International Journal of Academe and Industry Research
Volume 7 Issue 2 June 2026
DOI: https://doi.org/10.53378/ijair.353346

Quality and effectiveness of the instructional materials of new energy vehicles course in higher vocational colleges

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Abstract

This study examines the quality and effectiveness of instructional materials used in the "Introduction to New Energy Vehicles" course in higher vocational colleges in China. Driven by national carbon neutrality goals and industrial transformation, the rapidly expanding new energy vehicle (NEV) industry requires vocational education to provide relevant and high-quality curricula. Grounded in cognitive learning theory, particularly Ausubel' s assimilation theory, the study explores how textbooks and digital resources support student understanding, align with curriculum standards, and respond to evolving industry demands. Using a qualitative descriptive design, semi-structured interviews were conducted with four experienced instructors through purposive sampling; thematic analysis identified five key dimensions of textbook quality: content richness, alignment with national standards, timeliness, accessibility, and ease of use. Findings indicate that current materials-textbooks, PowerPoint presentations, online videos, and simulations-generally align with curriculum requirements and support blended learning. However, concerns were raised regarding outdated content, limited support for students with disabilities, and insufficient coverage of emerging technologies like battery recycling and intelligent connectivity. Integrating real-world case studies, simulation tools, and online platforms was found to enhance student engagement and comprehension. Participants emphasized the need for a structured, collaborative evaluation framework involving both educators and learners to ensure continuous improvement. Recommendations include strengthening update mechanisms, promoting inclusivity, enhancing curriculum-industry alignment, and establishing formal textbook evaluation systems. The study underscores the vital role of high-quality instructional materials in fostering active learning and preparing skilled professionals for the evolving NEV industry.

Keywords: *textbook evaluation, vocational education, teaching quality, curriculum alignment*

Article History:

Received: *February 20, 2026* ***Revised***: *April 4, 2026*
Accepted: *April 18, 2026* ***Published online***: *May 4, 2026*

Suggested Citation:
Yu, N. & Saong, M. (2026). Quality and effectiveness of the instructional materials of new energy vehicles course in higher vocational colleges. *International Journal of Academe and Industry Research*, 7(2), 1-27. https://doi.org/10.53378/ijair.353346

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1. Introduction

In recent years, traditional fuel vehicles have encountered a development bottleneck due to global energy shortages, environmental pollution, and the push for international carbon neutrality (Lv et al., 2021). The Chinese government has strengthened policy support for the new energy vehicle (NEV) industry (Xu, 2026), and some automakers have announced plans to discontinue production of fuel vehicles (Yao & Sun, 2026). Therefore, many higher vocational colleges in China realize that the new energy vehicle industry is facing the current situation of needing a large number of talents (Ding, 2025) and have opened new energy vehicle-related courses to train and encourage students to find jobs in new energy vehicle enterprises (Li & Zhou, 2024).

In addition, higher vocational colleges' special positioning requires emphasizing students' practical skills in talent training and curriculum standards (Li, 2025). Thus, selecting high-quality textbooks is crucial, as they determine teaching quality (Xu, 2025) and reflect curriculum standards (Cai et al., 2023), guiding students to grasp knowledge systematically. It is therefore necessary to analyze the quality of "Introduction to New Energy Vehicles" textbooks, including content completeness, alignment with standards, and teaching suitability. This analysis can identify problems and propose improvement strategies, helping teachers better understand curriculum concepts and select appropriate textbooks (Gu, 2024). Integrating textbook characteristics with cognitive learning theory also achieves interdisciplinary integration and provides a revision reference.

However, existing research focuses on vocational textbook design and reform (Li, 2024), with insufficient insights into their practical application. Notably, teachers' and students' perspectives on textbook quality, usability, and suitability are underexplored, and few studies address alignment with industry technologies and sustainability (Chen & Liu, 2026). This leaves a gap in qualitative, experience-based analysis of NEV introductory textbooks in higher vocational education. This study addresses that gap. For students, textbook perception initiates learning (Bai, 2024); this study helps select high-quality NEV textbooks that systematize knowledge and facilitate independent learning (Li, 2025). For teachers, it clarifies how to select high-quality textbooks, improving lesson preparation efficiency and teaching quality.

