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Learning Ecology: Using the 5MYs Learning Ecosystem Model to Enhance the Research Skills of Student Teachers at a University in the Three Southern Border Provinces of Thailand

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ABSTRACT
Learning ecology represents the transfer of knowledge and skills beyond traditional teacher-student interactions, engaging all elements of the learning environment. It follows the 5 stages of the 5MYs learning ecosystem model: MY CONTEXTS (identifying problems or interests based on learners' experiences), MY RESOURCES (gathering relevant knowledge and tools), MY WILL & CAPABILITY (emphasizing planning, teamwork, and work processes), MY PROCESS (applying critical thinking and assessing task feasibility), and MY RELATIONSHIPS (fostering communication and discussion in the development of research proposals). These stages support the development of authentic research skills. This study aimed to: (1) evaluate the research skills of student teachers using the 5MYs learning ecosystem model, and (2) assess their satisfaction with the learning management using the 5MYs learning ecosystem model. The participants were 17 third-year students majoring in Teaching Islamic Studies and Early Childhood Education who enrolled in the Research and Innovation Development course. The instruments included: (1) an evaluation form for assessing classroom research proposals, and (2) a satisfaction assessment form measuring perception of learning management using the 5MYs learning ecosystem model. The data were analyzed using descriptive statistics. The findings revealed that student teachers' research skills were rated at a good level, with an average score of 3.79 (0.09). The highest scores were observed in the area of data collection and planning/teamwork. Group analysis showed that 71% (5 groups) performed demonstrated a good level of performance, while 29% (2 groups) demonstrated a moderate level. Satisfaction with the 5MYs learning ecosystem model ranged from satisfied to very satisfied with the highest score of 4.82 (0.52) attributed to the instructor's role in fostering critical thinking and participation. These results highlight the effectiveness of the 5MYs learning ecosystem model in enhancing research skills and its potential for future educational applications.
Keywords: Ecosystem model, Learning ecology, Research skills, Student teachers, 5MYs learning

Introduction

Learning ecology is essential for educational management, as it emphasizes not only individual components of learning but also the dynamic interactions among learners, their physical environments and social contexts. In other words, learning ecology provides a holistic perspective on education (Sangrá et al., 2019), moving beyond the traditional view of learning as a simple teacher-student interaction. Instead, it connects all the components of the learning ecosystem, fostering relationships among these components to support each other. As Assapun (2023) stated, the learning ecology involves the dynamic flow of knowledge and experiences across various elements within the system, leading to meaningful learning. This approach can create significant changes in educational management by addressing the learners' needs, allowing them to access knowledge and understand the learning process as interconnected process between individuals and their environments. It also provides opportunities for learners to recognize that learning processes vary across different contexts, encouraging them to pursue individualized learning paths and develop confidence in their own learning journeys. This contributes to promote lifelong learning and reduce educational inequality. As mentioned by the Office of the Education Council (2014), the design and development of education that involves participation from all sectors is essential for achieving comprehensive national development across all dimensions related to individuals and society.

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Learning ecology is defined as a space where learning occurs (Siemens, 2007). This concept extends beyond the traditional four-walled classroom to include any environment that facilitates learning, encompassing all elements that contribute to the learning process. Research by Redecker et al., (2011), which studied the future of learning and preparing for change, found that personalized learning processes, relying on collaborative and informal learning, will be central to future education. Therefore, learning ecology addresses current learning needs by integrating all related components to facilitate knowledge creation for learners, both directly and indirectly, with teachers serving as the core of the learning ecology. A study by Kongrod (2023) on teachers' perspectives about learning ecosystems in schools found that teachers should serve as the central figures within the learning ecosystem, as they are directly responsible for managing learning process and fostering student development. However, another critical aspect of the learning ecosystem is the process itself. Resources, people, spaces, and environments, when considered in isolation, do not inherently facilitate learning. Thus, the process acts as a mechanism that enables the flow of knowledge and experiences through interactions among the various components within the ecosystem.

The 5MYs learning ecosystem model emphasizes adaptability, creativity, and collaboration, positioning it as a transformative tool in teacher education. By connecting each stage of the learning ecology to real-world teaching scenarios, the model ensures that learning outcomes are both relevant and impactful. This model is derived from Jackson's (2013) MY LEARNING ECOLOGY model, which comprises five stages: 1) MY CONTEXTS: referring to the learner's background, including education, family, preferences, and interests; 2) MY RESOURCES: encompassing the knowledge, expertise, skills, or tools that facilitate learning; 3) MY WILL & CAPABILITY: which relates to the learner's motivation and ability to develop processes through understanding and refining knowledge ; 4) MY PROCESS: involving analytical thinking to evaluate task success and manage risks, and 5) MY RELATIONSHIPS: which concerns the people, society, or living beings surrounding the learner. The research has adapted and developed the MY LEARNING ECOLOGY concept into the 5MYs learning ecosystem. In this model, learners assume the role of researchers, applying each stage of MY LEARNING ECOLOGY in alignment with the 5MYs framework to promote effective learning. According to Sawyer (2015), learning is optimized when engage in hands-on activities, actively create knowledge, collaborate with others, and employ improvisation skills.

