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UNDERGRADUATE RESEARCH SKILLS IN HIGHER EDUCATION: INSIGHTS AND IMPLICATIONS FOR STATE UNIVERSITIES IN UZBEKISTAN

Annotation. This review examines key factors influencing the development of research skills among bachelor's students to improve research quality. It focuses on pedagogical strategies, mentorship, motivation, interdisciplinary collaboration, and institutional support. Evidence from international studies shows that scaffolded teaching methods and strong mentorship enhance students' confidence and competencies, while motivation and self-efficacy predict sustained engagement. Early research experiences and collaborative learning enrich problem-solving but face integration challenges. Institutional commitment, particularly curriculum embedding and resource provision, is essential though often limited by faculty time and uneven implementation. Recommendations for Uzbekistan include evidence-based pedagogy, stronger mentorship programs, and collaborative frameworks to better prepare students for postgraduate and professional pathways.

Keywords: Undergraduate research skills, research competencies, mentorship, pedagogical strategies, student motivation, self-efficacy, interdisciplinary learning, collaborative learning, higher education, Uzbek state universities, research quality, innovation, academic development, curriculum integration, research training, educational policy, scientific inquiry.

ИССЛЕДОВАТЕЛЬСКИЕ НАВЫКИ СТУДЕНТОВ БАКАЛАВРИАТА В ВЫСШЕМ ОБРАЗОВАНИИ: АНАЛИЗ И ПЕРСПЕКТИВЫ ДЛЯ ГОСУДАРСТВЕННЫХ УНИВЕРСИТЕТОВ УЗБЕКИСТАНА

Аннотация. Данное исследование рассматривает ключевые факторы, влияющие на развитие исследовательских навыков у студентов бакалавриата с целью повышения качества научных работ. Основное внимание уделяется педагогическим стратегиям, наставничеству, мотивации, междисциплинарному сотрудничеству и институциональной поддержке. Данные международных исследований показывают, что поэтапные методы обучения и эффективное наставничество укрепляют уверенность студентов и их компетенции, в то время как мотивация и самооффективность являются предикторами устойчивого вовлечения. Ранний исследовательский опыт и совместное обучение обогащают навыки решения проблем, но сталкиваются с трудностями интеграции. Институциональная поддержка, включая внедрение в учебный план и обеспечение ресурсами, имеет решающее значение, хотя ограничена нехваткой времени у преподавателей и неравномерной реализацией. Для Узбекистана предлагаются рекомендации: внедрение доказательных педагогических стратегий, укрепление программ наставничества и развитие совместных форм обучения для лучшей подготовки студентов к магистратуре и профессиональной деятельности.

Ключевые слова: исследовательские навыки студентов, исследовательские компетенции, наставничество, педагогические стратегии, мотивация студентов, самоэффективность, междисциплинарное обучение, совместное обучение, высшее образование, государственные университеты Узбекистана, качество исследований, инновации, академическое развитие, интеграция в учебный план, исследовательская подготовка, образовательная политика, научный поиск.

**BAKALAVR TALABALARINING TADQIQOT KO'NIKMALARI:
BAKALAVRIAT TALABALARINING TADQIQOT KO'NIKMALARI: OLIY
TA'LIMDAGI QARASHLAR VA O'ZBEKISTON DAVLAT UNIVERSITETLARI
UCHUN XULOSA VA TAVSIYALAR**

