

**MINISTRY OF EDUCATION AND TRAINING
EDUCATION MANAGEMENT ACADEMY**



NGUYEN TRUNG KIEN

**MANAGEMENT OF STEM EDUCATION
ACTIVITIES FOR PRIMARY SCHOOL STUDENTS
IN HUNG YEN PROVINCE UNDER A
PARTICIPATORY APPROACH**

**Major: Educational Management
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**SUMMARY OF DOCTORAL DISCUSSION
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INTRODUCTION

1. Reasons for choosing the topic

STEM education is understood as an interdisciplinary educational approach that integrates science, technology, engineering, and mathematics through learning activities connected to real-life contexts. The 2018 General Education Curriculum clearly emphasizes competency development through integrated teaching, experiential learning, and the practical application of knowledge [5]. The Ministry of Education and Training has issued various policies and directives to promote the implementation of STEM education across the general education system. For STEM education to be implemented effectively in primary schools, these activities need to follow a scientifically designed process of organization and management and involve the participation of multiple stakeholders. This requires coordination among teachers, students, parents, enterprises, and social organizations. As a result, STEM education activities are not confined to the classroom but are extended into the wider social environment, thereby contributing to the development of a practice-oriented educational ecosystem.

In Hung Yen Province, the implementation of STEM education in primary schools has achieved encouraging initial results. However, the organization of STEM education activities has yet to follow a well-defined implementation process, and the competencies, roles, and responsibilities of participating stakeholders, as well as the conditions required for effective implementation, have not been fully identified. The management of STEM education activities under a participatory approach also remains constrained by several shortcomings, as it has not been organized according to a systematic management cycle. Furthermore, the absence of specific evaluation criteria for STEM education activities has made it difficult to monitor, adjust, and continuously improve their implementation.

From the perspective of educational research, although numerous studies have been conducted on STEM education, most have focused on STEM teaching methods or the development of students' STEM competencies. Research on the management of STEM education activities at the primary school level remains limited, particularly studies adopting a participatory approach that position the school principal as the central management actor responsible for planning, organizing, coordinating, monitoring, and improving STEM education activities.

Based on the above theoretical and practical considerations, the author selected the research topic entitled "*Management of STEM Education Activities for primary school students in Hung Yen Province under a participatory approach.*" The study aims to provide scientific evidence and practical solutions to enhance the effectiveness of managing STEM education activities in primary schools.

2. Research Objectives

The study aims to clarify the theoretical foundations and practical basis of managing STEM education activities for primary school students under a

participatory approach. On this basis, the dissertation proposes management solutions for STEM education activities in primary schools in Hung Yen Province under a participatory approach, with the aim of improving the quality of STEM education activities and contributing to the development of students' qualities and competencies in response to the current requirements of educational reform.

3. Research Subject and Object

3.1. Research Subject

STEM education activities for primary school students under a participatory approach.

3.2. Research Object

The management of STEM education activities for students in primary schools in Hung Yen Province under a participatory approach.

4. Research Questions

1) What specific steps should be followed in organizing STEM education activities for primary school students under a participatory approach? Which stakeholders should participate in these activities, what competencies should they possess, and what roles should they perform at each stage? How can the PDCA quality management cycle be applied to the management of STEM education activities for primary school students under a participatory approach so as to clearly assign management responsibilities to each participating stakeholder and achieve the intended objectives?

2) What is the current status of managing STEM education activities for students in primary schools in Hung Yen Province under a participatory approach, and what strengths and limitations can be identified?

3) What management solutions should be proposed to improve the quality and practical effectiveness of STEM education activities for students in primary schools in Hung Yen Province under a participatory approach?

5. Research Hypothesis

The management of STEM education activities for primary school students under a participatory approach requires the active involvement of both internal and external stakeholders throughout all stages of designing, implementing, and evaluating STEM education activities, as well as managing these processes, based on clearly defined lead–coordinate roles and responsibilities.

Although the management of STEM education activities in primary schools in Hung Yen Province has achieved initial positive outcomes, it has yet to effectively engage a diverse range of stakeholders, lacks a well-defined coordination mechanism, and is constrained by limitations in the awareness and implementation capacity of school leaders and teachers. It is hypothesized that if management solutions clearly establish the lead–coordinate mechanism, promote the active participation of relevant stakeholders by leveraging local conditions and resources, and enhance the competencies of school leaders and teachers in organizing and

managing STEM education activities, these limitations can be overcome. Consequently, the quality of STEM education activities will be improved, thereby contributing to the holistic development of primary school students.

6. Research Tasks

6.1. To establish the theoretical foundations for the management of STEM education activities for primary school students under a participatory approach.

6.2. To investigate, analyze, and evaluate the current status of STEM education activities and the management of STEM education activities for students in primary schools in Hung Yen Province under a participatory approach.

6.3. To propose management solutions for STEM education activities for students in primary schools in Hung Yen Province under a participatory approach; to assess the necessity and feasibility of the proposed solutions; and to pilot one of the proposed management solutions presented in the dissertation.

7. Scope and Delimitation of the Study

7.1. *Scope of the Research Content:* The study focuses on the management of STEM education activities for students in public primary schools in Hung Yen Province under a participatory approach. The research examines the role of the school principal as the primary management actor within the framework of decentralized school management, with management responsibilities delegated to vice principals and heads of professional groups.

7.2. *Scope of the Research Setting:* The study was conducted in 20 public primary schools in Hung Yen Province, where surveys were carried out to investigate the management of STEM education activities for primary school students under a participatory approach.

7.3. Scope of the Research Participants

The survey was conducted with four groups of participants from the 20 selected public primary schools, including:

Educational managers (150 participants): representatives of the Hung Yen Provincial Department of Education and Training; commune-level officials responsible for cultural and social affairs in Hung Yen Province; principals, vice principals, and heads and deputy heads of professional groups in public primary schools.

Teachers: 550 participants.

Social stakeholders: 80 participants, including representatives from enterprises, production facilities, farms, higher education institutions, vocational education institutions, and research institutes.

Parents: 120 participants.

