighting the importance of empathy, leadership, and adaptability when responding to real-world crises.

This paper examines the impact of the experience on all participants, emphasizing the lessons learned while navigating the complexities of such a significant natural disaster. It explores how the shift from a technical curriculum to crisis response enriched the students' professional and personal development and how faculty adapted to maintain a positive learning environment. The study underscores that engineering education must extend beyond technical training to prepare students for the unexpected, fostering resilience and compassion in future engineers

Introduction

Engineering global experience programs play an important role in preparing students to operate in an increasingly globalized and interconnected world (Tunno, 2023). These experiences expose students not only to real world technical experiences in international contexts, but also to the cultural, political, and societal dimensions that shape engineering practice. This emphasis aligns with ABET accreditation criteria, which require engineering programs to demonstrate that graduates are able to recognize ethical and professional responsibilities and make informed judgments that consider the global, economic, environmental, and societal impacts of engineering solutions (ABET, 2026). The *Exploration of Energy and Electrification in Brazil* course was developed with these objectives in mind, offering students an immersive opportunity to study Brazil's energy infrastructure, renewable energy resources, and electrification strategies while engaging directly with Brazilian culture and academic partners. Through site visits, technical discussions, and collaboration with local universities, the course was designed to help students compare Brazilian and United States approaches to energy systems while developing global awareness and cultural competence.

Central to the course design was the recognition that the engineer of the future must be globally competent, capable of working across borders, adapting to unfamiliar environments, and responding effectively to complex, evolving challenges. Beyond technical proficiency, modern engineering practice demands flexibility, ethical awareness, leadership, and the ability to engage empathetically with communities affected by infrastructure decisions and external disruptions. Global experience programs are uniquely positioned to cultivate these skills by placing students in real-world contexts that differ significantly from their home institutions.

During the Spring 2024 offering of the course, however, the planned academic structure was fundamentally altered due to a once-in-a-generation natural disaster. Shortly after arrival in southern Brazil, the state of Rio Grande Do Sul encountered continuous, heavy rainfall that persisted for several days. It quickly became apparent that this was not an isolated weather event, but a large-scale natural disaster. Widespread flooding impacted cities and surrounding regions, displacing hundreds of thousands of residents and severely disrupting transportation, utilities, and daily life. Many of the course scheduled site visits and academic activities were canceled as critical infrastructure was overwhelmed, and emergency response efforts took precedence.

Faced with these rapidly changing conditions, the instructional team, consisting of faculty from the University of Pittsburgh, a faculty partner from UNISINOS and program leadership, was required to make immediate and consequential decisions. These included determining how to continue the course in a manner that preserved meaningful learning outcomes, rapidly adapting course content to reflect the unfolding situation, ensuring the physical and emotional safety of students, and coordinating an evacuation from the affected region and eventual safe return to the United States. These decisions were made under significant uncertainty and time pressure, requiring close collaboration, clear communication, and constant reassessment of risk.

Ultimately, the course pivoted from its original electrification and renewable energy engineering focus to a service-oriented response to the humanitarian crisis that was unfolding each day. Students and faculty partnered with local organizations to assist displaced Brazilian residents, supporting relief efforts through organizing supplies, distributing essential items, and providing direct assistance in shelters. While the educational pivot was unplanned, this shift proved to be a profoundly impactful educational experience for the entire global experience team. Students were exposed firsthand to the human consequences of infrastructure failure and extreme weather events, gaining insight into the role engineers can play in planning for and during crises. The experience fostered resilience, adaptability, leadership, empathy, and an appreciation for humanitarian engineering that extended well beyond the original course objectives. It also provided the students with a firsthand understanding of the importance of infrastructure planning, crisis management, and designing redundance in critical infrastructure.

This paper examines how a natural disaster transformed the learning objectives of an engineering global experience in Brazil. It reflects on how the shift from a structured technical curriculum to crisis response influenced student learning and professional development, and how faculty adapted pedagogical approaches to maintain a meaningful educational experience under extraordinary circumstances. By documenting this experience, the paper argues that engineering education should intentionally prepare students not only for planned technical challenges, but also for the unpredictable realities they may face as professionals, where compassion, flexibility, and ethical responsibility are as critical as technical expertise.

Course Description

Brazil is an ideal country for American engineering students to study energy systems and electrification. In many respects, Brazil and the United States are comparable nations. The United States is the third most populous country in the world, while Brazil is the seventh most populous country (Worldometers, January). Similarly, the United States is the third-largest country by land area, while Brazil is the fifth largest. Figure 1 illustrates this comparison by overlaying Brazil onto a map of North America, highlighting the geographic scale of the two countries (Open Rivers, 2026).

