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Managing the Localization of Foreign Engineering Programs in Higher Education: Policy Alignment and Institutional Practices in Kazakhstan

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A B S T R A C T
Foreign university programs are increasingly promoted in emerging economies to strengthen higher education and support economic development. This study examines the localization pathways of foreign engineering programs in Kazakhstan, where higher education internationalization is closely linked to state-led industrialization and innovation. Drawing on policy documents and institutional materials, the study qualitatively compares three types of foreign engineering education programs: joint engineering degree programs, English-taught and international engineering programs, and industry-embedded engineering education programs. The findings show that localization is shaped by policy alignment, institutional integration, and functional relevance to industrial development. Programs that integrate these dimensions more effectively are better positioned to support skills development, institutional capacity building, and alignment with domestic industrial needs.

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INTRODUCTION

Internationalization has expanded beyond student mobility to include joint degrees, cross-border program delivery, and foreign curricula embedded in host-country institutions. For engineering education, these arrangements raise a practical governance question: how can international academic models be adapted to domestic regulatory requirements, institutional capacity, and labor-market priorities? Kazakhstan is a useful setting in which to examine this question because higher education internationalization is pursued alongside economic diversification and technological modernization.

Over the past two decades, Kazakhstan has implemented comprehensive reforms aimed at integrating its higher education system into the global academic landscape. These reforms have included participation in the Bologna Process, the expansion of academic mobility, and the active promotion of partnerships with foreign universities. Contemporary scholarship emphasizes that higher education internationalization now extends beyond traditional student exchange schemes and increasingly takes the form of cross-border program delivery, joint and dual degrees, and the incorporation of foreign curricula into host-country institutional frameworks (Knight, 2004; de Wit et al., 2015). Within this broader process, engineering education has received particular policy attention due to its direct relevance to technological modernization, industrial upgrading, and the development of skilled human capital (UNESCO, 2010).

However, existing research indicates that the outcomes of higher education internationalization vary significantly across national contexts and are not always uniformly positive. On one hand, international engineering programs can help boost educational quality and research capabilities. But on the other, if these programs aren't tailored well to a country's key priorities, they might end up not meeting the needs of the local job market, or even make existing institutional inequalities worse (Altbach & Knight, 2007). This tension is particularly noticeable in industrializing countries, where higher education is expected to do more than just educate—it also needs to act as a strategic tool to diversify the economy and build technological self-reliance.

Kazakhstan's policy agenda emphasizes engineering expertise, applied research, and innovation. Foreign engineering programs may contribute to these priorities, but the presence of an international partner does not itself demonstrate successful localization. The key issue is how policy expectations are translated into program governance, curriculum decisions, staffing, and links with employers. Existing studies often examine internationalization at a system level or discuss dual-degree arrangements without comparing the mechanisms through which engineering programs are adapted to local institutions and industrial priorities.

Research on international cooperation in Kazakhstan suggests that joint and dual-degree arrangements can create opportunities for curriculum development and academic exchange, while also depending on stable partnerships and effective regulatory coordination (Komekbayev et al., 2025). However, evidence about a program's existence or formal design should not be treated as proof of improved employment or industrial outcomes. This study therefore focuses on

documented localization mechanisms rather than causal effects.

This study asks: through what policy, institutional, and functional mechanisms are foreign engineering programs localized in Kazakhstan? It makes three contributions. First, it connects higher-education internationalization and policy-transfer research with engineering education and industrial development. Second, it operationalizes localization through three dimensions—policy alignment, institutional integration, and functional relevance. Third, it compares documented program examples and program types while distinguishing published institutional commitments from evidence of implementation or outcomes. The analysis is qualitative and exploratory; it does not estimate the causal effect of foreign programs on industrialization.

LITERATURE REVIEW

Internationalization and Cross-Border Higher Education

Higher education internationalization has expanded from a focus on student and staff mobility to include cross-border program delivery, joint and dual degrees, and institution-level partnerships. These arrangements are shaped by regulation, quality assurance, and coordination among governments and universities (Knight, 2004; de Wit et al., 2015; OECD, （2025）). International partnerships may support knowledge exchange and curriculum development, but outcomes depend on the host context and the degree to which cooperation becomes embedded in local institutions.

Within this broader framework, foreign university programs running in host countries are increasingly seen as tools for building capacity and exchanging knowledge—not just as extensions of the universities that offer them. Past research shows that international collaborative programs can support knowledge transfer, improve teaching practices, and help develop research cultures, especially in science and engineering fields (Altbach & Knight, 2007; Knight, 2004; Teichler, 2009). That said, the research also points out that outcomes can vary widely, depending on the regulatory environment, institutional autonomy, and the host country's development priorities.

When it comes to Europe and its neighboring regions, the Bologna Process has had a strong influence on higher education internationalization. This process promotes degree comparability, quality assurance, and mobility across different national education systems. Studies looking at countries that follow Bologna standards suggest that formal alignment with these norms doesn't automatically lead to meaningful integration—especially when there are big differences in institutional capacities and labor market conditions (Witte, 2006). This observation is particularly relevant for post-Soviet and emerging economies, where structural reforms often exist alongside long-standing institutional traditions and legacies.