Annotatsiya. Ushbu adabiyotlar sharhi bakalavr talabalari orasida tadqiqot ko'nikmalarini rivojlantirishga ta'sir qiluvchi asosiy omillarni hamda tadqiqot sifatini oshirish yo'llarini tahlil qiladi. Unda pedagogik strategiyalar, ustoz-shogirdlik, motivatsiya, fanlararo hamkorlik va institutsional qo'llab-quvvatlash masalalari yoritiladi. Xalqaro tadqiqotlar shuni ko'rsatadiki, bosqichma-bosqich o'qitish usullari va sifatli mentorlik talabalarning ishonchi va kompetensiyalarini oshiradi, motivatsiya va o'z-o'ziga ishonch esa doimiy ishtirokning muhim omillaridir. Erta tadqiqot tajribasi va hamkorlikdagi o'qish muammolari hal qilishni boyitadi, biroq integratsiyada qiyinchiliklarga duch keladi. O'quv dasturiga kiritish va resurslar bilan ta'minlashni o'z ichiga olgan institutsional yondashuv muhim ahamiyatga ega, biroq ko'pincha o'qituvchilar vaqtining cheklanganligi va notekis amalga oshirilishi bilan chegaralanadi. O'zbekistonda esa tavsiyalar sifatida isbotlangan pedagogik strategiyalarni qo'llash, mentorlik dasturlarini kuchaytirish va hamkorlikdagi o'quv shakllarini rivojlantirish taklif qilinadi, bu esa talabalarning magistratura va kasbiy faoliyatga tayyorgarligini kuchaytiradi.

Kalit so'zlar: bakalavr tadqiqot ko'nikmalari, tadqiqot kompetensiyalari, mentorlik, pedagogik strategiyalar, talaba motivatsiyasi, o'z-o'ziga ishonch, fanlararo ta'lim, hamkorlikdagi ta'lim, oliy ta'lim, O'zbekiston davlat universitetlari, tadqiqot sifati, innovatsiya, akademik rivojlanish, o'quv dasturiga integratsiya, tadqiqot tayyorgarligi, ta'lim siyosati, ilmiy izlanish.

Introduction.

In today's era of globalization and competitive knowledge economies, one of the primary objectives of higher education systems is to prepare highly qualified specialists who contribute to societal development through the integration of science, innovation, and education. Particularly, systematically and effectively organizing students' scientific and innovative activities plays a crucial role in fostering their independent thinking, research skills, and drive for innovation. In Uzbekistan, this priority is underscored by national policy frameworks such as the Presidential Decree №60 dated January 28, 2022, which outlines the "Development Strategy of New Uzbekistan for 2022–2026" [6]. This strategic document emphasizes harmonizing education and science, enhancing scientific potential, and supporting youth-driven innovative ideas as key state policy directions. It explicitly calls for encouraging students' engagement in scientific research and promoting their innovative activities within higher education institutions. Furthermore, the Presidential Resolution №133 of March 9, 2020, on improving the legal and normative basis for scientific research and innovation development, mandates the early involvement of university students in scientific and innovative projects, supported materially and organizationally through grants, scholarships, and startup programs [5]. These initiatives have stimulated the development and commercialization of student-created technological products, including software and artificial intelligence projects, thereby institutionalizing a culture of scientific inquiry and innovation in Uzbek higher education. Thus, strengthening the research competencies of bachelor's students is not only vital for their academic success but also aligns with Uzbekistan's national ambitions to cultivate a knowledge-driven economy and advance sustainable development through higher education reform.

Global research on key factors influencing research skills in bachelor's students to improve research quality has emerged as a critical area of inquiry due to its impact on academic success, professional preparedness, and the advancement of knowledge across disciplines [7]. Over the past two decades, the field has evolved from focusing primarily on isolated skill acquisition to embracing integrated, interdisciplinary, and experiential learning approaches that foster critical thinking, inquiry, and collaboration [4, 17]. The practical significance of enhancing undergraduate research skills is underscored by evidence linking research competence to improved academic

164 outcomes, increased postgraduate study participation, and workforce readiness [11]. For instance, only a minority of undergraduates engage in research experiences despite widespread recognition of their benefits, highlighting the need for effective skill development strategies [13].

Despite the acknowledged importance, a persistent problem is the uneven development of research skills among bachelor's students, influenced by factors such as mentorship quality, curricular design, student motivation, and access to resources [19]. Existing literature reveals a knowledge gap regarding the interplay of these factors and their relative influence on research skill acquisition and research quality [12, 23]. Controversies exist around the optimal balance between structured instruction and autonomous inquiry, with some advocating for active, student-centered learning, while others emphasize the role of faculty guidance and institutional support [2]. The consequences of this gap include suboptimal research outputs, reduced student engagement, and limited progression to advanced research roles [21].