Figure 1: Map of Brazil overlaid on a map of North America (Open Rivers, 2026)

Despite the many similarities in population and land area, Brazil and the United States differ significantly in how electrical energy is generated. The United States generates approximately 24.4% of its electricity from renewable energy sources, with wind generation being the largest percentage. In contrast, Brazil generates approximately 89.1% of its electricity from renewable sources, with hydro power leading the way (International Energy Agency, 2026). It is clear to see that while the United States is heavily dependent on fossil fuels for electricity generation, Brazil is well-positioned as fossil fuel consumption continues to decline globally. This contrast, shown in **Error! Reference source not found.**, provides a strong educational contrast for students to conduct a comparative analysis of national energy strategies, infrastructure development, and electrification efforts.

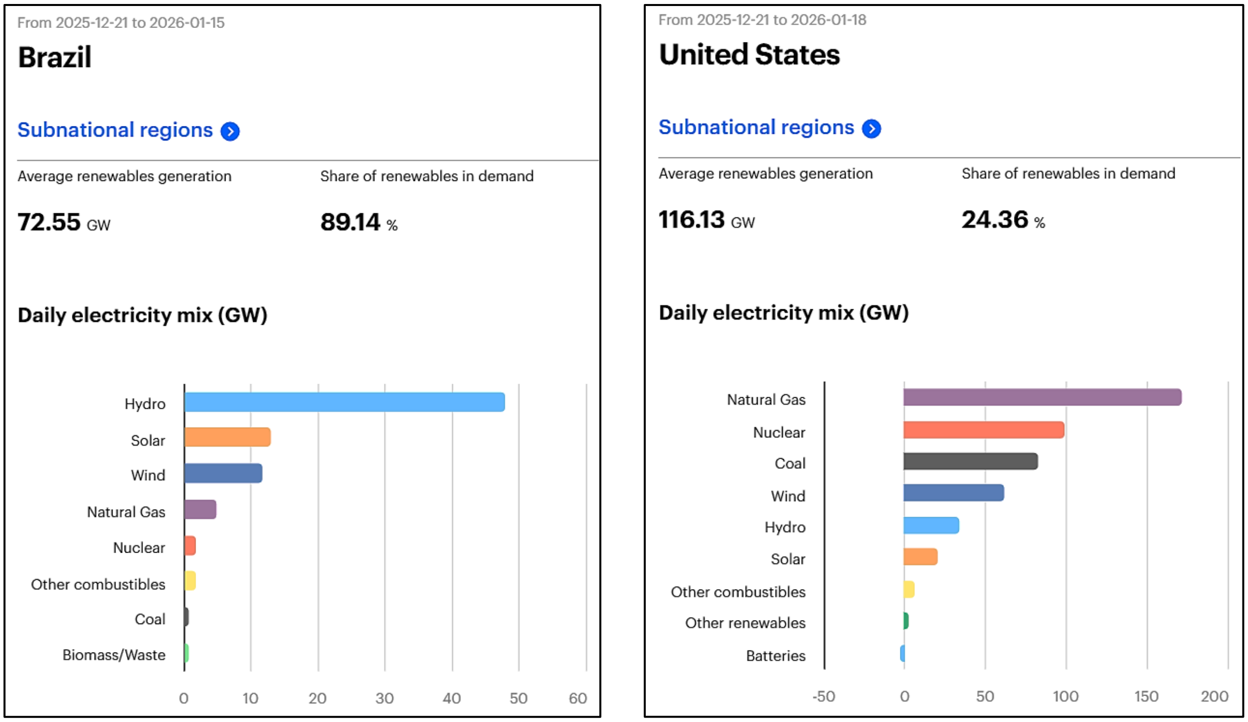

Figure 2: Comparison of Electricity Generation in Brazil and the United States

The *Exploration of Energy and Electrification in Brazil* course was designed to leverage these differences through an immersive, faculty-led global experience. Each offering of the course typically includes 16 to 24 undergraduate engineering students and is conducted in southern Brazil, primarily in the state of Rio Grande do Sul, with additional travel to Foz do Iguaçu. The course brings students directly into the Brazilian context to study energy production, delivery, and electrification while engaging with local institutions and communities.

A central objective of the course is to compare Brazilian and United States approaches to energy and electrification. Brazil has made substantial progress in clean energy generation, particularly through hydropower and other renewable resources, while the United States has historically excelled in widespread electrification, grid development, and reliability. Through this comparative framework, students examine how geographic, economic, political, and cultural factors influence engineering decisions and national energy policies.

The course includes multiple technical site visits that reinforce these themes. Students visit an electrical distribution utility company to study grid operations and infrastructure, a combined wind energy and cattle farming operation to explore land-use integration, a solar photovoltaic production installation at UNISINOS, and two different hydropower facilities, including the 2nd most productive hydropower plant in the world, the Itaipu Dam. These site visits expose students to renewable energy technologies at varying scales and allow them to engage directly with engineers and professionals working within Brazil's energy sector.

