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Enhancing Teachers' Instructional Skills in Higher Vocational Education through Mind Mapping

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Abstract

Amid global educational reform, higher vocational education demands teachers demonstrate integrated skills combining subject knowledge, pedagogy, and technology. However, many vocational teachers struggle with organizing complex content and systematic reflection, while traditional training often lacks practical tools for integrated competence. Mind mapping, a visual cognitive tool, shows considerable potential in supporting instructional design, classroom teaching, and reflective practice. Grounded in mind mapping theory and the Technological Pedagogical Content Knowledge (TPACK) framework, this study adopts a reform-oriented qualitative approach based on literature analysis and reflective examination. The findings indicate that mind mapping supports teachers in clarifying instructional logic, strengthening pedagogical coherence, deepening reflective awareness, and improving the integration of technology, pedagogy, and content. These results provide theoretical support and practical implications for instructional reform and teacher professional development in higher vocational education.

Keywords

Mind Mapping; Higher Vocational Education; Teachers' Instructional Skills; Educational Reform; TPACK.

1. Introduction

1.1. Research Background

With the rapid development of globalization, information technology, and digital transformation, education systems worldwide are undergoing continuous reform. Higher vocational education, as an essential component of modern education systems, plays a key role in cultivating skilled professionals who can meet the demands of industrial upgrading and economic development. In recent years, educational reforms have increasingly emphasized competency-based education, the integration of digital technologies, and closer alignment between education and labor market needs, placing higher requirements on teachers' instructional skills in vocational institutions. Teachers are no longer merely transmitters of knowledge, but designers of learning experiences, organizers of teaching processes, and facilitators of students' skill development, requiring them to integrate disciplinary knowledge, pedagogical strategies, and technological tools. However, many vocational teachers still face challenges in instructional planning, content integration, and systematic reflection due to fragmented training, limited pedagogical support, and a lack of effective instructional tools. In this context, there is a growing need for approaches that can support teachers in structuring instructional content, clarifying teaching logic, and enhancing reflective practice. Mind mapping, as a visual representation of thinking processes, offers a potential solution by enabling holistic organization of information and clearer perception of relationships among concepts. Although it has been widely applied in student learning and curriculum development, its role in

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supporting teachers' instructional skill development in higher vocational education remains insufficiently explored, making it a meaningful focus from an educational reform perspective.

1.2. Research Purpose and Significance

The primary purpose of this study is to examine how mind mapping can be applied to enhance teachers' instructional skills in higher vocational education. Specifically, the study focuses on three core dimensions of instructional skills: instructional design skills, classroom teaching skills, and reflective teaching skills. By analyzing the application of mind mapping in these areas, the study aims to clarify its functional value in supporting teachers' professional development and instructional improvement.

From a theoretical perspective, this study extends existing research on mind mapping beyond student-centered learning and explores its role in teacher instructional competence development. By integrating mind mapping theory with teacher instructional skill frameworks and the TPACK model, the study provides a new analytical perspective for understanding instructional reform in higher vocational education. From a practical perspective, the findings of this study can inform the design of teacher training programs and provide vocational teachers with concrete strategies for improving instructional coherence, adaptability, and reflective capacity. Therefore, this research contributes to both educational theory and instructional practice.

1.3. Current Research Status

International research on mind mapping has mainly focused on its effects on student learning outcomes. Studies indicate that mind mapping facilitates understanding of complex knowledge structures and supports meaningful learning by reducing cognitive load (Davies, 2019; Sweller et al., 2019). In higher education, it has also been applied to curriculum design, collaborative learning, and interdisciplinary knowledge integration.

Recent studies have extended mind mapping research to teacher professional development, suggesting its value in lesson planning, curriculum organization, and reflective practice through visual structuring of instructional thinking (Keles, 2020). However, empirical research focusing on higher vocational teachers remains limited.