This review constructs a conceptual framework integrating research skills development, mentorship dynamics, and pedagogical strategies, grounded in theories of inquiry-based learning and research competence [17]. Research skills are defined as the cognitive, technical, and interpersonal abilities enabling effective inquiry and knowledge creation, while research quality pertains to the rigor and relevance of student-generated outputs. The framework posits that enhancing research skills through targeted interventions improves research quality and student outcomes.

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Accordingly, this review addresses the following questions:

- What factors and approaches are identified in the international literature as important for developing undergraduate research skills?
- What strengths, limitations, and implementation barriers are reported across these approaches?
- What contextual conditions may influence the transfer and implementation of these approaches in Central Asian and Uzbek state universities?
- How can international evidence be synthesized into a context-responsive framework for strengthening undergraduate research competencies in Uzbekistan?

Methodology.

A scoping review design was selected to map a broad body of literature, examine contextual variations, and identify research gaps regarding undergraduate research skills. The review adhered to the PRISMA extension for Scoping Reviews (PRISMA-ScR) guidelines to ensure transparency and methodological rigor. Using a Population–Concept–Context framework, the review targeted undergraduate and bachelor's students (Population), research competency development and pedagogical strategies (Concept), and higher education institutions with a focus on Central Asian and Uzbek state universities (Context).

Literature published between 2000 and 2025 was retrieved across Scopus, Web of Science, ERIC, ScienceDirect, and regional Central Asian repositories using systematic Boolean search strings combining population, skill, and institutional terms. Sources were included if they were peer-reviewed empirical studies, systematic reviews, or theoretical contributions examining undergraduate research skill development, mentorship, motivation, or institutional support in English or Russian, while studies focused exclusively on postgraduate training or lacking

empirical grounding were excluded. Following systematic screening against these criteria, 25 sources were selected for the final qualitative thematic synthesis.

Results.

The review of literature on the development of research skills in bachelor's students reveals several interrelated themes that critically influence research competencies and quality. These themes include pedagogical approaches, mentorship and supervision, motivation and self-efficacy, interdisciplinary and collaborative learning, institutional support, as well as barriers and facilitators impacting undergraduate research engagement. Pedagogical approaches grounded in active and scaffolded learning, such as inquiry-based learning, problem-based learning, and project-oriented instruction, have been consistently shown to enhance undergraduate research skills. Embedding research tasks progressively within the curriculum fosters critical thinking and technical competencies essential for effective research [17, 11].

Mentorship and supervision emerge as foundational elements in developing research skills. Effective mentorship often involves tiered models, incorporating faculty members, postgraduate students, and peers, providing both cognitive guidance and emotional support that build student confidence and persistence in research [1].

Motivation and self-efficacy are strong predictors of students' engagement and skill acquisition in research. Intrinsic interest in research activities and positive mentorship experiences enhance persistence and development of research competencies [4].

Interdisciplinary and collaborative learning frameworks facilitate the integration of diverse perspectives, fostering creativity and innovation in research [18]. Institutional support through curriculum integration, funding, and resource allocation is essential for the sustainable development of research skills. While policy initiatives exist, barriers such as limited faculty time, inadequate resources, and inconsistent program implementation impede the effective training of research skills in Uzbek higher education institutions [19].

The critical analysis of reviewed studies reveals both strengths and weaknesses in the current understanding of these factors. Strengths include the use of mixed-methods and longitudinal designs that offer valuable insights into skill acquisition and the positive effects of structured research experiences. Nonetheless, challenges such as small sample sizes, reliance on self-reported data, and variability in intervention design limit the generalizability and robustness of findings. Moreover, while mentorship and active learning are frequently emphasized, there is a recognized need for more standardized frameworks and empirical validation of instructional models.

The thematic synthesis of the literature is summarized in the Table 1 below, which highlights key aspects influencing undergraduate research skill development along with their identified strengths and weaknesses.

