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Managing the professional development of natural science teachers in secondary schools in Kien Thuy District, Hai Phong City, using experiential learning

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Abstract--Research Objectives: This study aims to assess the current status and effectiveness of professional development management for natural science teaching at secondary schools in Kien Thuy District, Hai Phong City. The objective is to identify strengths and weaknesses in the current professional development programs and propose solutions for improvement. **Research Methodology:** A mixed-methods approach was employed, combining survey and case study methods. Data were collected from five secondary schools in Kien Thuy District: Dai Hop Secondary School, Doan Xa Secondary School, Tu Son Secondary School, Minh Tan Secondary School, Liem Tuyen Secondary School. Subjects included education and training department staff, school management personnel, teachers, and students. Data collection tools included structured questionnaires with quantitative and open-ended questions, semi-structured interviews with school management and teachers, and direct classroom observations to evaluate the implementation of experiential learning methods. **Research Results:** The results indicate that professional development programs have actively adopted diverse methods such as problem-solving, role-playing, and experiments. However, challenges remain in organizing experimental activities and field trips due to resource limitations (average score of 2.25). Monitoring and evaluating teacher engagement require improvement, with an average score of 2.18. Assessment of training outcomes also needs enhancement, with an average score of 2.20. The utilization of resources and policy implementation received the lowest score of 2.08,

highlighting a significant need for improvement in resource mobilization and policy enforcement. Subjective factors such as teachers' self-motivation (2.40) and unified understanding among educational stakeholders (2.34), as well as objective factors like facility conditions (2.38) and leadership from higher authorities (2.25), all impact the effectiveness of professional development management. Proposed solutions include raising awareness, improving training plans, enhancing program management and execution, revising assessment and evaluation methods, and embracing digital tools to improve the quality and effectiveness of professional development programs.

Keywords---natural science teaching, professional development, secondary schools.

1. Introduction

In recent years, there has been a growing recognition of the need for effective professional development programs for teachers, particularly in the context of secondary education. This is especially crucial for Natural Science teachers, whose role is pivotal in fostering scientific literacy and critical thinking among students. In Kien Thuy District, Hai Phong City, there is a noticeable gap in the current professional development practices, which affects the quality of teaching and learning outcomes in Natural Science subjects. This study aims to address this issue by exploring the management of professional development for these teachers, with a specific focus on employing experiential learning methods.

Professional development for teachers has long been recognized as a key factor in improving educational quality. Research underscores that effective professional development can enhance teachers' pedagogical skills, subject knowledge, and overall teaching effectiveness (Guskey, 2002). However, traditional models of professional development, which often involve passive learning methods such as lectures and workshops, have been criticized for their limited impact on classroom practice (Desimone, 2009). In contrast, experiential learning, which emphasizes hands-on, reflective, and participatory learning experiences, has been shown to be more effective in fostering meaningful professional growth (Kolb, 1984).

Experiential learning involves learning through direct experience and reflection, which aligns well with the dynamic and interactive nature of teaching Natural Science. This approach enables teachers to actively engage with the content, reflect on their practices, and apply new strategies in their classrooms (Kolb, 1984). The effectiveness of experiential learning in teacher professional development is well-documented. For example, studies have demonstrated that teachers who participate in experiential learning programs show improved instructional practices and increased confidence in their teaching abilities (Bransford, Brown, & Cocking, 2000).

In Kien Thuy District, the current professional development programs for Natural Science teachers predominantly rely on conventional methods. These programs often fail to address the specific needs of teachers and do not provide sufficient opportunities for practical application and reflection. As a result, there is a significant need for innovative approaches to professional development that can better support teachers in enhancing their instructional practices. The integration of experiential learning into these programs offers a promising solution. By providing teachers with opportunities to engage in hands-on activities, collaborate with peers, and reflect on their experiences, experiential learning can potentially lead to more effective professional development outcomes (Darling-Hammond et al., 2017).

The aim of this study is to evaluate the management of professional development programs for Natural Science teachers in Kien Thuy District, with a focus on incorporating experiential learning methods. This research will explore how these methods can be effectively implemented, the challenges that may arise, and the potential benefits for teachers' professional growth. By addressing these aspects, the study seeks to contribute to the development of more effective and responsive professional development programs that can ultimately enhance the quality of education in the district.