Research on vocational teachers' instructional skills emphasizes integrated competence development. Although vocational teachers often possess strong technical expertise, insufficient pedagogical training frequently leads to fragmented instructional practices. The TPACK framework proposed by Mishra and Koehler (2006) has been widely used to analyze teachers' integrated competence in technology-enhanced teaching, yet many teachers struggle to operationalize the relationships among technology, pedagogy, and content in daily practice. This gap highlights the need for practical tools such as mind mapping to support visualization and integration within the TPACK framework.

1.4. Research Methods and Innovations

This study adopts an educational reform–oriented qualitative research approach. Through systematic literature analysis and reflective examination of instructional practice, the study explores how mind mapping functions as a practical tool in enhancing teachers' instructional skills. Rather than conducting large-scale quantitative experiments, this research emphasizes contextual understanding and instructional process analysis, which aligns with the characteristics of higher vocational education.

The innovation of this study lies in three aspects. First, it focuses on teachers rather than students, extending the application of mind mapping to teacher instructional skill development. Second, it integrates mind mapping with the TPACK framework, providing a concrete approach for supporting integrated teacher competence. Third, it situates the analysis within the context

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of higher vocational education and educational reform, highlighting the practical relevance of mind mapping for instructional improvement in vocational institutions.

2. Overview of Mind Mapping, Teachers' Instructional Skills and Higher Vocational Education

2.1. The Connotation and Characteristics of Mind Mapping

Mind mapping is a visual thinking tool systematically proposed by Tony Buzan, grounded in cognitive psychology. Buzan argued that unlike traditional linear note-taking, mind mapping aligns with the brain's associative and radiative functioning. It organizes information around a central theme, extending outward through hierarchical branches that use keywords, images, and colors to represent ideas. This approach enables individuals to construct a holistic cognitive structure rather than a fragmented one.

The key characteristics of mind mapping include visualization, hierarchy, association, and flexibility. Visualization renders abstract concepts concrete, while hierarchy clarifies the logical relationships between primary and secondary information. Association facilitates connections across different branches to support integrative thinking, and flexibility allows the map to be continuously modified, reflecting the dynamic nature of the teaching process.

From a cognitive perspective, mind mapping aligns with dual coding theory and cognitive load theory. By activating both verbal and non-verbal channels, visual elements facilitate information processing and reduce unnecessary cognitive burden (Sweller et al., 2019). These attributes make mind mapping particularly suitable for organizing complex instructional content and supporting the higher-order thinking essential in higher vocational education.

2.2. Teachers' Instructional Skills in Higher Vocational Education

Teachers' instructional skills refer to the comprehensive abilities required to plan, implement, and evaluate teaching activities effectively. In higher vocational education, these skills are characterized by the close integration of theoretical knowledge and practical competence. Vocational teachers are required not only to explain conceptual knowledge but also to guide students in applying skills in real or simulated professional contexts, which places high demands on instructional design, classroom teaching, and reflective abilities.

Instructional design skills involve analyzing learning objectives, organizing teaching content, selecting appropriate teaching methods, and designing assessment strategies. Classroom teaching skills include presenting content clearly, managing learning activities, engaging students, and adapting instruction to diverse learner needs. Reflective teaching skills refer to teachers' ability to evaluate teaching effectiveness and continuously improve teaching practice through reflection.

However, many vocational teachers possess strong industry experience but lack systematic pedagogical training, resulting in fragmented instructional practices that rely heavily on personal experience rather than structured design and reflection. Therefore, enhancing teachers' instructional skills has become a key issue in vocational education reform, highlighting the urgent need for instructional tools that support knowledge organization, teaching visualization, and reflective analysis.

2.3. Characteristics and Development Requirements of Higher Vocational Education

Higher vocational education focuses on applied learning and skill-oriented instruction aligned with industry needs, aiming to cultivate professionals capable of adapting to occupational and technological changes. Compared with general higher education, it places greater emphasis on practical competence and teaching effectiveness.

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Educational reform requires vocational curricula to integrate theory with practice, adopt participatory and problem-solving teaching methods, and incorporate digital technologies, which increases instructional complexity.