7.4. *Time Frame of the Study:* Secondary data were collected from the 2021–2022 to 2024–2025 academic years. Primary data for the empirical survey were collected in 2025. The research and completion of the dissertation were carried out during the period 2022–2026.

8. Research Approaches and Research Methods

8.1. Research Approaches

8.1.1. Participatory Approach

8.1.2. Systems Approach

8.1.3. Competency-Based Approach

8.1.4. Practical and Contextual Approach

8.1.5. PDCA Quality Management Approach

8.2. Research Methods

8.2.1. Theoretical Research Methods

8.2.2. Empirical Research Methods

- Questionnaire Survey Method
- Experience Review Method
- In-depth Interview Method
- Expert Consultation Method
- Pilot Implementation Method

8.2.3. Mathematical Statistical Methods

9. Key Arguments for the Defense of the Dissertation

9.1. The management of STEM education activities in primary schools under a participatory approach is essential to improving the quality of general education in the context of educational reform. This approach requires the coordinated involvement of both internal and external stakeholders throughout the entire process, from the design and organization of STEM education activities to their evaluation and improvement, based on a clear delineation of the lead and coordinating roles of each stakeholder. Therefore, it is necessary to develop a specific process for organizing STEM education activities for primary school students under a participatory approach.

9.2. The empirical study conducted in primary schools in Hung Yen Province shows that this management model has initially been established but has not yet achieved optimal effectiveness due to the absence of a coherent coordination mechanism, the limited range of participating stakeholders, and uneven implementation competencies among educational managers and teachers.

9.3. If management solutions for STEM education activities for primary school students under a participatory approach are designed and implemented in a manner that ensures their necessity and feasibility, strengthens coordination mechanisms, effectively utilizes local practical conditions, and enhances the competencies of management actors, the existing limitations can be addressed. This will contribute to improving the quality and sustainability of STEM education and to the holistic development of primary school students' competencies and qualities.

10. Original Contributions of the Dissertation

10.1. Theoretical Contributions

The dissertation develops, supplements, and refines the theoretical framework

for the management of STEM education activities for primary school students under a participatory approach. Specifically, it establishes the core concepts of the study, identifies the stakeholders involved in STEM education, and clarifies the competencies required of these stakeholders. The dissertation also develops a process for organizing STEM education activities and clarifies the management contents of STEM education activities under a participatory approach from the perspective of primary school principals in the context of educational reform. On this basis, the study provides scientific evidence and theoretical foundations for improving the management of STEM education activities in primary schools.

10.2. Practical Contributions

Based on the investigation and evaluation of the current status of the management of STEM education activities in primary schools in Hung Yen Province under a participatory approach, the dissertation identifies the strengths, limitations, opportunities, challenges, and the underlying causes of the identified limitations. The system of management solutions proposed in the dissertation provides practical reference value for improving the management of STEM education activities in primary schools.

These solutions can be applied by educational authorities, educational managers, and primary school principals to strengthen the management of STEM education activities, thereby enhancing their effectiveness in the context of ongoing educational reform.

The dissertation also serves as a valuable reference for teacher educators at higher education institutions, as well as for teachers and educational managers in general education schools, particularly primary schools, in studying and applying its findings to educational practice.

11. Structure of the Dissertation

In addition to the Introduction, Conclusion, List of Publications, References, and Appendices, the dissertation is organized into three chapters:

Chapter 1: Theoretical Foundations of the Management of STEM Education Activities for Primary School Students under a Participatory Approach.

Chapter 2: Current Status of the Management of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach.

Chapter 3: Management Solutions for STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach.

CHAPTER 1:

THEORETICAL FOUNDATIONS OF THE MANAGEMENT OF STEM EDUCATION ACTIVITIES FOR PRIMARY SCHOOL STUDENTS UNDER A PARTICIPATORY APPROACH

1.1. Literature Review

1.1.1. Studies on STEM Education Activities for Students

This section reviews representative studies on STEM education activities conducted by English and King (2015) [53], Le Xuan Quang (2017) [29], Nguyen Thanh Nga et al. (2019) [32], Akgunduz et al. (2015) [43], Thai Quoc Bao et al. (2018) [1], Nguyen Quang Linh (2019) [26], Le Thi Xinh and Bui Van Hong (2023) [40], Le Thi Ngoc Thuy et al. (2023) [36], Nguyen Van Bien and Pham Vu Bich Hang (2026), Nguyen Nga and Hoang Phuoc Muoi (2018) [2, 27], Miller and Knezek (2013) [74], Kim and Park (2012), Jin, Chong, and Cho (2012) [61], the SiCi-Campaign project [103], and Nguyen Van Bien, Tuong Duy Hai et al. (2019) and Nguyen Thi Hang et al. (2022) [3, 19].

1.1.2. Studies on STEM Education Activities under a Participatory Approach

This section reviews representative studies on STEM education activities under a participatory approach conducted by Le Thi Ngoc Thuy et al. (2023) [36], Bui Van Hong, Phan Nguyen Truc Phuong, and Nguyen Quoc Tiep (2023) [21], A Framework for K–12 Science Education (2012) [50], Sanders (2009) [90], Henry Jenkins et al. (2006) in *Confronting the Challenges of Participatory Culture: Media Education for the 21st Century (Part One)* [62], Nguyen Chi Thanh and Dang Van Son (2019) [33], Nguyen Lan Phuong (2024) in *Vietnam’s STEM Education Landscape: Evolution, Challenges, and Policy Interventions* [87], and Bang-Hee Kim and Jinsoo Kim (2016) [64].

1.1.3. Studies on the Management of STEM Education Activities under a Participatory Approach

This section reviews representative studies on the management of STEM education activities under a participatory approach, including Prepare and Inspire (PCAST, 2010) [88], the White Paper issued by the Virginia Beach City Public Schools (2011) [91], the study by Thai Van Thanh, Nguyen Thi Nhi, and Le Thi Binh (2022) [34], *Immersive STEM Learning Experiences to Shape Shared Futures* published by Dublin City University (2021) [58], and the report *Federal Strategic Plan for Advancing STEM Education and Cultivating STEM Talent* issued by the White House Office of Science and Technology Policy (OSTP, 2024) [80].

