

Classifying Opportunities for Lifelong Learning in Satun Through the Geo Camp Project: A Community-Driven Model of Education

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Abstract

This study investigates how learning environments can be developed in Satun, Thailand, recognized both as a UNESCO Global Geopark and an emerging Learning City, through the implementation of the Geo Camp Project. Drawing on an action research framework, the study examines two years of field interaction with local communities, aiming to classify critical factors that drive learning and uncover new educational opportunities. The conceptual model is built around the intersection of three domains: learner profiles, learning content, and learning experiences. This classification reveals that people-to-people interaction and context-based content, particularly in geo-science and geo-culture, are essential to Satun's educational character. Through qualitative observation and analysis, the research highlights how Satun's untapped local knowledge, especially narratives rooted in "Geo-culture," fosters both community awareness and engagement. Geo Camp emerged as a co-created program designed and implemented by local stakeholders. It supports experiential, place-based learning while stimulating civic participation and local pride. Moreover, it acts as a strategic catalyst, influencing local government to adopt policies that align with lifelong learning principles and quality tourism development. This paper argues that such community-centered initiatives can serve as scalable models for other rural learning cities in Asia. Geo Camp's classification model, integrating learner diversity, local content, and immersive experience, offers a practical framework to empower underserved communities through inclusive and sustainable learning ecosystems.

Keywords: lifelong learning, learning city, geopark, geo camp, community-based education

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Introduction

Satun, Thailand, is internationally recognized as a UNESCO Global Geopark and is simultaneously advancing toward becoming a Learning City. These dual designations highlight the area's rich geo-science heritage and diverse geo-cultural knowledge embedded within local communities. Despite this abundance of place-based knowledge, transforming such assets into accessible and continuous learning opportunities for people of different ages, backgrounds, and cultural groups remains a persistent challenge.

While geo-science and geo-cultural knowledge is deeply rooted in Satun, existing learning environments often struggle to translate this knowledge into engaging forms of lifelong learning. The challenge lies not in the availability of content, but in how learning is activated through interaction, place-based experience, and the active participation of local actors. This challenge is particularly evident in Satun's multicultural context, where learning must respond to diverse learner profiles and lived experiences. In response to these challenges, this study examines how learning environments can be developed through community-driven processes using the Geo Camp Project as a research platform. Drawing on an action research approach and two years of field engagement, the study focuses on identifying the key conditions that enable learning to emerge across diverse groups and settings.

The study aims to explore why the transmission of geo-based knowledge into lifelong learning practices remains challenging in Satun, and to identify the critical factors that influence learning engagement within community-based educational initiatives. By examining the relationships between learner profiles, learning content, and learning experiences, the research develops a conceptual framework that explains how these elements interact to form a functional learning ecosystem. Through this classification, the study seeks to articulate how local knowledge and community participation can be mobilized to support lifelong learning and contribute to the development of Satun as a Learning City with an inclusive and sustainable learning environment.

By articulating these relationships, the study contributes to a deeper understanding of how local knowledge, community participation, and experiential learning can be aligned to strengthen lifelong learning in practice. The findings are intended to inform not only Satun's ongoing development as a Learning City, but also to offer a scalable, community-centered model for other rural and geopark-based learning cities in Asia.

Literature Review

Lifelong Learning and Learning Ecosystems

Lifelong learning is widely recognized as a key mechanism for developing learning ecosystems that support continuous learning across formal, non-formal, and informal contexts. According to UNESCO, lifelong learning emphasizes the integration of learning into everyday life, communities, workplaces, and urban environments, thereby extending learning beyond institutional boundaries (UNESCO, 2015). This perspective highlights learning as a systemic process shaped by interactions among individuals, organizations, and socio-cultural contexts.

The literature consistently shows that effective learning ecosystems emerge when lifelong learning is supported through multi-stakeholder collaboration, including educational institutions, local authorities, civil society, and the private sector (König & Evans, 2013). Such

ecosystems are characterized by flexibility, accessibility, and responsiveness to local needs, enabling individuals to navigate diverse learning pathways throughout their lives (OECD, 2018). In this regard, lifelong learning functions not only as an individual learning process but also as a structural framework that aligns policies, spaces, and resources toward sustainable learning development (UNESCO Institute for Lifelong Learning [UIL], 2021). Geopark as a Learning Platform (Revised – Smooth Version).