Accordingly, teachers need integrated instructional skills combining content knowledge, pedagogy, and technology. Traditional planning tools offer limited support for such integration, whereas mind mapping enables systematic organization of instructional content and clear visualization of teaching processes.

Table 1 Comparison between Traditional Instructional Planning and Mind Mapping-based Planning

Comparison Dimension	Traditional Linear Planning	Mind Mapping Planning
Thinking Mode	Linear & Sequential	Radiant & Associative
Content Structure	Fragmented knowledge points	Holistic & Hierarchical
Logic Visibility	Implicit & Hidden	Explicit & Visualized
Modification	Difficult to insert new ideas	Flexible & Expandable
TPACK Integration	Separated elements	Integrated connection

2.4. The Relationship between Mind Mapping and Teachers' Instructional Skills

Mind mapping and teachers' instructional skills are closely related in terms of cognitive support and instructional practice. As a visual thinking tool, mind mapping helps teachers externalize their instructional thinking, making implicit teaching logic explicit. This externalization supports instructional design by clarifying relationships among objectives, content, methods, and assessment.

In classroom teaching, mind mapping serves as an instructional guide that helps teachers maintain logical flow and emphasize key learning points. Visual representations can also enhance student understanding and engagement by making complex content more accessible. In reflective teaching, mind mapping provides a structured framework for analyzing teaching experiences, identifying problems, and generating improvement strategies.

Therefore, mind mapping functions not merely as a teaching aid but as a comprehensive instructional support tool that contributes to the development of teachers' instructional skills. Its application aligns with the goals of educational reform, which emphasize instructional quality, integration, and sustainability in higher vocational education.

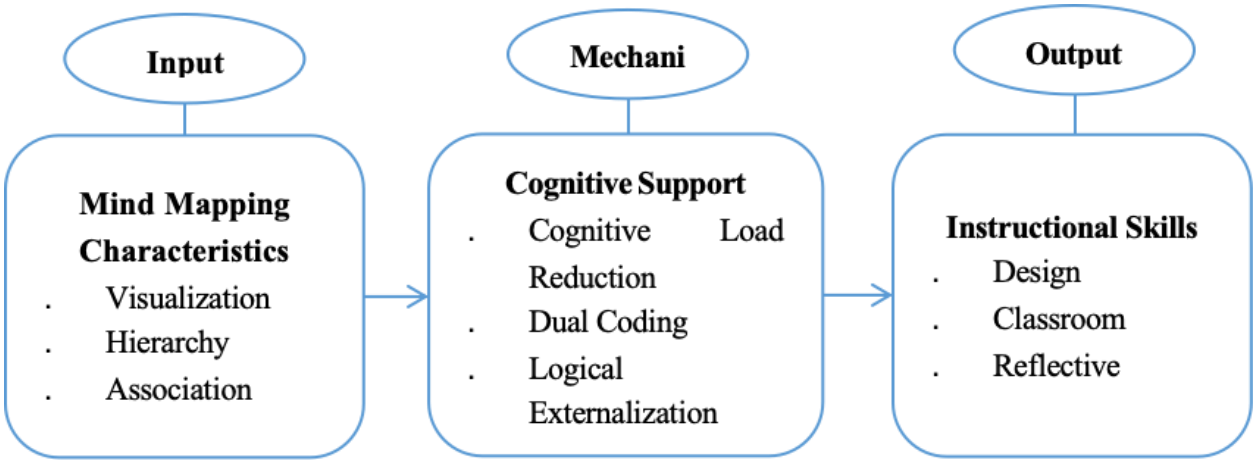

Figure 1 The theoretical framework of mind mapping facilitating instructional skills

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3. Design and Practice of Teachers' Instructional Skill Development Based on Mind Mapping

3.1. Instructional Design Concepts and Principles Based on Mind Mapping

The design of teachers' instructional skill development based on mind mapping should adhere to clear educational concepts and practical principles. From an educational reform perspective, instructional improvement in higher vocational education should emphasize integration, applicability, and sustainability. Mind mapping, as a visual cognitive tool, provides an effective foundation for achieving these goals.