1.1.4. Nhận xét chung về các công trình nghiên cứu và những vấn đề cần đặt ra để luận án tiếp tục nghiên cứu

1.1.4.1. General Remarks on Previous Studies

Studies on STEM education activities for students in Vietnam and around the world have generally been conducted from three main perspectives: an interdisciplinary integrated teaching approach involving STEM-related subjects; a

STEM approach based on the scientific research process; and a STEM approach in the form of experiential education activities.

The management of STEM education activities for students under a participatory approach has received research attention through the application of the CIPO model...

1.1.4.2. Issues Not Yet Addressed in Previous Studies

It is necessary to specifically identify the participating stakeholders, the competencies required of these stakeholders, and the competency criteria for those involved in STEM education for students in the current context of digital transformation.

A scientifically grounded process for implementing STEM education for students needs to be developed.

Further research is needed on the ecosystem and the organization of STEM education activities under a participatory approach at the primary school level in a specific and scientific manner.

1.1.4.3. Issues to Be Addressed by the Dissertation

The dissertation investigates the theoretical foundations of STEM education activities in primary schools under a participatory approach. It also examines the theoretical foundations of managing STEM education activities for students under a participatory approach, with particular emphasis on identifying a specific management cycle linked to the responsibilities of each stakeholder participating in STEM education activities for primary school students.

The dissertation surveys and evaluates the current status of STEM education activities and the management of STEM education activities at the primary school level under a participatory approach, and identifies the shortcomings and limitations of these activities.

The dissertation seeks management solutions for STEM education activities in primary schools under a participatory approach, thereby contributing to improving the quality of STEM education activities in primary schools.

1.2. Basic Concepts of the Dissertation

1.2.1. STEM Education Activities

Based on the analysis and selective inheritance of the viewpoints of the above-mentioned authors, the dissertation defines STEM education activities as the process of organizing students to apply interdisciplinary knowledge of Science, Technology, Engineering, and Mathematics to solve real-world problems through activities such as exploration, design, product fabrication, and product testing, thereby enabling students to develop the qualities and competencies required by the intended educational objectives.

1.2.2. STEM Education Activities for Primary School Students under a Participatory Approach

STEM education activities for primary school students under a participatory approach can be understood as a process in which multiple stakeholders (teachers, students, parents, schools, enterprises, and the community) collaborate by sharing responsibilities and resources in designing, implementing, and evaluating students' STEM learning activities. Through this process, students develop scientific thinking, as well as the core qualities and competencies required at the primary education level by solving simple real-world problems.

1.2.3. Management of STEM Education Activities for Primary School Students under a Participatory Approach

The management of STEM education activities for primary school students under a participatory approach is the process in which the school management authority (the principal) plans, organizes, monitors and evaluates, and adjusts and improves STEM education activities in order to mobilize, coordinate, and effectively utilize the participation of multiple stakeholders (teachers, students, families, communities, and social organizations) in designing, implementing, and evaluating STEM education activities for students, thereby ensuring the development of students' qualities and competencies in accordance with the objectives of primary education.

1.3. Fundamental Issues of STEM Education Activities for Primary School Students under a Participatory Approach

1.3.1. The Primary General Education Curriculum, Characteristics, Necessity, and Competencies of Stakeholders Participating in STEM Education Activities for Primary School Students

1.3.1.1. The Primary General Education Curriculum

Objectives; Curriculum content and instructional time; Modes of implementation: (STEM lessons; STEM experiential activities; Introduction to scientific and technological research); Assessment.

1.3.1.2. Characteristics of STEM Education Activities for Primary School Students

STEM education activities for primary school students have the following basic characteristics: interdisciplinary integration; connection with real-life contexts;

1.3.1.3. The Necessity of Implementing STEM Education Activities in Primary Schools under a Participatory Approach

It can be affirmed that implementing STEM education activities under a participatory approach expands the educational space and strengthens the relationship between schools, families, and society, while connecting knowledge with local real-world contexts and students' daily lives.

1.3.1.4. Stakeholders Participating in STEM Education Activities and Their Competencies

- *Stakeholders participating in STEM education activities for primary school students include:* teachers; primary school students; parents of primary school students; and social and community stakeholders (Youth Union, Young Pioneer Organization, Trade Union, Women's Union, Veterans' Association, Commune/Ward People's Committees, enterprises, local artisans, etc.).

- *Competencies of stakeholders participating in STEM education activities for primary school students:*

(1) *Teachers' competencies:* Competency in understanding STEM education and interdisciplinary integrated teaching; competency in designing STEM themes and lessons; competency in organizing active learning activities; competency in networking and collaboration; competency in assessing the development of students' qualities and competencies.

(2) *Primary school students' competencies:* Competency in identifying and solving problems; competency in practical application and design thinking; competency in collaboration and multidirectional communication; competency in self-directed learning and critical thinking.

(3) *Parents' competencies:* Competency in understanding the objectives and significance of STEM education; competency in creating a supportive learning environment at home; competency in collaborating with teachers and schools.

(4) *Competencies of social and community stakeholders:* These stakeholders should possess competency in providing consultation and connecting learning with real-world contexts; competency in supporting educational activities; competency in collaborating with schools in organizing STEM education activities; and competency in participating in the evaluation of STEM education activities.

1.3.2. STEM Education Activities in Primary Schools under a Participatory Approach

1.3.2.1. Objectives of STEM Education Activities for Primary School Students under a Participatory Approach

The objectives of STEM education activities for primary school students under a participatory approach are to establish a foundation in scientific, technological, engineering, mathematical, and biological thinking; to provide students with practical learning experiences accompanied by the active and proactive guidance and support of relevant stakeholders (teachers, parents, schools, and the community); thereby developing students' problem-solving competency, creative thinking, and collaboration skills to meet the requirements of educational reform in the context of digital transformation and international integration.

