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Validating hybrid training curriculum for primary science teachers: Ubon Ratchathani Geopark study

Chanarak Vetsawat[1], Natthitaporn Chatree[1], Piyaphat Nithitakkharanon[1]
[1]Faculty of Education, Ubon Ratchathani Rajabhat University, Thailand

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ABSTRACT
Science education is essential for helping young students develop science literacy. The study used geopark as a learning resource to get students excited about science. This study develops and validates a training curriculum for primary science teachers by employing the geology course, Ubon Ratchathani Geopark. The findings revealed that the program consisted of 4 modules and it has potential for use in the fields of science education and ecotourism. Students of both Thai and English may benefit emphasizing on scientific communication through junior guides' practices. In this course, teachers can create learning management systems by utilizing geopark resources as real-world media and develop virtual representations. Consequently, the Ubon Ratchathani Geopark serves as the primary location for the integration of information for students who have gained their knowledge through hands-on and mind-on experiences in a natural classroom.

Corresponding Author:
Piyaphat Nithitakkharanon
Faculty of Education
Ubon Ratchathani Rajabhat University
Thailand
Email: piyaphat.n@ubru.ac.th

1. INTRODUCTION

The transformation of education in digital era is now has significantly altered expectations regarding teachers' professional competencies (Alenezi et al., 2023; Abulibdeh et al., 2025). Science teachers are increasingly required not only to possess strong content knowledge in science but also, they have integrated digital technologies into the classroom (Sengamalam, 2022; Krishnan et al., 2023). Students should have science literacy and connect scientific concepts with local contexts and real-world issues. In Thailand, science education reform has highlighted the importance of contextualized and experiential learning approaches (Jampaklay et al., 2022; Durongkaveroj, 2023). It enables students to understand scientific phenomena through their surrounding environments by various kinds of methods. Primary school science teachers continue to face challenges in implementing innovative instructional strategies.

Effective professional learning should be continuous, collaborative, practice-oriented, and responsive to teachers' authentic needs of students (Poonputta & Nuangchalerm, 2024). The increasing adoption of digital technologies in the way of learning has encouraged the development of hybrid

training models. It integrates between face-to-face and online learning experiences which offer greater flexibility and accessibility. Hybrid training for teacher profession development has emerged as a promising approach, it integrates the strengths of conventional training and digital learning environments (Purwanto et al., 2025). Through hybrid learning, teachers can participate in synchronous and asynchronous learning activities. They can access diverse educational resources, engage in collaborative reflection, and apply newly acquired knowledge in authentic teaching contexts. Hybrid professional development programs can enhance teachers' pedagogical knowledge (Manciaracina, 2022; Raes, 2022). The instructional competencies and confidence in implementing innovative teaching practices are promoted. It supports sustained professional growth by facilitating ongoing communication among participants beyond the duration of formal training sessions.

In addition, one educational resource with considerable potential for enriching science learning is geopark. The geopark recommended by UNESCO Global Geoparks (2024) are internationally recognized territories that integrate geological heritage conservation. Teachers can engage their students in the learning environment through science education and sustainable community development. Geoparks provide authentic learning environments where scientific concepts can be explored through direct observation and interaction with natural and cultural resources. Educational activities within geoparks encourage students to investigate environmental processes. Students appreciate their local heritage, can develop scientific inquiry skills, and cultivate environmental stewardship.

