

Chinese Language and Culture Learning in Belt and Road Contexts: A Post-Pandemic Study of Russia and Uzbekistan

Pang Lianyun^{1,*}, Miriam Leah Ivanenko¹, Shakhrizoda Abdujabborova¹

¹ Kunshan Duke University, Kunshan 215316, China

*Corresponding Author

Pang Lianyun

Lianyun.pang@dukekunshan.edu.cn

Received: 17 February 2025 / Accepted: 7 January 2026 / Published online: 17 January 2026

Abstract

Against the backdrop of the continued advancement of the Belt and Road Initiative (BRI), the dissemination of the Chinese language and Chinese culture has increasingly become a crucial component of “soft connectivity” in transnational cooperation. Taking Russia and Uzbekistan as comparative cases, this study draws on questionnaire survey data supplemented by follow-up interviews to examine the strategies, challenges, and social impacts of Chinese language and culture dissemination in BRI-participating countries. The findings reveal four key patterns. First, the dissemination of the Chinese language and culture has developed into a multi-pathway configuration jointly shaped by institutional platforms and everyday social contact spaces, significantly enhancing social visibility. Second, although young people generally hold positive attitudes toward learning Chinese, learning trajectories are often short-lived, with a clear pattern of “many beginners but few long-term learners,” reflecting structural challenges related to learning sustainability and advanced support. Third, cultural understanding tends to remain at the level of observable differences, while deeper cultural interpretation requires sustained interaction and systematic learning. Fourth, while the COVID-19 pandemic expanded access to learning through online modalities, it also intensified inequalities in interaction quality and learning support. From a comparative perspective, Russia and Uzbekistan differ significantly in motivational structures, frequency of contact, and awareness of policy support, indicating that the effectiveness of Chinese language and culture dissemination is highly contingent on national contexts. This study argues that the key to effective dissemination in BRI-participating countries lies in the systematic integration of diverse dissemination pathways, enabling a meaningful transition from initial exposure to be sustained learning and deeper cultural understanding.

Keywords: Chinese as a Foreign Language; Learning Motivation; Learning Persistence; Intercultural Competence

1. Introduction

Since the Belt and Road Initiative (BRI) was proposed by China in 2013, it has aimed to promote cross-regional infrastructure development, economic cooperation, and policy coordination. As the initiative has evolved, the BRI has gradually expanded from an economically oriented framework into a comprehensive platform encompassing mobility, institutional alignment, and socio-cultural interaction (Dunford, Liu, & Society, 2019; Johnston & Studies, 2019; Rolland, 2017; Summers, 2016). Within this process, language and cultural exchange has increasingly been recognized as a key dimension of “soft connectivity” supporting the long-term sustainability of the BRI (Costa, 2020; Y. J. S. Gao, 2020; Gu & Schweisfurth, 2015; Xu, 2021)

As BRI-related cooperation deepens, large-scale infrastructure projects, corporate investments, and cross-border collaborations are often accompanied by sustained interactions between Chinese actors and host societies. These interactions not only facilitate the flow of capital and technology but also increase the social visibility of the Chinese language and culture, creating practical conditions for language learning, cultural activities, and everyday intercultural contact. Previous research has emphasized that language and culture dissemination is not a one-way transmission but a process that must be locally embedded within specific national contexts, with outcomes highly dependent on institutional environments, social acceptance, and interaction mechanisms (Gu & Schweisfurth, 2015; Hartig, 2015)

Within the field of international Chinese language dissemination, Confucius Institutes and related educational exchange mechanisms are widely regarded as key institutional platforms. On the one hand, studies have acknowledged their contributions to curriculum provision, teacher training, and cultural programming (Gil, 2017; Zhao, Huang, & Practice, 2010); On the other hand, scholars have also highlighted the institutional controversies and divergent public perceptions they encounter across national contexts (Hubbert & review, 2014; Paradise, 2009). Meanwhile, an emerging body of research has drawn attention to the fact that the dissemination of the Chinese language and culture increasingly occurs beyond formal classrooms, extending into everyday spaces such as corporate activities, consumption sites, and community interactions (Gil, 2017; Hartig, 2015). However, existing studies tend to examine institutional platforms and everyday contact spaces separately, with limited systematic analysis of how these pathways interact within specific national contexts.