1.3.2.2. Contents, Methods, and Forms of STEM Education Activities for Primary School Students under a Participatory Approach

According to the guidance provided in Official Dispatch No. 909/BGDĐT-GDTH, STEM education activities are implemented through three basic forms: STEM lessons, STEM experiential activities, and introduction to scientific and technological research.

Contents of STEM experiential activities: focus on practical issues related to the daily lives of primary school students and the local context.

Methods: direct experience, hands-on practice, observation, and other appropriate methods.

Forms of organization: include regular STEM clubs, theme-based activities, short-term projects, and STEM festivals.

1.3.2.3. Assessment of the Outcomes of STEM Education Activities for Primary School Students under a Participatory Approach

Circular No. 27/2020/TT-BGDĐT shifts the focus of assessment from knowledge acquisition to the assessment of learning processes and products, aiming at the comprehensive development of learners' qualities, competencies, and creativity, thereby contributing to the development of lifelong learners who are capable of adaptation, innovation, and integration in the era of digital transformation.

1.3.2.4. Conditions for Implementing STEM Education Activities for Primary School Students under a Participatory Approach

- Facilities and learning materials
- School cultural environment
- Information systems and digital transformation

1.3.3. Developing a Process for Organizing STEM Education Activities in Primary Schools under a Participatory Approach

1.3.3.1. Principles for Developing the Process of Organizing STEM Education Activities for Primary School Students under a Participatory Approach

- Promoting students' active participation.
- Ensuring the appropriateness of stakeholders' competencies.
- Enhancing students' experiential and practical learning.
- Ensuring continuous adjustment and improvement throughout the process.

1.3.3.2. The Process of Organizing STEM Education Activities for Primary School Students under a Participatory Approach and the Roles of the Stakeholders

Step 1: Identify real-world problems and generate STEM ideas.

Step 2: Establish STEM objectives and research questions.

Step 3: Form learning groups and assign tasks.

Step 4: Explore knowledge and develop STEM skills.

Step 5: Design, test, and refine STEM products.

Step 6: Present STEM products and organize feedback and peer review.

Step 7: Evaluate, draw lessons learned, and disseminate the outcomes.

Table 1.1. Summary of the Process Steps and the Roles of Stakeholders in STEM Education Activities in Primary Schools under a Participatory Approach

Step	Lead Stakeholders	Assessment Tools/Methods
1. Identify real-world problems and generate STEM ideas	Teachers/Professional Groups (lead the discussion); Students (propose ideas); School Leadership (approve); Parents and Social Partners (provide feedback)	Group assessment forms; learning journals; checklists for the practicality and safety of ideas
2. Establish STEM objectives and research questions	Teachers (develop objectives and research questions); Students (propose objectives and questions); Professional Groups/School Leadership (review); Parents and Social Partners (provide feedback)	Planning diagrams; solution criteria checklists; rubrics for assessing objectives and research questions
3. Form learning groups and assign tasks	Teachers (form groups and assign tasks); Professional Groups (provide guidance); School Leadership (provide support)	Role assignment forms; group progress charts; checklists for assessing group collaboration
4. Explore knowledge and develop STEM skills	Teachers (guide practical activities); Students (conduct experiments and keep records); Parents and Community Stakeholders (provide support and mentoring); School Leadership (inspect facility safety)	Experiment/learning journals; teacher observation forms; laboratory safety checklists
5. Design, test, and refine STEM products	Teachers (coordinate product development); Students (design and construct products); Parents and Social Partners (provide materials and technical guidance)	Design drawings/design plans; product assessment rubrics (skills, creativity, safety); expert feedback forms
6. Present STEM products and organize peer review	Teachers (organize presentations); Students (present and discuss); School Leadership (organize STEM events); Parents and Social Partners (serve as reviewers)	Presentation and content rubrics; peer assessment forms; reviewer feedback forms
7. Evaluate, draw lessons learned, and disseminate outcomes	Teachers (conduct summative evaluation); Students (self-assessment and group assessment); Professional Groups/School Leadership (conduct review meetings); Division of Culture and Social Affairs (conduct inspection)	Competency development rubrics; completed learning journals; summary reports and reflection checklists

(Lead stakeholders: Teachers; Students; School Leadership; Professional Groups; Parents; Social Partners, including enterprises, community organizations, research institutes, and universities.)

1.4. Management of STEM Education Activities for Primary School Students under a Participatory Approach

1.4.1. Roles of Management Stakeholders in Organizing STEM Education Activities for Primary School Students under a Participatory Approach

The principal is the management authority. The vice principal, who is responsible for professional affairs, directly supports the principal in managing and administering STEM education activities. Professional groups are responsible for organizing and implementing STEM education activities at the professional level. Teachers are the key personnel directly responsible for organizing and implementing STEM education activities. Organizations within the school, including professional groups, the Ho Chi Minh Young Pioneer Organization, and school clubs, play a supporting and coordinating role in organizing STEM education activities. Parents and the local community participate in providing resources and supporting the implementation of STEM education activities.

1.4.2. Planning the Organization of STEM Education Activities for Primary School Students under a Participatory Approach (Plan)

Planning the organization of STEM education activities shall cover the entire activity process established in seven steps: (1) identifying real-world problems and generating STEM ideas; (2) establishing objectives and research questions; (3) forming learning groups and assigning tasks; (4) exploring knowledge and developing STEM skills; (5) designing, testing, and refining products; (6) presenting products, providing feedback, and conducting peer review; and (7) evaluating, drawing lessons learned, and disseminating the results.

1.4.3. Organizing the Implementation of STEM Education Activities for Primary School Students under a Participatory Approach (Do)

The implementation of STEM education activities is carried out through STEM lessons, STEM experiential activities, STEM clubs, STEM festivals, or introduction to scientific and technological research.

During the implementation stage, the seven-step process established in the plan is carried out in an appropriate sequence corresponding to each form of activity.

1.4.4. Monitoring and Evaluating STEM Education Activities for Primary School Students under a Participatory Approach (Check)

The principal directs the development of a system of assessment criteria and assessment tools that are appropriate to the objectives of STEM education activities and the characteristics of primary school students.