Research skills are essential across all sectors, particularly in education, where they play a critical role in teaching and policymaking. Educators depend on research to develop effective teaching methods, while policymakers utilize it to shape educational strategies that respond to emerging trends. For example, Thailand's educational policies prioritize lifelong learning and the reduction of inequality, emphasizing research-driven approaches as a fundamental basis for educational development (Office of the Education Council, 2014). Similarly, international frameworks, such as the learning ecology model, emphasize the role of teachers as researchers, enabling them to adapt and innovate methods to address diverse classroom challenges (Redecker et al., 2011). Teachers play a critical role in meeting students' needs and aligning teaching methods with policy goals. By acting as researchers, they drive classroom transformation by identifying problems, conducting systematic investigations, analyzing data, and presenting findings (Bjorkvold & Blikstad-Balas, 2018). For student teachers, developing research skills is vital for their growth as future educators. These skills not only improve classroom management but also enhance problem-solving, adaptability, and innovation. Additionally, cultivating research skills supports the development of broader competencies such as life skills, self-esteem, communication, and collaboration (O'Donnell, 2017). This highlights the importance of integrating research training into teacher education to prepare educators for the evolving demands of the profession.

The evaluation of the research skills among student teachers at a university in the three southern border provinces of Thailand revealed unsatisfactory results, as many students did not fully recognize their dual role as both teacher and researcher. To address this gap, the application of research skills through a learning ecology approach offers multiple benefits. First, it empowers student teachers to become researchers capable of addressing real classroom issues with innovative solutions. Second, it strengthens problem-solving and critical thinking skills. Third, it promotes lifelong learning by building teachers' confidence and enabling them to continually improve their methods. Finally, it

fosters collaboration across educational ecosystems, contributing to the collective enhancement of learning environments. Thus "Learning Ecology: Using the 5MYs Learning Ecosystem Model to Enhance the Research Skills of Student Teachers at a University in the Three Southern Border Provinces of Thailand" is a classroom-based research that marks the beginning of establishing a sustainable learning ecosystem for these future educators. By assuming the role of researchers and engaging with the five-step learning ecology process, student teachers interact with all relevant component of the ecosystem, thereby strengthening their research competencies. As Fielding and Bragg (2003) stated, learning through the research process plays a crucial role in cultivating lifelong learning skills.

Literature review

Research skills

Translanguaging was first used pedagogically to describe a bilingual practice in the Welsh context where students receive information through the medium of one language (e.g. English) and then verbally discuss or write about this information in another language (e.g. Welsh) (García & Wei, 2009). Since then, definitions of translanguaging and translingualism have continued to evolve as scholars in various contexts employ these terms differently. Baker (2011) defined translanguaging as the "process of creating meaning, shaping experiences, gaining understanding, and acquiring knowledge through the utilization of two languages" (p. 288). However, this definition may not fully capture the complex and multifaceted nature of the concept, which extends beyond using specific languages. Canagarajah (2011) applied translanguaging to describe bilingual/multilingual encounters in language learning, highlighting how bilingual/multilingual speakers creatively improvise and interpret linguistic signs to optimize communication potential. Nevertheless, this interpretation risks reinforcing the notion of distinct languages within an individual's linguistic repertoire, potentially oversimplifying the fluidity of language use (Cenoz & Gorter, 2020). García (2009) addressed these concerns by broadening the definition of translanguaging by characterizing it as "various discursive practices in which bilinguals participate to make sense of their bilingual worlds" (p. 45). This expanded perspective emphasizes practice, with the 'trans' prefix underscoring practices that are fluid and transcend socially constructed language systems and structures. From this perspective, translanguaging is not about shuttling between the L1 and the second language (L2) as distinct entities. Instead, it focuses on the creativity of individuals deployed in navigating communication across boundaries and adapting to local situational demands.

Research skills are the ability to identify problems and the desire to solve them systematically, with clear plans and procedures to find answers and resolve issues. This aligns with Bjørkvold and Blikstad-Balas (2018), who noted that research skills involve acting like a researcher, which includes asking questions about arising problems or doubts, systematically investigating, gathering data, and analyzing and comparing findings with theoretical knowledge or initial hypotheses. Additionally, it involves presenting research or findings from studies. Thus, research skills are essential, especially for teachers, as they have a direct relationship with students, classroom, and school. Researchers have presented learning management strategies that develop research skills and promote the essence of being a researcher. Teachers play a central role in facilitating the learning process for students through the following key actions: 1) Facilitator Role: mentoring and monitoring the progress and readiness of students' work from the beginning to the end of the process. 2) Coaching and Guidance: providing guidance and recommendations, helping students construct knowledge from their own work. 3) Adaptive Teaching Methods: Teachers adjust their teaching methods by using questions that promote critical thinking and the synthesis of answers. 4) Support for Independent Research: Encouraging students to study topics of interest independently and promoting collaborative work among peers and stakeholders. 5) Promoting a Growth Mindset: Creating an atmosphere that encourages thinking and taking initiative, fostering a growth mindset, creativity, and the ability to think critically, and 6) Providing Feedback: providing reflective feedback to students on their work (Fielding & Bragg, 2003; Randall et al., 2020; Wright et al., 2019).

In Thailand, the implementation of learning management to enhance research skills is not widespread. The main approach used is research-based learning where teachers encourage students to engage in research through project work. This involves hands-on experience, direct engagement in research

processes, data analysis, synthesis of knowledge, and presentation of findings. For example, Lateh (2019) found that using research-based learning led to student achievement in statistics exceeding 80%, and significantly improved research skills post-study compared to pre-study. However, the application of learning ecology to enhance research skills remains limited. Therefore, this research attempts to expand learning management methods to foster research skills at an excellent level, requiring students to assume the role of researchers. This approach aims to develop and cultivate research skills, keeping pace with the continuously evolving body of knowledge.