From the learner perspective, second language acquisition research suggests that instrumental motivations—such as economic returns and employment prospects—are effective in attracting learners at the entry stage but do not necessarily ensure sustained learning engagement. Long-term learning persistence often depends on stable learning pathways, high-quality advanced support, and continuous opportunities for meaningful interaction (Dörnyei & self, 2009; Gardner, 1985). Within

the BRI context, the instrumental value of learning Chinese has increased substantially, yet tensions between initial interest and long-term commitment remain widely observed (X. Gao, Zheng, & Development, 2019).

The outbreak of COVID-19 further reshaped the structural conditions of cross-border education and cultural exchange. While border restrictions and reduced mobility weakened face-to-face interaction and immersive learning environments, the pandemic also accelerated the development of online instruction and digital resources. In the post-pandemic context, Chinese language and culture dissemination has exhibited a dual pattern of enhanced accessibility alongside increasingly differentiated learning experiences, the long-term implications of which remain underexplored at the national level (Ghosh & Jing, 2020; Giacometti & Wøien Meijer, 2021; Kurowska-Pysz; Wang, Zhan, & Liu, 2022).

In summary, existing research reveals three main gaps. First, studies on BRI-participating countries often focus on single national or institutional cases, with limited cross-national comparison (Rolland, 2017); Second, the internal connections among dissemination strategies, structural challenges, and social impacts remain insufficiently theorized. Third, the lived experiences and perceptions of young people in the post-pandemic context lack systematic empirical examination. To address these gaps, this study adopts Russia and Uzbekistan as comparative cases and employs questionnaire surveys supplemented by interviews to analyze the strategies, challenges, and impacts of Chinese language and culture dissemination in BRI-participating countries.

Specifically, the study examines: (1) the institutional and social pathways through which the Chinese language and culture enter the everyday lives of young people; (2) the structural constraints related to learning sustainability, resource provision, and cultural understanding; and (3) the ways in which dissemination practices shape young people's attitudes, motivations, and perceptions in the post-pandemic context. By comparing Russia and Uzbekistan in terms of geopolitical positioning, language education ecologies, and resource distribution, this study aims to deepen understanding of dissemination mechanisms under the BRI framework and to provide empirical insights for international Chinese education and cultural exchange.

2. Research Methodology

2.1. Sample Selection

This study adopts a purposive sampling strategy, selecting Russia and Uzbekistan as comparative cases. Purposive sampling is commonly used in exploratory and cross-cultural research, as it allows researchers to obtain information-rich cases within specific contexts (Creswell & Clark, 2017; Patton, 2014). The selection is not merely based on their shared participation in the Belt and Road Initiative, but on their representation of two structurally distinct modes of Chinese language and culture dissemination.

In Russia, Chinese learning has increasingly been embedded within existing foreign language education systems and employment-oriented frameworks. Chinese courses are institutionally integrated into higher education curricula and linked to professional development and labor market demands, resulting in relatively stable learning pathways. In this context, learning Chinese is often driven by instrumental motivations related to career advancement.

In contrast, Chinese language learning in Uzbekistan remains in an expansionary and developmental phase. Although regional cooperation and BRI-related exchanges have increased social interest in Chinese language and culture, institutionalization remains limited. Learning opportunities are more frequently shaped by cultural interest, symbolic value, and informal or semi-formal channels, with fewer clearly articulated long-term learning pathways.

This structural contrast enables the study to examine how different configurations of institutional support and motivational orientation shape learning participation, persistence, and depth of cultural understanding, offering a more analytically grounded comparison than single-country studies.

The survey targeted host-country citizens aged 18–22, a group typically enrolled in higher education and significantly affected by educational disruptions during the COVID-19 pandemic. Moreover, as a future labor force cohort, their attitudes toward language learning and educational choices provide insight into the long-term sustainability of Chinese language learning, especially the structural tension between initial interest and sustained engagement(Dörnyei & self, 2009).

A total of 160 questionnaires were distributed, and 150 valid responses were collected (75 from each country), yielding an effective response rate of 93.75%. In addition, semi-structured interviews were conducted with 20 respondents (10 in each country), including both learners and non-learners.

2.2. Research Design and Data Collection

A mixed-methods research design was employed, combining online questionnaires with follow-up interviews. Mixed-methods approaches allow researchers to identify overall trends while contextualizing quantitative findings through qualitative data, making them particularly suitable for exploratory and cross-cultural studies (Creswell & Clark, 2017; Valsiner, 2000; Wilkinson, Ferraro, & Kemp, 2017).

