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# Managing physics teaching activities in upper secondary schools in Vietnam's Central Highlands amid educational reform and digital transformation

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**Abstract**--This study investigates the management of Physics teaching activities in upper secondary schools in the Central Highlands of Vietnam in the context of educational reform and digital transformation. A mixed-methods research design was employed, combining quantitative surveys with qualitative document analysis and semi-structured interviews. Data were collected from 834 valid respondents, including 201 school administrators, 230 Physics teachers, and 403 students across forty upper secondary schools in four provinces of the Central Highlands. The results show that Physics teaching activities and their management are generally implemented at a fairly good level. Teachers demonstrate positive awareness of curriculum reform and actively engage in instructional innovation, while school administrators report moderate effectiveness in managing teaching activities. However, notable limitations persist in teaching and learning environments, particularly in laboratory facilities, digital infrastructure, and access to teaching and learning resources. From the students' perspective, although classroom engagement is relatively high, opportunities for experimentation, simulation, and real-life or STEM-based application of Physics knowledge remain limited. The findings indicate a clear gap between teachers' awareness of reform requirements and the actual conditions supporting implementation. This gap highlights the critical role of school management in aligning instructional practices with infrastructure development and digital transformation. The study provides empirical evidence to support the development of integrated management strategies aimed at improving the quality, equity, and sustainability of Physics education in disadvantaged regions of Vietnam.



**Keywords**---Physics education, teaching management, upper secondary schools, Central Highlands of Vietnam, educational reform, digital transformation.

## 1. Introduction

In recent years, upper secondary education in Vietnam has experienced major reforms following the implementation of the 2018 General Education Curriculum, which emphasizes competency-based education, learner-centered teaching, and the integration of digital technologies into teaching and learning processes (Ministry of Education and Training [MOET], 2018). Within this reform framework, Physics is identified as a core science subject that contributes significantly to the development of students' scientific thinking, problem-solving abilities, and capacity to apply knowledge to real-life contexts. As a result, the management of Physics teaching activities has become an essential responsibility of school leaders, particularly in regions with diverse socio-economic and infrastructural conditions.

International research highlights that effective school management plays a decisive role in improving teaching quality and student learning outcomes. Studies emphasize the importance of instructional leadership, systematic planning, and continuous monitoring of teaching activities in ensuring the successful implementation of curriculum reforms, especially in science education (Fullan, 2016; OECD, 2020). In the context of digital transformation, school management extends beyond administrative functions to include the coordination of digital infrastructure, teacher professional development, access to digital learning resources, and the pedagogical use of technology to promote active and inquiry-oriented learning (UNESCO, 2019). These management responsibilities are particularly critical for Physics education, where experiments, simulations, and visualization tools are central to conceptual understanding.

Digital transformation has been recognized globally as a key strategy for enhancing both the quality and equity of education. UNESCO (2021) emphasizes that the effective integration of digital technologies into teaching requires coherent management policies that align curriculum objectives, teaching methods, assessment practices, and teacher capacity development. Similarly, the OECD (2020) argues that digital tools can support deeper learning in science subjects only when school leaders actively guide pedagogical innovation and provide sustained support for teachers. These perspectives underline the importance of management capacity in translating national reform and digital transformation policies into effective classroom practices.

In Vietnam, although national policies on curriculum reform and digital transformation have been clearly articulated, their implementation at the school level remains uneven. The World Bank (2020) reports that disparities in educational resources, teacher capacity, and school management effectiveness continue to influence the quality of upper secondary education across regions. These challenges are particularly evident in the Central Highlands, a region characterized by complex geography, a high proportion of ethnic minority

students, and limitations in educational infrastructure. Many upper secondary schools in this area face constraints related to laboratory facilities, digital equipment, and internet connectivity, which directly affect the organization and management of Physics teaching activities (Ulas, 2019).

Previous studies in Vietnam have largely focused on teaching methods, curriculum implementation, or student learning outcomes in Physics, while limited attention has been given to the management of Physics teaching activities within the dual context of educational reform and digital transformation. International literature suggests that without effective management mechanisms, including clear instructional planning, systematic supervision of teaching practices, and strategic use of digital technologies, pedagogical innovations may remain fragmented and difficult to sustain (OECD, 2020; UNESCO, 2019). This issue is especially critical in disadvantaged regions, where management effectiveness can either reduce or intensify existing inequalities in educational quality.