Teachers are guided to play a direct role in monitoring, recording, and assessing students' progress throughout their participation in STEM education activities.

Students are instructed to participate in self-assessment and peer assessment.

Parents and social stakeholders in the community are involved in the assessment of students' STEM products.

1.4.5. Adjusting and Improving STEM Education Activities for Primary School Students under a Participatory Approach (Act)

The principal directs the school leadership, professional groups, and teachers to comprehensively analyze the process of organizing STEM education activities based on the results of monitoring and evaluation, as well as feedback from the participating stakeholders.

The adjustment of the process for organizing STEM education activities begins with the stage of identifying real-world problems and generating STEM ideas.

Table 1.2. Lead and Coordinating Roles of Stakeholders in the Management of STEM Education Activities Based on the PDCA Cycle

Management Stage	Lead Management Stakeholder	Lead Professional Stakeholder / Direct Implementer	Coordinating Stakeholders within the School	Coordinating Stakeholders outside the School	Main Responsibilities for Leadership and Coordination
Planning (Plan)	The principal leads the analysis of the context; determines the objectives, orientations, forms of implementation, timeline, and resources; approves the plan and the coordination mechanism. The vice principal provides advice within the assigned areas of responsibility.	Professional groups take the lead in providing professional advice; teachers develop STEM themes and learning tasks, and specify the seven-step process in lesson plans, experiential activities, or STEM projects.	The Trade Union, the Ho Chi Minh Young Pioneer Organization, and students participate in proposing activity contents, forms, and organizational needs.	Parents, educational experts, enterprises, production facilities, and social organizations provide information, give feedback on STEM themes, identify support capacity, and provide practical conditions.	Determine objectives, themes, processes, tasks, timelines, lead stakeholders, coordinating stakeholders, resources, assessment criteria, and safety measures.
Implementation (Do)	The principal directs, coordinates, allocates resources, and resolves emerging issues; the	Teachers take the lead in organizing students to implement the seven-step process; professional	Students directly carry out learning tasks; the Ho Chi Minh Young	Parents provide learning materials, learning conditions, and practical	Implement STEM themes; organize learning groups; explore knowledge;

Management Stage	Lead Management Stakeholder	Lead Professional Stakeholder / Direct Implementer	Coordinating Stakeholders within the School	Coordinating Stakeholders outside the School	Main Responsibilities for Leadership and Coordination
	vice principal directly monitors, supports, and administers implementation according to the assigned responsibilities.	groups coordinate professional activities, provide support, and monitor implementation progress.	Pioneer Organization coordinates experiential activities, STEM clubs, and STEM festivals; the Trade Union provides professional support and mobilizes resources.	experience; experts, enterprises, artisans, and production facilities provide professional support, equipment, and experiential learning environments.	design, construct, test, refine, and present STEM products; maintain coordination, implementation progress, and safety.
Monitoring and Evaluation (Check)	The principal leads the monitoring of plan implementation, organizational quality, coordination effectiveness, and resource utilization; the vice principal organizes the collection, synthesis, and analysis of evidence.	Professional groups and teachers take the lead in assessing professional implementation, learning outcomes, implementation of the seven-step process, and students' development of qualities and competencies.	Students conduct self-assessment and peer assessment; the Trade Union and the Ho Chi Minh Young Pioneer Organization coordinate the organization of summary activities, exhibitions, and product presentations.	Parents, experts, enterprises, and the community provide feedback on the learning process, the practical relevance, and the applicability of STEM products.	Collect and analyze data; compare objectives with outcomes; assess STEM products, learning processes, the level of stakeholder participation, coordination responsibilities, and the effectiveness of resource utilization.
Adjustment and Improvement (Act)	The principal leads decisions on adjustment;	The vice principal, professional groups, and	The Trade Union coordinates motivation,	Parents and social stakeholders provide	Adjust implementation plans, contents,

Management Stage	Lead Management Stakeholder	Lead Professional Stakeholder / Direct Implementer	Coordinating Stakeholders within the School	Coordinating Stakeholders outside the School	Main Responsibilities for Leadership and Coordination
	improves the implementation plan, coordination mechanism, personnel assignment, and supporting conditions for the next management cycle.	teachers take the lead in adjusting STEM themes, objectives, methods, the seven-step process, and assessment tools; propose professional development activities and the dissemination of good practices.	professional development, and professional sharing; the Ho Chi Minh Young Pioneer Organization improves experiential activities, STEM clubs, and STEM festivals; students provide feedback on the activity contents and organization	feedback, continue supporting resources, expand experiential learning environments, and participate in disseminating appropriate models.	methods, group organization, equipment, learning materials, and coordination mechanisms; provide teacher professional development; address identified limitations; and share and replicate effective models.

Source: Developed by the author based on the application of the PDCA cycle and an analysis of the roles of stakeholders.

1.5. Factors Affecting the Management of STEM Education Activities for Primary School Students under a Participatory Approach

1.5.1. State Policies, Policies of the Ministry of Education and Training, and the Legal Framework for STEM Education

1.5.2. Digital Transformation Trends and the Local Socio-economic Context

1.5.3. Management Competencies of School Principals

1.5.4. Awareness and Competencies of Teachers

1.5.5. School Facilities and Financial Resources

1.5.6. Consensus and the Level of Participation of Parents and the Community

1.5.7. The School Education Plan

CONCLUSION OF CHAPTER 1

CHAPTER 2: CURRENT STATUS OF THE MANAGEMENT OF STEM EDUCATION ACTIVITIES FOR PRIMARY SCHOOL STUDENTS IN HUNG YEN PROVINCE UNDER A PARTICIPATORY APPROACH

2.1. International Experience in STEM Education Activities and the Management of STEM Education Activities for Students under a Participatory Approach

2.1.1. The United States (The Americas)

The United States is a leading country in the development of STEM education through a systematic approach that is closely aligned with strategies for human resource development and national competitiveness. A distinctive feature of the United States' approach is the development and implementation of STEM education strategies in successive phases.

