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## **The current situation of managing STEM education activities for primary school students in Hung Yen Province, Vietnam, under a participatory approach**

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**Abstract**--STEM education has been increasingly promoted as a strategic approach to developing students' problem-solving skills, creativity, and interdisciplinary thinking. However, the effectiveness of STEM education depends not only on pedagogical design but also on how STEM activities are managed and sustained within schools. This study examines the current situation of managing STEM education activities for primary school students in Hung Yen Province, Vietnam, under a participatory approach. The study employed a quantitative research design using a structured questionnaire administered to 700 respondents, including school administrators and teachers from 20 primary schools. The survey focused on two key dimensions: leadership in implementing the STEM education process (design, implementation, evaluation, and improvement) and the construction of organizational conditions supporting STEM education, such as facilities, financial mechanisms, stakeholder coordination, and feedback systems. Data were analyzed using descriptive statistical methods to identify implementation levels, strengths, and limitations. The findings indicate that the overall level of managing STEM education activities reached a moderate level. Schools have made initial progress in planning and organizing STEM activities and in mobilizing community and enterprise support. Nevertheless, management practices remain fragmented, particularly in relation to feedback mechanisms, multi-stakeholder coordination, and the systematic use of evaluation results for continuous improvement. The participatory approach has been applied in form, but shared decision-making and accountability have not been fully institutionalized. The study highlights the need to shift from activity-oriented



implementation toward system-oriented management of STEM education at the primary school level. Strengthening leadership capacity, clarifying stakeholder roles, and closing feedback loops are essential for enhancing the sustainability and effectiveness of participatory STEM education. The findings provide empirical evidence to inform school leaders and policymakers seeking to improve STEM education management in primary schools, particularly in provincial contexts.

**Keywords**---STEM education management, participatory approach, primary education, school leadership, organizational conditions, Vietnam.

## 1. Introduction

STEM education has increasingly moved from a pedagogical innovation to a strategic priority in many education systems, as it is expected to equip learners with the ability to solve complex problems, apply interdisciplinary knowledge, and adapt to rapidly changing socio-economic contexts. At the primary school level, STEM education is particularly significant because it shapes students' early attitudes toward science, technology, and problem solving, laying the foundation for later learning trajectories (Tan et al., 2023; Rasyid et al., 2023).

While a growing body of research confirms the positive effects of STEM-based learning on students' problem-solving skills, creativity, and critical thinking (Güven & Alpaslan, 2022; Topsakal et al., 2022; Zeeshan et al., 2021), less attention has been paid to how STEM education is managed and sustained within schools. In practice, many STEM initiatives remain dependent on individual teachers or short-term projects, resulting in fragmented implementation and limited long-term impact. This gap between pedagogical potential and organizational reality suggests that STEM education should be examined not only as a teaching approach but also as a management and governance issue (Lansiquot et al., 2011; Lin et al., 2015).

Recent studies emphasize that effective STEM education requires coherent leadership, appropriate assessment frameworks, adequate resources, and continuous feedback mechanisms (Amalina & Vidákovich, 2022; Lin et al., 2015). In this regard, a participatory approach, which actively involves school leaders, teachers, parents, communities, and external partners, has been increasingly advocated as a way to enhance relevance, resource mobilization, and shared responsibility in STEM education (Bicer et al., 2017; Sheth & Pathak, 2023). However, translating participatory principles into daily management practices remains challenging, especially in primary education contexts where institutional capacity and coordination mechanisms are still developing.

In Vietnam, STEM education has been promoted as part of broader educational reforms aimed at fostering innovation-oriented human resources and aligning education with socio-economic development goals. Although several studies have reported positive trends in STEM-oriented programs and student engagement

(Chen et al., 2021; Linh et al., 2019), implementation at the primary school level continues to face constraints related to leadership capacity, resource allocation, and stakeholder coordination. These challenges are particularly evident in provincial contexts, where schools are expected to innovate while operating under limited and uneven conditions.

Hung Yen Province, located in northern Vietnam, represents a typical case of this situation. Primary schools in the province have actively introduced STEM activities, often in collaboration with local communities and enterprises. Nevertheless, questions remain regarding how these activities are managed, how leadership roles are enacted, and how organizational conditions are built and sustained under a participatory approach. Empirical evidence on these issues is still scarce, limiting the ability of policymakers and school leaders to design context-sensitive management strategies (Disterheft et al., 2015).