2. Theoretical Framework

2.1. Concepts and Role of Professional Development

Professional development (PD) for teachers is a critical component in enhancing educational quality and improving student outcomes. It encompasses a range of activities designed to support and advance teachers' knowledge, skills, and effectiveness in the classroom. Understanding the concepts and the role of professional development is essential to grasp how it can be optimized to meet the evolving needs of educators and students.

Concepts of Professional Development

Professional development refers to the continuous process through which educators acquire new knowledge and skills related to teaching and learning. It includes various forms of learning opportunities such as workshops, seminars, conferences, and collaborative learning groups (Guskey, 2002). The underlying aim of PD is to enable teachers to stay current with educational practices and methodologies, enhance their instructional strategies, and ultimately improve student learning outcomes (Desimone, 2009).

A key concept in professional development is the notion of sustained learning. Effective PD is not a one-time event but a continuous, long-term process. Research indicates that sustained professional development that provides ongoing support and follow-up is more effective than isolated workshops or seminars (Borko, 2004). This approach allows teachers to gradually integrate new strategies into their practice, receive feedback, and make necessary adjustments.

Another important concept is relevance and context. For PD to be effective, it must be relevant to the teachers' specific subject areas and educational contexts. This means that professional development should be tailored to address the unique needs and challenges faced by teachers in their particular settings. For example, Natural Science teachers might benefit from PD programs that focus on hands-on experiments and inquiry-based learning strategies, which are directly applicable to their teaching (Garet et al., 2001).

The Role of Professional Development

The role of professional development in education is multifaceted and crucial for several reasons. Firstly, PD plays a significant role in enhancing teacher effectiveness. By participating in professional development programs, teachers gain access to new teaching strategies, methodologies, and resources that can improve their instructional practices. Studies have shown that teachers who engage in high-quality PD are more likely to implement innovative teaching techniques and demonstrate increased effectiveness in their classrooms (Yoon et al., 2007).

Secondly, PD contributes to teacher motivation and job satisfaction. When teachers feel that their professional growth is supported and valued, they are more likely to remain committed to their profession and experience greater job satisfaction. This, in turn, can lead to reduced turnover rates and a more stable teaching workforce (Ingersoll, 2001). For instance, teachers who participate in collaborative PD opportunities often report higher levels of engagement and enthusiasm for their work, as they feel more connected to their colleagues and more confident in their teaching abilities (Hargreaves, 2003).

Furthermore, professional development is essential for adapting to educational changes. The field of education is constantly evolving, with new research, technologies, and pedagogical theories emerging regularly. PD helps teachers stay abreast of these changes and integrate new approaches into their practice. For example, the advent of digital technologies in education has necessitated that teachers acquire new skills and adapt their teaching methods to incorporate these tools effectively (Ertmer & Ottenbreit-Leftwich, 2010).

Effective professional development also plays a critical role in improving student outcomes. Research has consistently demonstrated that there is a direct link between high-quality PD for teachers and improved student achievement. When teachers are equipped with the latest knowledge and best practices, they are better able to create engaging and effective learning environments, which enhances students' academic performance (Robinson & Timperley, 2007). For instance, PD programs that focus on differentiated instruction enable teachers to tailor their teaching strategies to meet the diverse needs of their students, thereby promoting better learning outcomes for all.

To be effective, professional development should be designed with certain principles in mind. It should be evidence-based, meaning it is grounded in current research and best practices. Additionally, PD should be collaborative, allowing teachers to work together, share experiences, and learn from one

another. Finally, it should be reflective, providing opportunities for teachers to critically assess their own practices and make improvements based on feedback and reflection (Darling-Hammond et al., 2017).

2.2. Experiential Learning in Professional Development

Experiential learning has emerged as a significant approach in professional development (PD) for educators, offering a dynamic alternative to traditional, lecture-based models. This approach, grounded in the theory of experiential learning developed by David Kolb, emphasizes learning through direct experience, reflection, and application, which aligns closely with the needs of teachers seeking to enhance their instructional practices.