Accordingly, this paper analyzes the quality of instructional materials for the "Introduction to New Energy Vehicles" course, with three objectives: (1) identify and analyze

the types of instructional materials utilized; (2) evaluate material quality based on content richness, alignment with national and industry standards, timeliness and relevance, accessibility for diverse learners, and ease of use; and (3) propose strategies for evaluating and selecting high-quality textbooks and instructional resources.

2. Literature Review

2.1. Instructional Materials in Vocational and Technical Education

Research emphasizes integrating theory with industrial practice via work-process-oriented and task-based designs, particularly in emerging technologies (Wei, 2026). Traditional subject-centered textbooks are seen as hindering vocational competence development and should be reorganized around authentic work processes (Mahmood et al., 2024). Empirical studies confirm this focus: work-manual-based materials align learning with workplace procedures (Zhou et al., 2023); print-digital integrated models address NEV's rapid updates (Chen et al., 2025); and leaflet-style materials boost learning efficiency (Liao, 2025). In the NEV field, Yang (2024) emphasizes vocational colleges must align talent cultivation with industry demands, framing instructional materials as foundational to this alignment.

2.2. Instructional Materials in Vocational NEV-Related Courses

Research highlights a shift from single format to diversified, blended systems (Wang, 2026). Integrated multi-modal systems are essential given NEV's rapid technological evolution (Wan et al., 2024), a key factor in evaluating the course's materials. Curriculum reform studies support this shift. For instance, Chen et al. (2025) show print-digital integrated work-process materials mitigate traditional textbooks' limitations in adapting to NEV technological changes, Sun et al. (2025) stress virtual-real resource integration to address practical teaching shortages, Zhou et al. (2023) position work-manual materials as reform foundations, Gong (2025) underscores project-based methods and Wei (2018) notes VR materials' value for NEV learning efficiency and safety. Traditional NEV textbooks remain foundational but lack adaptability (Zhang & Wang, 2026). However, existing studies are largely descriptive (Wei, 2026), with scarce empirical research on material selection, implementation, and stakeholder perceptions, the gap this study addresses.

2.3. Evaluation of Instructional Material Quality

As instructional materials diversify, the evaluation of their quality, which is central to this study's main goal, has attracted attention in vocational education (Cai et al., 2023). This evaluation includes dimensions such as content relevance, clarity, instructional design, usability, and industry alignment, which guide the assessment of NEV materials in this study. Empirical benchmarks consist of Firdaus et al. (2024) with 86.5% practicality for automotive electronic materials, and Nugrah et al. (2024) with scores of 3.73 for content alignment, 3.60 for instructional media, and 3.55 for user evaluation.

Universal Design for Learning (UDL) has emerged as a key framework for enhancing vocational material accessibility and equity (Du, 2025). Multiple representation, action, and engagement methods make accessibility a key evaluation indicator. In NEV education, He (2024) stresses technology-aligned instruction, Wang et al. (2024) developed an entropy weight-TOPSIS evaluation system, and Wang et al. (2021) provided policy text evaluation methods. However, systematic empirical evaluation of NEV-specific materials remains limited (Wang et al., 2024), with gaps in understanding material synergy and learning outcome support, gaps this study addresses.

2.4. Theoretical Framework

This study integrates Constructive Alignment Theory (primary), Instructional Design Theory (complementary), and Cognitive Learning Theory (foundational), which together provide a rigorous, multi-dimensional framework for evaluating NEV materials.

Proposed by Biggs (1996), Constructive Alignment Theory emphasizes aligning learning outcomes, teaching activities, and assessments for deep learning (Wang & You, 2025), ensuring NEV materials align with curriculum objectives and vocational competencies to address the research aim.