Learning ecology

The concept of ecology has been applied beyond the field of biology in many instances. The key aspect of the ecological perspective is its holistic view. An ecology can also be seen as a system where different subunits interact or connect with each other. Applying this ecological perspective to learning helps to visualize learning spaces, learning resources, and various components such as textbooks, teaching media, or people as parts of an ecology. Moreover, it facilitates the dynamic flow of knowledge, information, and experiences from the interactions of these components, thus forming a learning ecology (Assapun, 2023). The learning ecology represents a new dimension in learning management because the traditional perspective on learning may lead to a narrow understanding of the problems faced by students. For example, addressing students struggling with reading might focus solely on classroom teaching methods, neglecting issues stemming from family interactions (Pinitwetchakarn, 2018). Similarly, developing students to foster desirable traits might concentrate exclusively on curricular activities without considering extracurricular activities or interactions between students and parents (Nootpong, 2018). Therefore, it can be said that learning ecology opens the second, third, or fourth dimensions of learning management, moving beyond addressing learning or problem-solving in only one dimension.

A learning space is defined as a learning ecology (Siemens, 2007) that is not limited to the classroom, which consists only of teachers and students. It also encompasses information, knowledge, and experiences, which are not measured solely by outcomes or achievements. This includes knowledge about the learners themselves, philosophies, concepts, and processes of educational management, as well as resources that can motivate learning, foster positive attitudes towards learning, leadership, responsibility, socio-emotional skills, and other learner characteristics. These units enhance the competencies of learners within the learning ecology (Assapun, 2023; Jackson, 2016). Consequently, learning ecology relies on the integration and interaction of various subunits, to foster genuine learning. Research on the future of learning has found that informal collaborative learning processes, emphasizing hands-on activities, self-constructed knowledge, teamwork, and survival skills, will be crucial for future education (Redecker et al., 2011; Sawyer, 2015).

The learning ecology that supports student learning is based on Jackson's (2013) MY LEARNING ECOLOGY, which consists of five components:

1) MY CONTEXTS, Involves the background of the learner.
2) MY RESOURCES, includes knowledge, skills, or tools that facilitate learning.
3) MY WILL & CAPABILITY, emphasizes motivation and ability.
4) MY PROCESS, involves analytical thinking and task success, and
5) MY RELATIONSHIPS, highlights interactions with people and society.

The researcher adapted Jackson's concept into the 5MYs learning ecosystem model to comprehensively address learners' needs at each stage of the learning process. To enhance research skills, the Cheminais' (2012) four key components were integrated which included:

1) Searching and collecting data, which equips learners to identify and evaluate information sources.
2) Planning and teamwork, emphasizing collaboration in structuring research projects.
3) Analytical thinking, fostering critical reflection and synthesis of findings, and
4) Communication/ presentation, ensuring effective dissemination and application of results.

This combined approach provides a robust framework for enhancing both learning and research competencies.

Objectives

1. To evaluate the research skills of student teachers at a university in the three southern border provinces of Thailand using the 5MYs learning ecosystem model
2. To assess the satisfaction with the learning management using the 5MYs learning ecosystem model

Research framework

The concept of learning management using the 5MYs learning ecosystem model was studied and adapted from Jackson (2013). This model promotes students to create their own learning ecology from five components: MY CONTEXTS, MY RESOURCES, MY WILL & CAPABILITY, MY PROCESS, and MY RELATIONSHIPS, as shown in Figure 1.

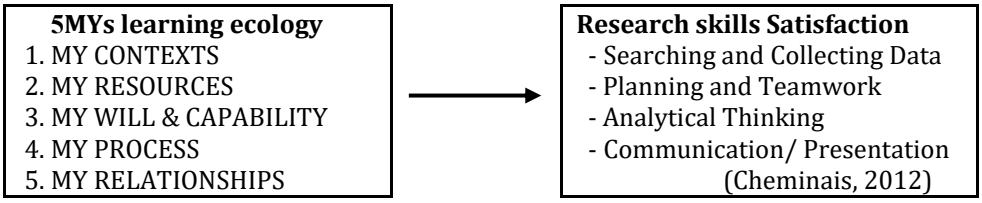

Figure 1 Research framework

Research methodology

The research on Learning Ecology: Using the 5MYs learning ecosystem model to enhance the research skills of student teachers at a university in the three southern border provinces of Thailand classroom-based experimental research. It comprises the following details:

Experimental design

This research utilizes a one-group posttest only design as follows:

X	**O_2**

When **X** represents the 5MYs learning ecosystem model
O_2 represents research skills

Participants

Seventeen third-year students from majoring in Teaching Islamic Studies (13 students) and Early Childhood Education (4 students) were selected by purposive sampling to participate in this study. The participants were selected because they were enrolled in a course designed to develop research and innovation skills, aligning with the objectives of the 5MYs learning ecosystem model. Their experiences as third-year education students provided a practical context to assess the model's impact on research skill development.

Research procedures

The researcher conducted the study in two phases: 1) the implementation phase of using the 5MYs learning ecology and 2) the post-implementation phase of the 5MYs learning ecology.

1. The implementation phase of using the 5MYs learning ecology. The researcher organized the teaching and learning process using the 5MYs learning ecosystem model, which is adapted from MY LEARNING ECOLOGY of Jackson's (2013), as shown in Figure 2. The 5MYs learning ecosystem model was created with students taking on roles similar to classroom researchers, as illustrated in Figure 3. The details are as follows:

> 1) MY CONTEXTS involves students' interests in events or occurrences observed during their teaching practice and experience gained from schools, classrooms, teachers, mentors, or students. This initial process in classroom research allows students to identify problems, areas of interest, or aspects they wish to develop in the classroom through their practical experiences.

2) MY RESOURCES pertains to the knowledge, information search, and data collection needed to address their interests or solve problems arising from observed events using technology, documents, textbooks, or relevant people. This is the process of gathering information related to the problem or area of interest for their research, as well as finding methods to address these issues.

3) MY WILL & CAPABILITY relates to planning, work processes, and teamwork. Students are grouped based on similar contexts and problem-solving methods, with no more than three students per group. This step involves collaborative work, division of tasks, responsibilities, and defining the research scope to address classroom issues.

