



Volume 21 (2026), pp. 1-16
*American Journal of STEM Education:
Issues and Perspectives*
eISSN 30.3-1190 | Print ISSN: 3069-0072
Star Scholars Press
<https://doi.org/10.32674/h03cyn34>

Internationalizing STEM Education in Laos: Institutional Responses to Global Higher Education

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ABSTRACT

As science, technology, engineering, and mathematics (STEM) education becomes increasingly important for national development and global competitiveness, higher education institutions are under growing pressure to equip graduates with both technical expertise and international competencies. This qualitative study examines how universities in the Lao People's Democratic Republic (Lao PDR) are responding to the internationalization of STEM education. The research draws on an analysis of institutional policy documents and semi-structured interviews with 29 administrators and academic staff from four public universities. The findings indicate that universities have adopted an "open-door" approach to internationalization through four primary strategies: student and academic mobility, international research collaboration, internationalization at home, and strategic institutional partnerships. These initiatives have generated multiple benefits for students, faculty members, and institutions, including enhanced academic capacity, broader research networks, and increased global engagement. However, institutions also face challenges related to resources, infrastructure, and policy implementation. The study provides insights for institutional leaders and policymakers seeking to strengthen internationalization strategies and enhance the global competitiveness of STEM education in emerging higher education systems.

Keywords: STEM education, internationalization, motivations, benefits, challenges, academics, administrators

Editors: Dr. Cristina Alfaro, San Diego State University, USA | Dr. Krishna Bista, Morgan State University, USA

INTRODUCTION

Governments worldwide are increasingly recognizing that science, technology, engineering, and mathematics (STEM) education and research are vital for a national growth, economic competitiveness, and overall societal well-being (Freeman et al., 2019). This has led to a global shift toward STEM, which is evident in government policies for both school and university-level. Despite a high global demand for STEM graduates, their supply often remains insufficient to meet the needs of growing industries such as MedTech, digital services, and computer science (World Economic Forum, 2023). Meanwhile, the proportion of STEM graduates varies significantly by country. According to UNESCO data, nations such as Malaysia, Tunisia, the United Arab Emirates, and South Korea boast some of the highest shares of STEM graduates worldwide, while Western European countries and the United States report lower figures (World Economic Forum, 2023). The contemporary society is defined by rapid technological advancements and complex global challenges, such as COVID-19 pandemic and climate change. These challenges have increased demands for skilled STEM workforce in the current knowledge economy, which is driven by innovation and human capital. As such create implications for higher education institutions (HEI) worldwide to revise and adapt strategies in improving education provisions and aim to recruit more STEM international students (Marginson et al., 2013). In line with this global context, small or resource-constrained countries and HEIs have attempted to channel resources and international opportunities to engage in regional and global communities.

Lao PDR, a lower-middle-income country located in Southeast Asia, has recently prioritized STEM education to equip future generations with the technical skills essential for fostering innovation and achieving sustainable economic growth (Souvannasane, 2025; MOES, 2020). These initiatives are supported by several key national strategies, including the 10-year ICT in Education Strategy (2025-2035), National Digital Economy Strategy (2021-2030), and National Digital Economy Development Plan (2021-2025). These plans collectively outline a visionary path for integrating technology into teaching and learning nationwide, empowering both students and educators with the digital tools and skills necessary to enhance learning outcomes and cultivate the competencies crucial for future careers and everyday life. Such sustained efforts demonstrate the long-term commitment of Lao PDR to building an inclusive digital society (Fukami, 2024). In response, HEIs have embraced such needs of digitalization in education and economic development and improved their educational provision to align with regional and international standards. National and institutional agendas responding to impacts of globalization and seizing its opportunities through a wide range of methods and approaches depended on local and regional context (de Wit et al., 2017). Universities and regional networks often internationalize through academic and student mobility, international programs, and collaborative research programs in STEM-related areas. To align with local and regional needs, efforts in Lao PDR are focused on improving the quality of teaching and learning, particularly within STEM fields, at public and private HEIs (MOES, 2020). With supportive policies on international cooperation, Lao HEIs are willing to engage in regional and international higher education landscapes. This is because regional and international engagement is significant for Lao HEIs to improve international visibility and seize international opportunities, including external funding resources (Sisavath, 2024).