Localization and Policy Transfer

Localization is often used to explain why international higher education initiatives produce different outcomes in different national settings. Rather than simply copying or adopting policies developed elsewhere, localization involves adapting external models so that they fit local institutional arrangements,

cultural contexts, and economic priorities (Mok, 2016). In higher education research, this process is frequently discussed through the concepts of policy transfer and policy translation. These perspectives highlight those international ideas are rarely implemented unchanged; instead, domestic actors reinterpret and adjust them in ways that reflect local conditions and institutional constraints (Steiner-Khamsi, 2004).

Policy transfer theory further distinguishes between several forms of transfer, including voluntary learning, negotiated adaptation, and coercive adoption. Each of these pathways can lead to different institutional outcomes and levels of sustainability (Dolowitz & Marsh, 2000). Empirical studies generally suggest that reforms tend to be more effective when international models are incorporated into existing governance systems and aligned with national development strategies. By contrast, reforms introduced mainly for symbolic reasons or to signal international prestige often produce only limited and short-lived changes (Steiner-Khamsi, 2004).

When considering foreign university programs, localization takes place across several interconnected levels. At the macro level, national governments establish the regulatory environment, including rules related to accreditation, degree recognition, and quality assurance. At the institutional level, universities make decisions about curriculum structure, language of instruction, and staffing arrangements. Finally, at the classroom level, localization influences teaching approaches, assessment practices, and students' everyday learning experiences (Marginson, 2018). Research suggests that if one of these levels is overlooked, the overall effectiveness of cross-border engineering programs may be weakened.

Engineering Education and Industrial Development

Human-capital theory provides a rationale for examining education as an investment in skills and productive capacity (Becker, G. S. (1975)). Engineering education may also contribute to innovation through links among universities, industry, and government (Etzkowitz & Leydesdorff, 2000). These theoretical arguments establish plausible mechanisms, not proof that a particular international program has increased productivity or industrial output. Such outcome claims require graduate, employer, or economic data beyond the public documents examined here.

In countries aiming to industrialize and diversify their economies, engineering education is often closely tied to national development goals. Studies on emerging industrial economies point out that how well engineering curricula align with industry needs can significantly influence the contribution of higher education to structural change (UNESCO (2010)). Such alignment goes beyond technical skills—it also involves fostering problem-solving abilities, hands-on project experience, and engagement with real industrial environments.

Still, cross-country comparisons warn that directly transferring engineering curricula from developed nations without adapting them to local contexts can result in skill mismatches and lower graduate employability (Grubb & Lazerson, 2005). Programs originally created for advanced industrial settings may not reflect the technological conditions or labor market demands of developing countries. For this reason, researchers increasingly advocate for more locally

grounded engineering education models that combine international standards with domestic industrial priorities.

An Integrated Analytical Framework

Three gaps motivate the study. First, internationalization research frequently emphasizes mobility and institutional strategy rather than the concrete adaptation of engineering programs. Second, policy-transfer research explains how external models are selected and reinterpreted but is less often applied to engineering program arrangements. Third, engineering education research recognizes the importance of industry links, yet the connection between program localization and national industrial priorities is not always examined in a single framework. This study addresses these gaps through a document-based comparison of policy alignment, institutional integration, and functional relevance.

The framework extends existing localization and policy-transfer perspectives by treating the three dimensions as complementary analytical questions rather than as a validated causal model. Policy alignment examines whether program objectives and documented arrangements correspond to national education and industrial priorities. Institutional integration examines formal governance, curriculum responsibility, staffing, and the program's position within the host institution. Functional relevance examines evidence of applied learning, employer participation, and explicit links to domestic engineering or sectoral needs. The framework helps organize evidence across program models; it does not assume that all three dimensions are present or that they necessarily produce measurable economic outcomes.

More specifically, the framework defines localization pathways through three key dimensions:

(1) Policy alignment: This refers to how consistent foreign program models are with a country's national education and industrial strategies;

(2) Institutional integration: This includes things like governance structures, joint curriculum design, and faculty involvement;

(3) Functional relevance: This captures how well localized engineering programs meet the industrial demand for skills and the needs of innovation.

By applying this framework, the study adds to the existing research on international higher education by providing evidence-based insights into how foreign engineering programs are localized to support industrialization in emerging economies. Instead of seeing localization as just a technical or administrative adjustment, the framework views it as a development-focused governance process shaped by national policy priorities. In doing so, the study builds on education and development research by examining foreign engineering programs not just as internationalization efforts, but as policy tools that are part of a country's national industrial and skills strategies.

Policy and Institutional Context in Kazakhstan

Since becoming an independent country, Kazakhstan has put in place a series of reforms aimed at transforming its higher education system to match its broader national development goals. In recent years, these efforts have been

ramped up through several strategic policy initiatives—ones that focus on developing human capital, modernizing technology, and diversifying the economy. Within this larger policy framework, engineering education has gotten special attention, simply because it plays a critical role in supporting industrial modernization and driving economic growth through innovation.