Instructional Design Theory (Branch & Kopcha, 2019) provides structured material evaluation approaches, guiding assessments of NEV materials' clarity, accessibility, and suitability for vocational learners.

Cognitive Learning Theory (Chen et al., 2025) underpins how students acquire NEV knowledge, highlighting logical organization and active engagement, critical for evaluating materials that enhance comprehension.

These theories enable comprehensive, rigorous evaluation of NEV material quality, strengthening the study's theoretical grounding and relevance to vocational education research.

3. Methodology

3.1. Study Design

This study used the qualitative descriptive (QD) method, a widely used qualitative approach that collects and analyzes non-numerical, descriptive data to deeply understand a specific phenomenon, particularly suitable for exploring practical experiences and perspectives related to a research topic (Kim et al., 2016). Unlike other complex qualitative approaches, it emphasizes straightforward and accurate description of the research object, making it highly appropriate for examining instructional material quality and usability (Polit & Beck, 2009).

Per the study's purpose, experts were interviewed about textbook quality and type focused on four key aspects: textbook content comprehensiveness, alignment with curriculum standards, accessibility, and whether printing and audio meet teaching requirements. Based on the interview results and combined with the study's objectives, conclusions on existing textbook quality evaluation were drawn, existing problems were identified, and improvement and evaluation strategies were proposed, intended to help teachers and students use higher-quality textbooks aligned with the study's core goals.

3.2. Participants of the Study

This study employed purposive sampling, a non-probability technique selecting participants by research objective-relevant criteria to ensure an information-rich sample (Liu, 2022). Participants were full-time instructors from a northwest China higher vocational college's School of Automotive Engineering, with NEV curriculum and textbook development expertise. Using purposive sampling, the most authoritative experts from each teaching and research department were selected based on three criteria: systematically taught at least two rounds of introductory NEV courses; participated in compiling NEV-related curricula or teaching materials; and had at least three years of teaching experience. Instructors were excluded if they had not taught the course in the current academic year, declined to participate, or had less than three years of NEV teaching experience. All participants were adult volunteers who could withdraw without penalty.

This study did not involve vulnerable populations such as minors, individuals with cognitive impairments, or other protected groups. Refusal or withdrawal did not affect participants' professional standing or employment. According to these criteria, teachers who did not meet them were excluded, and four experts participated in the interviews. Table 1 displays the biographical data of the experts.

Table 1

The biographical data of the experts

Expert No.	Academic Background	Professional Title	Work Experience	Research Focus
T1	Master of Automotive Engineering	Associate Professor	12 years of teaching experience; has taught the NEV course for 5 rounds	Vocational NEV education
T2	Doctor of Vocational Education	Associate Professor	11 years of teaching experience; has taught the NEV course for 6 rounds	NEV talent cultivation
T3	Master of Automotive Engineering	Senior Lecturer	10 years of teaching experience; has taught the NEV course for 4 rounds	NEV practical teaching
T4	Doctor of Vocational Education	Senior Lecturer	10 years of teaching experience; has taught the NEV course for 3 rounds	Digital instructional materials

This study adopted a qualitative paradigm prioritizing insight depth over sample breadth, consistent with qualitative descriptive research tenets (Mei, 2025). The small sample was justified: the specialized NEV field limited eligible instructors; purposive sampling ensured information-rich, authoritative perspectives; and qualitative descriptive research does not require large samples for data saturation, with four interviews yielding sufficient detailed data to meet research objectives. Four instructors with specialized NEV teaching experience were purposively selected, providing rich, relevant insights despite the small sample size.

3.3. Instrumentation and Data Gathering Process

Semi-structured interviews were conducted following a predefined protocol (Lin et al., 2025). Four one-hour interviews were held in participants' offices over one month, audio/video/written recorded. The interview guide covered three areas: NEV textbook quality (content richness, compliance, timeliness, accessibility), teaching material types (print, audio, audiovisual), and improvement/evaluation strategies for textbook selection.