However, some scholars (e.g., Knight, 2013; Marginson, 2023) argued that internationalisation is increasingly motivated by commercialization and competition rather

than goals of academic and human capacity building. Learning and knowledge were imagined as direct drivers of economic growth, fueled by human capital and research-based innovation (Marginson, 2023). For instance, universities in developed countries take economic advantages from their counterparts in developing countries through recruitment of international students, transnational programs and franchise campuses. This focus on economic gain often overshadows the importance of international development cooperation and capacity-building initiatives, particularly for institutions in the developing world (Knight, 2013). Given this context, this paper aims at exploring the motivations, benefits and facing challenges of STEM internationalization at universities in Lao PDR. The analysis is based on policy documents and the perspectives of institutional administrators and academics. This research context is considered unique as Lao PDR remains an under-researched context within the discourse on internationalization in higher education although Lao HEIs have attempted to increase their international cooperation, frequently responding to regional changes like the establishment of the ASEAN Economic Community 2015.

LITERATURE REVIEW

Meaning of Internationalization in Higher Education

Internationalization is a multifaceted concept, with its interpretation and implementation varying across countries and among different stakeholders. This variation is shaped by diverse factors, including priorities, culture, history, politics and available resources (Knight, 2004). Practically operating at national and institutional levels, internationalization involves a range of factors and stakeholders. Given these factors, Knight (2004, p. 11) defines internationalisation as “the process of integrating an international, intercultural or global dimension into the purpose, function or delivery of post-secondary education.” This definition highlights the integration of international and intercultural dimensions across all areas of institutional life without specifying beneficiaries or outcomes. Building on this, de Wit et al. (2015, p. 29) refined the definition, describing it as “the intentional process of integrating an international, intercultural or global dimension into the purpose, functions and delivery of post-secondary education, in order to enhance the quality of education and research for all students and staff and to make a meaningful contribution to the society.” This revised definition presents internationalization as a purposeful mechanism for improving the quality, inclusivity, and social responsibility of HEIs. So, it is essential to move beyond the Western-dominated lens – focusing on commodities, and explore alternative perceptions of internationalization (Hill et al., 2019). In other words, this process can be interpreted uniquely and differently by individuals, institutions, and countries based on their specific goals and contextual factors.

In Southeast Asia, particularly within CLMV countries (Cambodia, Lao PDR, Myanmar, Vietnam), internationalization in HE is widely perceived as a strategy to seize opportunities, access resources, and advance national higher education system (Hill et al., 2019). This perception is evident in country-specific initiatives. In Cambodia, internationalization is considered a modernization process that leads to enhanced academic standards, updated curricula, and greater opportunities for staff and student mobility (Yun, 2014). This ultimate goal is to build human capital and improve country’s regional competitiveness. Similarly, in Vietnam, internationalization is framed in Vietnamese

policy discourse as integration and prioritized in the country's development and reform of higher education (Hoang et al., 2018; Tran et al., 2014). This has led to notable collaboration between Vietnamese and prestigious Western institutions, which provide advanced programs to develop local human resources and meet socio-economic demands (Hoang et al., 2018). These regional trends are reflected in Lao PDR, where recent policies have allowed foreign universities, such as FPT University from Vietnam to partner with local private HEIs to offer joint undergraduate programs to Lao students. Additionally, overseas branch campus is visible in Lao PDR, like Soochow University from China (MOES, 2018). These demonstrate that internationalization functions as a strategic instrument for reinforcing the evolution of the local higher education systems, helping them align with growing demands for local labor market and a globally-oriented education.