A major milestone in this process was the approval of the Concept for the Development of Higher Education and Science in the Republic of Kazakhstan for 2023–2029 by the Kazakhstani government in 2023 (Government of the Republic of Kazakhstan, 2023). This document frames higher education as a key strategic asset for boosting the country's global competitiveness. It also singles out engineering and technology-related fields as priority areas for government support. The main goals outlined in the policy include updating university curricula, strengthening the connection between research and teaching, and expanding international academic partnerships.

From a governance standpoint, the responsibility for higher education policy mostly falls to the Ministry of Science and Higher Education of the Republic of Kazakhstan, along with other ministries that handle industrial and innovation policy. This multi-actor governance structure reflects the government's bigger goal of strengthening cooperation between universities, industry, and the state—especially in engineering and technology sectors (Ministry of Science and Higher Education of the Republic of Kazakhstan, 2023).

At the same time, Kazakhstan's broader industrial development plan has been shaped by long-term national strategies that prioritize innovation, advanced manufacturing, and building technological capabilities. In this context, higher education institutions are expected to do more than just train a skilled workforce. Universities are increasingly being encouraged to contribute to applied research and help solve real-world industrial problems. As a result, technical universities and engineering departments are facing growing pressure to make sure their educational programs stay closely aligned with the changing needs of domestic industries.

Regulatory Framework for Foreign and Joint Engineering Programs

Kazakhstan's willingness to engage in international cooperation for higher education is built right into its regulatory framework that governs foreign and joint educational programs. Its participation in the Bologna Process has helped align its degree structures, quality assurance systems, and credit systems with those in Europe—and this has made it easier for institutions to form international partnerships by reducing institutional barriers (European Higher Education Area, 2015).

Foreign engineering university programs in Kazakhstan usually operate through a few different models. These include joint degree programs, dual-degree arrangements, and the localized delivery of foreign curricula through partner institutions. All these models have to meet national accreditation and quality assurance standards. The goal here is to make sure they comply with domestic requirements, while still allowing some flexibility when it comes to curriculum design.

Policy documents stress that international programs shouldn't be isolated

or just symbolic initiatives—instead, they need to contribute to the country's national priorities. In practice, this means foreign engineering programs are either encouraged or required to show that they're relevant to Kazakhstan's labor market, industrial sectors, and technological development goals. This policy approach sets Kazakhstan apart from models of cross-border education that are driven purely by market interests.

Figure 1 summarizes the key regulatory and policy instruments shaping the operation of foreign engineering university programs in Kazakhstan. It illustrates how national education policy, industrial development priorities, and regulatory and quality assurance arrangements form the broader institutional context for these programs.

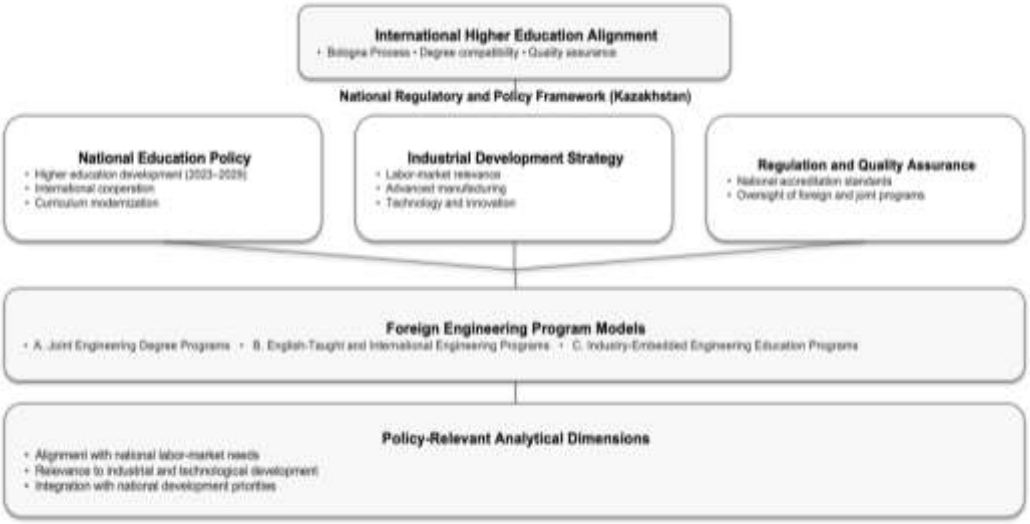

Figure 1. National Policy and Regulatory Framework for Foreign Engineering University Programs in Kazakhstan

Institutional Landscape of Engineering Education

Kazakhstan's higher education system is made up of a range of different institutions—think national universities, regional public universities, and specialized technical schools. Engineering education is mostly centered in national and regional technical universities, and many of these have already set up partnerships with foreign institutions.