UNESCO Global Geoparks are increasingly understood as learning platforms that integrate geo-science knowledge, cultural heritage, and community engagement. Beyond conservation, geoparks support education and public awareness by interpreting Earth heritage through place-based and participatory approaches that connect scientific knowledge with local contexts (UNESCO, 2015; UNESCO, n.d.). In this sense, geoparks are frequently conceptualized as open-air learning environments that support experiential, informal, and lifelong learning for diverse audiences, extending learning opportunities beyond formal education systems (Farsani et al., 2011; Henriques et al., 2011).

Information further highlights that geoparks facilitate informal and non-formal learning for a wide range of learners, including local residents, students, and visitors. Zouros (2004) emphasizes the role of geoparks in linking geological heritage with education and local development, particularly in rural areas, while Farsani et al. (2011) underscore their potential to support learning through geotourism and community-based interpretation. By embedding learning within everyday experiences and local identity, geopark-based initiatives align closely with the principles of lifelong learning and inclusive learning ecosystems (Henriques et al., 2011).

Place-Based Education

Place-Based Education (PBE) provides a strong pedagogical foundation for learning city development in contexts where local heritage, environment, and community knowledge function as central learning resources. PBE is commonly defined as an educational approach that uses the local community and environment as the primary context for teaching and learning, emphasizing experiential, real-world engagement and fostering meaningful relationships between learners and their places (Sobel, 2004). By grounding learning in familiar settings, PBE enhances relevance and supports deeper engagement through community participation, intergenerational knowledge exchange, and the integration of local expertise into the learning process (Smith & Sobel, 2010).

A critical extension of this approach is articulated through Greenwood and Gruenewald's concept of a "critical pedagogy of place," which argues that place-based learning must attend not only to ecological dimensions but also to cultural, social, and political contexts. This perspective encourages educators and learners to examine how power relations, identities, and historical narratives shape the meanings of place and influence whose knowledge is recognized and valued (Greenwood, 2008; Gruenewald, 2003). Such a critical lens is particularly important in multicultural regions, where learning design should move beyond treating local knowledge as a fixed resource to be transmitted, and instead support participatory meaning-making and respectful representation of diverse cultural perspectives.

Recent applications of place-based education have further expanded beyond natural or rural settings into urban contexts, reinforcing the idea that learning can occur throughout the city. The notion that "every part of the city can function as a classroom" reflects an evolving

understanding of place-based learning rooted in everyday urban experience. An illustrative example is the *Wandering Challenge*, initiated by Anny Chang, co-founder of City Wanderer, which applies gamification to city-based learning activities for youth development. Through experiential missions designed to promote self-exploration, social interaction, and active engagement with urban environments, the project demonstrates how thoughtfully designed activities can transform ordinary city spaces into meaningful learning settings. Such city-based, experiential tasks broaden the definition of learning spaces beyond schools, libraries, or museums, while fostering skills and competencies that are difficult to cultivate within conventional classroom contexts (TK Park, 2022).

Together, these perspectives position place-based education as a flexible and context-responsive framework that connects learning to lived experience, supports diverse learner engagement, and provides a critical foundation for designing inclusive learning environments within learning cities.

Theoretical Integration for the Geo Camp Context

Taken together, the reviewed theoretical perspectives establish a coherent framework for understanding Geo Camp as an experimental learning intervention situated within a geopark-based learning city. Lifelong learning provides the foundational rationale for positioning learning as a continuous, inclusive process that extends beyond formal education and is embedded in everyday life and community participation (UNESCO, 1996). Within this perspective, Geo Camp is conceived not merely as an educational activity, but as a mechanism for activating lifelong learning among diverse groups through direct engagement with local knowledge and lived experience.