Benefits of Internationalization in STEM education

Internationalization in STEM covers a range of activities, policies and curriculum changes designed to integrate global and intercultural dimensions into education, research and engagement. Rather than a peripheral activity, this process has become a core institutional function in HE (Knight, 2012), involving components like student and staff mobility, internationalization at home, internationalization of curriculum, transnational education and program-partnerships. These activities yield a variety of benefits including enhanced educational quality, broader cultural perspectives, and improved global competencies for students and academics. Integration of international content into STEM curricula is crucial in a globalized world, as it helps students understand and appreciate different cultural contexts (Garza, 2021). Furthermore, student and academic mobility provide unique learning opportunities beyond the traditional classroom, fostering immersive cultural and interdisciplinary learning (Jung & Caffarella, 2010; Dickerson et al., 2018). Such experiences can support students' primary research, career interests, and graduation requirements while providing them with a global perspective (Jung & Caffarella, 2010). For some institutions, integrating international experiences into STEM programs is linked to increased graduation rates and higher student engagement in STEM careers (McCormack et al., 2017). Internationalization also facilitates internationalization at home, where students can gain cross-cultural knowledge without traveling abroad (Garza, 2021). Connecting to this, utilizing AI technology for automated translation in English or vice versa notably enhances accessibility of the materials for international students, breaking down the language barriers (Falasca, 2025).

For academics, collaborative research and academic exchanges with international partners can lead to innovative solutions, advancements in STEM fields (Doerry & Charles, 2013), leading to joint publications. This can also create expanded research placement opportunities from experienced institutional partnerships and increase the participation of women and minorities in STEM internationalization efforts (Lum et al., 2016). Many STEM programs now leverage online and international formats, such as virtual mobility, to add value and provide students with unique delivery options outside traditional classroom settings (Dickerson et al., 2018). AI-driven tools break down geographical barriers in international STEM education and enable students to access to international education offering beyond their national borders (Siddiqi, 2025). Altogether, internationalizing STEM education is beneficial for not only students, academics, but also institutions, especially to retain and engage students in academic activities.

Challenges in Internationalization in STEM Education

Despite its benefits, internationalization in STEM programs faces structural, cultural, and logistical impediments that limit participation and prevent not achieve intended learning outcomes. Research highlights several critical barriers like low participation rates, uneven access to international opportunities, and difficulties with assessment, integration, and sustainability of agreements (Lantada & Sevillano, 2017). A major concern is that internationalization, particularly student mobility, often attracts already-advantaged students. Underrepresented STEM students require proactive measures, such as tailored programming and dedicated financial support (Lum et al., 2016). Due to the nature of their disciplines, STEM students are less likely to actively seek out or show interests in student exchange programs abroad compared to their peers in social sciences (Sisavath, 2021). Additionally, personal factors, such as family obligations, can deter students from participating in mobility programs (Almukhambetova & Kuzhabekova, 2022), thereby exacerbating existing disparities in participation among STEM students.

At institutional level, newly established or smaller universities frequently struggle to negotiate attractive agreements and manage the complexities of credit recognition and student integration (Lantada & Sevillano, 2017). Furthermore, the sustainability of international programs is vulnerable to external factors. Funding cuts and geopolitical shifts can abruptly disrupt in-person mobility and expose institutional dependencies on external partners or foreign funding (Szyszlo & Kimpolo, 2023). While technological advancements have led many HEIs to implement virtual activities, online and hybrid formats present new challenges for organizing and managing field experiences, particularly STEM fields, which need hand-on experience (Dickerson et al., 2018). In developing contexts like Lao PDR, specific challenges further hinder internationalization. These include a lack of English proficiency among students and academics, a limited number of inbound students, and lack of credit transfer system (Hill et al., 2019).