The differences between these institutions play a big role in how localization plays out. Flagship universities often have more administrative freedom, stronger research capabilities, and broader international networks. This means they're able to host more complex joint or dual-degree engineering programs. On the other hand, regional universities might get involved in more limited forms of international cooperation, focusing mainly on adapting curricula and building partnerships that are centered on teaching.

Even with these differences, policy documents keep stressing the same thing: all engineering programs—whether they're domestic or linked to foreign institutions—are expected to contribute to the country's national industrial development. This is part of the broader policy framework that's shown in Figure 2.

Figure 2 illustrates the institutional positioning of foreign engineering programs within Kazakhstan's higher education and industrial policy framework.

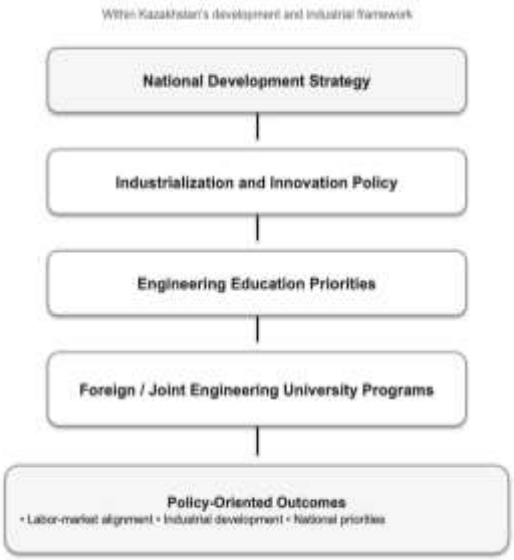

Figure 2. Policy Positioning of Foreign Engineering Programs

Policy Implications for Localization

The policy and institutional context outlined above creates both opportunities and constraints for the localization of foreign engineering university programs. On the one hand, strong state support for internationalization and engineering education provides a favorable environment for cross-border cooperation. On the other hand, the emphasis on alignment with national industrial goals imposes additional expectations on foreign partners and host institutions.

Localization, therefore, emerges not as an optional adjustment but as a policy-driven requirement. Foreign engineering programs are expected to adapt curricula, research agendas, and training models to domestic industrial contexts while maintaining international academic standards. This dual expectation underscores the importance of examining how localization is operationalized in practice, an issue explored in the subsequent methodological and empirical sections.

Taken together, the institutional dynamics discussed in this section provide the analytical basis for the case-type approach adopted in this study. Variations in administrative autonomy, international engagement capacity, and industry linkage shape distinct localization pathways for foreign engineering programs within Kazakhstan's higher education system. The following section operationalizes these dynamics through a case-type framework, allowing for systematic comparison across program models situated within a broader state-led development and industrialization agenda.

Theoretical Contributions

The theoretical contribution has three parts. First, localization is treated as

a governance process within higher-education internationalization, rather than only a technical adjustment. Second, policy-transfer theory is connected to engineering education through attention to selective adaptation of external models. Third, the framework links international program design with domestic institutional arrangements and stated industrial priorities. The contribution is conceptual and analytical; the study does not claim to validate causal relationships.

Together, these contributions offer a framework for comparing cross-border engineering programs in emerging economies. Its applicability beyond Kazakhstan should be assessed through further comparative research rather than assumed from this single-country document analysis.

METHODOLOGY

Research Design

This study uses a qualitative, policy-oriented document analysis with a comparative case-type design. It does not test causal relationships or claim statistical representativeness. The unit of analysis is a publicly documented engineering program or program arrangement in Kazakhstan, considered alongside the policy context in which it operates. To address the limits of broad typologies, the analysis uses named examples where an official institutional source provides sufficiently specific information. Examples are treated as documentary illustrations, not as a representative sample of all foreign engineering programs in the country.

Rather than testing causal relationships through quantitative indicators, the study focuses on identifying dominant localization pathways and examining their institutional characteristics. Such an approach is appropriate for investigating complex governance processes in higher education, where policy frameworks, institutional arrangements, and external partnerships interact in ways that are not easily captured through statistical analysis. The research therefore emphasizes analytical interpretation of institutional patterns and policy dynamics.

The analysis proceeded in four steps. First, relevant policy and institutional documents were identified. Second, documents were screened for direct relevance to engineering education, international partnership, curriculum, governance, or industry engagement. Third, evidence was coded against the three analytical dimensions. Fourth, patterns were compared across program arrangements and checked against the original source wording. Claims about announced partnerships were distinguished from claims about programs already operating; claims about expected benefits were distinguished from observed outcomes.

Data Sources

The empirical material used in this study is derived from three categories of publicly available sources.

The first source category consists of publicly available Kazakhstan policy documents issued between 2015 and 2024, including national higher-education strategy, regulatory material, and official reports. These documents were used to

identify stated policy priorities rather than to infer implementation outcomes.