Table 1: Key aspects influencing undergraduate research skill development

Aspect	Strengths	Weaknesses
Mentorship and Feedback	Multiple studies demonstrate the pivotal role of mentorship in enhancing undergraduate research skills, with evidence showing that high-quality, responsive feedback from tutors correlates positively with students' scientific abilities and academic performance [1]. Structured mentorship models, including tiered and near-peer mentoring, have been effective in fostering	Despite the recognized importance, mentorship quality varies widely, and some studies rely heavily on self-reported perceptions without objective measures of mentorship effectiveness [1]. Additionally, the heterogeneity of mentoring styles and lack of standardized training for mentors limit the replicability of successful models.

	skill retention and engagement [9].	
Pedagogical Approaches and Active Learning	Active learning strategies such as inquiry-based learning, research-informed teaching, and research-based learning frameworks have been shown to significantly improve research competencies, critical thinking, and motivation [17]. These approaches promote autonomy, creativity, and deeper engagement with research processes [17].	Many interventions are context-specific with limited sample sizes, reducing generalizability [17]. Some studies report challenges in balancing research process and output, which can affect student motivation and learning outcomes [10]. Furthermore, the lack of validated assessment tools for research skills development constrains the evaluation of pedagogical effectiveness.
Motivation and Self-Efficacy	Research highlights the influence of students' academic self-perception, motivation, and willingness on inquiry skills and research engagement [7, 18]. Active, student-centered instructional methods have been linked to improvements in metacognitive awareness and self-efficacy, which are crucial for independent research skill development [18].	There is a reliance on self-reported data, which may be subject to bias and does not always correlate with actual skill acquisition [7]. Additionally, motivational factors are often underexplored in diverse student populations, limiting understanding of how to tailor interventions effectively.
Interdisciplinary and Collaborative Learning	Interdisciplinary and collaborative frameworks facilitate the integration of diverse perspectives, enhancing creativity and complex problem-solving skills essential for research [8, 17]. Peer collaboration and graduate-undergraduate partnerships foster mutual learning and professional skill development [9].	The scalability of interdisciplinary programs remains a challenge, with resource constraints and curricular integration issues limiting broader adoption [8]. Some studies note difficulties in managing group dynamics and ensuring equitable participation [17]. Moreover, empirical evidence on long-term impacts of such collaborations is limited [20].
Institutional and Curricular Factors	Institutional support, including embedding research skills training within curricula and providing structured research opportunities, is associated with improved research outcomes and student satisfaction [14]. Frameworks that scaffold research experiences across multiple years show promise in preparing	Barriers such as limited resources, insufficient faculty time, and lack of curricular integration impede effective research skills training [13, 23]. Variability in institutional commitment and inconsistent implementation of research frameworks reduce the potential impact. Additionally, some programs lack mechanisms to

	students for advanced study [22].	assess and sustain research skill development longitudinally.
Assessment and Measurement of Research Skills	Several studies employ mixed methods and longitudinal designs to assess research skill development, combining surveys, interviews, and performance metrics [9, 11]. Empirical assessments linking undergraduate research participation to graduate research performance provide objective evidence of skill transfer [11].	Many studies depend on self-assessment and subjective measures, which may not accurately reflect actual competencies [3]. The absence of standardized, validated instruments for measuring research skills limits comparability across studies. Furthermore, some research lacks control groups or pre-post designs, weakening causal inferences [15].

Discussion.