RESEARCH METHOD

This research employed a qualitative research approach (Creswell, 2013) to inquire what HEIs have done to internationalize their STEM education. It utilized a two-tiered approach to data collection. First, a documentary review was conducted, drawing on national and institutional strategic plans and media coverages to establish the current context of STEM education and internationalisation practices at the institutional level. Second, semi-structured interviews were conducted with 29 stakeholders, including two university leaders, four senior international relation officials, and twenty-three academics (i.e., deans, vice deans, professors). Participants were selected from four public universities in Lao PDR based on specific criteria: (a) have experienced with international activities either at home or abroad, (b) be involved in STEM program development and management, and/or (c) teach STEM disciplines. The interviews were administrated through both oral and written formats during 2020 – 2023 via face-to-face and online channels (e.g., phone calls, ZOOM Meetings) to accommodate participants' availability. The questions were designed to investigate their perceptions regarding the drivers, benefits and challenges of internationalizing STEM fields.

The collected interview data were prepared for analysis using thematic analysis, a systematic method for identifying, analyzing, and reporting patterns within data (Braun &

Clarke, 2006). The six-step process, performed manually, began with data familiarization, which involved reading all interview transcripts multiple times to immerse the researcher in the data. Following familiarization, initial codes were generated by highlighting significant words, phrases, and statements. This process helped to simplify the data and focus on specific characteristics relevant to the research question (Nowell et al., 2017). These initial codes were then revisited, reviewed, and collated into meaningful groups to form emergent themes. To ensure reliability and trustworthiness of findings, an iterative process was employed. This involved repeatedly revisiting the data and connecting it with the emerging themes to refine key points and understandings (Srivastava & Hopwood, 2009). The final themes were then defined and named to accurately reflect the core ideas presented in the data. When reporting the findings, direct quotes from participants' responses are used to provide illustrative evidence. The quotes are formatted with a simple convention: a "P" for "Participant," followed by a number (e.g., P1, P2) to maintain anonymity while allowing for traceability.

FINDINGS AND DISCUSSION

An analysis of diverse data sources revealed that internationalization in STEM programs in Lao HEIs is primarily driven by academic rationales aimed at meeting local demands, accessing external resources and aligning with global developments toward further modernizing academic programs and management, and integrating into regional and global communities. Despite financial constraints and challenges within higher education system, internationalization practices offered benefits for students, academics, and institutions across multiple dimensions.

Key Drivers and Forms of Internationalization in STEM Education

Recognizing their developmental context, Lao universities embraced an "open door" policy for international academic cooperation, which is fundamental to building HE system in Lao PDR (Hill et al., 2019; Knight, 2013). This strategy aimed at boosting institutions' global visibility and seizing opportunities to secure external resources essential for building human and institutional capacity to meet regional and international standards. Consequently, universities actively expand international partnerships and networks (Sisavath, 2021), supported by the Lao HE policy to strengthen academic and research activities through collaboration with public, private, and international organizations (MOES, 2020).

Data analysis revealed four key rationales driving the internationalization in STEM programs in Lao HE. First, a primary driver was the institutional commitment to enhancing academic quality for students. Collaboration with foreign partners, particularly through practices like twinning program, co-teaching, co-supervision, and joint curriculum development, directly enriches educational content and elevates academic qualifications. It is because Lao national qualification framework was designed aligning with the ASEAN qualification framework (Hill et al., 2019). Second, universities prioritized research excellence, evidenced by the establishment of centers of excellence in fields such as environmental science, engineering, agriculture and logistics (MOES, 2011). These centers played a role in facilitating international research collaboration and fostered a more robust research culture. Third, it is an economic imperative, meaning that the government's economic agenda exerted significant pressure on universities to advance science and

technology (MOES, 2020). The establishment of National Science Council and encouraging students to pursue STEM studies abroad underscore this national priority. Notably, international partnerships for STEM programs were increasingly driven by a strategic focus on attracting more domestic students, which use scholarships as an incentive. For examples, NUOL collaborates with a Chinese university to offer a twinning undergraduate program in Artificial Intelligence (AI). Under this collaboration, students receive scholarships from the Chinese partner to complete a portion of their studies in China. Fourth, the ASEAN Economic Community's skilled labor mobility policy, implemented in 2015, has created a demand for graduates with a global mindset and intercultural competence. Consequently, the academic community recognized that proficiency in foreign languages, intercultural understanding, and strong communication skills are becoming crucial for STEM graduates to thrive in this new professional landscape.