Concept of Experiential Learning

Experiential learning is based on the idea that learning is most effective when it involves direct, active engagement with the subject matter. Kolb's experiential learning theory (ELT) proposes that learning is a process involving four key stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation (Kolb, 1984). This cyclical model suggests that learners gain knowledge by actively experiencing an activity, reflecting on that experience, forming abstract concepts based on their reflections, and then testing these concepts in new situations.

Kolb's theory posits that this cyclical process facilitates deeper learning and understanding. In the context of professional development for educators, experiential learning translates into PD programs that incorporate practical, hands-on activities, opportunities for reflection, and real-world application of new skills and knowledge. Such programs are designed to be interactive and immersive, ensuring that teachers are not just passive recipients of information but active participants in their own learning processes (Kolb, 1984).

Benefits of Experiential Learning in Professional Development

The integration of experiential learning into PD programs offers several benefits. First and foremost, it enhances engagement and motivation. Teachers who participate in experiential PD activities are more likely to find the learning process engaging because it involves active participation and problem-solving. This increased engagement can lead to higher levels of motivation and enthusiasm for implementing new strategies in the classroom (Bransford, Brown, & Cocking, 2000).

Experiential learning also fosters deeper understanding and retention of new concepts. When teachers are involved in hands-on activities, they are more likely to understand and remember the material because they apply it in practical contexts. For instance, a PD workshop for science teachers that includes hands-on experiments allows participants to directly engage with the scientific methods they are expected to teach, thereby reinforcing their understanding and ability to teach these concepts effectively (Darling-Hammond et al., 2017).

Moreover, experiential learning promotes reflective practice. Reflection is a critical component of experiential learning, enabling teachers to think critically about their experiences, identify what worked well, and consider areas for improvement. This reflective process helps teachers integrate new knowledge into their existing practices and adapt their teaching strategies based on real-world experiences (Schon, 1983).

Application of Experiential Learning in Professional Development

In practice, experiential learning in PD can take various forms. One common approach is interactive workshops that use simulations, role-playing, and problem-solving activities. These workshops allow teachers to experience and practice new techniques in a supportive environment before applying them in their own classrooms. For example, a workshop on classroom management might include simulations of challenging classroom situations, where teachers can practice and refine their responses (Guskey, 2002).

Another effective form of experiential PD is peer collaboration and learning communities. In these settings, teachers work together to share experiences, solve problems, and develop new instructional strategies. Collaborative learning fosters a community of practice where teachers can learn from each other's successes and challenges, thus enhancing their professional growth and development (Lave & Wenger, 1991).

Challenges and Considerations

Despite its benefits, implementing experiential learning in PD can present challenges. One challenge is ensuring that the activities are relevant and applicable to teachers' specific contexts. Experiential learning activities must be carefully designed to align with teachers' subject areas and instructional needs to ensure that they are meaningful and useful (Desimone, 2009).

Additionally, sustaining the impact of experiential PD can be difficult. While experiential learning can lead to immediate improvements in teaching practices, ongoing support and follow-up are necessary to maintain and extend the benefits. Without continued reinforcement and opportunities for reflection, the impact of experiential learning may diminish over time (Borko, 2004).

To address these challenges, PD programs should incorporate mechanisms for ongoing support and reflection. This might include follow-up sessions, coaching, or online communities where teachers can continue to discuss and refine their practices. By providing continuous support, PD programs can help teachers sustain and build upon the gains achieved through experiential learning (Hargreaves, 2003).

3. Research Methodology

Research Design

This study employs a mixed-methods approach, combining survey and case study methodologies to assess the management of professional development for natural science teachers at secondary schools in Kien Thuy District, Hai Phong City. The survey method is used to collect data from a large sample of respondents, while the case study approach provides in-depth insights into the specific practices and challenges encountered at individual schools.

Subjects and Data Sources

The study focuses on the following subjects:

Education and Training Department Staff: 2 individuals.

School Management Personnel: 20 individuals, including 5 Principals, 5 Vice Principals, 5 Department Heads, and 5 Deputy Department Heads.

Teachers: 43 teachers currently teaching natural science at the selected secondary schools.

Students: 50 students from the selected schools.

Data is collected from five specific secondary schools in Kien Thuy District: Dai Hop Secondary School, Doan Xa Secondary School, Tu Son Secondary School, Minh Tan Secondary School, Liem Tuyen Secondary School. Additional data is obtained from relevant educational documents and reports from the Kien Thuy District Education and Training Department.