The first design concept is integration. Instructional activities in vocational education involve multiple elements, including learning objectives, teaching content, teaching methods, learning activities, and assessment. Mind mapping enables teachers to integrate these elements into a unified visual structure, avoiding fragmented instructional planning. Through mind maps, teachers can clearly perceive the internal logic of instruction and ensure coherence among different teaching components.

The second principle is learner-centeredness. Although mind mapping is applied to teacher instructional skills, its ultimate purpose is to improve student learning outcomes. By using mind maps in instructional design, teachers can better analyze students' learning needs, prior knowledge, and skill levels, and design teaching activities that support active learning and practical application. This principle aligns with competency-based education and student-centered teaching advocated in vocational education reform.

The third principle is flexibility and adaptability. Higher vocational education is characterized by rapidly changing industry requirements and diverse student backgrounds. Mind mapping allows instructional plans to be adjusted dynamically, enabling teachers to revise content, methods, and activities according to instructional feedback and contextual changes. This flexibility supports continuous instructional improvement and professional growth.

3.2. Instructional Skill Development Goals

Based on the characteristics of higher vocational education and the requirements of educational reform, the development goals of teachers' instructional skills can be divided into three dimensions: instructional design skills, classroom teaching skills, and reflective teaching skills.

The goal of instructional design skill development is to enable teachers to systematically plan teaching activities and construct coherent instructional frameworks. Through mind mapping, teachers can clearly identify instructional objectives, organize content hierarchically, and align teaching methods and assessment strategies. This process helps teachers move from experience-based planning to systematic instructional design.

The goal of classroom teaching skill development is to improve teachers' ability to organize teaching processes, present content clearly, and engage students actively. Mind maps can be used as visual teaching guides that support logical instruction and emphasize key learning points. By integrating mind mapping into classroom teaching, teachers can enhance instructional clarity and improve student participation.

The goal of reflective teaching skill development is to cultivate teachers' ability to evaluate instructional effectiveness and continuously improve teaching practice. Mind mapping provides a structured approach for reflective analysis, enabling teachers to document teaching experiences, analyze problems, and generate improvement strategies. This goal supports the formation of reflective practitioners in vocational education.

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3.3. Construction of an Instructional Skill Development Framework

Based on mind mapping, an instructional skill development framework for higher vocational teachers can be constructed by integrating instructional design, classroom teaching, and reflective practice. At the instructional design stage, mind maps are used to visualize the overall teaching structure, including objectives, content, methods, and assessment. Teachers can create course-level and lesson-level mind maps to ensure coherence across teaching units.

During classroom teaching, mind maps function as instructional guides that support teaching delivery. Teachers can use mind maps to organize teaching sequences, highlight key concepts, and manage classroom activities. In addition, teachers may encourage students to participate in mind mapping activities, promoting interaction and collaborative learning.

At the reflective practice stage, mind mapping supports systematic reflection by enabling teachers to analyze teaching processes and outcomes. Reflective mind maps may include branches related to teaching objectives, student performance, instructional strategies, and areas for improvement. Through continuous reflection, teachers can refine their instructional approaches and enhance professional competence.

This framework emphasizes the cyclical nature of instructional improvement, in which design, implementation, and reflection are interconnected. Mind mapping serves as a consistent cognitive tool throughout the instructional process, supporting sustained teacher development.