Against this background, this study investigates the current state of managing Physics teaching activities in upper secondary schools in the Central Highlands of Vietnam in the context of educational reform and digital transformation. By examining perspectives from school administrators, Physics teachers, and students, the study seeks to identify key strengths, limitations, and challenges in management practices. The findings are expected to provide empirical evidence to support policy-making and school-level management improvements, thereby contributing to the enhancement of Physics education quality and the effective implementation of digital transformation in Vietnamese upper secondary schools (Fidan & Tuncel, 2019).

## **2. Research Methods**

This study employed a mixed-methods research design to investigate the current status of Physics teaching activities and their management in upper secondary schools in the Central Highlands of Vietnam within the context of educational reform and digital transformation. Quantitative data were collected through structured questionnaires, while qualitative data were obtained through document analysis and interviews to support and clarify the survey findings.

The survey was conducted in forty upper secondary schools across four provinces in the Central Highlands. A stratified random sampling method was used to ensure representativeness across urban wards, central communes, and remote communes. The research participants included school administrators, Physics teachers, and students studying Physics.

A total of 850 questionnaires were distributed, of which 834 were valid and used for analysis, including responses from 201 school administrators, 230 Physics teachers, and 403 students. Three questionnaires were developed for the three participant groups, covering teaching activities, learning activities, teaching and learning environments, management practices, influencing factors, outcomes, and improvement proposals. All items were measured using a five-point Likert scale.

Quantitative data were analyzed using descriptive statistics, including mean scores and standard deviations. Qualitative data were analyzed thematically and used to triangulate and enrich the interpretation of quantitative results.

### 3. Results

#### 3.1. Current Status of Physics Teaching Activities in Upper Secondary Schools

Results from the survey of 230 Physics teachers indicate that Physics teaching activities in upper secondary schools in the Central Highlands are implemented at a fairly good level. The overall mean scores of the observed factors range from 3.83 to 3.98 on a five-point Likert scale, suggesting positive perceptions but also revealing specific limitations.

Table 1. Teachers' Assessment of Physics Teaching Activities (n = 230)

Observed factors	Mean	Standard deviation	Interpretation
Awareness and orientation toward Physics teaching	3.946	0.824	Fairly good
Teaching activities in Physics lessons	3.977	0.854	Fairly good
Student learning activities	3.926	0.874	Fairly good
Teaching and learning environment	3.828	0.869	Moderate
Influencing factors	3.902	0.890	Fairly good
Outcomes of teaching innovation and digital transformation	3.978	0.841	Fairly good

Among these factors, teaching activities and outcomes of innovation and digital transformation achieved the highest mean scores, indicating that teachers perceive their instructional practices and reform efforts positively. In contrast, the teaching and learning environment obtained the lowest mean score, highlighting limitations related to facilities, digital infrastructure, and learning resources.

#### 3.2. Awareness and Orientation toward Physics Teaching Reform

Detailed analysis of teachers' awareness and orientation toward Physics teaching reform shows a high level of consensus on the necessity of pedagogical innovation and digital transformation, although support conditions remain insufficient.

Table 2. Teachers' Awareness and Orientation toward Physics Teaching (F\_NTGV)

Indicator	Mean	Standard deviation	Rank
Need to innovate Physics teaching in a digital learning environment	4.461	0.858	1
School management integrates teaching, learning, and the environment	3.982	0.721	2

Indicator	Mean	Standard deviation	Rank
Use of teaching equipment aligned with lesson content	3.852	0.988	3
Support for teachers in applying digital transformation	3.392	0.729	4
<b>Overall mean</b>	<b>3.946</b>	<b>0.824</b>	

The lowest score relates to institutional support for teachers in applying digital transformation, suggesting a gap between teachers' awareness and their practical capacity to implement innovation effectively.

### 3.3. Management of Physics Teaching Activities as Perceived by School Administrators

Responses from 201 school administrators reveal that the management of Physics teaching activities is also assessed at a fairly good level. However, the results indicate uneven effectiveness across management domains.