The questionnaire was developed based on established research on second language motivation, learning persistence, and intercultural contact (Dörnyei & self, 2009; Gardner, 1985), with items adapted and contextualized for the BRI and post-pandemic setting. Additional items were self-designed to capture everyday exposure to Chinese language and culture and perceptions of institutional support.

Representative items included questions on learning duration, learning motivation, frequency of contact with Chinese language or interlocutors, and perceived accessibility of learning resources. The questionnaire was distributed through online and offline channels, including social media platforms and direct contacts. Interviews focused on learning trajectories, perceived barriers to sustained

learning, experiences during and after the pandemic, and expectations regarding advanced courses and learning pathways.

2.3. Reliability, Validity, and Data Analysis

Internal consistency reliability was assessed using Cronbach's alpha. The overall scale demonstrated good reliability ($\alpha = 0.82$), with subscale values ranging from 0.74 to 0.85. Content validity was ensured through reference to established theoretical frameworks and expert review.

Descriptive statistics were used to illustrate overall trends. Independent-samples t-tests were conducted to examine cross-national differences in learning duration, motivation, contact frequency, and resource awareness ($p < .05$). Interview data were analyzed using inductive thematic analysis to support interpretation. Given the modest sample size, the analysis emphasizes pattern identification and cross-national comparison, providing directions for future large-scale and inferential research (Creswell & Clark, 2017).

3. Results

3.1. Current Status of Chinese Learning and Learning Duration

Survey results indicate clear cross-national variation in respondents' engagement with Chinese learning. Among Russian respondents, both learners and non-learners were represented, with 45.3% reporting no systematic study of Chinese. Regarding learning duration, the largest proportion consisted of learners with less than one year of experience (33.3%), followed by those with one to three years (17.3%), while only a small minority reported more than eight years of study (4%). Overall, the distribution suggests relatively broad entry-level participation but limited persistence at advanced stages.

In Uzbekistan, non-participation in systematic Chinese learning was even more pronounced, with 68.9% reporting no formal learning experience. Moreover, the proportion of learners with one to three years of experience was lower than that in Russia, indicating a steeper drop-off beyond the beginner stage. Independent-samples t-tests reveal a statistically significant difference between the two countries in reported learning duration ($p < 0.05$), confirming that Russian respondents are more likely to have sustained exposure to Chinese than their Uzbek counterparts.

Across both contexts, the results point to a consistent empirical pattern: Chinese learning is often characterized by short learning trajectories rather than long-term progression. While initial access to Chinese learning opportunities appears relatively available, the transition from initial engagement to sustained learning remains structurally weak.

3.2. Learning Interest and Motivation

Respondents in both countries expressed generally positive attitudes toward learning Chinese, though motivational structures differed. In Russia, 69.3% reported interest in learning Chinese, while

12% expressed a lack of interest. A high proportion of Russian respondents reported multilingual backgrounds (87.32% speaking two or more languages), which may correspond to broader openness toward additional language learning. In Uzbekistan, approximately 60% also reported interest in learning Chinese, indicating favorable attitudes despite lower participation rates.

Employment prospects emerged as the most frequently cited motivation in both samples, though the strength of endorsement differed significantly between the two countries (Russia: 68.57%; Uzbekistan: 55.56%; $p < 0.05$). In contrast, cultural motivation—specifically interest in understanding Chinese culture—was more prominent among Uzbek respondents (48.15%) than among Russian respondents (31.43%), a difference that was also statistically significant ($p < 0.05$).

These findings suggest that instrumental and cultural motivations coexist rather than function as mutually exclusive categories. However, positive motivation alone does not guarantee sustained learning. Even among respondents with strong interest, learning trajectories often remained short, indicating a potential gap between motivational orientation and the availability of structured learning pathways capable of supporting long-term engagement.

3.3. Visibility of Chinese Enterprises and Cultural Presence

Respondents in both countries reported increased visibility of Chinese-related presence in daily life, though perceived levels differed. In Russia, only 17.6% reported no noticeable increase in Chinese enterprise visibility, whereas in Uzbekistan approximately 35% reported no such change, reflecting fewer or less salient exposure opportunities. This difference between the two samples was statistically significant ($p < 0.05$).