Prior to travel, students participate in several preparatory sessions establish a common technical foundation. These sessions introduce general concepts of energy production and delivery, followed by focused discussions on fossil fuel-based generation, hydropower, wind energy, and solar photovoltaic systems. This preparation ensures that students arrive with the background necessary to meaningfully engage with the technical content encountered during the global experience.

In addition to technical instruction, the course emphasizes Brazilian culture and its relationship to engineering practice. Students study how cultural values and historical context influence how problems are framed and addressed in Brazil. Other aspects of Brazilian culture, including capoeira, food, and art, are also incorporated into the course to reinforce the connection between engineering, society, and culture. This integration supports the broader course goal of developing globally competent engineers who understand that technical solutions are shaped by the communities in which they are implemented.

2024 Rio Grande do Sul Flood Event

During the Spring 2024 offering of the *Exploration of Energy and Electrification in Brazil* course, southern Brazil experienced an unprecedented hydrometeorological disaster. The state of Rio Grande do Sul was struck by the worst flooding recorded in approximately 80 years, affecting an estimated 2.4 million people across the region. Of these, more than 600,000 residents were displaced; hundreds were injured; dozens were reported missing, and at least 183 fatalities were confirmed. Floodwaters were estimated to exceed 1.5 billion cubic meters, overwhelming urban and rural areas alike. In total, over 420,000 individuals were directly impacted, including approximately 67,000 people considered especially vulnerable due to existing social and economic conditions. Approximately 16% of the affected communities were classified as socially vulnerable prior to the disaster (Simoes-Sousa, 2025).

Figure 3: Porto Alegre city center flooded

The flooding resulted from a rare combination of atmospheric and climatic conditions. Unusually high temperature anomalies, combined with a persistent atmospheric blocking pattern, led to prolonged and intense rainfall over southern Brazil in May 2024. Researchers identified the role of large-scale moisture transport phenomena, commonly referred to as "flying rivers," in which moisture-laden air masses originating from the Amazon basin transported and released extreme volumes of precipitation over the region (Simoes-Sousa, 2025). These conditions produced rainfall totals within a four-day period equivalent to approximately one-third of the region's typical annual precipitation, far exceeding historical norms.

Climate scientists and regional experts have linked the severity of the event to broader climate change trends. Warmer ocean temperatures associated with global warming have altered atmospheric circulation patterns, creating favorable conditions for extreme precipitation events. According to climatologists at the Federal University of Rio Grande do Sul (UFRGS), the magnitude and intensity of the flooding represent the largest flood disaster in Brazil's recorded history and serve as a clear indicator of the accelerating climate crisis (Molina, 2025). These findings highlight the growing challenge engineers face in designing infrastructure resilient to increasingly frequent and severe climate-driven events.

Figure 4: Devastation in the Navegantes neighborhood

The flooding also triggered a widespread infrastructure crisis, particularly in the metropolitan region of Porto Alegre. The city's flood protection system, consisting of dikes, floodgates, and pumping stations, experienced critical failures during the event. Post-event assessments attributed these failures to a combination of insufficient maintenance and potential design limitations. Deterioration of mechanical components such as bolts, rubber seals, and rails reduced system effectiveness, while backflow through pumping station galleries contributed to flooding in areas that were expected to remain protected, including parts of the historic city center (Palummo Lantes, 2025). These failures underscored vulnerabilities in aging infrastructure systems and the consequences of deferred maintenance.

During the flood event, the course group was based in São Leopoldo, a city located within the greater Porto Alegre metropolitan area and near some of the most severely affected communities. As conditions deteriorated, transportation networks were disrupted, scheduled academic activities were canceled, and daily life was significantly altered. The group's physical proximity to the unfolding crisis transformed the global experience from a planned academic program into a direct encounter with a large-scale natural disaster and its human and infrastructural consequences.

This context fundamentally reshaped the course experience. Rather than observing energy and electrification systems under normal operating conditions, students and faculty were confronted with the realities of infrastructure stress, emergency response, and humanitarian need. The flood event served as a powerful, unplanned case study illustrating the intersection of climate change, infrastructure resilience, social vulnerability, and engineering ethical responsibility, setting the stage for the course pivot described in the following section.

Global Experience Program Pivot: Adapting Course Direction Amid Emerging Challenges

Midway through the global experience, unprecedented flooding in southern Brazil fundamentally altered the feasibility of continuing the course as originally designed. What began as isolated disruptions rapidly escalated into a regional humanitarian crisis, rendering the original travel schedule, site visits, and planned instructional activities untenable. At this point, “business as usual” was no longer possible, and faculty were required to make real-time decisions balancing educational objectives, student safety, logistical feasibility, and emotional well-being.