The protocol was validated by three vocational and NEV experts, with a pilot interview refining wording and sequencing. Ethical approval was obtained from Shaanxi Polytechnic Institute's IRB. All participants signed informed consent; responses were anonymized, and withdrawal rights were retained.

Scientific rigor was ensured through consistency (same researcher/protocol), transparency (traceable records), anonymity/confidentiality (coded participants, encrypted data), and credibility (probing questions, cross-verification for triangulation). Interviews were conducted in offices to reduce interference; encrypted transcripts and recordings were stored securely.

After collection, audio and written materials were systematically coded and categorized for thematic analysis, with cross-verification enhancing credibility.

3.4. Data Analysis

This study adopted Braun and Clarke's (2006) six-step thematic analysis framework to rigorously identify patterns in qualitative data, using a thematic table to collate themes, subthemes, occurrence frequencies, and interviewee codes for structured organization.

Step 1: Data familiarisation via repeated in-depth reading of transcripts and expert feedback, recording preliminary observations.

Step 2: Initial coding of data segments aligned with research objectives.

Step 3: Theme generation by grouping codes into broader categories.

Step 4: Theme review via cross-verifying coded excerpts with the full dataset, merging overlapping themes.

Step 5: Formal theme definition.

Step 6: Integrating and reporting findings under the final thematic framework, supported by participant quotations.

3.5. Research Ethics

This study adhered to ethical guidelines from recruitment to dissemination. Participation was fully voluntary, with no coercion or compensation, and participants could withdraw at any time without penalty. To protect anonymity, no identifiable information was collected. Participants received unique codes, data were de-identified from the outset, stored securely (password-protected files and locked storage), and raw data access was restricted to

authorized researchers under non-disclosure agreements. Participant selection was objective and non-discriminatory, limited to adult professionals teaching an introductory NEV course at vocational colleges, with no bias regarding personal attributes.

Minimal risks (e.g., interview fatigue) were mitigated through flexible scheduling, optional pauses, and avoidance of sensitive topics. The study involved no invasive procedures, no foreseeable long-term harm, and no participant costs.

Findings were disseminated without identifying individuals. Participants could request result summaries, and key findings were shared with participating instructors and the institute's educational administration.

4. Findings and Discussion

This section presents a comprehensive thematic analysis of interviews with four experienced "Introduction to New Energy Vehicles" course instructors. Findings are organized by theme based on mention frequency. Table 2 summarizes core themes, sub-themes, mention counts, and representative quotes.

Table 2

Thematic analysis frequency

Theme	Sub-theme	Number of Teacher Mentions	Representative Quote
Types of Instructional Materials Used	Textbooks and PPT	4	"I mainly use textbooks and PPT as the main teaching materials..." (T1)
	Videos and Animations	3	"Videos... enhance students' intuitive understanding" (T4)
	Online Platforms (Wisdom Tree, MOOCs, etc.)	3	"Many institutions partner with platforms such as Wisdom Tree..." (T3)
	Simulation Software	2	"The value of virtual labs and simulation software..." (T4)
Effectiveness of Materials	Practical Engagement via Video/Simulation	2	"In practical skills teaching, video and simulation are significant" (T1)
	Structured Knowledge through Textbooks	3	"Textbooks help build a coherent knowledge framework" (T4)
	Flexible Access and Peer Evaluation	1	"Online courses enable preview, engagement, and assignments" (T2)

Theme	Sub-theme	Number of Teacher Mentions	Representative Quote
Quality of Instructional Materials	Richness of Content	3	"The course employs a variety of instructional media" (T1)
	Alignment to Standards	4	"Materials closely follow new curriculum standards" (T1)
	Timeliness	4	"Printed materials cannot stay current with rapid innovation" (T2)
	Accessibility	3	"The textbook lacks Braille versions" (T1)
	Ease of Use	4	"Content is clearly classified and modular" (T3)
Strategies for Textbook Evaluation	Selection Process	4	"A multi-step procedure... instructor identification... departmental review" (T2)
	Evaluation Strategies	4	"Establish a diversified evaluation mechanism" (T1)
	Continuous Optimization	2	"Establish a dynamic update mechanism" (T4)

Findings are interpreted through cognitive learning theory and Mayer's Cognitive Theory of Multimedia Learning, with links to relevant literature.