4) MY PROCESS involves analytical thinking about the feasibility of classroom research to address the identified problems, the relationship between variables, and research methodologies. This step includes brainstorming at every stage of the research to clearly outline the research direction and writing the research proposal.

5) MY RELATIONSHIPS deals with communicating or presenting classroom research to fellow students, teachers, experts, and addressing questions about the research. This step involves students presenting their research to peers, teachers, and interested parties, as well as answering any questions that arise.

All steps in learning ecology used the research classroom in the course "Research and innovation development for student development" as the center of the learning ecology, with the instructor as a researcher to observe the students' classroom research projects.

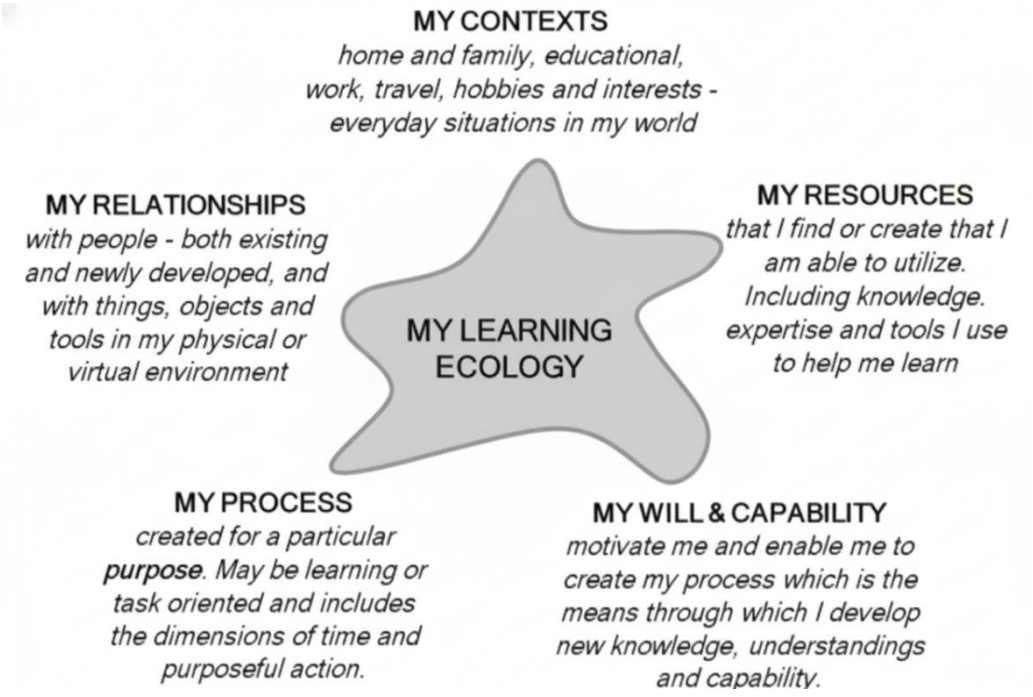

Figure 2 MY LEARNING ECOLOGY

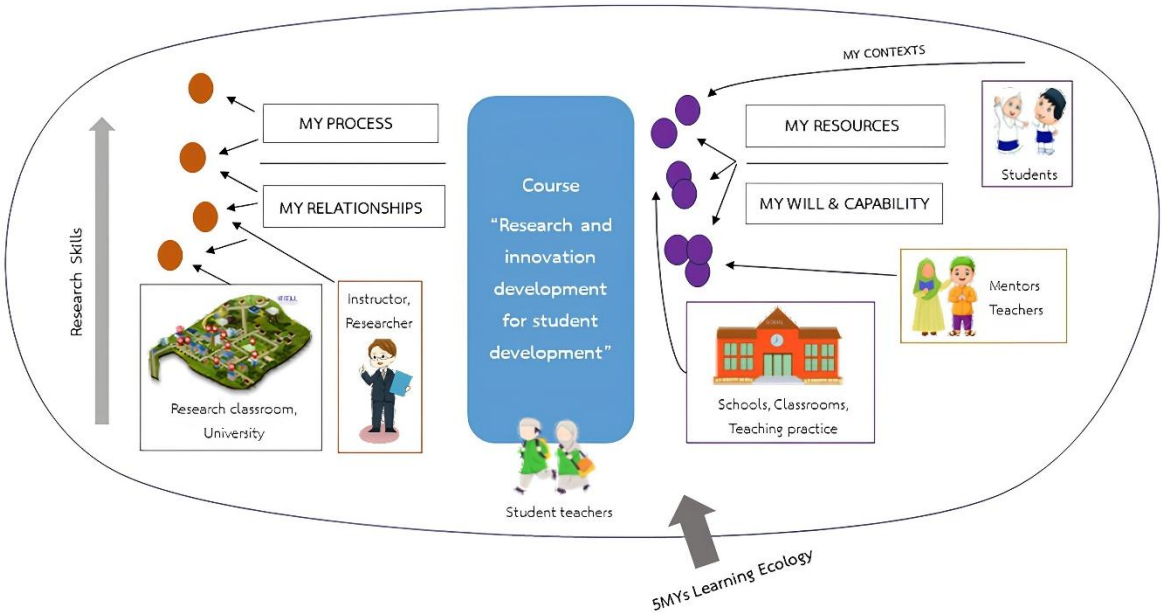

Figure 3 5MYs learning ecosystem model

2. The post-Implementation phase of the 5MYs learning ecology

This phase involves evaluating the research skills of teacher students at a university in the three southern border provinces of Thailand in four areas according to Cheminais (2012), which aligns with the 5MYs learning ecosystem model as follows:

5MYs learning ecosystem model	→	**Research skills**
MY CONTEXTS and MY RESOURCES		Searching and Collecting Data
MY WILL & CAPABILITY		Planning and Teamwork
MY PROCESS		Analytical Thinking
MY RELATIONSHIPS		Communication/ Presentation

The research skills of teacher students were assessed based on their classroom research proposals, as well as their satisfaction with the learning management using the 5MYs learning ecosystem model.