The timeline of the flood unfolded rapidly following the group’s arrival in Rio Grande do Sul on Sunday, April 28th. Heavy rainfall began the next day, and regional flooding began by May 1st. As the crisis became more dire in the surrounding communities, UNISINOS graciously opened its doors to approximately 1,300 refugees on May 4th. Faculty and students immediately pivoted from engineering-focused academics to active volunteers, a humbling experience that demonstrated how immediate human needs to supersede planned technical educational objectives. By Monday, May 6th, program leaders had arranged for safe transportation to evacuate the group to Florianopolis. This departure was bittersweet for all involved. While there were relief and excitement to resume the educational and experiential aspects of the program, the group left with heavy hearts and a strong awareness of the devastation remaining.

The flooding events taking place became an unplanned but powerful instructional inflection point. Rather than treating the disruption as a failure of planning, faculty intentionally framed the situation as a case study in leadership under pressure. Students observed, in real time, how engineering professionals respond when assumptions collapse; constraints change, and stakes are high. One student noted, “While it is common for tropical cities like Rio de Janeiro or São Paulo to take on a few feet of floodwater during heavy rainfall, seeing infrastructure fail to the point where bridges collapse, roads are washed out, and power grids shut down are shocking." — Felipe Junqueira, an electrical engineering student (Stanick, 2024). The students and faculty alike were in the midst of a historic flood and the educational objectives needed to rapidly pivot. Faculty did not merely lecture about leadership, risk management, or ethical responsibility; they modeled these behaviors through transparent decision-making, frequent communication, and adaptive problem solving in the face of uncertainty.

Leadership during this period took multiple forms. Logistically, faculty and international program directors coordinated with local providers to manage rapidly changing transportation plans, lodging contingencies, and safety protocols, while maintaining close communication with university partners and local institutions. Equally important was the emotional dimension of leadership. Students experienced anxiety, disappointment, and concern for both their own safety and the well-being of the surrounding communities. Faculty intentionally created space for these concerns, acknowledging uncertainty while providing reassurance, structure, and clarity. This approach reinforced that leadership in engineering contexts extends beyond technical competence to include empathy, communication, and a sustained commitment to people.

Academically, the course pivoted toward contextualized learning that directly engaged with the unfolding disaster. Faculty collaborated with an expert in electrical grid resilience and natural disaster response to rapidly develop new lectures and discussions focused on infrastructure vulnerability, power system failures, emergency response, and recovery planning. These topics were not presented abstractly; students were studying natural disasters, infrastructure fragility, and grid resilience while living through the consequences of such events. This immediacy transformed theoretical concepts into lived experience and deepened students' understanding of the societal responsibilities inherent in engineering practice.