In terms of practice, four major forms of internationalization in STEM programs were identified. The first and most prevalent form is student mobility, providing STEM students with opportunities to gain international experience through activities such as exchange programs, international internships, and summer camps. The second form is academic mobility and collaboration, which is particularly common in sciences and engineering disciplines. This includes activities like visiting scholar programs, international collaborative research projects, co-supervision of graduate students, and participation in international conferences and workshops. The third form, internationalization at home, serves as an alternative for students unable to travel abroad. Examples include blended workshops, lectures by international guest speakers, and Collaborative Online International Learning (COIL) initiatives. These hybrid international activities are particularly accelerated by the COVID-19 pandemics (Dickerson et al., 2018), which highlighted the need for resilient, inclusive policy and diversified funding streams for internationalization (Hardiman et al., 2022; Szyszlo & Kimpolo, 2023). Given this form, notably technology is redefining pedagogical methods, enabling instructors to leverage diverse teaching approaches (e.g., research-based teaching, design thinking) in STEM-related courses and utilize digital resources. This access to online or international partner institutions' databases, often facilitated by international academic cooperation in terms of sharing scholarly resources. The capacity to implement these technology-supported methods, even with limited preparation time, enhances learning, particularly when students have direct access to digital resources and instructors can implement in the classroom setting (Golegou et al, 2026). The fourth form involves international partnerships in STEM, becoming increasingly prominent through the establishment of joint technical training centers and industry collaborations with international dimensions. These forms collectively illustrate the diverse strategies employed at universities in Lao PDR to enhance the global engagement of STEM education and research.

Benefits of Internationalizing STEM education

Benefits for students and academics

Internationalizing STEM education provided students and academics with a broader knowledge and exposure to diverse teaching and research methodologies and ultimately enhance their transferable skills. These benefits improve their employability, providing access to international job markets and helping them develop valuable global professional

networks, which would lead to innovative solutions and advancements in STEM fields (Doerry & Charles, 2013).

Enriching academic knowledge

Based on academics' interview data, internationalizing STEM education enhanced academic development of students and academics across multiple domains. A key finding was that students selected for mobility programs were often academically exceptional. Some were groomed for potential roles as faculty members in the future, indicating a strategic investment in developing future educators. These students gained valuable technical and transferable skills, such as improved English language proficiency and an expanded global perspective from their exposure to diverse cultural and academic environments. Furthermore, participation in internships abroad or with foreign direct investment (FDI) companies at home strengthened soft skills such as communication, problem-solving, and teamwork. This is important because Lao students need both hard and soft skills to enhance their employability (MOES, 2020).

“At our faculty, the 4th year students are placed for internships for 2-3 months at Vietnamese and Thai factories at the economic zone. There, they learn about industrial production and chemical substance mixture which link to our lesson taught in classes” (P8)

The analysis also highlighted those international activities conducted locally, such as IT workshops, internship and robotic competitions led by international specialists, provide an accessible alternative for students to improve their technical expertise and English language skills without traveling abroad.