Against this background, this study aims to examine the current situation of managing STEM education activities for primary school students in Hung Yen Province, Vietnam, under a participatory approach. The study focuses on two interrelated dimensions: leadership in implementing the STEM education process and the construction of organizational conditions supporting STEM education. By providing systematic empirical evidence from a large-scale survey, the study seeks to contribute to the understanding of STEM education not only as an instructional innovation but also as a managed organizational practice within primary schools.

## **2. Managing STEM Education Activities for Primary School Students under a Participatory Approach**

Managing STEM education activities for primary school students under a participatory approach can be understood as a comprehensive process of organizing, coordinating, and regulating educational practices in which multiple stakeholders jointly contribute to planning, implementation, evaluation, and improvement. This form of management emphasizes shared responsibility and collaboration, ensuring that STEM education is embedded in the overall development strategy of the school rather than being treated as a collection of isolated teaching activities (Deunk et al., 2018).

Within this approach, management practices are oriented toward placing students at the center of decision-making while simultaneously promoting the active involvement of teachers, school leaders, parents, communities, and external partners. Management decisions are expected to align objectives, learning content, instructional methods, assessment practices, and resources coherently. At the same time, flexibility is required so that STEM activities can be adapted to specific school contexts and continuously refined based on feedback from practice (Eden, 2015).

The management of STEM education objectives focuses on translating broad educational goals into concrete and developmentally appropriate targets for primary school students. These targets typically integrate knowledge, skills, and attitudes, with particular emphasis on problem-solving, creativity, collaboration,

and the application of learning to real-life situations. Under a participatory approach, objectives are developed through dialogue and consensus among stakeholders, which helps build shared understanding and commitment while allowing for ongoing adjustment in response to students' learning progress and contextual changes.

In terms of content and curriculum, management plays a guiding role in ensuring that STEM learning remains relevant, interdisciplinary, and connected to students' lived experiences. School leaders support teachers in selecting themes and learning tasks that link scientific concepts with practical contexts, including local and community-based issues. The participatory approach encourages collaboration with experts and community members to enrich learning materials, while management processes maintain coherence across grade levels without constraining innovation and adaptation.

The organization of STEM education activities also requires careful coordination and support. STEM learning may take diverse forms, such as project-based learning, experiential activities, thematic integration, clubs, or community-based initiatives. Effective management creates conditions for flexible scheduling, collaborative teaching, and active student participation. It also facilitates partnerships with parents, communities, and external organizations, thereby expanding learning spaces beyond the classroom and enhancing the authenticity of students' learning experiences.

Assessment is managed as an integral part of the STEM education process, with an emphasis on supporting learning and development rather than merely measuring outcomes. School management guides teachers in using diverse assessment methods, including observation, performance-based tasks, self-assessment, and peer feedback. Transparency and shared understanding of assessment criteria are promoted so that students can actively engage in reflecting on their learning, while assessment results are systematically used to inform instructional adjustments and improvement.

Finally, the management of STEM education requires sustained attention to the conditions that enable effective implementation. This includes ensuring the availability and efficient use of facilities, equipment, financial resources, and human capacity. School leaders coordinate shared resource use and mobilize support from parents, communities, and external partners, while clearly defining roles, responsibilities, and accountability. Continuous monitoring, feedback collection, and adjustment of implementation conditions contribute to the quality and sustainability of STEM education activities over time.

## **2. Research Methods**

The study employed a quantitative research approach to examine the management of STEM education in primary schools of Hung Yen Province, Vietnam, under a participatory approach. This design was selected to identify overall implementation patterns and assess the level of leadership and organizational conditions supporting STEM education across schools in the local context.

Data were collected through a survey of 700 participants from 20 primary schools in Hung Yen Province, including 120 administrators at different management levels (education officers, principals, vice principals, and heads of subject groups) and 580 teachers directly involved in STEM-integrated teaching. Participants were purposively selected due to their direct roles in planning, organizing, and implementing STEM education activities in primary schools.

A structured questionnaire was used as the main research instrument. The questionnaire was designed on a five-point Likert scale ranging from “Very good” to “Poor” and consisted of two main dimensions: (1) leadership in implementing the participatory STEM education process, including the stages of design, implementation, and evaluation; and (2) the construction of organizational conditions for STEM education, such as facilities, financial mechanisms, multi-stakeholder coordination, feedback, and community support.