The second category consists of official institutional materials, including program descriptions, partnership announcements, and university regulations. For concrete illustrations, official pages document a double-degree Petroleum Engineering program between Kazakh-British Technical University (KBTU) and China University of Petroleum (East China), with study divided between Kazakhstan and China, and a joint double-degree program in wind-turbine maintenance and operation announced by Satbayev University and Université de Lorraine in February 2026. The latter is treated as an announced program arrangement, not as evidence of completed implementation or graduate outcomes (KBTU, n.d.; Satbayev University, 2026).

The third category consists of academic literature on internationalization, policy transfer, and engineering education. Academic sources informed the conceptual framework; they were not treated as direct evidence that a specific Kazakhstan program had achieved particular outcomes.

Triangulation was used to compare policy expectations with institutionally documented arrangements. Because the evidence is predominantly public and institution-produced, the analysis can identify formal design and stated objectives more reliably than everyday classroom practice, employer satisfaction, graduate employment, or long-term industrial impact.

Case Selection Logic

The study uses purposive selection of documentary examples rather than a population sample. Selection criteria were: (1) relevance to engineering education and cross-border cooperation in Kazakhstan; (2) availability of an official institutional source identifying the program or partnership; and (3) sufficient information to assess at least one localization dimension. These criteria support analytical comparison but do not establish that the examples are exhaustive or representative.

The case-selection criteria were applied as follows:

Policy relevance: the example concerns engineering education and can be connected to published national priorities. This criterion identifies alignment in stated objectives; it does not establish policy effectiveness.

Documentary specificity: an official source identifies the domestic institution, foreign partner, engineering field, and at least one feature of program design. Where a source reports an agreement or planned launch, the article describes it as announced rather than as an established operating program.

Functional diversity: the examples and broader program types permit comparison of joint/double-degree design, international or English-medium delivery, and industry-oriented arrangements. Where the available source base does not identify a named operating industry-embedded foreign program with adequate detail, conclusions about this type are framed as an analytical pattern from the reviewed documents, not as a fully documented individual case.

The analysis therefore combines named documentary illustrations with a broader case-type comparison. The distinction is important: the program examples ground the discussion in identifiable institutions, while the three types remain analytical categories rather than three equivalent, fully investigated

institutional case studies.

Description of Case Types

Three types of foreign engineering education programs were examined in this study.

Case Type A covers joint or double-degree engineering programs involving a domestic institution and a foreign partner. One documented example is KBTU's English-taught Petroleum Engineering double-degree program with China University of Petroleum (East China). KBTU's official program description states that students spend two years at KBTU and two years at the partner university and describes preparation for the petroleum industry. This supports analysis of formal partnership design and stated sectoral relevance, but it does not independently establish graduate employment or industrial effects (KBTU, n.d.).

Case Type B covers English-taught and internationally oriented engineering programs. English-medium delivery is not, by itself, evidence of localization. The analysis therefore considers whether the available documents also indicate domestic institutional governance, curriculum adaptation, or explicit links to Kazakhstan's engineering priorities. Where such information is not published, the corresponding dimension is coded as insufficiently documented rather than assumed to be strong.

Case Type C covers engineering education arrangements with substantive industry participation, such as employer involvement in curriculum design, structured practical training, or industry-based projects. These features are analytically relevant to functional relevance, but a claim that they directly increase industrial output would require outcome data not available in this study. The category is used only where the reviewed documents provide evidence of such arrangements; otherwise, the article discusses it as a potential localization pathway.

These three case types provide an analytical basis for comparing localization mechanisms across three dimensions: policy alignment, institutional integration, and functional relevance to industrial development.

Analytical Approach

The document analysis used a structured coding scheme. For each example, the researcher recorded source type and date, institution and partner (where named), program field, and evidence relevant to each dimension. Each dimension was coded as 'documented', 'partly documented', or 'not documented' based on explicit statements in the source. 'Documented' means that the source directly describes a relevant arrangement; 'partly documented' means that the source indicates an intention or limited feature without enough detail to establish implementation; 'not documented' means that the reviewed material did not provide evidence. Absence of public evidence was not interpreted as proof that an activity does not exist.

Policy alignment was coded from explicit links between program objectives and national education, engineering, or industrial priorities. Institutional integration was coded from evidence of joint governance, curriculum responsibility, staffing, or integration into the host university. Functional

relevance was coded from documented industry participation, applied projects, practical training, or explicit sectoral skill objectives. No numerical score was calculated, and the codes are descriptive judgments rather than validated measurements.

The comparison identifies recurring patterns but remains limited by the scope and quality of public documents. The analysis does not use interviews, student-level data, employer surveys, graduate employment records, or productivity indicators. It therefore supports conclusions about documented localization mechanisms and stated program purposes, not causal conclusions about labor-market or industrial outcomes.

Figure 3 illustrates the analytical process employed in this study.

Figure 3. Analytical Workflow for Identifying Localization Pathways in Foreign Engineering Programs

RESEARCH RESULTS

Localization Pathways of Foreign Engineering University Programs

This section compares localization mechanisms using policy documents and publicly available institutional materials. Named examples are used where official sources provide identifiable details; other observations are presented as patterns in the reviewed documents. The evidence is strongest for formal program design and declared objectives, and more limited for implementation quality and outcomes.