Instruments

The research instruments consist of two types, as follows:

1. Evaluation form for the classroom research proposals of teacher students. It includes four areas: Searching and collecting data, Planning and teamwork, Analytical thinking, and Communication/ presentation. A rubric score is used for evaluation as shown in Table 1, with a score range of 1-5 for each area, totaling 20 points.

2. Assessment form for satisfaction with learning management using the 5MYs learning ecosystem model. This form comprises two parts: part 1 is general information, and part 2 is the learning management using the 5MYs learning ecosystem model, divided into three areas: Research process, Course content and learning management, and Overall satisfaction. A 5-point Likert scale is used, with the levels being very satisfied, satisfied, neutral, unsatisfied, and very unsatisfied.

The instruments were reviewed by three experts, refined based on their feedback, and validated using the Item-Content Validity Index (I-CVI), with items selected that had a value of 1.00.

Table 1 Rubric scoring criteria for the evaluation of classroom research proposals

Score	Searching and collecting data	Planning and teamwork	Analytical thinking	Communication/ presentation
5	Demonstrates an excellent ability to identify relevant problems or areas of interest based on teaching experience; gathers comprehensive, credible data from diverse, reliable sources	Demonstrates exceptional planning and collaboration; organizes tasks efficiently, assigns clea responsibilities, and works seamlessly with peers to define the research scope.	Exhibits advanced analytical thinking; accurately identifies relationships between variables, develops a well-supported research proposal, and effectively defines research methodologies.	Presents research confidently and clearly, engaging the audience with well-organized and compelling content; answers questions thoroughly and thoughtfully.
4	Identifies relevant problems or areas of interest based on teaching experience; gathers mostly relevant and reliable data, though with slight gaps in sources or depth.	Plans and collaborates effectively, but with some minor inefficiencies or unclear task delegation; the research scope is mostly defined.	Demonstrates good analytical skills; identifies most key relationships and develops a logical research proposal, with minor issues in methodology or clarity.	Delivers a clear presentation with good organization, though some minor lapses in engagement or structure; responds to questions with sufficient detail.
3	Identifies problems or areas of interest but may struggle to gather sufficient or fully relevant data; relies on limited sources that may lack depth or reliability.	Planning and teamwork are functional but inconsistent; tasks may be poorly divided or research scope is partially undefined.	Demonstrates basic analytical thinking; some relationships are unclear, and the research methodology may be underdeveloped, leading to incomplete proposals.	Delivery a satisfactory presentation but lacks clarity or confidence; answers questions but may struggle to provide clear or thorough responses.
2	Struggles to identify relevant problems or gather appropriate data; relies on sources that are largely irrelevant or unreliable, failing to address the research question.	Minimal planning or collaboration; tasks are poorly distributed, and the research scope is unclear, leading to inefficiency in addressing classroom issues.	Analytical thinking is limited; struggles to define key relationships and develop a feasible research proposal. The methodology is unclear or underdeveloped.	Presentation lacks structure and clarity; struggles to engage the audience or answer questions adequately, often providing vague or incorrect information.
1	Fails to identify relevant problems or areas of interest; collects little or no data, or data collected is irrelevant and unreliable.	No evidence of planning or teamwork; tasks are disorganized, and the research scope is undefined, leaving the research process unproductive.	Lacks analytical thinking; fails to identify relationships or draw meaningful conclusions; no research proposal is developed.	Presentation is disorganized, unclear, and ineffective; does not engage the audience or fails to answer questions in a meaningful way.

Data collection

1. The researcher explained and conducted the learning management process using the 5MYs learning ecosystem model for students enrolled in the Research and Innovation Development course, as outlined in Table 2.

Table 2 Learning management using the 5MYs learning ecosystem model

Month (Week)	Learning activities	5MYs	Related ecology
1 (1-4)	Students conducted teaching practice and identified problems, areas of interest, or aspects they wished to develop in the classroom	MY CONTEXTS	Schools, Classrooms, Students, Teachers, Mentors, Community
2 (5-6)	Students surveyed and analyzed problems identified during teaching practice, selected problems of interest for research, and searched for relevant information and problem-solving methods	MY RESOURCES	Technology, AI platforms, textbooks, research, theses
2-3 (7-9)	Students were grouped based on similar problems and problem-solving methods, using teamwork to divide tasks, responsibilities, and frame the research to address classroom issues through research of student	MY WILL & CAPABILITY	Student peers, Group members, instructor, subject faculty
3 (10-12)	Students developed classroom research by analyzing research feasibility, the relationship between variables, research methodologies, reflective thinking, and writing classroom research proposals	MY PROCESS	Student peers, Group members, Research classroom, instructors, Researchers
4 (13-15)	Students presented their classroom research to peers, lecturer, researchers, experts, and answered questions	MY RELATIONSHIPS	Student peers, Group members, Researchers, Experts
4 (16)	Evaluation of research skills and satisfaction assessment		

2. Evaluate the research skills of teacher students and assess their satisfaction with the learning management using the 5MYs learning ecosystem model.