Table 3. Administrators' Assessment of Managing Physics Teaching Activities (n = 201)

Management dimensions	Mean	Standard deviation	Interpretation
Awareness of reform context and management orientation	3.806	0.899	Fairly good
Management of teaching activities	3.797	0.912	Fairly good
Management of student learning activities	3.749	0.858	Fairly good
Management of the teaching and learning environment	3.739	0.901	Moderate
Awareness of influencing management factors	3.812	0.886	Fairly good
Overall effectiveness of management	3.801	0.876	Fairly good

Similar to teachers' evaluations, the management of the teaching and learning environment received the lowest mean score. This finding reflects persistent challenges in planning, investing in, and coordinating physical and digital learning conditions, particularly in disadvantaged areas.

### 3.4. Students' Learning Experiences in Physics Classes

Students' responses provide additional evidence from the learner perspective. While overall engagement in Physics lessons is relatively high, experiential and application-oriented learning remain limited.

Table 4. Students' Learning Experiences in Physics (n = 403)

Learning aspects	Mean	Standard deviation	Interpretation
Participation and engagement in Physics lessons	4.201	0.653	Good
Teacher feedback and instructional support	3.95	0.68	Fairly good
Use of experiments, simulations, and digital tools	3.303	0.74	Moderate
Application of Physics knowledge to real life and STEM contexts	3.321	0.72	Moderate

The lowest mean scores are associated with the use of experiments, simulations, and digital tools, as well as the application of Physics knowledge to real life and interdisciplinary STEM contexts. These results suggest that students' learning experiences are constrained by limited access to practical and technology-supported activities.

#### 4. Discussion

Overall, both teaching activities and management practices were evaluated at a fairly good level by teachers and school administrators. However, the results also reveal persistent structural and managerial limitations that hinder the effective implementation of competency-based education and digital transformation in Physics teaching.

First, the relatively high mean scores for teachers' awareness and teaching activities indicate that Physics teachers have largely internalized the goals of the 2018 General Education Curriculum and recognize the necessity of pedagogical innovation and digital integration. This finding suggests that awareness is no longer the primary barrier to reform. Instead, the challenge lies in translating this awareness into consistent and effective classroom practices. The gap between teachers' positive perceptions and the moderate evaluation of teaching and learning environments highlights a clear imbalance between human readiness and material conditions. This imbalance is particularly critical in Physics education, which requires laboratories, experimental equipment, and digital simulations to support conceptual understanding (Kelchtermans, 2005).

Second, the results from school administrators confirm that management practices are implemented at a fairly good level, especially in relation to instructional planning and supervision of teaching activities. Nevertheless, the management of learning activities and, more notably, the management of teaching and learning environments received the lowest evaluations. This finding indicates that management efforts tend to focus more on pedagogical processes than on systemic conditions such as infrastructure, digital resources, and learning spaces. In the context of digital transformation, such an approach limits the sustainability of instructional innovation, as teachers may lack the necessary conditions to apply technology effectively in teaching and assessment.

Third, students' perceptions offer a critical perspective on the outcomes of teaching management. While student engagement in Physics lessons is rated positively, the moderate scores for experimental activities, simulations, and real-life or STEM applications suggest that learning remains largely theoretical. This finding aligns with teachers' and administrators' assessments of insufficient teaching and learning environments. It also indicates that management practices have not yet fully supported the shift from knowledge transmission to experiential and application-oriented learning, which is a core requirement of the current curriculum reform.

Taken together, these findings point to a central issue in the management of Physics teaching activities in the Central Highlands. The reform process has progressed further in terms of awareness, instructional orientation, and classroom-level innovation than in terms of structural investment and systemic support. As a result, the effectiveness of teaching innovation and digital transformation varies significantly across schools, particularly between urban and remote areas. This unevenness reflects broader regional disparities in educational resources and management capacity.

From a management perspective, the discussion suggests that improving the quality of Physics education in the Central Highlands requires a shift from predominantly pedagogical management toward more integrated management models. Such models should combine instructional leadership with strategic planning for infrastructure, digital resources, and teacher support systems. Without addressing these foundational conditions, efforts to promote competency-based learning and digital transformation are unlikely to achieve their intended impact, especially in disadvantaged regions.