2.1.2. Finland (Europe)

Finland is regarded as one of the countries with the most advanced education systems, in which STEM education is not implemented as a separate field but is deeply integrated into the structure of the general education curriculum.

2.1.3. Israel (The Middle East)

Israel is a country with a highly developed science and technology sector and is recognized as a "Start-up Nation", with one of the world's most dynamic innovation ecosystems [92].

2.1.4. Australia (Oceania)

Australia has implemented STEM education under a clearly defined national policy orientation, aligned with the goal of developing human resources [45, 52].

2.1.5. Japan (East Asia)

In Japan, STEM education is implemented through a combination of providing foundational knowledge and strengthening practical activities and research associated with real-world applications [82].

2.1.6. Singapore (Southeast Asia)

Singapore implements STEM education within the framework of its national development strategy based on knowledge and innovation.

2.1.7. Lessons Learned for the Management of STEM Education for Primary School Students

- School management should create an environment that enables teachers and students to be creative, recognizing creativity as an integral part of students' learning.
- International experience also indicates that STEM education should begin at the preschool and primary school levels through simple projects that focus on stimulating students' curiosity rather than emphasizing academic knowledge.

2.2. Overview of the Economic, Cultural, and Educational Context of Hung Yen Province

2.2.1. Overview of the Economic and Cultural Context in the Context of Administrative Merger

Table 2.1. Statistics on STEM-Related Enterprises in Hung Yen Province

No.	Classification of Enterprises by Main Business Sector	Former Thai Binh Province		Former Hung Yen Province		New Hung Yen Province	
		Number	%	Number	%	Number	%
1	High-tech STEM-related enterprises (information technology, software, data, electronics and telecommunications, computer technology, automation, biotechnology, research and development (R&D), etc.)	161	1.74	427	3.04	588	2.53
2	Low-tech STEM-related enterprises (construction, mechanical engineering, manufacturing, industrial production, electricity, water supply, environmental services, etc.)	1761	19.04	2719	19.37	4480	19.24
3	Enterprises in other business sectors (trade, services, real estate, agriculture, etc.)	7325	79.21	10891	77.59	18216	78.23
Total		9247		14037		23284	

Source: Compiled by the author based on statistical data from the People's Committee of Hung Yen Province (2025).

2.2.2. Overview of Primary Education in Hung Yen Province

2.2.2.1. Scale of Primary Education, Teaching Staff, and Educational Management Personnel

Table 2.2. Statistics on the Scale of Primary Education, Teaching Staff, Educational Management Personnel, and Primary School Students in Hung Yen Province

Statistical Indicator	Hung Yen Province	Thai Binh Province	New Hung Yen Province
Primary schools	77	120	197
Primary and Lower Secondary Schools	88	167	255
Primary, Lower Secondary, and Upper Secondary Schools	5	3	8
Total number of primary school students	117.659	140.023	257.682

Source: Department of Education and Training of Hung Yen Province (2025)

2.2.2.2. Facilities, Teaching Equipment, and Learning Resources Supporting STEM Education in Primary Schools in Hung Yen Province

In public primary schools, the existing facilities generally meet the requirements of the General Education Curriculum at the primary level. However, specialized conditions for STEM education, such as functional classrooms, laboratory equipment, and technological learning resources, remain insufficient. năng, thiết bị thí nghiệm, học liệu công nghệ còn thiếu.

2.2.2.3. Implementation of STEM Education Activities at the Primary School Level

Following the administrative merger, the new Hung Yen Province has established a unified mechanism for the implementation of STEM education. Resolution No. 767/NQ-HĐND of the Provincial People's Council stipulates that STEM education is an educational support service that is not subject to a tuition fee ceiling and is implemented on the basis of voluntariness and mutual agreement. This provides a flexible legal framework, overcomes the limitations previously encountered in both localities, and enhances the autonomy of schools in mobilizing resources [22].

2.3. Survey Design

2.3.1. Survey Objectives

2.3.2. Survey Contents

2.3.3. Survey Participants

2.3.4. Survey Period

2.3.5. Survey Methods

2.3.6. Survey Instruments

2.3.7. Data Processing

2.3.8. Reliability Testing of the Measurement Scales

Kết quả chạy phân tích trên phần mềm SPSS 20.0 cho thấy các thang đo đều đạt độ tin cậy cao,

2.4. Current Status of STEM Education Activities for Primary School Students in Primary Schools in Hung Yen Province under a Participatory Approach

2.4.1. Current Status of Educational Managers' and Teachers' Awareness of the Importance of STEM Education for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results show that educational managers and teachers have a highly positive and consistent awareness of the importance of STEM education under a participatory approach in primary schools in Hung Yen Province. This provides a favorable foundation for organizing and managing STEM education activities and mobilizing the participation of educational stakeholders in their implementation at schools.

2.4.2. Current Status of the Level of Participation and Competencies of Stakeholders Involved in STEM Education Activities for Primary School Students in Hung Yen Province

The results indicate that the competencies of stakeholders participating in STEM education activities for primary school students in Hung Yen Province achieved an overall mean score of 3.22, corresponding to a moderate level.

2.4.3. Current Status of the Achievement of the Objectives of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

Table 2.8. Level of Achievement of the Objectives of STEM Education Activities for Students under a Participatory Approach

No.	Assessment Criteria	Educational Managers (n=150) Mean	SD	Rank	Teachers (n=550) Mean	SD	Rank	Overall (n=700) Mean
1	Developing interdisciplinary and integrated thinking, as well as critical thinking and problem-solving competencies among primary school students	3,93	0,86	1	3,65	0,93	1	3,71
2	Promoting students' active participation in the learning process	3,88	0,84	2	3,63	0,91	2	3,68

No.	Assessment Criteria	Educational Managers (n=150) Mean	SD	Rank	Teachers (n=550) Mean	SD	Rank	Overall (n=700) Mean
3	Building a collaborative and creative learning culture in primary schools	3,52	0,88	3	3,24	0,95	3	3,30
4	Strengthening collaboration among schools, families, and society in organizing STEM learning and experiential activities for students	3,34	0,90	5	3,07	0,97	5	3,13
5	Contributing to improving the effectiveness of education in developing learners' qualities and competencies	3,48	0,87	4	3,21		4	3,27
Overall Mean		3,63	0,87		3,36	0,94		3,42

2.4.4. Current Status of the Implementation of the Contents, Methods, and Forms of STEM Education for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate that:

- The frequency of using methods for organizing STEM education activities in primary schools in Hung Yen Province under a participatory approach achieved an overall mean score of 3.56, corresponding to the "frequent" level. The overall standard deviation of 0.76 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations of educational managers and teachers.
- The frequency of organizing different forms of STEM education activities in primary schools in Hung Yen Province under a participatory approach achieved an overall mean score of 3.30, corresponding to the "occasional" level. The overall standard deviation of 0.85 indicates a low level of dispersion.