Data analysis

The data analysis process was divided into two main parts, which are the evaluation of research skills and the assessment of satisfaction with the learning management using the 5MYs learning ecosystem model. The research skills were assessed in four areas, including searching and collecting data, planning and teamwork, analytical thinking, and communication/presentation. Each area was scored on a 5-point rubric. The average scores were calculated and interpreted using the following criteria as slightly modified from the previous studies (e.g., Jaturanon, 2011; Khetchonprathan & Noumnorn, 2021):

4.51 - 5.00: Excellent level of research skills
3.51 - 4.50: Good level of research skills
2.51 - 3.50: Moderate level of research skills
1.51 - 2.50: Fair level of research skills
1.00 - 1.50: Needs improvement in research skills

For the assessment of satisfaction, the score was assessed using a 5-point Likert scale, ranging from 1 (very unsatisfied) to 5 (very satisfied). The average scores and standard deviations were calculated for each item, and the results were interpreted as follows:

4.51 - 5.00: Very satisfied
3.51 - 4.50: Satisfied
2.51 - 3.50: Neutral
1.51 - 2.50: Unsatisfied
1.00 - 1.50: Very unsatisfied

Findings

The research on Learning ecology: using the 5MYs learning ecosystem model to enhance the research skills of teacher students at a university in the three southern border provinces of Thailand was presented in two parts:

1. Evaluation of the research skills of student teachers using the 5MYs Learning Ecology

The 5MYs learning ecosystem, where students assumed the role of classroom researchers, resulted in the creation of seven classroom research projects. This was achieved by grouping students who presented similar classroom problems and solutions during the MY WILL & CAPABILITY stage. However, these classroom research projects serve as preliminary proposals that students will further develop during their fourth year, including data collection, data analysis, and conclusion stages. The researcher presents two examples of classroom research proposals: one from an Early Childhood Education (ECE) student, as shown in Figure 4, and one from a Teaching Islamic Studies (TIS) student, as shown in Figure 5.

Figure 4 Classroom research proposals of students majoring in Early Childhood Education (ECE)

From Figure 4, the student developed a classroom research topic after a one-month teaching practicum with Early Childhood Education students. With an interest in improving the concentration of children with ADHD, the student collaborated with group members to brainstorm ideas, review relevant literature, and examine related studies. They concluded that a set of Islamic integrated creative activities, which include activities that promote concentration while incorporating Islamic elements, could effectively enhance the concentration of ADHD children. The student then collaborated with group members to develop the classroom research proposal and engaged in reflective thinking, resulting in the presented research proposal. Additionally, Figure 5 illustrates the

classroom research proposal of a Teaching Islamic Studies student. Recognizing the importance of reading Arabic as a foundational skill for Muslim students to perform daily religious practices such as Solat and to read the Quran,, the student aimed to develop Arabic language skills using a set of flashcard activities. This was derived from a literature review, discussions, and searching, leading to the creation of a classroom research proposal that the education students can further develop.

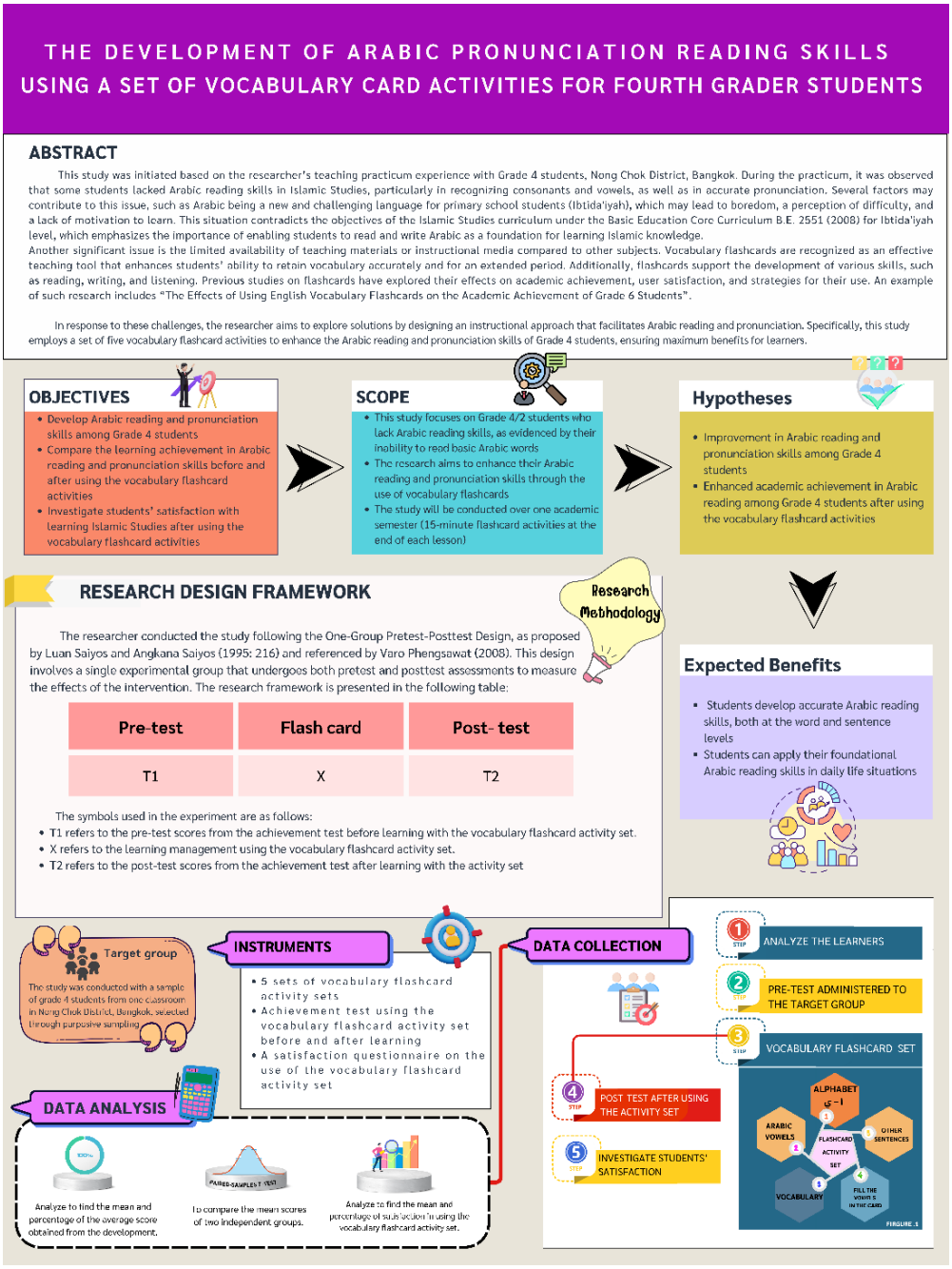

Figure 5 Classroom research proposals of students majoring in Teaching Islamic Studies (TIS)