Developing professional and global networks

Staff mobility and international collaboration provided benefits to academics, transcending individual professional development to impact their home institutions and students. Through engagement with foreign partners, academics forged cooperative relationships with labor market stakeholders. This exposure to international best practices also led to the adoption of new teaching methodologies. As such directly contributes to increasing the quality of teaching and innovative approaches, such as project-based learning, hybrid and COIL. This process would promote internationalization at home, enabling students to acquire international perspectives, understand and appreciate different cultures (Garza, 2021). Furthermore, interviewees agreed that these experiences enhanced academics' specialized knowledge, English language proficiency, and global perspective. The networks built during these collaborations also empower them to pursue larger-scale projects, such as writing grant proposals with international partners for research and capacity building projects. Altogether, these efforts create a globally-oriented educational environment that academics would equip students with essential skills like communication and teamwork through innovative teaching methodologies, ultimately boosting graduate employability. As one academic who experienced staff mobility abroad said:

“I took part in the teaching mobility. Notably, students don't sit and listen to professors like us. Mostly, students present what has been assigned.” (P1)

Benefits for Higher Education Institutions

Collaborating internationally offered advantages for institutions, bolstering their academic quality by enhancing research capabilities, increasing publication output, and fostering curriculum innovation. This collaboration also strengthened the institution's reputation and resources, leading to greater prestige and potential for new funding streams. Moreover, it provided faculty development opportunities through promoting professional growth and enriching the academic environment.

Enhancing academic quality

Internationalizing STEM fields offered benefits to universities by enhancing academic quality on multiple aspects. International projects and collaborations with foreign partners, particularly within the ASEAN region, provided a crucial opportunity to revise existing curricula, ensuring they are more compatible with regional standards. This compatibility allowed universities, with technological advancements, implementing innovative teaching approaches, such as COIL and virtual learning or workshops. This corroborates a previous study (Siddiqi, 2025) that AI and immersive tools, such as virtual and augmented reality, are transforming global STEM pedagogy. These technologies eliminate geographical barriers and increase access to hands-on learning and foster cross-cultural teamwork. In addition, universities hosted foreign specialists as visiting professors further enriches these programs, reflecting the university's commitment to academic excellence. Furthermore, mobility programs for both students and staff directly addressed the lack of on-site experimental facilities. By providing access to international laboratories, students were able to conduct scientific research experiments, applying theoretical knowledge in a practical setting. In academics' opinion, this experience was highly valued by industries that require graduates with hands-on skills in operating machinery and conducting experiments. Meanwhile, instructors are also to be empowered in order to guarantee the successful adoption of AI digital technologies in pedagogical redesign. With requisite tools, creative autonomy, and institutional supports, instructors can co-design transformative learning experiences for students to explore beyond their classroom (Falasca, 2025). Altogether, internationalization leads to an overall improvement in the academic quality of departments and institutions.

“For example, we teach theories for our students, but we send them to exchange at our partners in Thailand and Vietnam, for experiment at their laboratories and prepare their thesis experiment.” (P7)

“We collaborate with our partners in Thailand and Japan. It is essential for our research, as we can access specialized laboratories and equipment to conduct experiments on our samples. This is crucial for our work in fields such as biochemistry, animal anatomy, where we lack sufficient in-house resources.” (P20)

Strengthening reputation and resources

Drawing from the interview data, international partnerships were not merely a goal but a foundational component of institutional strategy. The strategy is driven by a dedicated

task force within international offices/divisions and supported by strong leadership commitment. Those offices function as a taskforce to convert policy into practices and embed internationalization within the departments and divisions (Sisavath, 2021). This is to ensure these partnerships led to tangible benefits, including new cooperation agreements and diversification of funding streams. The collaboration resulted in the provision of IT equipment, such as drones, robotic parts, and electronic machinery, and the establishment of technical training centers and laboratories, which directly enhance teaching, learning, and administrative functions of universities.

Beyond the institutional benefits of resources, internationalization impacted the institutional reputation. According to the interview data, student participation in international activities—both local and global—enhanced their technical and transferable skills, thereby improving graduate employability and contributing to national development. These students also acted as university ambassadors to share about their experience at the university, attracting new student cohorts. Furthermore, faculty and student engagement in international activities, widely publicized on social media, enhanced the university’s image and encouraged broader participation. The data further suggested that mobility programs fostered long-term research and investment networks in Lao PDR as beneficiaries forged networks during the programs.