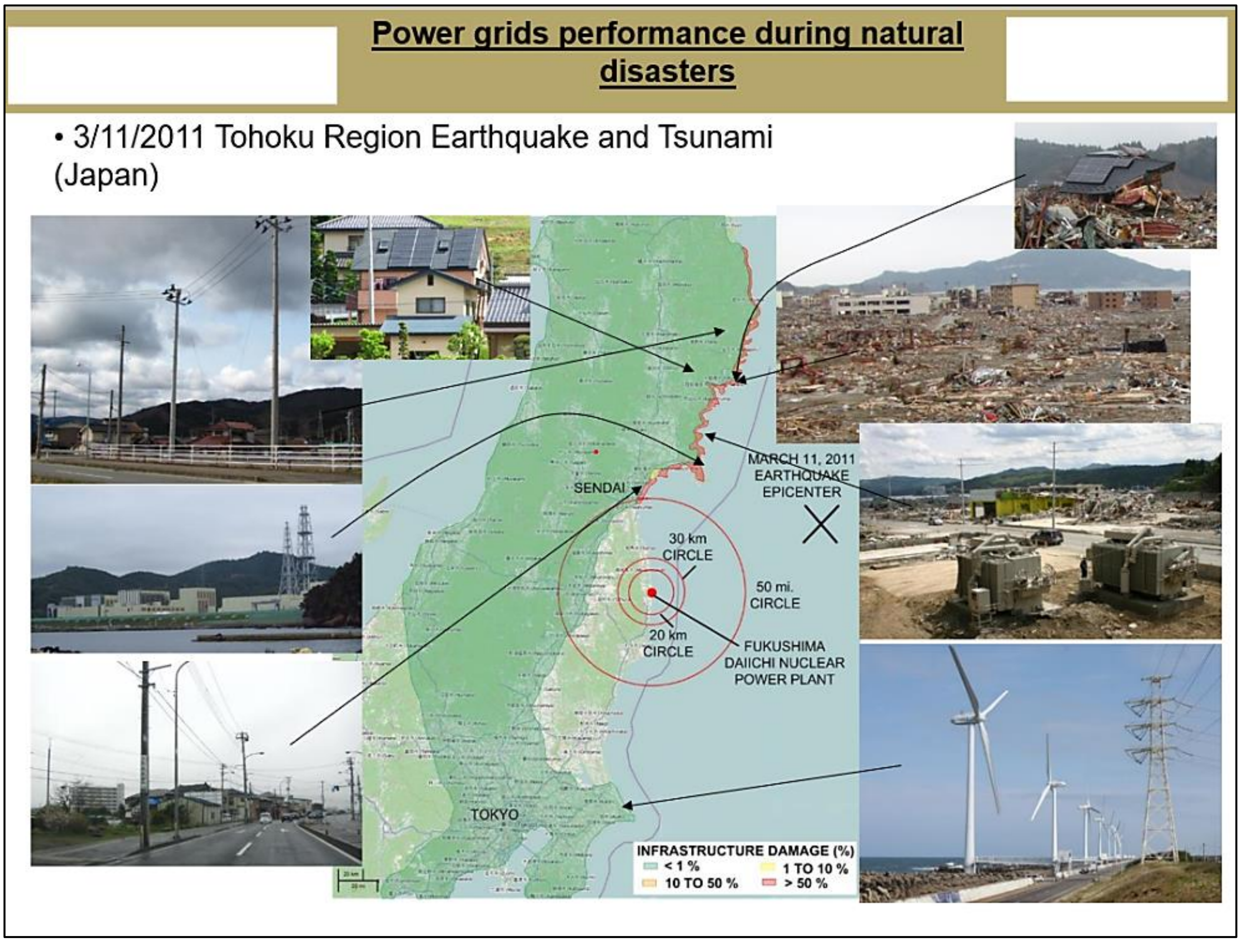

Figure 5: Lecture material on electrical grids during earthquakes and tsunamis

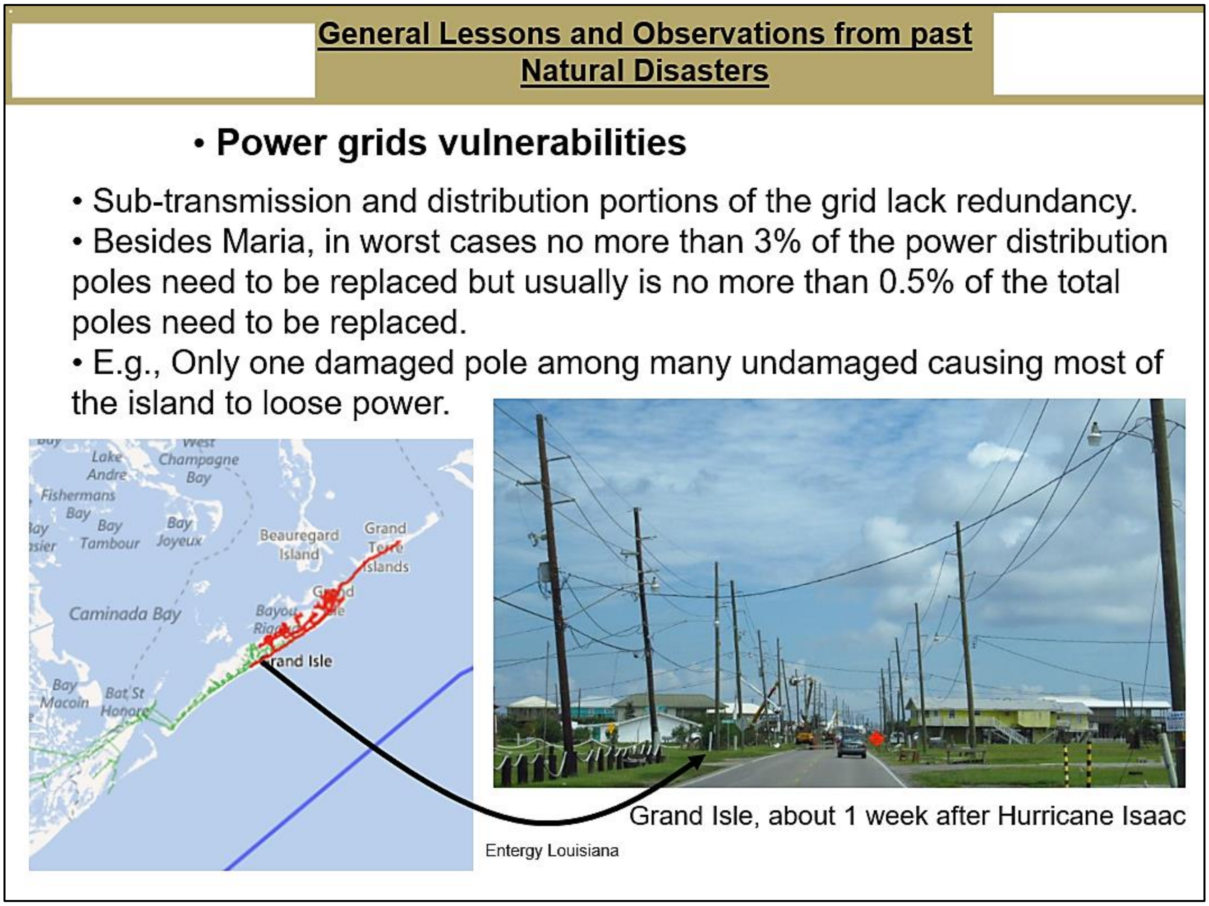

Figure 6: Example Lecture Materials that were Presented by Faculty to Introduce Resilience and Crisis Management Topics to the Students