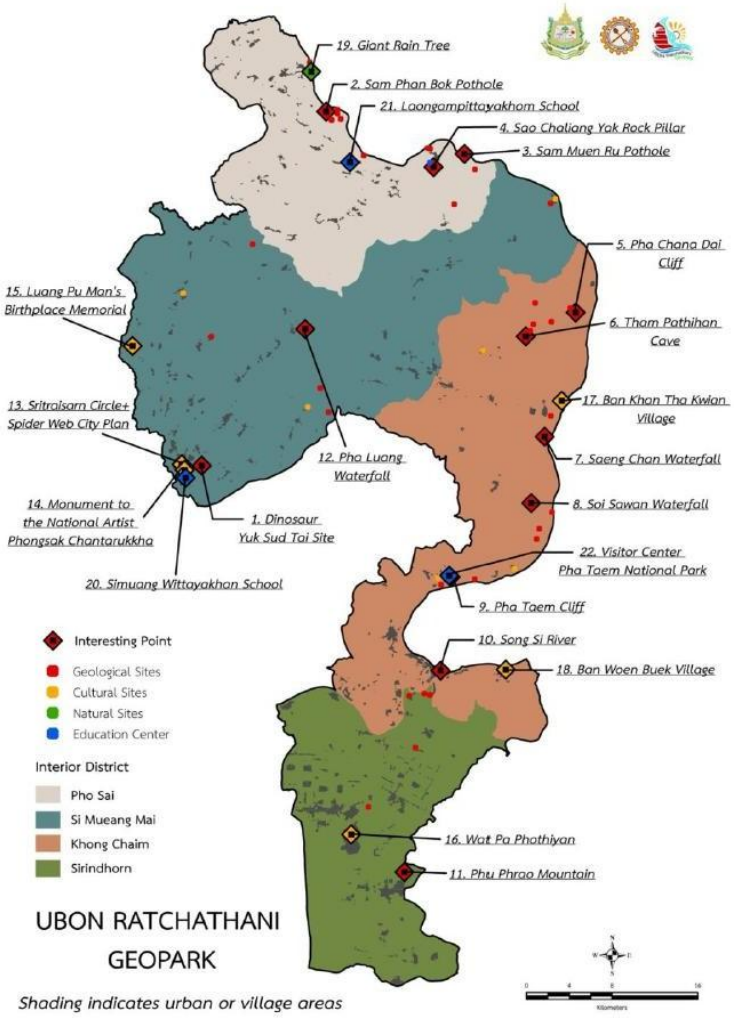

Figure 1. Ubon Ratchathani Geopark

The Ubon Ratchathani Geopark, located in northeastern Thailand. It represents one of the country's most significant geological and educational resources for science education. The geopark contains diverse geological formations, unique landscapes, paleontological sites, archaeological evidence, ecological systems, and cultural heritage (Somnuek et al., 2025). The learning resources collectively offer rich opportunities for inquiry-based learning. The area serves as an outdoor classroom where scientific concepts related to geology and other disciplines through authentic experiences. In addition, geopark contributes to local economic and social development through geotourism (Chanwanaku, 2025; Ferdowsi & Németh, 2026). Community can participate in the learning and teaching process by providing an ideal setting for promoting Education for Sustainable Development (ESD).

The educational potential of the Ubon Ratchathani Geopark, its integration into primary science education remains relatively limited. Many teachers require more sufficient knowledge regarding geopark resources. It is also place-based learning strategies integrated. Local learning resources for enhancing students' scientific understanding and environmental awareness are often underexploited. The previous studies have emphasized the need for curriculum development initiatives that strengthen teachers' capacities to design and implement contextualized learning experiences. Research concerning geopark-based educational materials has highlighted the importance of validating educational resources to ensure their relevance, quality, and effectiveness in supporting meaningful learning outcomes.

The development of a hybrid training curriculum specifically designed for primary science teachers in the context of the Ubon Ratchathani Geopark. Curriculum can provide teachers with opportunities to deepen their understanding of geopark concepts. Students can explore science disciplines and engage in collaborative learning. However, before widespread implementation, it is essential to establish the validity of the proposed training curriculum. Curriculum validation is a critical process that examines whether curriculum components. Validation ensures that the curriculum effectively addresses teachers' professional development needs and supports the broader goals of science education. It contributes to the credibility and quality assurance of educational innovations by providing empirical evidence regarding curriculum effectiveness and applicability.

Therefore, this study focuses on validating a hybrid training curriculum for primary science teachers based on the Ubon Ratchathani Geopark. The study explores the curriculum feasibility and alignment with teacher competency development goals. The findings are expected to contribute to the growing body of knowledge on geopark education and teacher development to strengthen their competencies through locally grounded and technologically enhanced learning environments.

2. METHOD

This research aims to validate a curriculum to strengthen the learning management capacity of primary science teachers using the Ubon Ratchathani Geopark through hybrid learning. The results of the study from Phase 1 are synthesized. It is defined as a component of the draft teacher development curriculum, consisting of 1) Principles of the curriculum, 2) Objectives of the curriculum, 3) Curriculum content, 4) Teacher development process, 5) Curriculum materials, and 6) Measurement and evaluation, which are divided into 5 steps as follows:

Step 1: Creating a curriculum outline to enhance the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. The researchers have synthesized the elements of the curriculum. The 6 elements of curriculum are as follows:

1. The curriculum's principle is to ascertain the source. The use of Ubon Ratchathani Geopark learning materials as a foundation for place-based learning is deemed consistent with the norms of science education. The implementation is a variety of teacher development approaches and methodologies. The acquiring knowledge is an experiential learning and field excursions. The process involves offering guidance, advising, evaluating learning results, and collaboratively deriving insights to enable educators to build successful learning management strategies.

