

# Research integrity for transnational education (TNE) in engineering

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**Abstract.** This paper comprehensively explores the research integrity for Transnational Education (TNE) in Engineering. The introduction illustrates the burgeoning expansion of TNE in engineering and overarching importance of the research integrity. It points out the TNE should not only bridged geographical divides, allowing students and faculty from diverse corners of the globe to converge and collaborate, but also should follow the research integrity from both side by amalgamating different perspectives and technical know-how. Then, the paper meticulously unpacks the multifaceted nature of research integrity. The grey areas are laid bare, such as the quandary of intellectual property rights when research spans multiple jurisdictions with varying legal frameworks. Potential challenges are enumerated, including the difficulties in ensuring consistent adherence to ethical guidelines across different cultural backgrounds and educational systems. Solutions are offered, like the development of adaptable international research codes and the promotion of cross-cultural ethical training modules. The conclusion emphasizes the crucial role of research integrity, to ensure TNE in engineering prospers long-term and has high credibility. It calls on all involved to safeguard ethical standards and keep the pursuit of knowledge through TNE.

## 1 Introduction

In the past few decades, transnational education (TNE) in engineering has emerged as a powerful force in the global educational landscape [1]. It has broken down geographical barriers, enabling students to benefit from international curricula, renowned faculty, and state-of-the-art research facilities [2]. TNE programs offer a unique blend of different educational cultures and methodologies, fostering innovation and cross-cultural understanding. It also has significantly enhanced the international mobility of students and faculty. This cross-border movement has not only broadened individual perspectives but also infused fresh ideas into classrooms and research labs [3].

TNE programs in engineering enrich course content, incorporating global best practices and emerging trends. These start-ups thrived on the confluence of diverse knowledge and market needs. However, the issue of research integrity becomes increasingly prominent as

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TNE expands. Without strict adherence to ethical and academic standards, the entire edifice of TNE in engineering risks crumbling, leading to compromised research outcomes and a loss of trust among collaborations. In a research misconduct case, a TNE project in an engineering specialty was tainted by data falsification.

A recent research misconduct case happens to a joint research project between a university in South America and one in North America. A senior researcher from the South American institution was found to have manipulated experimental results to make the findings seem more promising. The fabricated data was used in several publications and presentations, leading to false claims about the proposed energy conversion system efficiency. As a result, the project wasted valuable resources and the students involved in the TNE program were misled. They spent months attempting to reproduce experiments that were based on false data, causing delays in their academic progress and casting doubt on the credibility of the entire TNE endeavor.

This paper delves into the complex research integrity in TNE engineering, analyzing grey areas, challenges, and solutions.

## 2 Grey area of the research integrity

In TNE of engineering, the grey area of research integrity has become a topic of paramount importance. Research integrity varied from academic and scientific individuals, yet it is often marred by ambiguities and challenges that vary across borders [4].

Different cultural norms and values can significantly influence ethical behavior in research. For instance, in some Eastern cultures, the emphasis on collective achievement and respect for authority figures might lead to situations where individual researchers are hesitant to question or report potential misconduct by senior colleagues. This contrasts with Western cultures where whistleblowing is sometimes seen as a duty. In many TNE programs, there exists a gap between the policies of the collaborating institutions. One university might have stringent regulations regarding authorship and data management, its partner institution could have more lenient or even conflicting rules. This misalignment creates a grey area where researchers may exploit loopholes, either inadvertently or deliberately. Furthermore, with the increasing use of online Artificial Intelligence (AI) tools and open-access databases, the issue of plagiarism and improper citation has become more complex. In TNE projects, students and researchers often draw from a vast array of AI tools and international sources, making it difficult to track and ensure proper attribution.

Many scientific communities struggled to define what constitutes 'good science' and are equally hazy on what qualifies as research misconduct. Research misconduct encompasses a litany of unacceptable behaviors as shown in Fig. 1.



**Fig. 1.** Research misconduct examples for TNE in engineering.

Plagiarism, often rears its head in the nascent stages of research. Fabrication and falsification tend to occur when researchers feel pressured to show results. They may create data out of thin air or manipulate existing findings to fit a desired narrative. Multiple submissions, involves sending the same paper to different journals simultaneously, a desperate attempt to hasten the often-lengthy review process. Overlapping publication is a

related yet distinct issue. Some researchers, eager to pad their publication lists, split their work into multiple papers with minimal new content and submit them. Inappropriate authorship occurs when individuals are listed as co-authors despite making little or no meaningful contribution to the research.

The international nature of TNE exposes students and researchers to a vast array of cultures, academic norms, and expectations. For example, citation styles and the understanding of intellectual property can vary between countries.

Engineering research in TNE requires both technical skills and a firm commitment to integrity. Ethical standards and practices vary significantly for different countries. This divergence stems from multiple factors which shape the perception and enforcement of research ethics. Take the example of authorship attribution. When students and researchers from these different cultural backgrounds work together in a TNE program, misunderstandings and potential ethical dilemmas regarding authorship can easily arise [5].