Quantitative data were analyzed using descriptive statistical methods, including frequencies, percentages, and mean scores, to determine levels of implementation and to identify strengths and limitations in managing STEM education under a participatory approach in primary schools of Hung Yen Province.

### 3. Research Findings

#### 3.1. Current Situation of Leadership in Implementing the Participatory STEM Education Process in Primary Schools of Hung Yen Province

**Table 1.** Survey results on leadership in implementing the participatory STEM education process in primary schools of Hung Yen Province

No.	Survey items	Very good (%)	Good (%)	Fair (%)	Average (%)	Poor (%)	Mean
	Phase 1. Leadership in designing STEM education activities						
1	School leaders/heads of subject groups provide clear orientation on STEM themes aligned with real-life contexts and students' capacities	89.38	93.13	105.63	149.38	0.00	3.28
2	Teachers lead the formulation of	81.25	89.38	110.00	150.63	6.25	3.20

No.	Survey items	Very good (%)	Good (%)	Fair (%)	Average (%)	Poor (%)	Mean
	objectives and assessment criteria with the participation of students and professional teams						
3	Flexible grouping and instructional design mobilize parental and community participation	89.38	93.13	105.63	149.38	0.00	3.28
Phase 2. Leadership in implementing STEM education activities							
4	School leaders facilitate resource connections (enterprises, community, facilities) for STEM activities	86.88	90.00	110.00	148.75	1.88	3.25
5	Teachers encourage students' initiative in inquiry, experimentation, and product creation	81.25	89.38	110.00	150.63	6.25	3.20
6	Two-way feedback mechanisms among leaders, teachers, students, and parents are maintained throughout implementation	82.50	90.63	107.50	153.75	3.13	3.22
Phase 3. Leadership in evaluation, feedback, and improvement							

No.	Survey items	Very good (%)	Good (%)	Fair (%)	Average (%)	Poor (%)	Mean
7	Heads of subject groups guide teachers in applying multi-dimensional assessment (rubrics, peer review, self-assessment)	90.63	86.25	105.00	155.63	0.00	3.26
8	Teachers facilitate students' self-reflection and learning from STEM project outcomes	89.38	93.13	105.63	149.38	0.00	3.28
9	School leadership summarizes, disseminates results, and adjusts the process based on multi-stakeholder feedback	81.25	89.38	110.00	150.63	6.25	3.20

The survey of 700 respondents (including 120 school administrators and 580 teachers) indicates that the overall level of leadership in implementing the participatory STEM education process reached an average mean score of 3.24, corresponding to a “Fair” level on a five-point Likert scale. This result suggests that primary schools in Hung Yen Province have begun to establish a structured leadership framework for STEM education; however, the process has not yet evolved into a fully institutionalized model of continuous improvement.

Across response categories, the “Average” level accounted for the largest proportion (approximately 34–35%), followed by “Fair” (24–25%) and “Good” (20–21%), while the “Poor” level remained below 1.5%. This distribution indicates that STEM education is widely implemented, yet it has not consistently developed into a reflective and improvement-oriented practice within schools.

In Phase 1 – leadership in designing STEM activities, all indicators achieved relatively consistent scores (Mean = 3.20–3.28). The highest-rated items were the orientation of STEM themes grounded in real-life contexts and flexible instructional design (Mean = 3.28), reflecting growing pedagogical coordination and professional initiative among teachers. In contrast, the collaborative development of objectives and assessment criteria involving students and professional teams received a lower mean score (Mean = 3.20), highlighting limitations in co-constructing assessment frameworks during the design stage.

In Phase 2 – leadership in implementing STEM activities, the mean scores ranged from 3.20 to 3.25. Although resource mobilization from enterprises and the community has been initiated, the two-way feedback mechanism among school leaders, teachers, students, and parents recorded the lowest score in this phase (Mean = 3.22). This finding suggests that stakeholder collaboration remains fragmented, particularly in community-based STEM projects.