2.4.5. Current Status of the Assessment of the Outcomes of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate that the assessment of the outcomes of STEM education activities for students under a participatory approach in primary schools in Hung Yen Province was rated by educational managers and teachers with an overall mean score of 2.97.

2.4.6. Current Status of the Conditions for Organizing STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate that the provision of conditions for implementing STEM education activities in primary schools in Hung Yen Province under a participatory approach achieved an overall mean score of 3.40, corresponding to the "moderate" level and approaching the "good" level. The overall standard deviation of 0.81 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations of the respondents.

2.5. Current Status of the Implementation of the Process and the Roles of Stakeholders in STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

Table 2.14. Level of Implementation of the Steps in Organizing STEM Education Activities

No.	Assessment Criteria	Educational Managers (n = 150) Mean	SD	Rank	Teachers (n = 550) Mean	SD	Rank	Overall Mean (n = 700)
1	Step 1: Identify real-world problems and propose ideas based on practical observations.	3,68	0,61	2	3,48	0,69	2	3,52
2	Step 2: Establish STEM objectives and research questions.	3,63	0,58	3	3,44	0,66	3	3,48
3	Step 3: Form learning groups, assign tasks, and discuss solutions.	3,82	0,55	1	3,60	0,62	1	3,65

No.	Assessment Criteria	Educational Managers (n = 150) Mean	SD	Rank	Teachers (n = 550) Mean	SD	Rank	Overall Mean (n = 700)
4	Step 4: Explore foundational knowledge and develop STEM skills.	3,49	0,64	4	3,31	0,74	4	3,35
5	Step 5: Design, test, and refine products using recycled and locally available materials.	3,39	0,71	5	3,21	0,79	5	3,25
6	Step 6: Test, measure, revise designs, report results, and provide peer feedback.	3,29	0,76	6	3,11	0,84	6	3,15
7	Step 7: Evaluate and disseminate outcomes (presenting and sharing products and experiences with the community and parents).	3,00	0,82	7	2,81	0,89	7	2,85
Overall Mean		3,47	0,67		3,28	0,75		3,32

The results presented in Table 2.14 indicate that the implementation of the steps for organizing STEM education activities in primary schools in Hung Yen Province achieved an overall mean score of 3.32, corresponding to the "good" level.

2.6. Current Status of the Management of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

2.6.1. Current Status of Planning the Implementation of STEM Education Activities in Primary Schools in Hung Yen Province under a Participatory Approach

The survey results indicate that the planning of STEM education activities in primary schools in Hung Yen Province under a participatory approach was rated by educational managers and teachers with an overall mean score of 3.33, corresponding to the "moderate" level. The overall standard deviation of 0.82 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations of the respondents.

2.6.2. Current Status of Organizing the Implementation of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate that educational managers and teachers rated the current status of organizing STEM education activities in primary schools in Hung Yen Province under a participatory approach with an overall mean score of 3.29, corresponding to the "moderate" level. An overall standard deviation of less than 1.0 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations of educational managers and teachers.

2.6.3. Current Status of Monitoring and Evaluating STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate that the current status of monitoring and evaluating STEM education activities in primary schools in Hung Yen Province under a participatory approach achieved an overall mean score of 3.09, corresponding to the "moderate" level. The overall standard deviation of 0.86 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations. These results indicate that the assessments of the two respondent groups were largely consistent.

2.6.4. Current Status of Adjusting and Improving STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

The survey results indicate an overall mean score of 3.15, corresponding to the "moderate" level. The overall standard deviation of 0.86 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations and suggesting that the assessments of the two respondent groups were generally consistent.

2.6.5. Current Status of the Participation of Parents and Social Stakeholders in the Management of STEM Education Activities for Primary School Students in Hung Yen Province

The survey results indicate that the participation of parents and social stakeholders in the management of STEM education activities for primary school students in Hung Yen Province achieved an overall mean score of 2.96, corresponding to the "occasional" level. The overall standard deviation of 0.82 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the respondents' evaluations.

2.7. Current Status of the Influence of Factors Affecting the Management of STEM Education Activities for Primary School Students in Hung Yen Province

The survey results indicate that the overall mean score for the entire sample was 4.08, corresponding to the "influential" level. The overall standard deviation of 0.67 indicates a low level of dispersion, reflecting a relatively high degree of consistency in the evaluations and suggesting that the assessments of the two respondent groups were generally consistent.

2.8. Overall Assessment of the Current Status of the Management of STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

**** General Remarks***

The findings indicate that STEM education activities for primary school students in Hung Yen Province have been implemented; however, the level of implementation has not been consistent and has not yet fully reflected the depth of the participatory approach.

**** Strengths***

A major strength is that educational managers and teachers demonstrate a highly consistent and positive awareness of the role and importance of STEM education.

**** Limitations***

The most significant limitation lies in the limited participation of stakeholders outside the school. Within the process of organizing STEM education activities, the stage of evaluation and dissemination of outcomes recorded the lowest level of implementation.

**** Causes***

The identified limitations stem from both the conditions required for implementation and the management competencies of school leaders in implementing STEM education for students.

There is a lack of appropriate spaces for organizing STEM education activities.