Joint Engineering Degree Programs

Joint engineering degree programs run by national technical universities are one of the most well-established ways to localize foreign programs in Kazakhstan. These programs usually involve a partnership between a domestic engineering university and a foreign institution, where both sides share the responsibility for designing the curriculum, setting academic standards, and awarding degrees.

For this type of program, localization mainly happens through joint curriculum development. The foreign curriculum provides a strong advanced

theoretical foundation and internationally recognized standards, but domestic institutions adjust the course content to reflect Kazakhstan's industrial priorities, regulatory rules, and local labor market needs. Core engineering courses are often aligned with global standards, while elective modules and project-based components include local case studies and real-world industrial problems that are relevant to the country.

Institutional integration is another key feature of these programs. Joint programs are typically part of the host university's existing faculty structures, rather than operating as separate, standalone entities. This setup makes it easier for knowledge to be transferred to domestic academic staff, and it also makes the program more sustainable even after the initial partnership phase. Having faculty from both institutions co-teach courses and forming joint curriculum committees further strengthens the process of institutional learning.

The KBTU–China University of Petroleum (East China) Petroleum Engineering program provides a concrete example of a double-degree arrangement. KBTU's published description identifies English as the language of instruction and specifies a two-plus-two study structure across the two institutions. It also states an objective of preparing specialists for the petroleum industry. These details support a finding of formal international integration and stated sectoral relevance. However, the public description alone does not demonstrate how extensively the curriculum is adapted to Kazakhstan's regulatory context or whether graduates achieve better employment outcomes (KBTU, n.d.).

English-Taught and International Engineering Programs

The second case type consists of English-taught engineering programs and international engineering schools established within domestic universities. These initiatives are often designed to enhance international visibility, attract high-performing students, and facilitate integration into global academic networks.

Localization in this model is more complex and multidimensional. On the one hand, English-medium instruction and foreign-aligned curricula strengthen international compatibility and graduate mobility. On the other hand, successful localization requires adjustments to teaching methods, student support systems, and assessment practices to accommodate diverse academic backgrounds.

Unlike joint degree programs, international engineering schools often operate with a higher degree of organizational autonomy. Dedicated administrative units, specialized admission criteria, and international accreditation ambitions are common features. However, policy documents and institutional strategies increasingly emphasize the need to integrate these programs into the broader national education and industrial framework.

The available institutional material suggests that international engineering programs may localize through the incorporation of Kazakhstan-relevant engineering problems, cooperation with domestic research bodies, and links to national innovation priorities. However, such mechanisms should be recorded as evidence only when an institutional source explicitly documents them. English-medium instruction and international branding alone are insufficient indicators of policy alignment or functional relevance.

Industry-Embedded Engineering Education Programs

Industry-embedded engineering education is analytically distinguished by documented employer participation in curriculum development, practical training, internships, or applied projects. These arrangements offer a plausible mechanism for connecting education with sectoral skill needs. In the present document set, however, public information is not sufficiently consistent to treat industry participation or its effects as uniformly established across named foreign engineering programs. Accordingly, the analysis treats industry embedding as a pathway whose strength must be assessed case by case, rather than assuming direct contribution to industrialization.

However, the literature and institutional documents indicate that this pathway also faces challenges, including coordination costs, uneven industry participation, and the need for sustained regulatory support. Localization success therefore depends on stable partnerships and supportive policy frameworks. Industry-embedded engineering education models of this kind are increasingly evident in Kazakhstan's higher education landscape, particularly in programs that have been designed in close coordination with domestic industrial partners and sectoral development agendas.

Comparative Analysis of Localization Mechanisms

Table 1 presents a qualitative coding summary of the three program types. The ratings refer to the extent of explicit documentary evidence in the materials reviewed, not to measured performance or proven effects.

Table 1. Comparative Characteristics of Localization Pathways in Foreign Engineering Education Programs in Kazakhstan

Dimension	**A. Joint Engineering Degree Programs**	**B. English-Taught and International Engineering Programs**	**C. Industry-Embedded Engineering Education Programs**
Policy alignment	Partly documented: sectoral objective stated in KBTU–UPC example; national-policy alignment not independently assessed	Not consistently documented; English-medium delivery alone is insufficient	Documented only where a source explicitly links the arrangement to a stated sectoral priority

Curriculum adaptation	Partly documented; shared program structure reported, detailed local adaptation not established	Not consistently documented in available materials	Requires explicit evidence of employer input or locally adapted content
Institutional integration	Documented at formal partnership level in the KBTU–UPC example	Varies; code only where host governance/staffing/curriculum responsibility is described	Varies; code only where formal university–industry arrangements are described
Language of instruction	English in the KBTU–UPC example	English-medium by category definition, where documented	Varies by program; not inferred without source evidence
Industry involvement	Sectoral orientation stated; direct employer involvement not established by the cited program page	Not consistently documented	Central feature only when employer participation is explicitly documented
Contribution to industrialization	Potential/anticipated contribution; no outcome effect established	Potential contribution; no outcome effect established	Plausible mechanism if employer engagement exists; direct impact not measured

The comparison indicates that localization is not a uniform outcome. Joint/double-degree arrangements can formalize international curriculum and

governance links; English-taught programs can strengthen international compatibility but require additional evidence to establish domestic integration; and industry-embedded arrangements can connect learning with practical needs when employer participation is documented. These are conditional patterns, not a ranking of actual program performance.