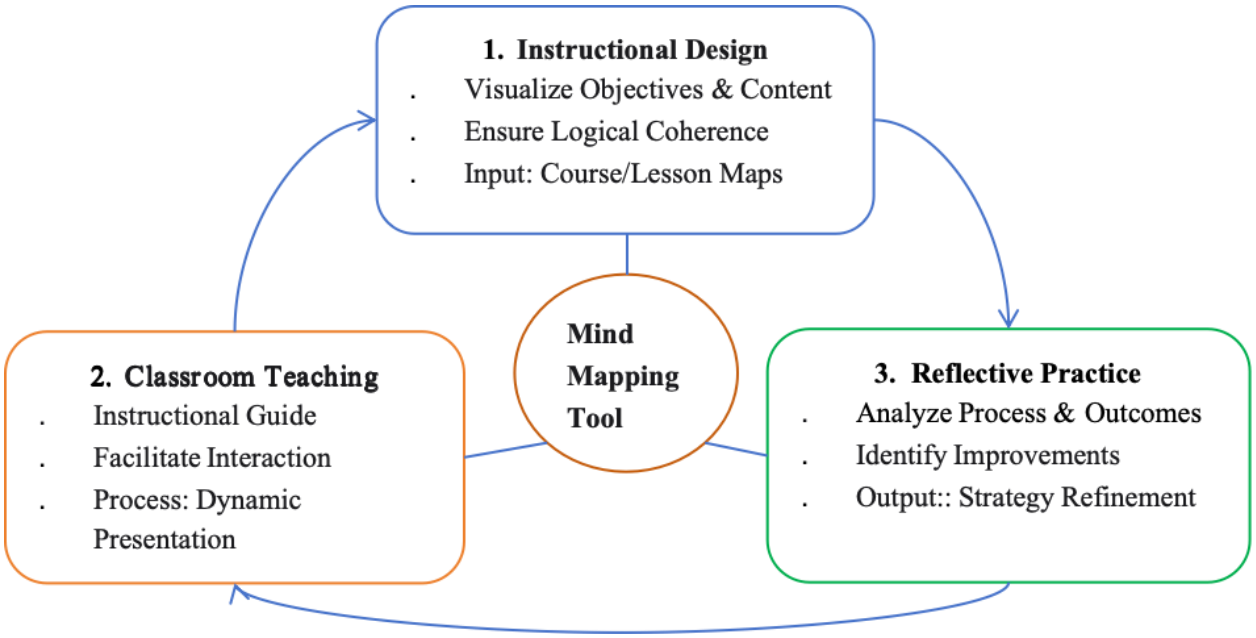

Figure 2 The Instructional Skill Development Framework Based on Mind Mapping

3.4. Integration of Mind Mapping with the TPACK Framework in Practice

The integration of mind mapping with the TPACK framework provides practical support for developing teachers' integrated instructional competence. The TPACK framework emphasizes the interaction among technological knowledge, pedagogical knowledge, and content knowledge. However, these relationships are often abstract and difficult for teachers to operationalize in daily teaching practice.

Mind mapping offers a visual means of representing TPACK components and their interactions. In instructional design, teachers can use mind maps to align digital tools with pedagogical strategies and content objectives. For example, teachers may map how simulation software supports practical skill training or how multimedia resources enhance conceptual understanding.

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In classroom teaching, mind mapping helps teachers manage technology-enhanced instruction by clarifying the role of technological tools in teaching activities. Teachers can visualize when and how technology is used to support learning, ensuring that technology serves pedagogical purposes rather than becoming a distraction.

In reflective practice, mind mapping supports evaluation of technology integration. Teachers can analyze the effectiveness of technological tools in achieving instructional goals and adjust their teaching strategies accordingly. Through this integrative approach, mind mapping facilitates the development of teachers' TPACK competence and supports instructional reform in higher vocational education.

4. Practice Effect Analysis Based on Mind Mapping

4.1. Introduction of Instructional Practice Cases

To examine the practical effects of mind mapping on teachers' instructional skill development, this study draws on representative instructional practice cases from higher vocational education contexts. These cases focus on teachers' application of mind mapping in instructional design, classroom teaching, and post-teaching reflection within theory–practice integrated courses.

In instructional design practice, teachers used mind mapping to construct course frameworks and lesson plans by placing instructional objectives at the core and extending branches to content modules, teaching methods, learning activities, and assessment approaches. This visual planning process supported clearer instructional organization and alignment among teaching elements.

During classroom teaching and reflective practice, mind maps functioned as visual guides to support lesson progression, highlight key learning points, and analyze teaching outcomes, providing a basis for subsequent instructional improvement.