Collaboration among schools, families, and the community in organizing STEM education activities remains limited.

No management mechanism has been established to clearly define the responsibilities of participating stakeholders, nor has a stable coordination mechanism been developed.

A comprehensive assessment system and sufficiently robust data for continuous improvement have not yet been established.

CONCLUSION OF CHAPTER 2

CHAPTER 3: MANAGEMENT SOLUTIONS FOR STEM EDUCATION ACTIVITIES FOR PRIMARY SCHOOL STUDENTS IN HUNG YEN PROVINCE UNDER A PARTICIPATORY APPROACH

3.1. Principles for Proposing the Management Solutions

- 3.1.1. Principle of Ensuring Goal Orientation
- 3.1.2. Principle of Ensuring the Participatory Approach
- 3.1.3. Principle of Ensuring Systematicity and Consistency
- 3.1.4. Principle of Ensuring Practicality
- 3.1.5. Principle of Ensuring Effectiveness and Continuous Improvement

3.2. Management Solutions for STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

3.2.1. Developing and Implementing a Management Mechanism for STEM Education Activities for Primary School Students in Hung Yen Province under a Participatory Approach

3.2.2. Organizing Professional Development to Enhance the Competencies of Educational Managers in Managing STEM Education Activities under a Participatory Approach in Primary Schools in Hung Yen Province

3.2.3. Organizing Coordination among Schools, Families, and the Community in Implementing STEM Education Activities for Primary School Students in Hung Yen Province

3.2.4. Directing the Development of Creative Spaces for STEM Education Activities in Primary Schools in Hung Yen Province

3.2.5. Organizing Multi-stakeholder Coordination in the Assessment of STEM Education Activities for Primary School Students in Hung Yen Province

3.3. Relationships among the Solutions

The proposed solutions are closely interrelated, mutually interactive, and supportive throughout the entire management process. Each solution performs a distinct function while simultaneously depending on and enhancing the effectiveness of the other solutions.

3.4. Pilot Study of the Proposed Solutions

3.4.1. Objectives of the Pilot Study

3.4.2. Participants and Sample of the Pilot Study

3.4.3. Methods and Instruments of the Pilot Study

Table 3.2. Evaluation of the Feasibility and Effectiveness of the Proposed Management Solutions for STEM Education Activities under a Participatory Approach in Primary Schools in Hung Yen Province

No.	Management Solutions	Feasibility Mean (n = 62)	SD	Rank	Effectiveness Mean (n = 62)	SD	Rank
1	Developing and implementing a management mechanism for STEM education activities for primary school students in Hung Yen Province under a participatory approach	4,32	0,57	1	4,38	0,55	1
2	Organizing professional development to enhance the competencies of educational managers in managing STEM education activities under a participatory approach in primary schools in Hung Yen Province	4,28	0,60	2	4,34	0,58	2
3	Organizing coordination among schools, families, and the community in STEM education activities for primary school students in Hung Yen Province	4,06	0,67	3	4,19	0,61	3
4	Directing the development of creative spaces for STEM education activities in primary schools in Hung Yen Province	3,92	0,74	5	4,11	0,66	5

No.	Management Solutions	Feasibility Mean (n = 62)	SD	Rank	Effectiveness Mean (n = 62)	SD	Rank
5	Organizing multi-stakeholder coordination in the assessment of STEM education activities for primary school students in Hung Yen Province	4,00	0,69	4	4,16	0,63	4
Overall Mean		4,12	0,65		4,24	0,61	

3.5. Pilot Implementation of Solution 2: Organizing Professional Development to Enhance the Competencies of Educational Managers in Managing STEM Education Activities under a Participatory Approach in Primary Schools in Hung Yen Province

3.5.1. Objectives and Participants of the Pilot Implementation

3.5.2. Content of the Pilot Implementation

3.5.3. Results of the Analysis of the Pilot Data

3.5.3.1. Comparison of Baseline Competencies (Before the Pilot Implementation)

Table 3.4. Comparison of Competency Assessment Results Before the Pilot Implementation

No.	Competency	Control Group (n = 16)	Pilot Group (n = 16)	Difference in Mean Scores
1	Multi-stakeholder coordination competency	2,78	2,88	0,10
2	Competency in the co-design and implementation of STEM education activities	2,81	2,95	0,14
3	Competency in collecting and analyzing feedback data	2,58	2,66	0,08
Overall Mean		2,72	2,83	0,11

** Results of the Baseline Equivalence Test*

Table 3.5. Independent Samples t-test Results for Baseline Equivalence between the Control Group and the Pilot Group (Five-point Scale)

Group	N	Mean (X ⁻)	SD	SE	t	Sig. (p)
Control Group (CG)	16	2.72	0.46	0.12	-0.74	0.465
Pilot Group (PG)	16	2.83	0.44	0.11	-0.74	0.465

(Sig. (p) = 0.465 > 0.05 → indicating no statistically significant difference between the two groups)

3.5.3.2. Results After the Pilot Implementation

Table 3.6. Competency Assessment Scores After the Pilot Implementation

Group	Part A (30đ)	Part B (40đ)	Part C (30đ)	Total (100 points)	Performance Level
Control Group (n = 16)	21.2	25.6	19.8	66.6	Pass
Pilot Group (n = 16)	24.8	32.5	25.6	82.9	Good
Difference	+3.6	+6.9	+5.8	+16.3	

*(Assessment based on the competency test (n = 32; Control Group: n = 16;
Pilot Group: n = 16)*

3.5.4. Overall Results After the Pilot Implementation of the Solution

A comparison of the pre- and post-pilot implementation results for the Pilot Group shows a marked improvement across all three competency components. The overall mean score increased from 2.83 to 3.82 (on a five-point scale), representing an improvement of nearly one point.

CONCLUSION OF CHAPTER 3

CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

2. Recommendations

2.1. For the Department of Education and Training of Hung Yen Province

2.2. For the Commune-level Division of Culture and Social Affairs

2.3. For Primary Schools

2.4. For Parents and Social Stakeholders

LIST OF THE AUTHOR'S RESEARCH WORKS

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