DISCUSSION

Localization as a Strategic, Policy-Driven Process

The reviewed policy documents position engineering education and international cooperation as relevant to Kazakhstan's modernization and skills priorities. This supports the interpretation that localization is shaped by policy expectations. It does not show that every foreign program complies fully with these expectations, nor that policy alignment alone guarantees effective implementation. This interpretation is consistent with policy-transfer research emphasizing adaptation rather than simple replication (Dolowitz & Marsh, 2000; Steiner-Khamsi, 2004).

Differentiated Localization Pathways and Institutional Roles

The documentary comparison suggests different potential emphases across program arrangements. Joint/double-degree programs make formal cooperation and shared curriculum structures visible; English-taught programs emphasize international delivery but may provide less public evidence about local integration; industry-oriented arrangements are functionally relevant where employers participate in training or curriculum decisions. These distinctions should be understood as analytical tendencies, since the available sources do not provide equivalent implementation data for every type.

Industry-oriented arrangements may improve the connection between engineering education and practical skill requirements when employer participation is sustained and documented. The present study does not establish that these arrangements directly increase industrial output, employment, or productivity. Those outcomes would require additional evidence, such as graduate tracking, employer interviews, or program-level outcome data.

These different pathways highlight just how important institutional roles are. Flagship universities are in a better position to host complex joint programs, while industry-focused models depend heavily on stable partnerships and supportive regulatory frameworks. So, the success of localization doesn't just depend on how the program is designed—it also relies on the institution's capacity and the governance structures in place.

Implications for Engineering Education Internationalization Theory

The study's theoretical contribution is to bring policy alignment, institutional integration, and functional relevance together as a practical framework for examining localization. Compared with approaches that focus mainly on mobility or international visibility, the framework directs attention to whether external academic models are connected to domestic policy priorities, embedded in host institutions, and linked to local engineering needs. It extends localization and policy-transfer perspectives as an analytical synthesis, rather

than claiming to validate a new causal theory.

Policy Implications

From a policy angle, our findings tell us that governments looking to use foreign engineering programs to boost industrial development should focus on putting together clear, consistent regulatory frameworks—frameworks that actually encourage meaningful localization. When policies send clear signals about what matters—like making sure curricula are relevant, fostering industry engagement, and promoting institutional integration—they can make international cooperation more effective for driving development. For Kazakhstan, maintaining alignment between foreign engineering programs and national industrial priorities can enhance the developmental contribution of higher education. At the same time, regulatory frameworks should remain sufficiently flexible to avoid constraining institutional innovation.

Limitations and Directions for Future Research

This study has several limitations. First, it relies on publicly available policy and institutional documents, many of which are produced by the institutions themselves. These sources may describe formal intentions more clearly than implementation challenges. Second, the cases are selected purposively and do not represent all foreign engineering programs in Kazakhstan. Third, no interviews, classroom observations, employer surveys, graduate employment records, or industrial performance data were collected. The findings therefore concern documented localization mechanisms and stated program objectives, not causal impacts. Future research could use interviews, comparative case studies, graduate tracking, and employer evidence to test whether the identified mechanisms are associated with measurable educational or labor-market outcomes.

Future research building on this foundation would be highly valuable. For example, we could conduct on-campus fieldwork and hold face-to-face interviews with academic leaders, policymakers, and industry representatives to capture the dynamic details and real voices hidden behind the text. At the same time, comparing with more countries at similar stages of development would help us more clearly understand the micro-level operational mechanisms in the localization process, as well as how they influence a country's industrial and technological development.

CONCLUSION

This study examined how foreign engineering programs in Kazakhstan are localized through policy alignment, institutional integration, and functional relevance. The document analysis indicates that these dimensions provide a useful structure for comparing program arrangements and for distinguishing formal international cooperation from evidence of domestic adaptation.

The analysis identifies three broad pathways: joint or double-degree programs, English-taught and internationally oriented programs, and industry-embedded arrangements. The KBTU–China University of Petroleum (East China) Petroleum Engineering program illustrates a formally structured double-degree

model with an explicit petroleum-sector orientation. Other arrangements can only be assessed to the extent that public sources document their governance, curriculum, and industry links. The evidence does not justify ranking all program types by effectiveness or concluding that they have already improved industrial outcomes.

Joint/double-degree programs may facilitate formal academic cooperation and curriculum coordination; English-taught programs may support international compatibility; and industry-embedded arrangements may strengthen the relevance of training where employers participate substantively. These are plausible mechanisms identified from documentary evidence, not demonstrated effects on employment, productivity, or industrial output.