Increasing faculty development opportunities

The analysis of interview data revealed a strategic focus on enhancing academic qualifications and fostering international engagement to benefit faculty development. University leadership leveraged scholarship opportunities to improve faculty credentials, aiming to achieve a 3:6:1 ratio of doctoral, master’s, and bachelor’s degree holders, respectively. Previous research (e.g., Knight, 2013; Sisavath, 2024) showed that Lao universities leveraged international cooperation for scholarships to upgrade qualifications of their academics and staff.

“Our university is a member of the ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN-SEED-net), which provide our faculty members and researchers with several opportunities. These include scholarships for master’s and PhD programs abroad, as well as support for organizing international conference where they can share research findings and widen networks for collaboration.”
(P8)

Furthermore, academics accessed various professional development opportunities abroad, including short courses, conferences, workshops, and training programs on specialized subjects, R&D management, and industry collaboration. These internationalizing activities were instrumental in raising awareness of benefits of internationalization, thereby encouraging greater participation despite language barriers. For instance, academics actively utilized their professional networks to organize collaborative activities and secure funding.

Challenges for Internationalizing STEM Education

Based on the analysis of interview data, three major challenges emerged, including curricula difficulties, financial constraints, and bureaucratic obstacles. First, student mobility, particularly outbound semester exchange programs, faces academic and administrative challenges. A critical barrier was the rigidity of curricula, which offer limited elective courses and fixed course systems, which complicates the credit transfer process. This credit recognition is often complicated, resulting in discouraging students to study abroad (Lantada & Sevillano, 2017). In Lao PDR, this issue was compounded by a lack of understanding among academics regarding credit transfer regulations and unavailable of practical guidance for credit transfer. The data also revealed an imbalance in mobility, with a predominance of outbound over inbound students, largely attributed to the limitation of international or English-medium instruction programs. Furthermore, the relevance of existing curricula, particularly in STEM programs, were constrained by a disconnect from industry needs and a lack of contextual adaptability. For academics, the limited experience in modern science education, specifically in course design and assessment methodologies, further contributed to these curricular and systemic challenges.

“Recently, under the Erasmus+ Programme, our universities have developed authentic assessment frameworks for engineering and teacher education. However, a critical challenge remains in practices: a lack of understanding among academics regarding effective course design, student workload management, and class management necessary for the successful implementation of these authentic assessment measures.” (P3)

Second, despite a strong institutional commitment in policy and a positive attitude among academics, the full internationalization in STEM education was hindered by financial constraints. Current international programs and collaborations were largely reliant on external funding from partner institutions and international agencies, such as the European Union, ASEAN University Network, Japan International Cooperation Agency, and Korea International Cooperation Agency. This heavy reliance on external assistance raises serious concerns about the long-term sustainability of STEM initiatives, including the suspension of projects. For example, a digitalization in HE supported by USAID was cancelled due to shifts in donor policy. Funding cut and geopolitical shifts can disrupt in-person mobility and expose institutional dependencies on external partners or foreign funding (Szyzlo & Kimpolo, 2023). This financial precarity underscores a critical vulnerability in internationalization efforts, suggesting that without internal funding streams, these collaborations are unlikely to be sustained.

Third, top-down management and bureaucratic system posed impediments to the progress of academic and research collaborations. These structural issues often create delays, hindering the timely execution of international projects and activities, including permission for grant proposals. This reflects the fact that while governments provide administrative and financial support for international activities, they often limit the autonomy of institutions and academics in implementing these practices (Hill et al., 2019). Furthermore, a substantial administrative burden was placed on academics tasked with international responsibilities. These tasks limit their capacity to focus on core academic

research and engagement in international activities. One participant highlighted how workload of academics affects international collaboration:

“At present, our academics face excessive workload as they are wearing many hats. This is a critical challenge, resulting in inability to meet deadline for deliverables related to international project collaborations.” (P13)