Historical developments also contribute to the variance in ethical norms. Countries with a long tradition of scientific research, have had centuries to refine their ethical guidelines and regulatory systems. They have weathered numerous scientific scandals that have implemented stringent measures to safeguard research integrity. Emerging economies engaging in TNE may still be developing and adapting their ethical frameworks. This can lead to a disconnect when collaborating with more established international partners.

Also, different countries have diverse laws governing intellectual property, data privacy, and research funding. In a TNE project involving institutions from both regions, navigating these legal differences becomes a crucial aspect of maintaining research integrity.

Therefore, clear guidelines that transcend cultural and institutional boundaries, and training on proper research conduct are essential. Only this way can TNE in engineering flourish, generating reliable knowledge and cultivating an ethical research community.

### **3 Challenges and potential solutions**

Implementing policies to address research integrity in TNE still face several challenges. To address these challenges, TNE programs in engineering must prioritize cross-cultural education on research ethics. Institutions need to design curriculum modules that explicitly explore the differences in ethical norms and provide practical guidance on how to reconcile them. International collaborations should also establish clear protocols at the outset, agreeing on common ethical standards and procedures for handling potential conflicts. By acknowledging and actively managing the variation in ethics from country to country, TNE in engineering can build a solid foundation for ethical and impactful research. Universities and educational institutions can take several proactive measures to effectively address the grey area of research integrity in TNE as follows.

#### **3.1 The issue of institutional resistance**

Universities and institutions, bound by long-established procedures and cultures, are often reluctant to adapt to unified policies. Some fear losing research decision-making autonomy. This resistance delays new regulations.

Solution: Harmonizing institutional policies.

Policy differences among collaborating institutions breed misconduct. They must review authorship, data management, and ethical review rules. Unified guidelines for TNE programs can plug loopholes. For example, a peer-mentoring program could be formed with representatives from each partner university to draft and implement these common policies [6].

### **3.2 The complexity of cross-cultural communication**

Different languages and cultural connotations can lead to misinterpretations of policy directives. For example, a term related to ethical review might have subtly different meanings in different cultures, causing confusion among researchers.

Solution: Cultural sensitivity training

For cultural differences with varying norms influence perceptions of ethical behavior, institutions need to educate their staff and students. This training should aim to raise awareness about different cultural perspectives on research integrity and encourage open dialogue. Workshops and seminars can be organized, inviting experts to discuss case studies and facilitate discussions [7]. This way, researchers will be better equipped to navigate cross-cultural collaborations and understand when to question or report potential misconduct, regardless of cultural backgrounds.

### **3.3 The dynamic nature of TNE collaborations**

The policies need to be adaptable for new partnerships and projects. However, updating and disseminating revised policies in a timely manner can be a logistical nightmare. For instance, when a new international partner joins a TNE program, getting their researchers and students to quickly know and follow existing integrity policies needs efficient communication and constant monitoring. But this is harder to do than to say.

Solution: Internal oversight mechanisms.

Regular audits of TNE research projects can help identify any signs of misconduct early on. An independent review board, with members from diverse backgrounds and expertise, could be established to conduct these audits. They would have the authority to investigate any suspicious activities and recommend appropriate sanctions if necessary. This would not only act as a deterrent to potential wrongdoers but also safeguard the credibility of the TNE initiatives.

### **3.4 Challenge on enforcement**

Even with well-crafted policies in place, ensuring compliance is a major hurdle. There may be a lack of clarity on who is responsible for monitoring and enforcing the regulations. In some cases, researchers might be aware of loopholes and exploit them, knowing that the chances of being caught are slim. This lack of effective enforcement mechanisms can undermine the entire effort to address research integrity in TNE.

Solution: Promoting a culture of integrity with leveraging technology

Universities and institutions should actively encourage and reward ethical behavior. This can be realized via recognition programs for researchers with high integrity and by incorporating research integrity education into the curriculum. By making integrity a core institutional value, the grey areas of TNE research integrity can be gradually reduced, fostering more reliable and impactful research in the global engineering field. Additionally, advanced plagiarism detection and citation management tools need timely updates to offer real-time alerts for potential plagiarism or improper citation, enabling immediate corrections.

## **4 Discussion and conclusion**

When TNE in engineering spans multiple countries and cultures, integrity becomes even more crucial. It is important to bridge cultural differences by establishing a common set of ethical values. In the complex and dynamic landscape of TNE in engineering, maintaining

the highest standards of integrity is the cornerstone for long-term success. When research is conducted with integrity, it fosters an environment where innovation can thrive. It means that the findings and advancements made within TNE programs in engineering are reliable and replicable, which in turn attracts more students, educators, and even funding opportunities. This unwavering commitment to integrity is what will enable TNE in engineering to not only survive but to prosper over the long haul, gradually building a sterling reputation that commands high credibility on the global stage.

This paper investigates the critical topic of research integrity within the scope of transnational education in engineering. The introduction highlights the growth and significance of TNE in engineering. Then, the complex of research integrity is explained on its grey area and the potential challenges and solutions. The indispensable role of upholding integrity is emphasized for the success and credibility of TNE in engineering.

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