The evaluation results of the research skills from the classroom research proposals of student teachers using the 5MYs learning ecosystem model (categorized by area), as shown in Table 3, reveal that the student teachers' research skills are at a good level, with an average score of 3.79 (0.09). When considering each area, it was found that the research skills in each area are also at a good level. The highest average score is in the area of Searching and Collecting Data, with an average of 4.00 (0.58). This is followed by Planning and Teamwork, Communication/Presentation, and Analytical Thinking, with average scores of 3.86 (0.69), 3.71 (0.49), and 3.57 (0.53), respectively.

Table 3 Evaluation results of classroom research proposals of teacher students using the 5MYs learning ecosystem model, Classified by area

Research skills	Mean (SD)	Level of research skills
Searching and Collecting Data	4.00 (0.58)	Good
Planning and Teamwork	3.86 (0.69)	Good
Analytical Thinking	3.57 (0.53)	Good
Communication/ Presentation	3.71 (0.49)	Good
Overall research skills	3.79 (0.09)	Good

Additionally, the researcher presents the evaluation results of the research skills from the classroom research proposals of student teachers using the 5MYs learning ecosystem model (categorized by group), as shown in Table 4. It was found that the research skills of the students are at a good level in 5 groups, accounting for 71 percent, with average scores between 3.51 and 4.50. Furthermore, the research skills of the students are at a moderate level in 2 groups, accounting for 29 percent, with average scores between 2.51 and 3.50.

Table 4 Evaluation results of classroom research proposals of teacher students using the 5MYs learning ecosystem model, Classified by group

Score range	Frequency (Group)	Percentage	Level of research skills
3.51-4.50	5	71	Good
2.51-3.50	2	29	Moderate

2. Satisfaction with the learning management using the 5MYs learning ecosystem model
The satisfaction with the learning management using the 5MYs learning ecosystem model of student teachers at a university in the three southern border provinces of Thailand is at a satisfied to very satisfied level, as shown in Table 5.

Table 5 Mean and standard deviation (SD) of satisfaction with learning management using the 5MYs learning ecosystem model

Statements	Mean (SD)	Interpretation
1. The learning management using the 5MYs learning ecosystem model helps students understand research content easily.	4.71 (0.58)	Very satisfied
2. The learning management using the 5MYs learning ecosystem model promotes students' analytical thinking skills.	4.65 (0.61)	Very satisfied
3.The content and learning activities align with students' interests and aptitudes.	4.71 (0.58)	Very satisfied
4. The learning management using the 5MYs learning ecosystem model promotes research skills among students.	4.64 (0.49)	Very satisfied
5. The instructor has the characteristics of a researcher.	4.82 (0.52)	Very satisfied
6. The instructor is well-prepared and designs lessons with dedication and responsibility towards learning activities.	4.76 (0.56)	Very satisfied
7. The instructor allows students to express their opinions, ask questions, critique constructively, and participate in learning activities.	4.82 (0.52)	Very satisfied
8. The instructor provides information and recommends additional resources for students to conduct self-study.	4.71 (0.58)	Very satisfied
9.The classroom atmosphere is warm and cooperative, emphasizing collaboration over competition, making students happy and valuing their opinions and thought processes.	4.76 (0.56)	Very satisfied
10. Students enjoy (feel like) conducting research.	4.47 (0.72)	Satisfied
11.Overall satisfaction with the learning management using the 5MYs learning ecosystem model.	4.76 (0.56)	Very satisfied

From Table 5, it is evident that the highest level of satisfaction with learning management using the 5MYs learning ecosystem model among student teachers was observed in two questions: 1) The instructor has the characteristics of a researcher, and 2) The instructor allows students to express their opinions, ask questions, critique constructively, and participate in learning activities, both scoring an average of 4.82 (0.52). Following closely are the following questions: 1) The instructor is well-prepared and designs lessons with dedication and responsibility towards learning activities, 2) The classroom atmosphere is warm and cooperative, emphasizing collaboration over competition, making students happy and valuing their opinions and thought processes, and 3) Overall satisfaction with the learning management using the 5MYs learning ecosystem model, all with an average score of 4.76 (0.56). Furthermore, satisfaction with: 1) The content and learning activities align with students' interests and aptitudes, and 2) The instructor provides information and recommends additional resources for students to conduct self-study, both reflect a slightly lower and equal average score of 4.71 (0.58). Overall, satisfaction with learning management using the 5MYs learning ecosystem model is very satisfied in all questions, except for one question, where students enjoy (feel like) conducting research, which satisfaction is at a satisfied level with an average of 4.47 (0.72).