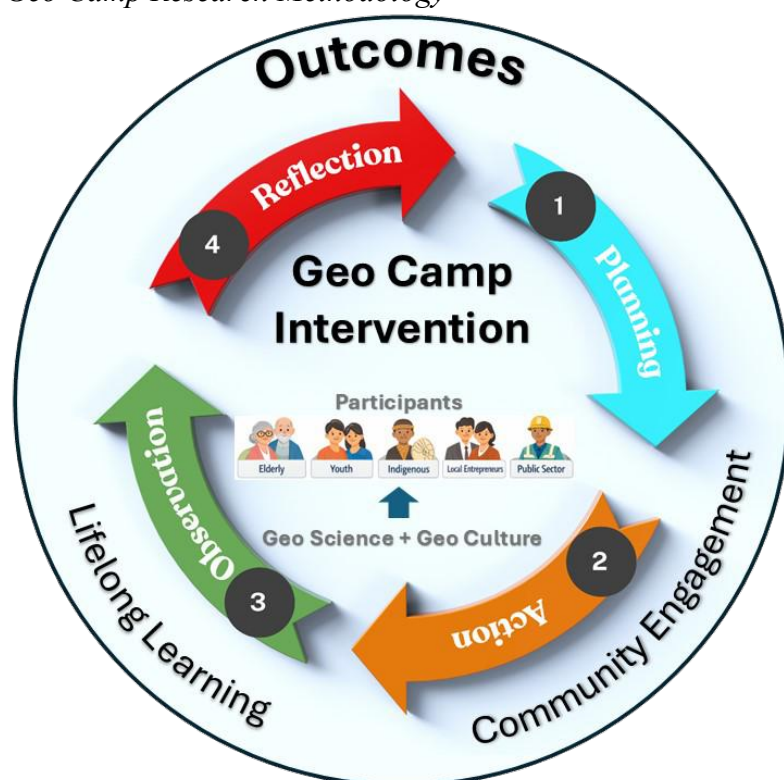
The learning city framework further situates Geo Camp within a broader learning ecosystem, emphasizing the role of coordinated actors, local governance, and community partnerships in shaping learning opportunities. Rather than operating as a stand-alone program, Geo Camp functions as a connective platform that links institutions, communities, and learning spaces, reflecting the system-level orientation of learning city development (UNESCO Institute for Lifelong Learning [UIL], 2015).

At the pedagogical level, place-based education explains how Geo Camp grounds learning in local relevance through experiential and participatory approaches. By engaging learners directly with geo-scientific sites, cultural narratives, and community practices, Geo Camp aligns with principles of place-based learning that emphasize meaning-making through real-world contexts (Sobel, 2004). The critical pedagogy of place further informs the design of Geo Camp by foregrounding cultural and ecological sensitivity, participatory knowledge production, and respect for diverse identities—an essential consideration in Satun’s multicultural context (Greenwood, 2008; Gruenewald, 2003).

Finally, geopark frameworks provide the territorial and conceptual foundation that enables Geo Camp to function as a learning experiment within a real-world setting. UNESCO Global Geoparks position geological and cultural heritage as resources for education, public awareness, and sustainable development, while prior studies emphasize their role as open-air learning environments supporting informal and lifelong learning (Farsani et al., 2011; UNESCO, 2015). Within this context, Geo Camp serves as a practical testing ground for examining how learner diversity, locally grounded content, and immersive learning experiences interact to generate meaningful learning outcomes.

Methodology

Figure 1
Geo Camp Research Methodology



Research Design

This study adopts an action research framework combined with qualitative inquiry to investigate how learning environments can be developed within the context of a geopark-based learning city. The research was conducted over a two-year period through iterative cycles of planning, action, observation, and reflection, with the Geo Camp Project serving as the primary research intervention. Rather than treating Geo Camp as a standalone educational program, the study positions it as an experimental platform for examining learning processes embedded in local contexts.

Research Context and Participants

Geo Camp was designed as an experiential learning intervention that connects knowledge embedded within the Satun UNESCO Global Geopark, integrating both geo-science knowledge and, with particular emphasis, geo-cultural knowledge. In this study, geo-culture is understood as an integral part of everyday life in the local context, rather than as a discrete or abstract form of heritage. The project adopts a community-driven, lifelong learning-oriented, and place-based education approach, guided by the central research question: How can learning within a geopark context be designed to enable diverse groups of people to become lifelong learners, and how can the city function as a genuine learning ecosystem?

Participants were intentionally recruited from diverse social groups to reflect the multicultural character of Satun and the principles of lifelong learning. These groups included older adults; children and youth; local Indigenous people (such as the Maniq); members of community

enterprises and local entrepreneurs; personnel from public organizations and learning spaces; as well as members of the general public, with initial participation focusing on residents of Satun Province.