In parallel, faculty and students were encouraged to engage directly with community response efforts. Many volunteered at shelters established at UNISINOS including the Complexo Desportivo Unisinos, which was repurposed to house individuals displaced by flooding. Students assisted with distributing bedding, organizing clothing donations, and supporting basic logistical needs. Through this work, students realized that volunteering is often about working alongside others to meet immediate human needs. Environmental engineering student Cassidy Laffey summarized this feeling well: 'The lives of these refugees had just changed forever, but all I could do was bring them a blanket... It seems very privileged for me to say the hardest thing I've ever done was pull myself together and help out as best I could.' This sentiment resonated across the group which began to shift their initial shock into a shared commitment to making a difficult situation more manageable for the displaced community. The experience compelled students to look beyond technical engineering and engage their empathy for the good of a suffering community.. Justin Winslow, civil engineering student, expressed this sentiment best when he said, " I could see in the way people acted, how much they still cared about their neighbors."

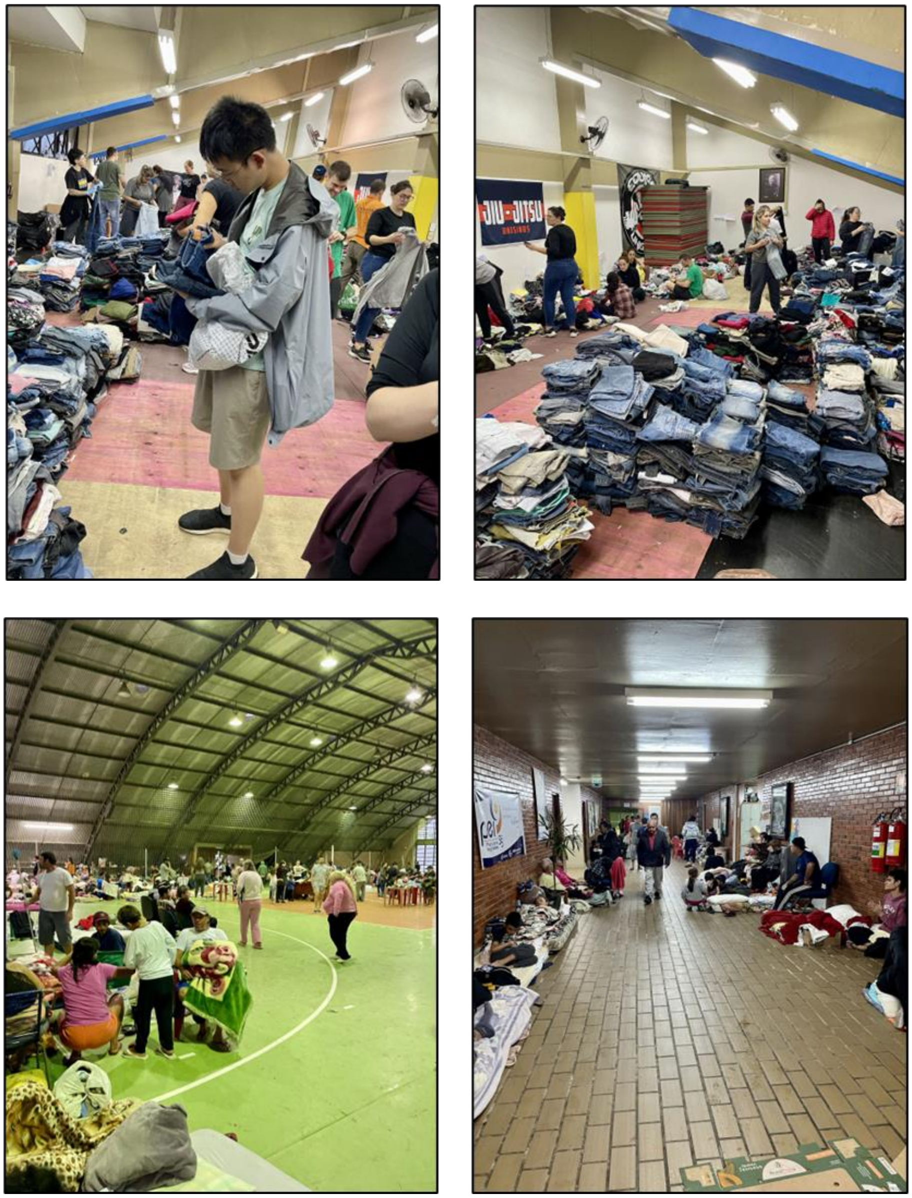

Figure 7: Students assisting displaced Brazilians at UNISINOS

Educational Outcomes

This pivot fundamentally reshaped the learning outcomes of the course. While some planned technical site visits were lost, students gained an authentic understanding of adaptive leadership, ethical responsibility, and the role of engineers in disaster contexts. The experience reinforced that engineering education is rarely a neat, linear process, and that the capacity to respond thoughtfully and humanely under changing conditions is itself a critical professional competency.