Practices and Emerging Models for Internationalizing STEM Education

Pedagogical innovation for internationalizing STEM education

Since 2017, NUOL has partnered with University A in Japan on the Global Dormitory Program with Regional Collaboration (G-DORM) Project. This initiative brings together Science and Technology (SciTech) students from Japan and the Mekong region (i.e., Cambodia, Lao PDR, Thailand, Vietnam) to participate in co-creative dormitory-style group work. The project offers various exchange program for students conduct group work (GW) – short-term (10 days), medium-term (2 months), and long-term (6–12 months) – which include a crucial group work internship component and COIL programs. These internships are offered in collaboration with Niigata regional companies that possess international development capabilities (including local subsidiaries in the Mekong region). These opportunities expose students to different societies and provide them with a first-hand understanding of industrial change, learn from international faculty and engage with peers from different countries.

This collaboration is strategic to enhance STEM students by fostering intercultural competence and technical skills through embedded activities and authentic work environments. Participation in the G-DORM project strengthens students’ research skills, teamwork, and leadership abilities while broadening their social-scientific perspective. Concurrently, academics involved in the COIL program improve their capacity for cross-border collaboration. Ultimately, this collaboration model aims to cultivate global SciTech leaders capable of solving regional revitalization issues from an integrative standpoint. By combining an industry-academia approach, multi-disciplinary thinking, and an international mindset, this program prepares human resources for economic development in the ASEAN+3 and the broader context of HE in Asia.

Blended learning for internationalizing STEM education

Since 2018, NUOL has partnered with University B in South Korea to participate in the UNESCO-UNITWIN Educational Program. This collaboration aims to empower women through intensive, five-day workshops focused on ICT, digital skills, and leadership. The program provides annual training for 20–40 female undergraduate students, primarily from computer science and engineering programs, in Python programming which is a language fundamental to programming and widely used in AI and Data Science. The workshops conducted both on-site at NUOL and online by University B’s professors, offer a unique opportunity for students to learn from international professors and engage with peers from other universities as the online classes are concurrently conducted with other participating universities. Outstanding participants are offered scholarships to attend an advanced workshop in South Korea. This initiative exemplifies internationalization at home, utilizing a blended workshop format and virtual collaboration platforms to enhance students’ digital proficiency, English language skills,

time management, communication, teamwork, and problem-solving abilities—competencies highly sought after in the Lao labor market and essential for future professional success.

University-industry collaboration for internationalizing STEM education

Since 2023, NUOL has partnered with a local skill training center and Japanese entrepreneurial association to establish a paid internship program. This initiative allows agriculture, science, and engineering students to complete a 6- to 12-month internship at manufacturing and food processing facilities in Japan. This program provides students with practical experience, exposure to a new work culture, and improved skills in Japanese and English. These skills give students a competitive advantage in Lao labor market. Beyond fostering STEM internationalization through university-industry collaboration, this partnership strengthens the bilateral relationship between Lao PDR and Japan, aligning with Japan's efforts for human resource development in Lao PDR.

CONCLUSION

In a context of limited resources, universities in Lao PDR have strategically adopted an “open door” policy to enhance their international visibility and access new funding streams. As this study demonstrates, internationalization in the developing world can serve as a critical instrument for improving educational quality and aligning with regional and global advancements. While internationalization in STEM education—through initiatives such as student mobility, research collaboration, internationalization at home, and strategic partnerships—offers substantial benefits to academics, students, and institutions, its implementation is fraught with challenges. These findings highlight that systemic obstacles, particularly bureaucratic processes, can hinder the full realization of these benefits. Moving forward, it is essential to evaluate emerging models for internationalizing STEM education. The findings underscore a need for greater equity in collaborations, particularly between institutions in the developed and developing world. This is crucial to ensure that internationalization efforts lead to inclusive practices and contribute to creating truly equitable educational and research opportunities on a global scale.

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