Figure 2

Diverse Social Groups of Participants in Geo Camp



Children and Youth

Older Adults

Maniq (local Indigenous people)

Members of Community

Over a two-year period, a total of 284 participants took part in six Geo Camp cohorts. Participants were engaged not only as learners but also as co-creators of learning activities, contributing local knowledge, perspectives, and experiences to the design and implementation of the Geo Camp program.

Geo Camp as a Community-Driven Learning Intervention

Geo Camp was collaboratively designed and implemented with local stakeholders to support experiential and place-based learning grounded in geo-science and geo-culture. Learning activities emphasized people-to-people interaction, field-based exploration, storytelling, and collective reflection, enabling participants to engage directly with local knowledge and lived experience while fostering community awareness, engagement, and local pride.

The program was structured as a two-day learning experience. The first day focused on geo-science through hands-on exploration at selected geopark sites and geo-learning spaces, where participants observed and examined real rock samples and fossils. These activities introduced key geo-science concepts through direct sensory engagement, supported by purpose-designed learning technologies such as online games, short digital clips, and interactive modules developed specifically for Geo Camp.

Figure 3
Learners Visit Geopark Sites for Geo-Science Learning in Geo Camp



The second day focused on geo culture through city walking and community-based learning activities. Participants explored culturally significant places and engaged in dialogue with residents who shared stories and lived experiences connected to specific sites. Learning was mediated through storytelling rather than formal instruction, helping learners understand the links between geological landscapes, cultural practices, livelihoods, and local identity. This approach positioned people and places as primary learning resources and enabled geo cultural knowledge to be experienced through social interaction and participation.

Figure 4
Learners Participate in a City Walk Activity to Explore Geo-Culture in Geo Camp



By structuring Geo Camp in this way, the learning design intentionally contrasted tangible geo-science exploration with the more interpretive and relational nature of geo-cultural learning. This combination enabled learners to move beyond factual understanding toward deeper place-

based awareness, empathy, and cultural understanding, while enhancing meaningful engagement, civic awareness, and local pride.

Data Collection and Analytical Framework

Data were collected through qualitative methods aligned with the action research approach, including participant observation during Geo Camp activities, documentation of learning materials and participant-generated outputs, reflective discussions, and short semi-structured interviews with selected learners. Formative pre- and post-activity learning checks, together with collaborative tasks and presentations, were used to explore changes in participants' understanding of geo-science and geo-cultural concepts rather than to assess standardized achievement.

Data analysis focused on identifying and classifying key conditions that enable learning to emerge within the local context. Using thematic analysis, observational data, interview reflections, and learning outputs were examined through a conceptual framework comprising learner profiles, learning content, and learning experiences, with particular attention to the role of context-based content and people-to-people interaction in shaping meaningful learning experiences.

Role of Geo Camp in Model Development

Geo Camp played a central role in the development of the conceptual model presented in this study by functioning as both a learning intervention and a research mechanism. Through repeated implementation across multiple cohorts, Geo Camp provided a real world setting in which learning processes could be observed, tested, and refined within the context of a geopark based learning city. While the overall learning structure comprising exploration, interaction, reflection, and co creation was consistently applied, the specific activities remained iterative and flexible, allowing them to be adapted to different learner groups as well as the spatial and geo cultural characteristics of each location visited.

Insights from Geo Camp activities revealed how learner diversity, locally grounded learning content, and immersive learning experiences interact to shape meaningful learning outcomes. Learning tasks were flexibly adjusted to participants' backgrounds and site-specific contexts, demonstrating how learning opportunities could be systematically classified rather than treated as isolated activities. Grounded in participants lived experiences, the analysis translated empirical observations into a context-responsive model that highlights people-to-people interaction and geo-cultural knowledge as key drivers of engagement, positioning Geo Camp as both an educational platform and a testing ground for a scalable, community-driven approach to lifelong learning in geopark and rural learning city contexts.

Results

Learner Profiles Identified Through Geo Camp

The results indicate that age plays a significant role in shaping learning patterns and learning opportunities among Geo Camp participants, with different learner groups demonstrating distinct interests, learning approaches, and roles. Children and youth tended to engage most actively with playful and interactive activities such as game-based learning, digital tools, and

hands-on exploration at geo-science learning sites. These activities supported rapid understanding of geoscientific concepts through direct experiential engagement.