The unplanned pivot of the global experience program resulted in significant educational outcomes that extended beyond the course's original technical objectives. Evidence for these outcomes was drawn from student journals and reflections, informal group discussions, and faculty observations conducted throughout and following the experience. Collectively, these data indicate meaningful growth in students' professional maturity, ethical awareness, adaptability, and leadership capacity.

Student reflections provide qualitative evidence of a clear transition from initial disappointment during the initial stages of the natural disaster to a sense of purpose and engagement as it became clear that there were many in need of assistance. Early journal entries and discussions reflected frustration related to canceled site visits, disrupted schedules, and uncertainty surrounding safety and travel. As students became involved in humanitarian relief efforts, these reflections shifted markedly. Students described an emerging sense of responsibility, empathy, and meaning derived from assisting displaced individuals, organizing donated supplies, and supporting shelter operations. Several students emphasized that, while planned technical activities were lost, the learning experience gained depth by connecting engineering concepts to immediate human needs. Faculty observations corroborated these shifts in perspective. Following the program pivot, students demonstrated increased initiative, situational awareness, and peer support. Faculty noted changes in student demeanor, including greater emotional maturity and a willingness to engage with uncertainty. Students who had previously been quiet in group settings emerged as informal leaders, helping to organize volunteer activities, coordinate tasks, and support peers experiencing stress or anxiety. These leadership behaviors arose organically rather than through formal role assignment, reflecting authentic development of professional competencies.
Across student reflections and faculty observations, several key competencies consistently emerged:

- **Crisis communication**, as students learned to share information clearly, manage expectations, and support one another during periods of uncertainty.
- **Adaptability and resilience**, demonstrated through students' ability to recalibrate expectations and remain engaged despite disrupted plans.
- **Empathy and ethical awareness**, as students connected technical infrastructure failures to human suffering and social responsibility.
- **Humble gratitude and perspective**, reflected in students' acknowledgment of privilege and increased appreciation for community, opportunity, and stability.

Taken together, these outcomes highlight the educational value of experiential learning under real-world constraints. While the course was originally designed to emphasize exposure to energy infrastructure and electrification, the program pivot created conditions for deeper learning related to leadership, ethics, and human-centered engineering practice. The experience reinforced that engineering education is not solely about technical mastery, but also about preparing students to respond thoughtfully, compassionately, and responsibly in moments of crisis. While the schedule of technical site visits was altered, the experience gained throughout this crisis response provided students with core engineering competencies in unexpected ways. Table 1 provides the unplanned activities mapped directly to ABET Student Outcomes, specifically regarding professional responsibility, teamwork, and the application of knowledge in unusual circumstances.

Event / Activity	ABET Student Outcome Mapping
Pivoting from Site Visits to Relief	Outcome 4: an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
Organizing Shelter Logistics	Outcome 5: an ability to function effectively on a team whose members together provide leadership, create a collaborative environment, establish goals, plan tasks, and meet objectives
Interacting with Displaced Residents	Outcome 2: an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.
Navigating Flooded Infrastructure	Outcome 7: an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Table 1: Disaster Response Activities Mapped to ABET Student Outcomes

Discussion

The events surrounding the Spring 2024 offering of the Exploration of Energy and Electrification in Brazil course illustrate how climate change is fundamentally reshaping the context in which global engineering education operates. Increasingly frequent and severe climate-driven disasters challenge long-standing assumptions about program stability, risk management, and curricular predictability. In this case, the flooding in Rio Grande do Sul transformed a carefully planned technical global experience program into a real-time encounter with infrastructure failure, humanitarian need, and crisis response. This experience highlights the need for global engineering programs to incorporate adaptability and resilience into the learning outcomes for global experience programs as well as into the strategic planning process by the program leaders.

From a programmatic perspective, the course pivot highlights how climate change increasingly influences how global experiences must be planned, coordinated, and executed. Traditional crisis planning often assumes localized disruptions or short-term logistical delays. The magnitude and duration of the flooding experienced on this global abroad challenges these assumptions, requiring faculty and administrators to consider changing the way they plan and make decisions for international programs. As climate-related disasters become more common, global programs should be developed within a comprehensive university risk management and continuity framework, with the capacity to adapt to events that fundamentally alter learning environments rather than merely disrupt them. This requires coordinated collaboration among academic units, global education offices, risk management, legal counsel, health and safety, and in-country partners to systematically integrate preparation for "unexpected disasters" into global experience curricula, thereby strengthening students' climate resilience, ethical responsibility, and leadership alongside technical competencies.