When asked to identify concrete forms of Chinese presence, respondents most frequently mentioned Chinese restaurants and cafés, educational and training institutions, and Chinese grocery stores. These findings indicate that Chinese language and culture are increasingly encountered through everyday social and commercial spaces rather than solely through formal educational channels.

The results further suggest that visibility operates across multiple low-threshold contact domains—such as food consumption, commerce, and informal learning markets—which may stimulate awareness and curiosity even among non-learners. However, increased visibility does not necessarily translate into sustained learning or deeper cultural understanding, highlighting the distinction between exposure and educational engagement.

3.4. Contact Frequency, Resource Awareness, and Pandemic Effects

Most respondents reported some degree of contact with Chinese people or the Chinese language, but contact frequency varied significantly between the two contexts. In Russia, only 16.4% reported no such contact, compared to approximately 36% in Uzbekistan ($p < 0.05$). This suggests that Russian respondents are more likely to encounter Chinese language or interlocutors through daily routines, potentially due to differences in urban internationalization and mobility patterns.

Perceptions of policy support and resource accessibility further illuminate structural conditions for learning. In Uzbekistan, 40% of respondents perceived support for Chinese as weaker than that for other foreign languages, whereas approximately 40% of Russian respondents perceived Chinese as receiving relatively stronger support. Across both samples, “moderate accessibility” of learning resources was the most frequently selected category, indicating neither acute scarcity nor easy abundance.

Open-ended responses and interview data repeatedly referenced shortages of qualified teachers and limited access to advanced-level resources. Importantly, several respondents explicitly noted that while online learning opportunities expanded during the COVID-19 pandemic, reduced face-to-face interaction weakened opportunities for sustained engagement and meaningful cultural exchange. Thus, the pandemic appears to have simultaneously increased access while intensifying differentiation in learning quality and support.

3.5. Cultural Difference and Similarity Perceptions

Open-ended responses indicate that respondents more readily articulated cultural differences than similarities. Frequently cited differences included food preferences, social etiquette, and interaction styles. Some respondents relied on observable behaviors, such as speaking volume in public spaces, or broad cultural labels, such as collectivism, to describe perceived contrasts.

In contrast, similarities were mentioned less frequently and with greater hesitation, though recurring themes included tea-drinking practices, respect for tradition, and diligence as a shared value. This imbalance suggests that respondents are more confident in describing salient and visible differences than in articulating shared cultural logic or deeper interpretive understanding.

This finding does not aim to establish a novel claim but empirically confirms patterns widely observed in second language learning literature within the specific BRI post-pandemic context. Overall, the results suggest that increased exposure has not yet been systematically translated into stable interpretive frameworks supporting deeper intercultural understanding.

4. Discussion

Drawing on comparative data from Russia and Uzbekistan, this study examines the strategies, challenges, and impacts of Chinese language and culture dissemination in BRI-participating countries within the post-pandemic context.

First, the persistent pattern of “many beginners but few long-term learners” reflects a structural tension between instrumental motivation and learning sustainability. While employment prospects and economic cooperation effectively attract initial learners, sustained engagement requires stable learning pathways, advanced-level support, and alignment with learners’ longer-term educational and professional identities (Dörnyei & self, 2009; Gardner, 1985). In both contexts, entry-level access is

relatively widespread, whereas advanced courses and progression mechanisms remain limited, constraining long-term commitment.

Second, the findings demonstrate that dissemination operates through multiple parallel pathways combining institutional platforms and everyday social contact spaces. Formal institutions provide foundational instruction, while enterprises, restaurants, and community spaces enhance social visibility. However, increased visibility alone does not automatically produce deeper cultural understanding. Without structured learning support, contact risks remaining episodic and superficial, yielding limited long-term educational impact.

Third, the predominance of difference-oriented cultural narratives highlights a gap between cultural display and cultural interpretation. Intercultural competence research emphasizes that deeper understanding emerges through sustained interaction, guided reflection, and meaning making rather than through sporadic exposure (Deardorff, 2006). The findings suggest that existing dissemination practices have expanded awareness but have not consistently facilitated these deeper processes.

The COVID-19 pandemic further intensified these dynamics. While online instruction expanded access and lowered entry barriers, reduced face-to-face interaction and immersive environments made it easier for learners to remain at short-term participation levels. This dual effect aligns with broader findings in pandemic-era language education research, in which accessibility increased alongside differentiation in learning quality (Wang et al., 2022).