The study's central contribution is an integrated, document-based framework for examining the governance of localization in an industrializing context. Its value lies in specifying what evidence should be sought across policy, institutional, and functional dimensions. Further empirical work is needed to determine whether and under what conditions these mechanisms translate into measurable outcomes.

RECOMMENDATIONS

The findings suggest four practical priorities. Policymakers can clarify expectations for localization while maintaining quality assurance; host universities can document responsibilities for joint curriculum design, faculty development, and internal review; program leaders can establish transparent evidence of employer participation and practical learning; and institutions can publish information that allows independent assessment of implementation. These recommendations follow from the documentary gaps identified in the study and should not be read as evidence that any one arrangement has already produced superior industrial outcomes.

Kazakhstan's experience illustrates the importance of examining how international engineering education is connected to domestic policy and institutional arrangements. Whether such programs produce sustained industrial or labor-market benefits remains an empirical question requiring program-level and outcome data.

ADVANCED RESEARCH

This study is limited by its reliance on selected case types and available institutional and policy documents. Future research could incorporate interviews and broader comparative data to further examine the long-term effectiveness of localization strategies in foreign engineering education programs.

REFERENCES

Altbach, P. G., & Knight, J. (2007). The Internationalization of Higher Education: Motivations and Realities. *Journal of Studies in International Education*, *11*(3-4), 290-305. https://doi.org/10.1177/1028315307303542

Becker, G. S. (1975). Investment in human capital: effects on earnings. In Human Capital: A Theoretical and Empirical Analysis, with Special Reference to

Education, Second Edition (pp. 13-44). NBER.

De Wit, H., Hunter, F., Howard, L., & Egron-Polak, E. (2015). Internationalisation of higher education. The Bloomsbury Handbook of the Internationalization of Higher Education in the Global South, 23, 328. https://digital.casalini.it/9781350139251

Dolowitz, D. P., & Marsh, D. (2000). Learning from abroad: The role of policy transfer in contemporary policy-making. *Governance*, *13*(1), 5-23. https://doi.org/10.1111/0952-1895.00121

Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. Research Policy, 29(2), 109–123. https://doi.org/10.1016/S0048-7333(99)00055-4

European Higher Education Area. (2015). Yerevan Communiqué. EHEA Ministerial Conference.

Grubb, W. N., & Lazerson, M. (2005). Vocationalism in Higher Education: The Triumph of the Education Gospel. *The Journal of Higher Education*, *76*(1), 1–25. https://doi.org/10.1080/00221546.2005.11772273

Government of the Republic of Kazakhstan. (2023). Concept for the Development of Higher Education and Science in the Republic of Kazakhstan for 2023–2029. Astana.

Kazakh-British Technical University. (n.d.). Petroleum Engineering (UPC): Bachelor's degree program.

Knight, J. (2004). Internationalization Remodeled: Definition, Approaches, and Rationales. Journal of Studies in International Education, 8(1), 5-31. https://doi.org/10.1177/1028315303260832

Komekbayev, Y., Kurmangaliyeva, D., & Dyke, G. J. (2025). Unlocking scientific potential through dual degrees in Kazakhstan's higher education system. *Iberoamerican Journal of Science Measurement and Communication*, *5*(2), 1–17. https://doi.org/10.47909/ijsmc.225

Marginson, S. (2018). Higher education, economic inequality and social mobility: Implications for emerging East Asia. International Journal of Educational Development, 63, 4–11. https://doi.org/10.1016/j.ijedudev.2017.03.002

Ministry of Science and Higher Education of the Republic of Kazakhstan. (2023). Development Priorities of Engineering Education in Kazakhstan. Astana.

Mok, K. H. (2016). Massification of higher education, graduate employment and social mobility in the Greater China region. *British Journal of Sociology of Education*, *37*(1), 51–71. https://doi.org/10.1080/01425692.2015.1111751

OECD (2025), "Policies for transnational collaboration in higher education", *OECD Education Policy Perspectives*, No. 121, OECD Publishing, Paris, https://doi.org/10.1787/e07d8c0f-en.

Satbayev University. (2026, February 24). A new step into the future: French Center at Satbayev University has opened new horizons for engineering education and green energy. https://satbayev.university/en/news/a-new-step-into-the-future-french-center-at-satbayev-university-has-opened-new-horizons-for-engineering-education-and-green-energy

Steiner-Khamsi, G. (Ed.). (2004). *The global politics of educational borrowing and lending*. Teachers College Press.

Teichler, U. Internationalisation of higher education: European experiences. *Asia Pacific Educ. Rev.* 10, 93–106 (2009). https://doi.org/10.1007/s12564-009-9002-7

Witte, J. K. (2006). Change of degrees and degrees of change: Comparing adaptations of European higher education systems in the context of the Bologna process.

UNESCO. (2010). *Engineering: Issues, Challenges and Opportunities for Development; UNESCO Report*. Unesco.