Discussion

The 5MYs learning ecology consists of five steps: MY CONTEXTS, MY RESOURCES, MY WILL & CAPABILITY, MY PROCESS, and MY RELATIONSHIPS. In this model, students take on the dual role of researchers and teachers, identifying classroom problems, gathering information from various sources, collaborating in teams, developing classroom research, and presenting their findings. This process resulted in seven classroom research proposals, showcasing the model's ability to enhance research skills. By actively engaging in the research process, students gain a comprehensive understanding of research methodologies, empowering them to drive the learning ecosystem and develop critical research capabilities. As Fielding and Bragg (2003) noted, learning through research fosters lifelong skills, while Sawyer (2015) emphasized that active engagement, collaboration, and improvisation lead to optimal learning outcomes. The 5MYs learning ecosystem model goes beyond traditional classroom teaching by integrating all interconnected components of the learning ecosystem, thereby promoting the development of authentic research skills. However, its implementation revealed several limitations. The study was context-specific, conducted with a single cohort of third-year student teachers at a university in the three southern border provinces of Thailand, which may limit the generalizability of the findings to other educational settings. Additionally, the single-semester timeframe may have constrained the comprehensive development of certain skills, particularly those requiring advanced critical thinking. Despite these limitations, the 5MYs learning ecosystem model demonstrates strong potential for fostering meaningful learning and research skills in student teachers, warranting further exploration and adaptation in diverse contexts.

The research skills of student teachers, as evaluated through their classroom research proposals, were rated at a good level. Teaching practice allowed student teachers to immerse themselves in classroom environments, sparking curiosity and a drive to innovate. This aligns with a study conducted by Phongampai (2008), that teachers, as researchers, significantly influence classrooms through research, benefiting both teaching and learning processes. Among the evaluated skills, searching and collecting data received the highest average score. This reflects the extensive use of learning ecology components, particularly the "MY CONTEXTS" and "MY RESOURCES" stages. During their one-month practicum, students identified issues or interests, gathered data, and explored strategies to address classroom problems using a range of resources, including technology and literature. These findings echo Phongampai (2008) conclusion that access to resources and time directly supports classroom research. Conversely, analytical thinking had the lowest average score, likely due to the complexity of tasks such as analyzing research feasibility, understanding variable relationships, and developing methodologies. This challenge aligns with Puripanya (2007) observation that limited understanding of research methodologies discourages teachers from conducting classroom research. To address this gap, activities that develop a clear and practical understanding of research methodologies are essential. Such efforts will encourage student teachers to engage in classroom research, ultimately enhancing teaching quality and equipping future teachers with robust research skills.

The satisfaction with the learning management using the 5MYs learning ecosystem model among student teachers at a university in the three southern border provinces of Thailand was rated at a very satisfied level. This was due to the instructor's characteristics, such as embodying the traits of a researcher and creating opportunities for students to express opinions, ask questions, engage in constructive criticism, and participate in learning activities. These aspects received the highest average scores, highlighting the critical role of the instructor in fostering a reflective and collaborative learning environment. The instructor's facilitation not only mirrors the researcher qualities that students are expected to develop but also encourages active participation, which is essential for effective learning management. Redecker et al., (2011) found that personalized learning processes that rely on collaborative and informal learning are a key to future education. Therefore, the 5MYs learning ecosystem model is an effective method of learning management that leverages every component of the learning ecosystem to foster learner-driven education. However, the enjoyment of conducting research was rated at a lower, satisfied level. This likely reflects challenges related to students' limited understanding of research methodologies and the complexity of analytical thinking, which scored lowest in the research skill evaluation. This suggests that students perceive research as challenging and intricate, requiring additional support. To address this, integrating research-based learning into the 5MYs learning ecosystem model could enhance both understanding and enjoyment of research. Lateh (2019) demonstrated that combining theoretical and practical teaching, along with research article writing, improved students' achievement and comprehension of research processes. Such an approach could foster deeper engagement, leading to better research outcomes and greater satisfaction in future implementations.

The 5MYs learning ecosystem model effectively enhances student teachers' research skills by integrating real-world teaching experiences with structured problem-solving, teamwork, and critical thinking. The model supports lifelong learning and equips future educators with practical skills for addressing classroom challenges. Theoretically, it advances the concept of learning ecology as a holistic and dynamic approach. However, the lower scores in analytical thinking highlight the need for additional activities to strengthen higher-order thinking and research methodologies. Future studies should explore long-term implementation in diverse contexts, using larger samples and pre-test/post-test designs to validate and generalize the findings. These insights underscore the importance of research-based teacher education in preparing educators for evolving challenges in education.

Conclusion

The research on Learning Ecology: Using the 5MYs learning ecosystem model to enhance the research skills of student teachers at a university in the three southern border provinces of Thailand. The present study aimed to 1) evaluate the research skills of student teachers at a university in the three southern border provinces of Thailand using the 5MYs learning ecosystem model, and 2) assess the satisfaction with the learning management using the 5MYs learning ecosystem model. The participants were 17 third-year students from majoring in Teaching Islamic Studies and Early Childhood Education who enrolled in the Research and Innovation Development course. The research was conducted by creating a 5MYs learning ecology consisting of MY CONTEXTS, MY RESOURCES, MY WILL & CAPABILITY, MY PROCESS, and MY RELATIONSHIPS. The research findings indicated that: 1) The research skills of student teachers exhibited a good level overall. When categorized by area, they were at a good level in each area, with the highest average score in searching and collecting data, followed by planning and teamwork, communication/ presentation, and analytical thinking, respectively. When categorized by group, the research skills of student teachers of 5 groups (71%) were analyzed as a good level, and 2 groups (29%) were at a moderate level. 2) Satisfaction with learning management using the 5MYs learning ecology was at a very satisfied to satisfied level. The instructor's characteristics resembling those of a researcher, and the instructor allowing students to express their opinions, ask questions, critique constructively, and participate in learning activities, had the highest average score of 4.82 (0.52). This research, conducted as classroom research, confirms that the 5MYs learning ecology enhances the research skills of student teachers and serves as a significant starting point for future studies.

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