In contrast, older adults and adult community members primarily contributed as holders of local narratives, cultural knowledge, and everyday histories. Their learning emerged through conversation, experience sharing, and storytelling related to multicultural practices and local identity. Within Geo Camp activities, adults frequently assumed roles as storytellers and interpreters, connecting specific places with broader social and cultural contexts.

Observations revealed that Geo Camp enabled intergenerational learning integration, in which children and youth shared knowledge related to fossils, technology, and learning games, while adults transmitted geo-cultural knowledge through lived experiences and narrative practices. In some cases, children produced creative outputs that were refined through guidance from adults, reflecting a reciprocal learning process that bridges age gaps and supports mutual knowledge construction.

Taken together, these results demonstrate how learner profiles function as a critical factor in the classification of learning opportunities, and how geo-science and geo-cultural content is activated and transmitted through people-to-people interaction across generations. This classification of learner roles provides a foundation for the subsequent analysis of learning content activated through the Geo Camp activities.

Types of Learning Content: Geo Science and Geo-Culture

The results show that learning content activated through Geo Camp emerged as context-based content grounded in both geo-science and geo-culture, with geo-cultural knowledge playing a particularly prominent role. While geo-science concepts such as rocks, fossils, and geological processes were introduced through hands-on and field-based activities, these elements were consistently connected to local stories and lived experiences.

One recurring activity across all Geo Camp cohorts was a batik dyeing workshop using natural pigments derived from locally grown plants within the geopark area. This activity enabled participants to engage with geo-science knowledge related to natural dyes and color processes, while simultaneously expressing geo-cultural meanings through fossil-inspired patterns rooted in local textile traditions. Through this process, scientific concepts were embedded within culturally meaningful creative practices rather than presented as abstract knowledge.

Observations and learner reflections further indicate that geo-cultural content shaped how participants made sense of what they learned, particularly during activities involving city walking, interaction with community members, storytelling, and collaborative making. Participants frequently linked scientific observations with narratives related to local history, livelihoods, beliefs, and multicultural practices, allowing learning to extend beyond factual understanding toward shared meaning and local identity.

Across different cohorts, learning content was activated primarily through people-to-people interaction rather than formal instruction alone, with geo-cultural narratives functioning as a bridge between geo-science knowledge and everyday life. These forms of content were most frequently activated through activities such as city walking and craft-based workshops, indicating a close relationship between the nature of learning content and the design of learning experiences. Taken together, these results demonstrate that the integration of geo-culture and

geo-science constitutes a critical factor in the classification of learning opportunities, as it shapes how learners engage with content, interpret knowledge, and relate learning to everyday life. Rather than encountering scientific concepts in isolation, participants experienced learning as a connected process in which scientific understanding was continuously reinforced through cultural narratives, local practices, and social interaction.

Learning Experiences and Interaction Patterns

The results indicate that learning experiences generated through Geo Camp were experiential, participatory, and socially embedded, emerging through direct engagement with places, people, and activities rather than formal instruction alone. Across cohorts, learning experiences were shaped through geographical site exploration, city walking, collaborative making, storytelling, and group reflection.

Activities such as city walking and community interaction transformed urban and geopark spaces into active learning environments, enabling learners to connect geo-science observations with geo-cultural contexts through movement, dialogue, and situated encounter, while also enhancing intergenerational conversations among participants. Craft-based workshops further supported immersive learning by facilitating people-to-people interaction and collaborative knowledge construction across age groups.

While the overall experiential structure remained consistent, learning activities were adapted to different learner profiles and site contexts. As a result, these experiences supported sustained engagement and active participation, demonstrating how experiential and place-based education approaches activate diverse learning opportunities within a geopark-based learning city. Taken together, these experiential patterns inform the subsequent findings on how learning opportunities are classified and sustained within the Geo Camp model.

Findings

Analysis of data generated through the Geo Camp Project reveals how opportunities for lifelong learning in Satun emerged through the interaction of learner diversity, locally grounded learning content, and immersive learning experiences. Rather than functioning as a fixed educational program, Geo Camp operated as a repeated yet adaptive learning process, in which learning structures were consistently applied while specific activities evolved in response to different learner groups and spatial contexts. Four key findings are presented below.