In Phase 3 – leadership in evaluation, feedback, and improvement, the mean score was the highest among the three phases (approximately Mean = 3.25). The application of multi-dimensional assessment and the facilitation of students' self-reflection were positively evaluated (Mean = 3.26–3.28), indicating a gradual shift from outcome-oriented assessment to assessment for learning. Nevertheless, the process of summarizing, disseminating, and adjusting STEM implementation based on feedback remained limited (Mean = 3.20), demonstrating that evaluation results have not been fully translated into actionable improvements.

### **3.2. Current Situation of Building Conditions for Organizing STEM Education in Primary Schools of Hung Yen Province under a Participatory Approach**

**Table 2.** Survey results on the current situation of building conditions for organizing STEM education in primary schools of Hung Yen Province under a participatory approach

No.	Survey items	Very good (%)	Good (%)	Fair (%)	Average (%)	Poor (%)	Mean
1	School principals lead the development, standardization, and optimization of facilities and equipment for STEM education in a shared and cost-effective manner	19.57	18.71	23.43	38.29	0.00	2.80
2	Schools establish flexible and transparent financial mechanisms combining public budgets and socialized resources to ensure sustainability of STEM activities	20.43	18.71	22.57	38.86	0.00	2.80
3	Stakeholders (schools, experts, enterprises, parents, community) jointly participate in building and using STEM facilities and learning resources	18.43	18.86	24.29	37.14	1.29	2.84
4	Principals design and operate multi-stakeholder coordination mechanisms	19.14	18.43	22.14	40.00	0.29	2.84

No.	Survey items	Very good (%)	Good (%)	Fair (%)	Average (%)	Poor (%)	Mean
	clarifying roles, responsibilities, and benefits in STEM education						
5	Schools regularly evaluate, collect feedback, and improve the use of facilities, finance, and human resources for STEM activities based on stakeholder input	18.57	20.43	25.14	34.43	1.43	2.80
6	Local communities and enterprises actively support resources and participate in organizing experiential STEM activities for students	20.43	21.29	24.14	34.14	0.00	2.72

The survey involved 700 respondents, including administrators at different levels (Department of Education and Training, district divisions, principals, vice principals, heads of subject groups) and teachers directly teaching STEM-integrated subjects. These two groups play a central role in organizing, managing, and implementing STEM education in schools. The questionnaire, designed on a five-point Likert scale (1 = Very good; 2 = Good; 3 = Fair; 4 = Average; 5 = Poor), consisted of six observed variables reflecting key dimensions of building conditions for participatory STEM education, including facilities, financial mechanisms, multi-stakeholder coordination, feedback and improvement, and social partnership.

Overall, the results indicate that the level of achievement was at a “Fair” level, with mean scores ranging from 2.72 to 2.84. This finding suggests that primary schools in Hung Yen Province have established basic conditions for organizing STEM education; however, these conditions remain fragmented and insufficiently systematized.

Across all items, the “Average” level accounted for the highest proportion (approximately 34–40%), while the “Poor” level was negligible. This distribution implies that although facilities, financial resources, and human support have been increasingly prioritized, school leaders and teachers still encounter difficulties in operating and optimizing available resources.

Notably, community and enterprise engagement emerged as a relative strength. Item (6) recorded the lowest mean score (2.72), representing the most positive evaluation, with over 41% of respondents selecting “Good” or “Very good.” This result demonstrates that socialization efforts and experiential STEM activities have been effectively promoted. Many primary schools have proactively invited local enterprises, artisans, and STEM centers to participate in STEM festivals and project-based learning, thereby expanding learning spaces beyond the classroom.

In contrast, multi-stakeholder coordination and co-construction of conditions remain challenging. Items (3) and (4), both with the highest mean score (2.84) and “Average” responses accounting for 37–40%, reveal limitations in collaborative governance and shared accountability. School management practices still tend to be administrative and directive, lacking clearly defined coordination regulations specifying roles, responsibilities, and benefits among schools, enterprises, parents, experts, and community actors.

Similarly, financial mechanisms and feedback for improvement, reflected in items (2) and (5) (Mean = 2.80), indicate relative stability but limited effectiveness. Although schools have implemented socialized funding, the absence of transparent reporting systems and periodic feedback mechanisms reduces the efficiency of resource mobilization and utilization, while also constraining opportunities for inter-school learning.

To further interpret the quantitative findings, in-depth interviews were conducted with representatives from enterprises, local communities, parents, and school staff. These interviews highlighted three key issues: (1) coordination mechanisms and accountability, (2) transparency in socialized finance, and (3) community partnership in student experiential learning.