Data Collection Tools and Techniques

Questionnaires: Structured questionnaires are used to gather quantitative data from respondents. The questionnaires include both closed and open-ended questions to assess the current state of professional development programs, management processes, and influencing factors.

Interviews: Semi-structured interviews are conducted with school management personnel and teachers to collect detailed information about management practices and challenges. Interviews provide deeper insights into issues that may not be fully captured through questionnaires.

Classroom Observations: Direct observations of classroom activities are carried out to evaluate the implementation of experiential learning methods in practice. Observations help to understand how these methods are applied and their effectiveness.

4. Results

4.1. Current Status of Professional Development in Natural Science Teaching

Evaluation of Implementation

The survey results regarding the management and execution of professional development programs for natural science teaching highlight several key aspects: Diversification of Content, Methods, and Forms of Professional Development is evaluated positively with an average score of 2.25. The training sessions have incorporated various teaching methods such as problem-solving, role-playing, and experiments. However, challenges related to organizing experimental activities and field trips persist due to limitations in resources and funding. Monitoring and Evaluating Teacher Engagement and Participation received an average score of 2.18. This indicates that more rigorous monitoring and evaluation are needed to ensure high levels of teacher engagement and participation in professional development. Assessment of Training Outcomes scored an average of 2.20, suggesting that the current methods for evaluating the effectiveness of training programs need improvement to better reflect the impact on teachers. Utilization of Resources and Implementation of Policies received the lowest score of 2.08, highlighting a need for significant improvements in resource mobilization and policy implementation to enhance the effectiveness of professional development programs.

Table 1. Evaluation of Professional Development Management Implementation

Aspect	Level of Implementation	Average Score	Rank
Diversification of Content, Methods, and Forms	3	2.25	1
Monitoring and Evaluating Teacher Engagement	2	2.18	3
Assessment of Training Outcomes	2	2.2	2
Utilization of Resources and Implementation of Policies	1	2.08	4

Evaluation of Assessment Practices

Regarding the assessment of professional development results, the evaluations are as follows:

Use of Assessment Results for Reward and Recognition achieved an average score of 2.29. This indicates that the use of assessment results for motivating and rewarding teachers is not adequately emphasized. Frequency of Evaluating Professional Development Efforts received an average score of 2.22. Regular evaluations are necessary but currently not sufficiently conducted to improve the training processes. Establishment of Assessment Criteria and Tools scored an average of 2.05, revealing that clear criteria and tools for evaluation are not well defined or applied. Transparency of Results Post-Assessment had an average score of 2.11. The lack of clear communication of assessment results needs to be addressed to enhance transparency and accountability.

Table 2. Evaluation of Assessment Practices in Professional Development

Aspect	Level of Implementation	Average Score	Rank
Use of Assessment Results for Reward and Recognition	3	2.29	1
Frequency of Evaluating Professional Development	2	2.22	2
Establishment of Assessment Criteria and Tools	1	2.05	4
Transparency of Results Post-Assessment	3	2.11	3

4.2. Factors Affecting Management of Professional Development

Subjective Factors

The subjective factors influencing the effectiveness of professional development management are:

Teachers' Self-Motivation for Professional Development is identified as having the greatest impact with an average score of 2.40. Teachers' intrinsic motivation and self-initiative are crucial for improving the effectiveness of the development programs. Unified Understanding Among Educational Forces in the School achieved an average score of 2.34. Coordinated efforts and shared understanding among all educational stakeholders are essential for effective implementation of professional development. Principal's Qualities and Competence received an average score of 2.26. The role of the principal is vital for directing and organizing professional development, although some principals have not fully embraced this responsibility.

Table 3. Evaluation of Subjective Factors Affecting Professional Development Management

Factor	Level of Impact	Average Score	Rank
Teachers' Self-Motivation for Professional Development	1	2.4	1
Unified Understanding Among Educational Forces	2	2.34	2
Principal's Qualities and Competence	3	2.26	3

Objective Factors

Objective factors impacting the management of professional development include: Conditions of Facilities and Equipment for Training received an average score of 2.38. Adequate facilities and equipment are critical but currently face challenges that impact the effectiveness of training. Attention and Leadership from Higher Authorities scored an average of 2.25. Support from higher authorities is crucial for organizing well-structured and in-depth training activities. Coordination Among Educational Forces had an average score of 2.20. Effective coordination among different educational entities is still lacking, affecting the smooth implementation of professional development.