## **5. Implications and Recommendations**

### **5.1. Implications for Educational Management**

The results suggest that educational reform in Physics has progressed further at the level of teachers' awareness and instructional orientation than at the level of systemic management and teaching conditions. This implies that school management should shift from a predominantly instructional focus toward a more integrated management approach that simultaneously addresses pedagogy, infrastructure, and digital capacity. Effective management in the current context requires aligning curriculum objectives, teaching practices, learning environments, and assessment systems into a coherent framework rather than treating these elements as separate domains.

Another key implication is that digital transformation in Physics education cannot be achieved solely through encouraging teachers to use technology. Instead, it must be managed as an organizational process that includes strategic planning, resource allocation, and continuous monitoring. Without clear management mechanisms and stable support systems, digital innovation risks remaining fragmented and uneven across schools, particularly in geographically disadvantaged areas.

Furthermore, students' learning experiences indicate that engagement alone is insufficient to ensure competency development. The limited opportunities for experimentation, simulation, and real-life application suggest that management practices must place greater emphasis on learning outcomes and learning processes, not only on teaching activities. This highlights the need for outcome-oriented management that prioritizes students' ability to apply Physics knowledge in practical and interdisciplinary contexts.

## **5.2. Recommendations for School-Level Management**

First, school leaders should prioritize the management of teaching and learning environments for Physics. This includes developing medium-term plans for upgrading laboratory facilities, digital equipment, and learning spaces, as well as ensuring equitable access to these resources across schools in different localities. Special attention should be given to remote and disadvantaged areas to reduce disparities in teaching conditions.

Second, the management of Physics teaching activities should be strengthened through clearer guidelines for competency-based and application-oriented instruction. School administrators should support Physics departments in designing lessons that integrate experiments, simulations, and STEM-related activities, and should monitor the implementation of these approaches through regular internal evaluation and professional discussion.

Third, digital transformation should be managed systematically rather than individually. Schools are encouraged to establish shared digital platforms for Physics teaching, such as learning management systems, digital repositories of teaching materials, and online assessment tools. Management should also provide ongoing technical and pedagogical support to help teachers use these tools effectively and confidently.

Fourth, professional development for teachers and administrators should focus on practical digital competencies and instructional management skills. Training programs should emphasize lesson design using digital simulations, assessment of student competencies, and the use of learning data to inform teaching decisions. Differentiated training pathways may be necessary to accommodate varying levels of digital readiness among teachers.

## **5.3. Policy Level Recommendations**

At the policy level, educational authorities should consider developing targeted support programs for Physics education in disadvantaged regions such as the Central Highlands. These programs may include dedicated funding for laboratory and digital infrastructure, incentives for teacher recruitment and retention, and region-specific guidelines for implementing digital transformation in science education.

In addition, policymakers should promote coordination between curriculum reform and digital transformation initiatives. Clear policy alignment can help

schools translate national reform goals into concrete management actions and reduce the gap between policy intentions and classroom realities.

## 6. Conclusion

This study examined the management of Physics teaching activities in upper secondary schools in the Central Highlands of Vietnam within the context of educational reform and digital transformation. Using a mixed methods approach, the research analyzed perspectives from school administrators, Physics teachers, and students to provide a comprehensive picture of current teaching practices, management processes, and learning experiences.

The findings indicate that Physics teaching activities and their management are generally implemented at a fairly good level. Teachers demonstrate positive awareness of curriculum reform and show active engagement in instructional innovation, while school administrators report reasonable effectiveness in managing teaching activities. These results suggest that the goals of the 2018 General Education Curriculum have begun to be reflected in school-level practices.

However, the study also reveals several persistent challenges that limit the effectiveness and sustainability of reform efforts. In particular, teaching and learning environments, including laboratory facilities, digital infrastructure, and access to learning resources, remain insufficient and uneven across schools. From the students' perspective, limited opportunities for experimentation, simulation, and real-life application of Physics knowledge highlight a gap between reform objectives and classroom realities. These challenges underscore the importance of management capacity in bridging the divide between awareness and effective implementation.

Overall, the study concludes that improving the quality of Physics education in the Central Highlands requires more than individual teacher efforts or isolated management initiatives. It calls for an integrated management approach that aligns instructional leadership with strategic investment in teaching conditions and digital resources. By strengthening the coherence between policy objectives, management practices, and classroom implementation, schools can enhance the effectiveness of educational reform and digital transformation, thereby contributing to more equitable and sustainable development of Physics education in Vietnam.

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