4.2. Methods and Process of Practice Effect Investigation

The investigation of practice effects adopted qualitative methods consistent with educational reform research. Data were collected through reflective teaching records, instructional artifacts such as lesson plans and mind maps, and teachers' reflective summaries, providing evidence of how mind mapping influenced instructional thinking and teaching behavior.

The analysis involved coding and categorizing reflective data according to instructional skill dimensions, including instructional design, classroom teaching, and reflection, with particular attention to changes in instructional organization, teaching clarity, and reflective depth before and after the application of mind mapping.

This qualitative approach emphasizes instructional process analysis rather than numerical measurement, aligning with the characteristics of higher vocational education and the reform-oriented purpose of the study, and enabling an in-depth understanding of mind mapping as an instructional support tool in authentic teaching contexts.

4.3. Analysis and Discussion of Practice Effects

The analysis indicates that mind mapping has a positive impact on teachers' instructional skill development in higher vocational education. In terms of instructional design, teachers demonstrated clearer instructional logic and stronger coherence among objectives, content, and assessment. Visual planning through mind mapping reduced fragmented instructional design and supported systematic teaching preparation. This finding is consistent with previous studies highlighting the role of visual tools in enhancing instructional clarity (Davies, 2019). Table 2 presents the comparison of teachers' self-evaluation scores regarding their instructional planning quality before and after applying mind mapping.

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Table 2 Teachers' Self-Evaluation of Instructional Planning Quality (Average Score: 1-5 Scale)

Evaluation Dimension	Traditional Planning	Mind Mapping–Based Planning	Improvement
Logical Structure	3.2	4.5	+1.3
Content Integration	3.0	4.6	+1.6
Alignment of Objectives	3.4	4.4	+1.0
Visual Clarity	2.5	4.8	+2.3
Design Efficiency	3.1	4.2	+1.1

In classroom teaching, mind mapping contributed to improved teaching organization and student engagement. Teachers reported greater confidence in managing lesson flow and responding to instructional contingencies. The visual structure of mind maps also supported students' understanding of complex content, reducing cognitive load and facilitating meaningful learning (Sweller et al., 2019). These results align with research indicating that visual representations enhance teaching effectiveness and learning outcomes (Keles, 2020).

In reflective teaching, mind mapping supported deeper and more structured reflection. Teachers moved beyond descriptive reflection to analytical reflection by mapping relationships among teaching strategies, student responses, and learning outcomes. This process enhanced teachers' metacognitive awareness and supported continuous instructional improvement, consistent with theories of reflective practice (Schön, 1983; Farrell, 2019).

From the perspective of integrated competence development, mind mapping also supported teachers' understanding and application of the TPACK framework. By visualizing the interactions among technology, pedagogy, and content, teachers were better able to design and evaluate technology-enhanced instruction (Mishra & Koehler, 2006; Chai et al., 2019). Overall, the practice effects demonstrate that mind mapping is a practical and effective tool for supporting instructional reform in higher vocational education.

5. Summary

From the perspective of educational reform, this study examined the application of mind mapping in enhancing teachers' instructional skills in higher vocational education. Grounded in mind mapping theory, teacher instructional skill research, and the TPACK framework, the study analyzed how mind mapping supports instructional design, classroom teaching, and reflective practice. Through qualitative analysis of instructional practice cases, the study demonstrated that mind mapping contributes to clearer instructional structure, improved teaching coherence, deeper reflective practice, and more effective integration of technology, pedagogy, and content knowledge.

The theoretical contribution of this study lies in extending mind mapping research from student learning to teacher professional development and instructional reform, and in proposing an integrated approach to teacher competence development through the TPACK framework. Practically, the study offers vocational teachers and institutions a feasible instructional support tool aligned with reform-oriented teaching objectives. Despite its qualitative scope and reliance on reflective data, the findings indicate that mind mapping holds strong potential as an instructional innovation tool in higher vocational education, and future research may further examine its long-term effects through mixed-methods approaches.

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