Finally, cross-national differences between Russia and Uzbekistan underscore the importance of national context. Russia's stronger integration of Chinese into foreign language education systems and employment frameworks amplifies instrumental motivation, whereas Uzbekistan exhibits relatively stronger cultural interest amid constraints in institutional support. These contrasts caution against treating BRI-participating countries as a homogeneous group and highlight the value of comparative approaches in understanding dissemination outcomes.

Overall, while diverse dissemination strategies are in place, their impact remains largely confined to enhanced visibility and positive attitudes. Transforming exposure into sustained learning and deeper cultural understanding requires systematic integration of pathways, stronger progression mechanisms, and expanded opportunities for meaningful interaction.

5. Conclusion

Focusing on BRI-participating countries, this study adopts Russia and Uzbekistan as comparative cases and based on questionnaire surveys supplemented by interviews, systematically examines the strategies, challenges, and social impacts of Chinese language and culture dissemination in the post-pandemic context. Despite significant differences in political environments, language ecologies, and education systems, several shared structural features emerge.

At the strategic level, dissemination has expanded beyond formal education systems to form a multi-pathway configuration combining institutional platforms, economic activities, and everyday social contact spaces. This diversification enhances social visibility and lowers barriers to initial exposure among young people. However, the findings indicate that visibility alone is insufficient to support sustained learning or deeper cultural understanding unless these pathways are meaningfully connected.

At the level of challenges, the study reveals a structural tension between increased interest and limited long-term persistence. While instrumental motivations linked to employment prospects and economic cooperation effectively strengthen initial attraction, insufficient advanced courses, the absence of clearly articulated learning pathways, and limited opportunities for sustained and meaningful interaction often confine learning to the introductory stage. As a result, cultural understanding remains largely concentrated on observable differences, reflecting constraints on the depth of intercultural engagement.

At the level of impact, dissemination practices have contributed to more positive attitudes toward Chinese language and culture and heightened initial interest among young people, yet these effects remain uneven. Social visibility and contact frequency tend to increase more rapidly than learning sustainability and cultural depth. The COVID-19 pandemic has acted as an amplifier in this process, simultaneously expanding access through digitalization while intensifying inequalities in learning experiences and support.

From a comparative perspective, Russia and Uzbekistan demonstrate that there is no single model for effective dissemination. Outcomes depend heavily on geopolitical positioning, language education traditions, and resource allocation. Russia tends to integrate Chinese into existing foreign language education systems and employment-oriented frameworks, whereas Uzbekistan exhibits relatively stronger cultural interest alongside developmental constraints in institutional and curricular support.

Building on these findings, the study suggests that improving dissemination effectiveness requires moving beyond fragmented exposure toward more coherent and sustainable learning structures. This entails designing advanced courses that integrate language proficiency development with cultural and professional content, establishing clearer progression pathways linking introductory and advanced stages, and expanding opportunities for in-depth interaction through project-based learning, community engagement, and sustained exchange initiatives.

In conclusion, this study argues that the effectiveness of Chinese language and culture dissemination in BRI-participating countries depends less on the number of strategies employed than on whether diverse pathways can be systematically connected. Only by transforming initial exposure into coherent learning trajectories and deeper cultural understanding can long-term dissemination outcomes be meaningfully enhanced in the post-pandemic context.

Author Contributions:

Lianyun pang: designing, writing—original draft preparation, writing—review and editing. Miriam Leah Ivanenko: investigation and do some basic data analysis. Shakhrizoda Abdujabborova: investigation and do some basic data analysis.

Funding:

Not applicable.

Institutional Review Board Statement:

Ethical review and approval were waived for this study due to its minimal risk nature. The research involved anonymous questionnaire surveys and voluntary follow-up interviews with adult participants, without the collection of identifiable personal or sensitive information. The study did not involve any intervention or manipulation, and all participants provided informed consent prior to participation.

Informed Consent Statement:

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement:

Not applicable.

Acknowledgments:

The authors would like to thank the Duke Kunshan University Student Research Scholars (SRS) Program for its support of this research.

Conflict of Interest:

The authors declare no conflict of interest.

Reference

Costa, C. M. (2020). The words of the belt and road initiative: A Chinese discourse for the world? In The Belt and Road Initiative: An old archetype of a new development model (pp. 23-44): Springer.