2. Course objectives are designed for the learning management competency of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. 3. Content and learning content in the curriculum, the researchers have carried out the creation of the essence. Contents are important issues in the learning management performance of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. These include Ubon Ratchathani

Geopark and science learning management, integrated science learning design with an emphasis on active learning, media and technology for science learning management, and measurement and evaluation for learner development.

4. The process and activities in the curriculum include activities that are consistent with the strengthening of learning management capacity by using Ubon Ratchathani Geopark through hybrid learning.

5. Course materials include the curriculum to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark and Google site which is @UbonGeopark is a source of various types of work files such as images, video clips, multimedia media, knowledge sheets, worksheets, activity sheets, etc.

6. Measurement and evaluation include cognitive tests and assessment of science learning management competencies.

Step 2: Evaluation of the curriculum outline to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning.

Step 3: Improvement of the curriculum outline to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. According to the advice of specialists.

Step 4: Pilot study of the curriculum to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. with non-sample groups.

Step 5: Improvement and preparation before the trial of the curriculum toby using Ubon Ratchathani Geopark through hybrid learning.

Data collected by the researchers brought an official letter from the Faculty of Education, Ubon Ratchathani Rajabhat University, which is a letter requesting cooperation in evaluating the usefulness and suitability of the researcher. The feasibility and validity of the draft curriculum to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning to all specialists. Then the researchers submitted a curriculum document to strengthen the learning management capacity of primary science teachers using Ubon Ratchathani Geopark through hybrid learning. By coordinating to make an appointment, date, time, location, and delivery details to qualified persons.

Data were analyzed by finding the mean and standard deviation on a case-by-case basis, with 5 levels of criteria and interpreting the meaning of the mean score according to the criteria. Level of feasibility can be considered through criteria divided into 5 levels and interpreting the mean score according to the criteria 4.51-5.00 highest; 3.51-4.50 high; 2.51-3.50 average; 1.51-2.50 low; and 1.00-1.50 lowest level of feasibility in respectively.

3. RESULT AND DISCUSSION

Curriculum designed to enhance the learning management skills of primary science teachers with Ubon Ratchathani Geopark in a hybrid learning environment. The researchers presented the curriculum outline to specialists and solicited suggestions for improvement on various aspects. The curriculum integrates hands-on activities and virtual resources, allowing teachers to effectively engage students both in-person and online. The graphical concept of this curriculum can be shown as shown in Figure 2.