Learner Diversity and the Transformation of Learning Roles

One key finding is that Geo Camp enabled participants from diverse age groups and backgrounds—including children, youth, older adults, and community members—to move beyond passive learning roles. Across different cohorts, learners demonstrated increased agency through participation, dialogue, and collaborative tasks. Differences in age, experience, and social roles did not hinder learning; instead, learner diversity functioned as a critical factor that enriched interaction and collective meaning-making. This finding highlights how varied learner profiles contribute to the classification of learning opportunities within a community-driven learning environment.

Geo-Cultural Learning as a Catalyst for Meaningful Engagement

Findings indicate that geo-cultural learning played a central role in sustaining learner engagement, particularly during activities that involved storytelling, walking-based exploration, and direct interaction with local residents. While geoscientific concepts were effectively introduced through hands-on engagement with rocks, fossils, and geo sites, participants consistently emphasized that learning through people, places, and lived narratives made the experience more meaningful. Geo-culture emerged as a form of context-based learning content that connected knowledge to everyday life, local identity, and shared memory, fostering emotional connection, community awareness, and motivation to continue learning.

People-to-People Interaction and Immersive Learning Experiences

Another significant finding concerns the role of people-to-people interaction in shaping immersive learning experiences. Learning frequently occurred through conversation, observation, and shared reflection rather than through instruction alone. Activities such as group discussions, city walking, and collaborative presentations transformed natural and urban spaces into active learning environments.

Observations show that these interactions often led to deep and meaningful conversations, particularly when children and youth expressed curiosity about local culture and history. Adults and older community members responded enthusiastically, viewing these exchanges as opportunities to transmit knowledge accumulated through lived experience. Many of the stories shared were not formally documented, allowing learners to access localized and exclusive forms of knowledge that could only be conveyed through direct interpersonal interaction. This finding highlights how people-to-people interaction supports immersive learning and enables knowledge transmission beyond formal learning contexts.

Geo Camp as an Adaptive Learning Process

A further key finding highlights the adaptive and scalable nature of the Geo Camp process, which enables it to be scaled up and scaled out to other sites and communities. While the core learning structure comprising exploration, interaction, reflection, and co creation was consistently applied, specific activities were flexibly adapted to different learner profiles, local geo cultural characteristics, and spatial contexts.

This adaptability allowed Geo Camp to function as a transferable learning process rather than a site-specific program, supporting the extension of learning opportunities across multiple locations. As a result, Geo Camp demonstrates how a community-driven, place-based intervention can contribute to a functional learning ecosystem that supports lifelong learning and advances the realization of a learning city in practice.

Discussion

This study set out to examine why the transmission of geo-based knowledge into lifelong learning practices remains challenging in Satun, and to identify the critical factors that shape learning engagement within community-based educational initiatives. The findings suggest that learning opportunities in a geopark-based learning city do not emerge from content delivery alone, but from the dynamic interaction between learner diversity, context-based

learning content, and experiential learning processes that are activated through people-to-people interaction.

One of the most significant insights concerns the nature of learner diversity in Satun. While age differences are often assumed to be the primary factor influencing learning engagement, the findings indicate that background, worldview, and lived experience play a more decisive role. In a multicultural context that includes ethnic groups such as the Maniq, differences in belief systems, modes of communication, and everyday practices can make mutual understanding difficult to achieve through explanation alone. Certain forms of knowledge cannot be fully translated across cultural boundaries; they must be encountered through shared experience. In this sense, Geo Camp did not eliminate these differences but created learning situations in which diversity became a productive condition, enabling learners to engage with unfamiliar perspectives without requiring complete cognitive alignment.

The findings also highlight the pedagogical complexity of geo-cultural learning. For participants from outside the community, geo-culture often appeared novel and exciting, whereas for local participants it was frequently perceived as familiar and therefore less interesting. This paradox reveals that geo-culture is not inherently engaging; its educational value depends heavily on how it is mediated. Deep storytelling across generations emerged as a crucial mechanism for reactivating interest, particularly when narratives were conveyed by experienced community members who could situate cultural knowledge within lived histories. However, storytelling alone was often insufficient, especially for younger learners with limited attention spans. The integration of hands-on activities and experiential learning proved essential for sustaining engagement, suggesting that geo-culture functions not merely as content but as a high-skill pedagogical practice that requires careful design and facilitation.