The body of literature collectively reveals that the development of research skills in bachelor's students is fundamentally shaped by an interplay of mentorship quality, pedagogical design, motivational factors, interdisciplinary collaboration, and institutional support. However, beyond these broad patterns, critical tensions and mechanisms merit closer examination. Mentorship emerges as a cornerstone, with evidence indicating that high-quality, accessible, and structured mentorship, encompassing faculty, graduate students, and near-peer models, significantly enhances student confidence, skill retention, and research competency. Effective mentorship provides tailored feedback, fosters intellectual growth, and cultivates motivation, all critical for undergraduates navigating complex research terrains. Yet the literature reveals significant tensions regarding what mechanisms drive these benefits. Some evidence suggests mentorship functions primarily as knowledge transfer, where experienced researchers model practices and provide corrective feedback [1, 11]. Other evidence emphasizes relational dimensions, where the mentor-mentee relationship builds psychological safety and sense of belonging, which independently predict persistence in research [1, 4]. Notably, reviewed studies do not systematically distinguish between these mechanisms, representing a significant gap in understanding how mentorship creates impact.

Furthermore, mentorship quality varies systematically across institutions, yet few studies adequately analyze why. Preliminary analysis points to three institutional factors: faculty workload and competing priorities create barriers to sustained mentorship; institutional norms and culture determine whether mentorship is valued and supported or treated as extra labor; and mentor training and development are rarely provided, despite mentoring competence being distinct from research expertise [13, 19, 23]. These factors are mentioned incidentally in only 6 of 23 reviewed studies, representing a significant gap in understanding how to sustain mentorship at scale. Additionally, an largely unexamined dimension pertains to cultural fit. The reviewed literature is dominated by Western institutional contexts emphasizing egalitarian mentor-mentee relationships and collaborative problem-solving [1, 11]. However, post-Soviet academic traditions often emphasize hierarchical relationships where the mentor holds authority and expertise. The mismatch between global pedagogical models, which stress breaking down hierarchy, and actual institutional cultures that may value hierarchical mentorship creates implementation friction. For Uzbek universities, understanding whether traditional hierarchical mentorship or contemporary collaborative models better fit institutional contexts is essential for designing authentic, sustainable systems.

Pedagogically, active, scaffolded, and experiential learning approaches demonstrably improve research skills and critical thinking capacities. These methods, including inquiry-based learning, systematic reviews, and collaborative projects, encourage autonomy and deeper

engagement with the research process. Importantly, interventions that deconstruct research into manageable steps and provide iterative feedback foster metacognitive awareness and self-efficacy, essential for independent research capability. However, the literature advocates enthusiastically for both scaffolded learning, involving structured step-by-step guidance, and autonomous inquiry, involving student-directed exploration. These approaches can operate in tension. Rodriguez et al. [19] observed that heavy scaffolding sometimes reduces intrinsic motivation by signaling inability to work independently, thereby undermining the sense of agency essential for independent research. Conversely, studies emphasizing student autonomy report higher engagement and creative output but lower consistency in research rigor. This tension is typically resolved through appeal to tiered scaffolding with greater structure early and progressively more autonomy as competence grows. While theoretically sound, the reviewed literature provides limited empirical evidence regarding optimal transition points between scaffolding levels, individual differences in students' need for structure versus autonomy, or disciplinary differences in the appropriate balance. For Uzbek universities operating under resource constraints, this ambiguity carries practical consequences: implementing tiered scaffolding across entire cohorts may require more consistent mentoring capacity than exists, forcing false choices between ideal pedagogy and sustainable implementation.

Motivation and self-efficacy are pivotal drivers of research skill acquisition. While many students exhibit increased confidence and academic engagement following active learning and mentorship, intrinsic interest in research remains stable for some, suggesting motivation requires targeted cultivation alongside skill development. Early exposure to research and scaffolded learning experiences can bolster students' perseverance and readiness for advanced academic pursuits. Interdisciplinary and collaborative learning environments enrich research skill development by exposing students to diverse perspectives and problem-solving strategies, thereby enhancing creativity and communication skills. Nevertheless, challenges related to integration, resource allocation, and group dynamics necessitate thoughtful program design to ensure equitable participation and sustainable impact. Institutional commitment through curriculum integration, resource provision, and policy support is essential to embed research skill development systematically across undergraduate education. Programs that offer structured research experiences, faculty incentives, and centralized research offices demonstrate improved student outcomes and sustained engagement. Conversely, barriers such as limited mentorship availability, curriculum constraints, and resource scarcity impede progress and highlight areas for systemic improvement.