A primary school teacher emphasized that overcrowded classes and limited specialized rooms reduce the effectiveness of STEM facilities, while maintenance and repair remain insufficient, restricting pedagogical innovation. A school principal further noted the need for clear coordination regulations on the use and maintenance of STEM equipment, reinforcing the quantitative result of item (4) regarding multi-stakeholder coordination.

Regarding financial transparency, a school accountant stated that parents are willing to contribute when schools publicly disclose objectives and outcomes of resource use, aligning with item (2) on financial mechanisms. Meanwhile, representatives from local enterprises and parents confirmed that contextualized STEM themes linked to local occupations significantly enhance student engagement, supporting the positive evaluation of item (6).

#### **4. Discussion**

The results indicate that primary schools of Hung Yen Province have begun to establish foundational management structures for STEM education; however, these structures remain fragmented and have not yet evolved into a coherent system of continuous improvement.

The results show that leadership practices related to planning and instructional organization were evaluated more positively than those related to feedback and adaptive improvement. This suggests that school leaders and teachers are relatively confident in initiating STEM activities and aligning them with real-life contexts, but they encounter difficulties in sustaining reflective cycles of evaluation and adjustment. In management terms, this reflects a transition phase in which STEM education is operationalized but not yet institutionalized as a learning-oriented organizational practice.

Another important issue emerging from the findings is the limited effectiveness of participatory mechanisms, despite their formal presence. Although multiple stakeholders are involved in STEM education activities, coordination among school leaders, teachers, parents, and external partners remains inconsistent. The relatively modest ratings for feedback mechanisms and multi-stakeholder coordination indicate that participation often takes the form of parallel involvement rather than shared decision-making and accountability. This highlights a gap between the conceptual ideals of participatory management and their practical enactment in school contexts.

While basic conditions related to facilities, financial mechanisms, and human resources have been established, their use is not always optimized. Community and enterprise engagement emerged as a relative strength, suggesting that schools are increasingly successful in mobilizing external support for experiential STEM activities. However, the absence of clear coordination frameworks and transparent feedback processes limits the long-term sustainability and scalability of these initiatives.

From a management perspective, the findings suggest that STEM education in primary schools is still largely activity-oriented rather than system-oriented. Schools tend to focus on organizing STEM events, projects, or thematic lessons, while less attention is given to embedding STEM education within formal management processes such as planning cycles, evaluation systems, and data-informed decision-making. This imbalance constrains the potential of participatory approaches to generate continuous improvement and organizational learning.

Taken together, the results underline the need to reconceptualize STEM education management not merely as the coordination of teaching activities, but as a strategic and participatory governance process. Strengthening leadership capacity, clarifying stakeholder roles, and closing feedback loops are essential steps toward transforming STEM education from a series of initiatives into a stable and value-generating component of primary education.

## **5. Conclusion**

This study examined the current situation of managing STEM education activities for primary school students in Hung Yen Province, Vietnam, under a participatory approach. Using data from a large-scale survey of administrators and teachers, the study focused on two key dimensions: leadership in implementing the STEM education process and the construction of organizational conditions supporting STEM education.

The findings indicate that the overall level of STEM education management reached a moderate level, reflecting initial progress in planning, implementation, and resource mobilization. Schools have demonstrated growing awareness of the importance of interdisciplinary learning, real-life relevance, and stakeholder involvement. Nevertheless, management practices remain uneven, particularly in relation to feedback mechanisms, coordinated governance, and the systematic use of evaluation results for improvement.

A key conclusion of the study is that participation alone does not guarantee effective management. Without clear coordination structures, transparent responsibilities, and data-informed feedback processes, participatory STEM education risks remaining fragmented and dependent on short-term initiatives. Therefore, managing STEM education at the primary level requires a shift from activity-based implementation toward system-based management that integrates planning, execution, evaluation, and improvement.

The study contributes to the literature by providing empirical evidence from a provincial context in Vietnam, highlighting the practical challenges of managing STEM education under a participatory approach. These findings offer useful implications for school leaders and policymakers seeking to strengthen the sustainability and effectiveness of STEM education in primary schools. Future research may extend this work by exploring longitudinal changes in management practices or by examining the impact of specific management interventions on student learning outcomes.

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