Creswell, J. W., & Clark, V. L. P. (2017). Designing and conducting mixed methods research: Sage publications.

Deardorff, D. K. (2006). Identification and assessment of intercultural competence as a student outcome of internationalization. *Journal of studies in international education*, 10(3), 241-266.

Dörnyei, Z. J. M., language identity, & self, t. L. (2009). The L2 motivational self system, 36(3), 9-11.

Dunford, M., Liu, W. J. C. J. o. R., Economy, & Society. (2019). Chinese perspectives on the Belt and Road Initiative, 12(1), 145-167.

Gao, X., Zheng, Y. J. J. o. M., & Development, M. (2019). Multilingualism and higher education in Greater China. In (Vol. 40, pp. 555-561): Taylor & Francis.

Gao, Y. (2020). How the Belt and Road Initiative informs language planning policies in China and among the countries along the road. *Sustainability*, 12(14), 5506.

Gardner, R. C. J. (1985). Social psychology and second language learning: The role of attitudes and motivation.

Ghosh, R., & Jing, X. (2020). Fostering global citizenship through student mobility: COVID-19 and the 4th wave in internationalization of education. *Beijing International Review of Education*, 2(4), 553-570.

Giacometti, A., & Wøien Meijer, M. (2021). Closed borders and divided communities: Status report and lessons from Covid-19 in cross-border areas. *Nordregio*.

Gil, J. (2017). Soft power and the worldwide promotion of Chinese language learning: The Confucius Institute project (Vol. 167). *Multilingual Matters*.

Gu, Q., & Schweisfurth, M. (2015). Transnational connections, competences and identities: Experiences of Chinese international students after their return 'home'. *British Educational Research Journal*, 41(6), 947-970.

Hartig, F. (2015). Chinese public diplomacy: The rise of the Confucius Institute. Routledge.

Hubbert, J. (2014). Ambiguous states: Confucius Institutes and Chinese soft power in the US classroom. *PoLAR: political and legal anthropology review*, 37(2), 329-349.

Johnston, L. A. (2019). The Belt and Road Initiative: what is in it for China?. *Asia & the Pacific Policy Studies*, 6(1), 40-58.

Kurowska-Pysz, J. (2021). Analysis of changes in the barriers to cross-border educational projects—the COVID-19 pandemic effect.<https://d-nb.info/126517315X/34>

Paradise, J. F. (2009). China and international harmony: The role of Confucius Institutes in bolstering Beijing's soft power. *Asian survey*, 49(4), 647-669.

Patton, M. Q. (2014). Qualitative research & evaluation methods: Integrating theory and practice. Sage publications.

Rolland, N. (2017). China's Eurasian century?: Political and strategic implications of the belt and road initiative. National Bureau of Asian Research.

Summers, T. (2016). China's 'New Silk Roads': sub-national regions and networks of global political economy. *Third World Quarterly*, 37(9), 1628-1643.

Valsiner, J. (2000). Data as representations: Contextualizing qualitative and quantitative research strategies. *Social science information*, 39(1), 99-113.

Wang, Y., Zhan, H., & Liu, S. (2022). A comparative study of perceptions and experiences of online Chinese language learners in China and the United States during the COVID-19 pandemic. *Journal of China Computer-Assisted Language Learning*, 2(1), 69-99.

Wilkinson, L. R., Ferraro, K. F., & Kemp, B. R. (2017). Contextualization of survey data: What do we gain and does it matter?. *Research in human development*, 14(3), 234-252.

Xu, C. (2021). Research on the Soft Power of Cross-border Language and Culture in the Core Area of the Belt and Road Initiative. Paper presented at the 7th International Conference on Humanities and Social Science Research (ICHSSR 2021).

Zhao, H., & Huang, J. (2010). China's policy of Chinese as a foreign language and the use of overseas Confucius Institutes. *Educational Research for Policy and Practice*, 9(2), 127-142.

License: Copyright (c) 2025 Author.

All articles published in this journal are licensed under the Creative Commons Attribution 4.0 International License (CC BY 4.0). This license permits unrestricted use, distribution, and reproduction in any medium, provided the original author(s) and source are properly credited. Authors retain copyright of their work, and readers are free to copy, share, adapt, and build upon the material for any purpose, including commercial use, as long as appropriate attribution is given.