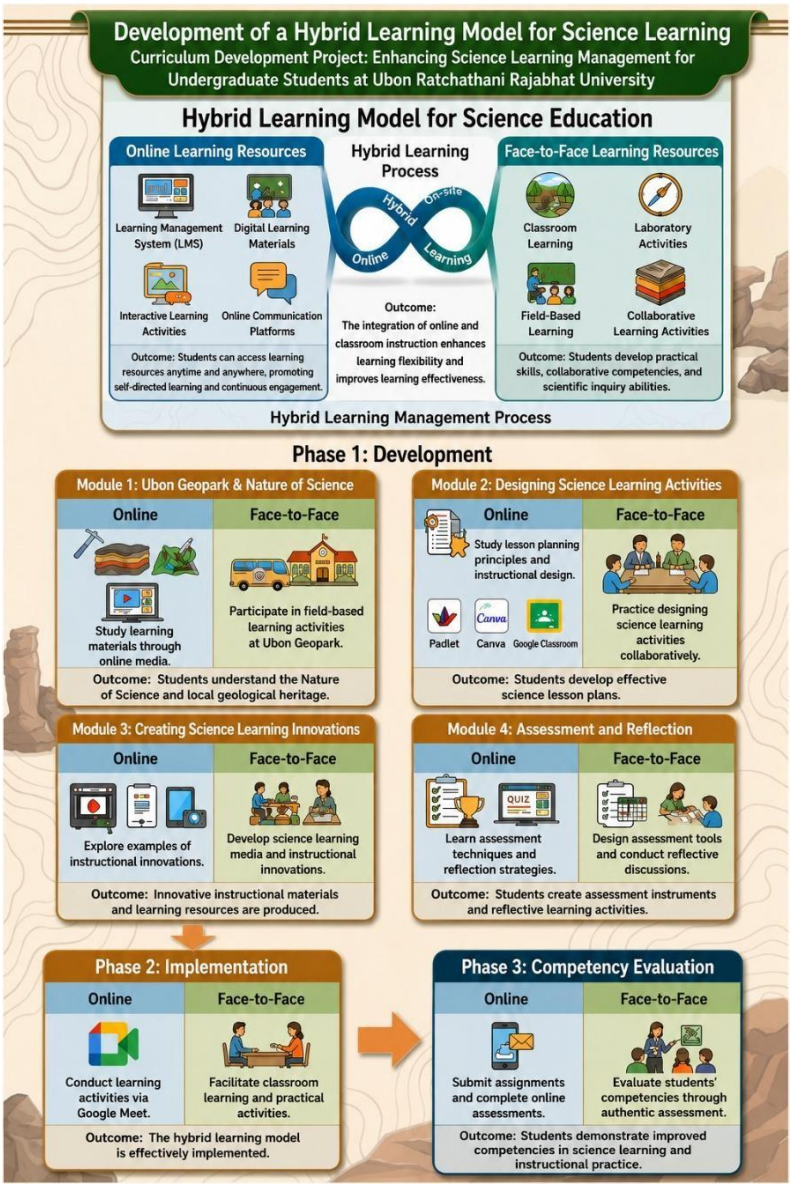

Figure 2. Conceptual curriculum

The growth of digital technology and learner-centered education have changed higher education globally. Students need more than traditional classroom learning. The goal is to create more flexible, engaging, and effective learning environments. Higher education institutions are increasingly using hybrid learning methods that integrate online and face-to-face training. The hybrid learning blends online and classroom learning with digital technology. It allows students to study anytime, anywhere. This integration enhances learning flexibility, diversity, and engagement throughout the process. The 3 important components that support hybrid learning are a learning management system (LMS), digital learning materials, interactive learning activities, and online communication platforms. Teachers can gain a deeper understanding of scientific concepts while promoting environmental awareness. The details of Geopark in a hybrid learning curriculum can be shown in Table 1.

Table 1. The feasibility of curriculum

Course Assessment Issues	$\bar{X}$	SD	Feasibility level
1. Principles of the curriculum			
1. curriculum make its possibility to education	4.42	0.42	High
2. Ubon Ratchathani Geopark strength the teachers to manage science learning	4.32	0.44	High
3. course helps teachers to deal with learning management	4.67	0.47	Highest
2. Objectives of the curriculum			
1. be clear in the actual management of learning	4.57	0.53	Highest
2. be consistent and comprehensive with the content	4.57	0.53	Highest
3. suitable for the participants	4.47	0.38	High
3. Curriculum content			
1. accurate and complete, covering the required content	4.71	0.49	Highest
2. sort in order of appropriateness	4.86	0.38	Highest
3. suitable for the participants	4.57	0.53	Highest
4. Teacher development process			
1. the course content is arranged to be simple and continuous learning	4.68	0.44	Highest
2. align with the objectives	4.68	0.38	Highest
3. suitable for the participants	4.57	0.53	Highest
4. linked between contents and learning activities	4.71	0.49	Highest
5. Curriculum materials			
1. systems support the process of mutual learning exchange in all contents	4.78	0.42	Highest
2. improve the learning experience	4.40	0.54	High
3. suitable for the trainees	4.71	0.49	Highest
6. Measurement and evaluation			
1. meets the objectives	4.57	0.53	Highest
2. measurement and evaluation tools are determined in accordance with the curriculum	4.43	0.82	High
3. assessment based on actual conditions in accordance with the assessment of management competencies	4.86	0.38	Highest
Overall	4.62	0.58	Highest

The feasibility of the curriculum outline for enhancing the capacity of science learning management of primary science teachers using Ubon Ratchathani Geopark through hybrid learning as a whole is at the highest level. However, the qualitative suggestions from specialists can be reported that before developing the curriculum to reflect the development of learning management competencies should be improved. Module 2 in the activity sheet for teachers to choose the format. Techniques and methods of self-learning management to diversify and meet the needs of individuals.