People-to-people interaction further emerged as a central driver of immersive learning experiences, though the findings challenge the assumption that such interaction occurs naturally. While moments of deep conversation were observed when children expressed genuine curiosity about local culture and history, participation was uneven and highly dependent on facilitation. The presence of trained Learning Administrators played a critical role in sustaining meaningful dialogue by initiating topics, bridging generational perspectives, and maintaining conversational continuity. Importantly, these Learning Administrators were developed from within the local community through targeted training, demonstrating that such human infrastructure can be cultivated locally. This finding underscores that effective people-to-people learning relies not only on social proximity but also on intentional mediation.

The adaptive and scalable nature of the Geo Camp process provides further insight into how community-driven learning initiatives can contribute to learning city development. While specific activities varied according to learner profiles, site conditions, and local contexts, the underlying learning structure remained consistent. This process-oriented design allowed Geo Camp to be scaled up and scaled out across different locations without replicating activities verbatim. However, scalability was shown to depend on more than pedagogical design alone. The readiness of learning spaces, availability of tools and technology, and institutional cooperation among local stakeholders were critical in ensuring that learning remained engaging, safe, and accessible. Without such support, even well-designed learning content risked becoming exhausting rather than empowering.

The limitations of this study are therefore not primarily related to the training of skilled facilitators or Learning Administrators, which proved achievable within the local context. A

more fundamental challenge lies in the recognition of geo-culture as a valuable form of knowledge. In some cases, geo-culture continues to be perceived as ordinary or outdated rather than as a source of identity formation and economic potential. This limited recognition can constrain the willingness of communities and institutions to invest in geo-cultural learning, despite its demonstrated capacity to generate both social value and income. Addressing this challenge requires a shift in perception, positioning geo-culture not as background heritage but as a living resource for learning and development.

The findings suggest that Geo Camp represents more than a localized educational program. It functions as a living experiment in how learning ecosystems can be activated through community participation, place-based content, and adaptive learning processes. By demonstrating how learner diversity, geo-cultural meaning-making, and people-to-people interaction intersect in practice, this study contributes to a deeper understanding of how geopark-based initiatives can support lifelong learning and advance the realization of learning cities as socially embedded and responsive systems.

Conclusion

This study demonstrates that the development of effective learning environments in Satun as a geopark-based learning city depends not solely on the availability of geo-science or geo-cultural knowledge, but on how learning is activated through interaction, experience, and community participation. Findings from the Geo Camp Project show that meaningful learning emerges through the dynamic interplay of learner diversity, context-based learning content, and immersive learning experiences. Learners of different ages and backgrounds contributed to and benefited from intergenerational knowledge exchange, transforming diversity into a key asset rather than a limitation.

Geo-cultural learning played a central role in enhancing engagement by connecting scientific knowledge to everyday life, local identity, and shared memory. However, the study reveals that geo-culture is not inherently engaging and must be carefully mediated through storytelling, hands-on activities, and experiential learning design. People-to-people interaction was identified as a critical driver of learning, though such interaction required intentional facilitation. Trained local Learning Administrators were essential in bridging generational perspectives and sustaining meaningful dialogue.

As an adaptive and community-driven process, Geo Camp functioned not as a fixed program but as a scalable learning framework that could be applied across different sites and learner groups. Overall, the study positions Geo Camp as a practical model for activating inclusive learning ecosystems, offering valuable insights for geopark-based and rural learning cities seeking to strengthen lifelong learning through place-based and community-centered approaches.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The author declares that generative AI and AI-assisted technologies were used in the writing process of this manuscript for language-related purposes only, including grammar and spelling correction, paraphrasing for conciseness, and refining sentence structure to improve clarity and alignment with the intended meaning. The use of these tools did not involve the generation of research ideas, study design, data collection procedures, findings, analysis, interpretation, or arguments. All core concepts, research design, data, results, and discussions were originally written and derived from the author's systematic conduct of the research, and the author takes full responsibility for the content of the manuscript.

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