4.1. Types and Effectiveness of Instructional Materials Used

4.1.1. Types of Materials

Textbooks and PPT. All interviewed experts confirmed printed textbooks as the primary resource for structured knowledge delivery, and PowerPoint slides as the standard classroom tool,

> *"I mainly use textbooks and PPT as the main teaching materials..."* **(T1)**
>
> *"In the new energy vehicle course, I mainly use textbooks..."* **(T2)**
>
> *"The textbooks as highly structured, allowing students to organize notes, follow lectures coherently."* **(T3)**
>
> *"I mainly use teaching materials, including textbooks and PPT."* **(T4)**

All four experts confirmed textbooks and PPTs as the cornerstone of NEV instruction. Recent research supports these findings. For example, Han (2021) found that hybrid teaching improves educational quality and student information literacy while Liu and Qian (2025)

emphasized digital material development. Hence, this study confirms that traditional materials work best within blended strategies.

Videos and animations. Videos make abstract technical concepts more accessible and engaging. They help students understand traditional knowledge and significantly enhance interest in the course. As three teachers said,

> *"I mainly use textbooks and PPT as the main teaching materials, supplemented by videos..."* **(T1)**
>
> *"The online resources include videos, texts, teaching plans and other resources"* **(T3)**
>
> *"Videos... can enhance students' intuitive understanding of these topics."* **(T4)**

Teachers noted that videos are employed both during class and for after-class review. One teacher shared:

> *"I am using videos to introduce new topics or clarify complex mechanisms"* **(T2)**

Thus, videos and animations simplify abstract NEV concepts. Teachers use them in class and for review, enabling self-paced learning that reduces cognitive overload. These resources also align with Mayer's multimedia learning theory by combining verbal explanations with visual demonstrations. On the other hand, empirical studies confirm these benefits: VR animation improves student acceptance and reduces low-quality work (Zhao et al., 2024), and multimedia teaching boosts autonomous learning and understanding (Zhang, 2025).

Online platforms (Wisdom Tree, MOOCs, etc.). Online courses are widely adopted as a flexible supplement to traditional instruction. Teacher 2 highlighted their value in supporting pre-class preparation, in-class engagement, and post-class review. Students can preview lessons, participate in discussions, and submit assignments via digital platforms. One teacher said:

> *"Many institutions partner with digital platforms such as Wisdom Tree, which house teacher-curated video lectures, texts, teaching plans, and assessments."* **(T3)**

These platforms support flipped classrooms and active learning, and facilitate pre-class preparation, in-class engagement, and post-class review through curated resources. This aligns

with cognitive learning theory to foster deeper knowledge construction. Online platforms also align with multimedia learning theory by integrating diverse media to support dual-channel processing and personalized learning paths. Their modular flexibility allows students to control learning pace and depth, reducing cognitive load, while platform analytics enable evidence-informed teaching. Research validates their effectiveness: user-friendliness and alignment with learning objectives (Cai & Aquino, 2023), and blended learning outperforming pure online methods (Chauhan & Jain, 2025).

Simulation software. Virtual simulation tools represent a growing component of instructional materials in NEV education. One teacher stressed:

> *"The value of virtual labs and simulation software in helping students understand the structure and operational principles of NEV systems."* **(T4)**
> *"Simulation tools are particularly beneficial in practical skills training"* **(T1)**

Virtual simulations enable NEV practical operations without physical risks, costs, or constraints. They align with constructivist principles, Mayer's Cognitive Theory of Multimedia Learning (2014), and blended learning. Research also confirms their value: digital simulations enhance conceptual understanding, engagement, and problem-solving skills (Kefalis et al., 2025); and virtual simulations bridge theory-practice gaps when physical resources are limited (Wang, 2025).