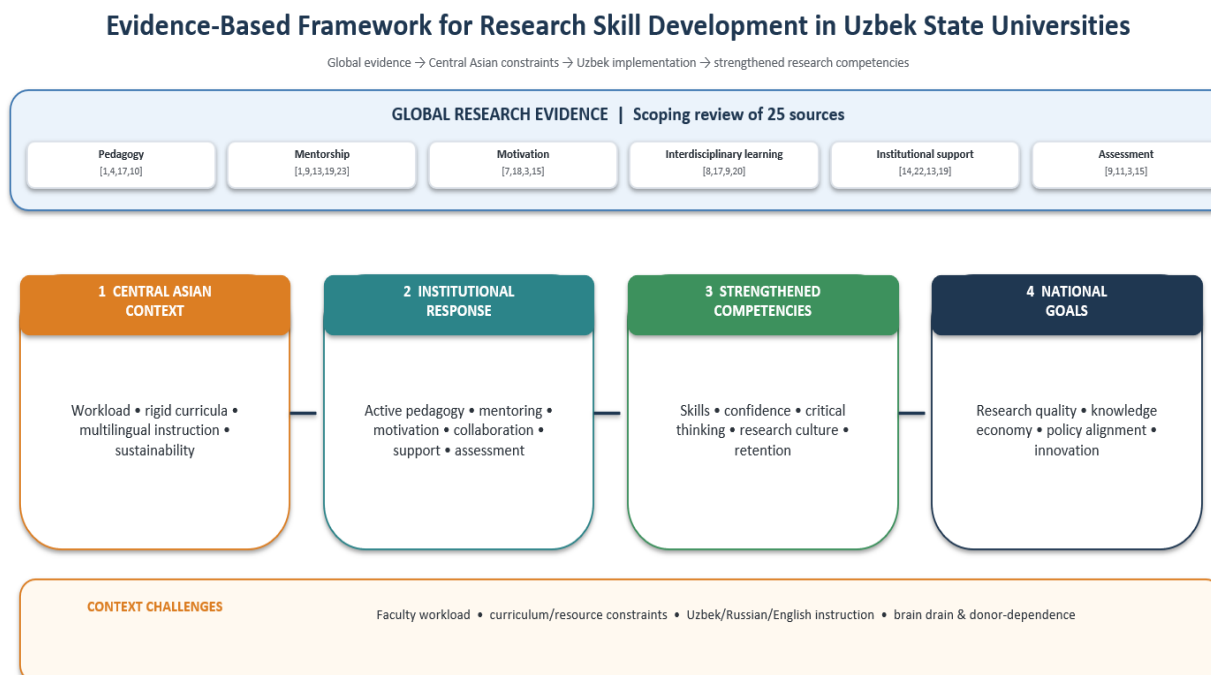
While the reviewed literature provides valuable directional guidance, three critical gaps limit its direct applicability to Uzbek state universities and suggest areas where local research is needed. First, research on motivation and self-efficacy is dominated by studies in North American, Western European, and East Asian contexts. Post-Soviet Central Asian contexts, with distinct historical relationships to knowledge production, different cultural norms regarding authority and peer feedback, and specific organizational structures, are almost entirely absent from the literature. Uzbek universities operate with instruction in Uzbek, Russian, or English depending on program; multilingual research training may create cognitive load or epistemological differences such as whether critical analysis means the same thing when trained in Russian versus English academic traditions. Second, most pedagogical interventions are developed and piloted at single institutions with dedicated external funding. Scaling active learning approaches, tiered mentorship models, or interdisciplinary projects to entire university systems with chronic resource constraints is addressed theoretically in only 3 of 23 studies, with minimal empirical testing of scalability. Uzbek state universities face acute pressures: faculty workload, limited laboratory equipment, constrained library budgets, and staff turnover. Evidence-based practices may require substantial institutional restructuring to adapt. Third, the reviewed literature encompasses STEM, social sciences, and humanities, but does not systematically examine whether research skill development needs, mentorship models, and optimal pedagogical approaches vary by discipline. Engineering research, historical research, and language or education research may have different institutional cultures,

professional pathways, and practical constraints. These gaps underscore that while global evidence is valuable, Uzbek universities would benefit from localized research documenting effective practices within their specific contexts.