As we interpret the educational impact of this experience we should compare between the course's originally planned learning objectives and the outcomes ultimately achieved as the group responded to a natural disaster. The initial curriculum emphasized technical exposure to Brazilian energy infrastructure, renewable generation technologies, and comparative electrification strategies. While some of these objectives were partially unmet due to canceled site visits, the lived experience of the disaster introduced students to equally critical dimensions of engineering practice. The faculty were able to quickly pivot to educational materials that were focused on resilience, crisis management and redundancy. Things the students were experiencing in real time. Students developed firsthand competencies related to disaster resilience, crisis communication, empathy, adaptability, and ethical judgment. In effect, the course shifted from teaching how energy systems function under normal conditions to examining how these same systems fail under stress and how engineers respond when societal needs are most evident. This unplanned substitution did not diminish educational value; rather, it expanded the scope of learning in ways that are difficult to replicate through traditional coursework. Although the educational objectives shifted slightly, we believe that the students received a more well-rounded and experiential learning scenario, that is unmatched by pre-planned lectures and site visits.

An important observation that was revealed from faculty reflections is the extent to which students applied engineering thinking even within the context of humanitarian relief. Although students were not formally tasked with engineering design or optimization problems during volunteer activities, many instinctively approached relief work through a systems-oriented lens. Faculty observed students discussing how to organize donated clothing more efficiently, how to improve the flow of people through shelters, and how to distribute the limited available resources equitably. These behaviors suggest that students were transferring analytical habits that were developed through engineering education into nontraditional contexts. Rather than disengaging from technical thinking, students reframed relief efforts as complex systems involving constraints, resources, and human factors. It was a marvel to see the engineering mind in action in a situation which was so unordered.

From a pedagogical perspective, the student's adaptation to the situation demonstrates that engineering cognition is not bound to technical environments; rather, it is a transferable mindset that students can deploy in response to societal challenges. This experience reinforced the idea that engineering thinking includes problem framing, systems analysis, and optimization, even when solutions are non-technical in nature. In this sense, the humanitarian response served as an authentic test of whether students could apply engineering perspectives beyond classrooms and laboratories.

Taken together, the discussion suggests that the educational value of the course pivot lies not in replacing technical content with service, but in integrating human-centered experiences with engineering ways of problem-solving and optimization. The flooding event revealed that engineering education, particularly in global contexts, must account for the realities of climate change and infrastructure vulnerability. Preparing students for future professional practice requires exposure not only to engineered systems operating as intended, but also to moments when systems fail and human needs supersede technical priorities.

Ultimately, this experience challenges traditional distinctions between technical learning and humanitarian engagement. The Spring 2024 Brazil program demonstrated that when students are placed in real-world, urgent environments shaped by climate-driven disruption, learning outcomes related to leadership, ethics, resilience, and empathy can emerge naturally and powerfully.

Conclusion

The Spring 2024 offering of the Exploration of Energy and Electrification in Brazil course demonstrates how engineering education can be meaningfully reframed when confronted with real-world disruption. What began as a technically focused global experience program centered on renewable energy systems and electrification evolved into an unplanned, yet profoundly impactful, learning experience shaped by one of the most catastrophic natural disasters in Brazil's history. This experience highlights a central argument of this paper: engineering education must extend beyond technical training to prepare students for the complex, uncertain, and human-centered realities of professional practice.

While several planned technical site visits were lost due to flooding, the educational value of the experience was not diminished. Instead, students developed critical competencies that are increasingly essential in modern engineering contexts, including adaptability, resilience, ethical awareness, crisis communication, and leadership under uncertainty. Through direct engagement with humanitarian relief efforts and contextualized academic discussions, students gained a deeper understanding of the societal consequences of infrastructure failure and the ethical responsibilities engineers carry during times of crisis.

From an instructional perspective, the course pivot highlighted the necessity of flexible pedagogical frameworks in global engineering programs. By navigating rapid decisions and prioritizing student safety, faculty modeled that engineering leadership extends beyond technical expertise to include emotional intelligence, ethical judgment, and transparent decision-making.

Ultimately, the experience reinforced the "human element" of engineering, demonstrating that when technical solutions are insufficient during a crisis, empathy and solidarity become our primary tools. As climate change accelerates the frequency of such disasters, engineering education must evolve to prepare students not only to design resilient systems but to respond humanely when those systems fail. This global experience confirms that combining technical understanding with compassionate awareness better equips students for the realities of an increasingly uncertain world. "Soft skills like teamwork, kindness and empathy are critical in understanding the human condition as an engineer." - Tatiana Louise Avila de Campos Rocha, assistant director of undergraduate affairs at UNISINOS.

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