Table 4. Evaluation of Objective Factors Affecting Professional Development Management

Factor	Level of Impact	Average Score	Rank
Conditions of Facilities and Equipment	1	2.38	1
Attention and Leadership from Higher Authorities	2	2.25	2
Coordination Among Educational Forces	3	2.2	3

5. Discussion

The research results on the professional development of natural science teaching at secondary schools in Kien Thuy District, Hai Phong City, have highlighted several prominent points and challenges in the implementation process. These results clearly reflect the current state and the need for improvement in teacher development efforts.

Firstly, in terms of content and methods of professional development, although current programs have actively adopted diverse methods such as problem-solving, role-playing, and experiments, there are still significant difficulties in organizing experimental activities and field trips due to limitations in resources and funding. This underscores the need for development plans that are better aligned with the actual conditions of the schools, aiming to optimize the application of experiential methods in teaching.

The current situation shows that monitoring and evaluating teacher participation in professional development programs need substantial improvement. The average score indicates that a more rigorous monitoring and evaluation system is required to ensure active and continuous teacher engagement. This is a critical weakness that needs to be addressed to enhance the effectiveness of the development programs.

The evaluation of training outcomes reveals that current assessment methods need to be improved to more accurately reflect the impact of the programs. Although existing evaluation methods are in place, they are not robust enough to measure the real effectiveness of the training activities. This highlights the necessity for renewing assessment methods to provide more accurate and valuable information about teachers' progress.

Furthermore, the utilization of resources and policy implementation in professional development currently faces many challenges. Issues related to resource mobilization and policy enforcement have significantly impacted the effectiveness of the development programs. This suggests that there needs to be a notable improvement in how resources are mobilized and policies are enforced to enhance the effectiveness of professional development.

The analysis of results highlights several key challenges in managing professional development, including both subjective and objective factors. To address these issues, specific measures are necessary:

Raising Awareness: Organize awareness programs for school management and teachers about the importance of experiential-based professional development. Ensuring that all stakeholders understand and commit to this approach is essential for effective implementation.

Planning: Develop training plans that are tailored to the practical conditions of secondary schools in Kien Thuy. These plans should be specific and feasible, ensuring that professional development activities are effectively delivered.

Implementation: Improve the management and execution of professional development activities. This includes coordinating and executing programs more effectively to ensure all teachers receive the necessary support.

Assessment and Evaluation: Innovate the methods for assessing and evaluating training outcomes. Updating and enhancing the assessment system will provide a clearer picture of the progress and impact of professional development activities.

Digital Transformation: Implement digital solutions in managing professional development. Utilizing information technology will improve the accuracy, efficiency, and transparency of the entire development process.

These measures will significantly enhance the quality and effectiveness of professional development programs for natural science teaching at secondary schools in Kien Thuy District, better meeting the needs of both teachers and students in the modern educational context.

6. Conclusion

The study on professional development for natural science teaching at secondary schools in Kien Thuy District, Hai Phong City, has highlighted several key areas needing attention. Despite the positive incorporation of diverse methods such as problem-solving, role-playing, and experiments, significant challenges remain, particularly in organizing practical activities and field trips due to resource constraints. Current practices in monitoring teacher engagement and evaluating training outcomes are insufficient, indicating a need for more rigorous systems to ensure active participation and accurately measure effectiveness. Additionally, issues with resource mobilization and policy enforcement have hindered the impact of development efforts. To address these challenges, it is crucial to raise awareness among school management and teachers about the importance of experiential-based professional development, create training plans that align with the practical conditions of the schools, and improve the management and execution of development activities. Revising assessment and evaluation methods is essential for providing accurate insights into the progress and impact of these programs. Furthermore, embracing digital tools and technologies will enhance the accuracy, efficiency, and transparency of managing professional development. Implementing these measures will lead to significant improvements in the quality and effectiveness of professional development programs, ultimately better meeting the needs of teachers and students and contributing to a more responsive educational system.

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