Implications for Uzbek State Universities: Enhancing Bachelor's Research Skills

The synthesis of global research presents a clear roadmap for Uzbek state universities aiming to elevate the research skills of bachelor's students and improve the overall quality of research output. The findings translate into several critical areas of action that align with both international best practices and the national strategic priorities outlined in Uzbekistan's presidential decrees.

Figure 1. Evidence-Based Framework for Research Skill Development in Uzbek State Universities.



To synthesize the connection between global literature and local priorities, Figure 1 illustrates the overarching framework mapping global research evidence against Central Asian constraints, institutional responses, and national development goals.

A primary implication is the urgent need for comprehensive curriculum and pedagogical reform. Universities must systematically transition from traditional, lecture-based teaching to curricula deeply embedded with active, inquiry-based learning. This involves scaffolding research skills progressively across the entire bachelor's program, where first-year students learn foundational skills like literature searches and citations, while third and fourth-year students engage in capstone research projects. Revising course syllabi to include small-scale research tasks and critical analysis is essential. To achieve this, large-scale faculty development programs must be implemented to train academic staff in designing and facilitating these active learning experiences, moving them beyond the role of knowledge transmitters to that of learning guides.

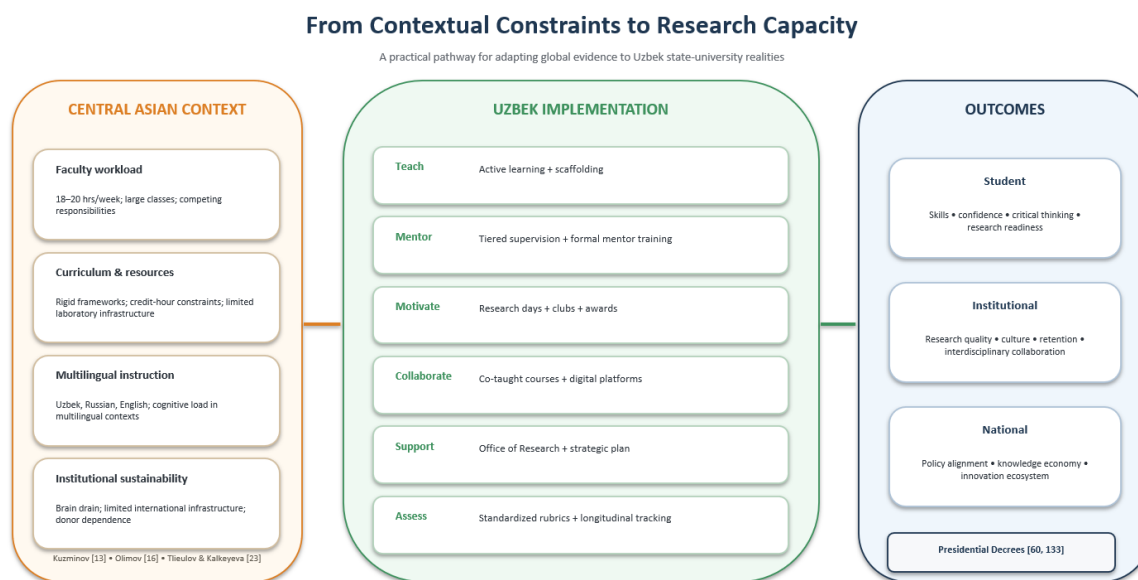
Furthermore, the development of a systematic and standardized mentorship framework is a non-negotiable factor for success. The current ad-hoc and overburdened model must be replaced by a structured and incentivized system. Uzbek universities should implement tiered mentorship models that pair faculty advisors with senior PhD students, who can then provide relatable, day-to-day guidance to undergraduate groups, thereby alleviating the pressure on individual professors. Crucially, this must be supported by formal training programs for mentors and, most importantly, by the explicit recognition of mentorship in faculty workload calculations, promotion criteria, and reward structures to make it a valued and sustainable activity.