The hybrid learning process combines online and face-to-face training into one seamless learning experience. This paradigm regards online and classroom learning as complementary instructional modalities (Mulenga & Shilongo, 2025). Online learning provides theoretical information before class, but face-to-face meetings allow for debate, experimentation, cooperation, and problem-solving (Manciaracina, 2022). This integration maximizes both learning capabilities to improve education. The third component covers classroom, laboratory, field, and collaborative learning (face-to-face learning resources).

The first lesson of Ubon Ratchathani Geopark and the nature of science, students study digital learning materials. These realistic learning activities help them grasp the nature of science and local geological heritage by connecting theoretical knowledge with real-world geologys. Field-based learning promotes observation, inquiry, scientific reasoning, and environmental protection.

The second module, designing science learning activities emphasize curriculum and instructional preparation. Students construct active scientific learning activities based on interests. This curriculum uses Padlet, Canva, and Google Classroom for collaborative planning, resource sharing, and creative course building. Thus, students learn to create well-structured scientific lesson plans for various learning environments.

The final module, creating scientific learning innovations to promotes creativity. Online learning helps students discover instructional innovations before classroom workshops. This program encourages students to create unique scientific learning tools by fostering creativity, technical competency, and instructional problem-solving.

Phase 2, instructional activities are implemented in real-world learning contexts. Google Meet allows teachers and students to communicate synchronously remotely during online learning. Face-to-face training emphasizes classroom learning, hands-on experiences, lab research, and conversations. Digital communication technology and classroom interaction guarantee educational continuity and high student engagement (Vetsawat et al., 2024). The integrating theoretical knowledge with practical experience to cultivate skilled local tour guides and also promote sustainable tourism.

Then, Phase 3 evaluates students' learning by using numerous approaches. Authentic face-to-face evaluation throughout classroom activities, collaborative projects, laboratory work, and field expeditions employed. Authentic assessment provides a more complete picture of students' knowledge, practical skills, communication skills, and professional competences than exams. Evaluation proves students' scientific learning, instructional practice, and professional development improvements. The hybrid learning model follows modern educational ideas of flexibility, learner-centered teaching, technology integration, and competency-based education in curriculum building. The strategy effectively integrates digital and experiential learning to help students improve conceptual knowledge, practical skills, critical thinking, teamwork, creativity, and reflective practice.

The approach of the hybrid learning management process is a process of strengthening the capacity of science learning management using the Ubon Ratchathani Geopark through various learning experience units. It emphasizes learning from social contexts that arise from interactions. It is believed that learning is a process that occurs within the learners. Students can create knowledge by using experiences in the environment or new information. In addition, learning process that occurs from the creation and linkage of knowledge to develop into a network (Vetsawat & Nuangchalerm, 2026). Learning the management process of each unit, knowledge will be managed in the same direction. The curriculum emphasized place-based learning and encouraged students to explore local geological sites and understand the importance of sustainable tourism (Phitchayapirath & Somnuek, 2025). The geotourism curriculum can enhances students' knowledge about local geological heritage and promotes awareness of sustainable tourism.

4. CONCLUSION

The hybrid learning curriculum using the Ubon Ratchathani Geopark to improve primary science teachers in science learning management skills is educationally valuable and feasible. Face-to-face and online learning provide teachers important opportunities to build pedagogical knowledge and practical teaching abilities. The hybrid learning framework blends online and face-to-face by online learning provides convenient access to theoretical knowledge, digital materials, and teamwork. Tools like Google Classroom, Padlet, Canva, and Google Meet, while in-person sessions focus on hands-on learning, lab work, field studies, teamwork, and thoughtful discussions. This complementary method improves learning continuity, engagement, accessibility, conceptual comprehension, and practical application. The hybrid learning and place-based education curriculum strengthens science learning management abilities well. It fosters scientific literacy, critical thinking, teamwork, creativity, and environmental responsibility by combining local geological resources with digital tools and practical learning. The curriculum also encourages instructors to use local resources to educate students about geological heritage and sustainable tourism. So, this curriculum offers a way for teachers to grow professionally and a model that can be used in different local areas to mix online learning, skills-based education, and community resources into science teaching.

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