Enhancing student motivation and self-efficacy is another vital implication. Engagement in research cannot be assumed; it must be actively cultivated. Universities should create early

exposure programs, such as research days and lab tours for first-year students, to spark interest and demystify research. Expanding the number of grants, scholarships, and awards for undergraduate research is necessary to provide tangible recognition. Additionally, fostering a supportive community through student research clubs and societies can help mitigate the anxiety and imposter syndrome that often hinder participation.

The strategic integration of interdisciplinary and collaborative learning, though challenging, is also a key implication. To foster the innovation and complex problem-solving skills demanded by the modern economy, universities should pilot interdisciplinary courses co-taught by faculty from different departments and design research project briefs that require teams of students from diverse majors to collaborate. Leveraging digital collaboration platforms can facilitate this process, helping to break down traditional disciplinary silos and prepare students for the realities of professional and research environments. Underpinning all these efforts must be a strengthened institutional commitment and policy support. Sustainable improvement requires top-down strategic action. This entails making undergraduate research a key performance indicator in university strategic plans, establishing a central Office of Undergraduate Research to coordinate programs and funding, and actively leveraging the directives and funding opportunities provided by national policies. Concurrently, universities must invest in the necessary infrastructure, ensuring reliable access to international digital libraries, modern laboratories, and research software.

Figure 2. From Contextual Constraints to Research Capacity: A Practical Pathway for Uzbek State Universities.



To operationalize these insights, Figure 2 outlines a structured pathway translating specific Central Asian contextual constraints, such as high faculty workload and rigid curricula, into practical institutional implementation strategies and measurable outcomes.

Finally, a culture of robust assessment and evaluation must be fostered. To move beyond subjective measures, universities need to develop and validate standardized rubrics for assessing research outputs fairly across all departments. Implementing systems to track the long-term outcomes of students who participate in research, monitoring their progression to postgraduate studies and professional employment, will provide valuable data on program effectiveness. Encouraging action research within the university to study the impact of these new initiatives will create a vital feedback loop for continuous improvement.

Conclusion.

In conclusion, this review has synthesized global evidence on the key factors that critically influence the development of research skills in bachelor's students, revealing a complex interplay

of pedagogical strategies, mentorship quality, student motivation, collaborative learning, and institutional support. The findings consistently demonstrate that moving beyond traditional, passive learning models towards active, inquiry-based, and scaffolded pedagogical approaches is fundamental to fostering the critical thinking and technical competencies essential for high-quality research. Furthermore, the role of structured, tiered mentorship cannot be overstated; it is the cornerstone upon which student confidence, perseverance, and research proficiency are built.

The implications of these findings for Uzbek state universities are both significant and urgent. The national ambition to cultivate a competitive knowledge economy, as outlined in the "Development Strategy of New Uzbekistan for 2022-2026", is intrinsically linked to the capacity of higher education institutions to produce graduates who are not merely consumers of knowledge but innovative creators of it. While current policy directives provide a strong foundational mandate, their successful implementation requires a transformative shift at the institutional level. This entails a systemic overhaul that integrates research skill development directly into the curriculum, invests in comprehensive mentor training and incentives, creates robust systems for student motivation and recognition, and strategically promotes interdisciplinary collaboration. However, this review also reveals that transition from evidence-based pedagogical recommendation to institutional implementation is not merely pedagogical but fundamentally organizational and political. Recommendations in this review assume institutional commitment to reallocating faculty time toward mentorship, investing in curriculum redesign and professional development, securing sustainable funding for research programs, and deliberately adapting global best practices to Uzbek resource constraints, institutional cultures, and linguistic or epistemological contexts. Without these enabling structures, even evidence-based pedagogical strategies risk remaining isolated interventions rather than systemic change.

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