4.1.2. Effectiveness of Materials

Practical engagement via video/simulation. Simulation and video resources were particularly effective in teaching technical and procedural knowledge. Two teachers said in an interview,

> *"In practical skills teaching, the application effect of video and simulation software is significant."* **(T1)**
> *"Virtual simulation software aids students in understanding the structure and operation principles of power systems."* **(T4)**

These tools allow learners to visualize systems, observe processes, and practice in a controlled, repeatable environment, critical when physical equipment is limited by cost, safety, or availability. By enabling repeated observation and virtual operation, videos and simulations help students internalize operational logic and transfer theory to practice. This aligns with

constructivist principles and Mayer's Cognitive Theory of Multimedia Learning (2014). Digitally supported practical learning is essential to NEV vocational education. Previous research also confirms that virtual simulation improves practical skills and outcomes (Wang & Liu, 2024), and that hybrid teaching enhances engagement (Li & Zhu, 2024). Thus, video and simulation resources are integral components of practice-oriented NEV courses.

Structured knowledge through textbooks. Textbooks remain a cornerstone for building systematic knowledge. Teachers noted,

> *"Textbooks provide easy access to content aligned with the teacher's instructional pace, facilitating consistent learning progress."* **(T2)**
> *"The highly systematic nature of textbooks, which supports effective note-taking and focused study during class sessions."* **(T3)**
> *"Textbooks can help students build a coherent framework of knowledge that lays the foundation for other materials."* **(T4)**

Textbooks are essential for organizing discipline-specific information logically, which enable students to internalize core concepts before applying them through videos or simulations. This structured approach ensures stability and clarity and serves as the backbone of integrated teaching. Previous studies also confirm that well-structured textbooks aid vocational students' cognitive progression and knowledge integration (Zhou et al., 2023).

Flexible access and peer evaluation. Online courses and peer assessment systems offer great flexibility that allow students to access materials anytime. Teacher 2 noted that online courses support a complete learning cycle: previewing concepts before class, participating during class, and submitting assignments afterward. This flexibility enables blended learning without time or space constraints. Flexible access and standardized peer evaluation encourage student initiative, provide timely feedback, and improve outcomes and engagement. Research supports these benefits: simulation technology enhances engagement and understanding (Wang et al., 2023), and team-based activities in flipped courses yield over 70% positive student reports (Motaref, 2020).

4.2. Quality of Instructional Materials

4.2.1. Richness of content

Comprehensive and varied content. Participants emphasized using diverse materials: textbooks, videos, and online content. These provide layered, comprehensive support for theoretical and practical learning. As two teachers noted,

> *"The course employs a variety of instructional media, including printed textbooks, PowerPoint slides, online modules, videos, and animations..."* **(T1)**
> *"The materials cover fundamental knowledge but also incorporate case studies and investigative activities."* **(T3)**

Instructional materials feature comprehensive, multi-layered content that supports both conceptual understanding and practical application. Textbooks, multimedia, and online resources allow students to engage with knowledge at different cognitive levels. Basic concepts are introduced systematically, while case studies and inquiry-based activities promote problem-solving. This structure addresses a key limitation in vocational education, where fragmented or overly practice-focused materials often hinder coherent knowledge construction.

Integration of learning theories. A significant strength identified in the interviews was the integration of cognitive learning theory within the instructional design. One teacher shared,

> *"The materials integrate cognitive learning theories, emphasizing the development of students' cognitive processes through a 'learn-practice-use' structure."* **(T1)**

A key strength of instructional design is its implicit integration of cognitive learning principles. The observed "learn-practice-use" structure reflects progression from knowledge acquisition to consolidation and application. This aligns with Ausubel's assimilation theory (2000). With clear objectives, inquiry-based tasks, and logically ordered content, the materials support active engagement and long-term retention. This theory-guided design resolves the frequent mismatch between instructional materials and learning theories in vocational curricula.

Case-based and problem-solving materials. Despite the overall positive evaluation, some experts noted limitations in real-world application contexts. Textbooks include basic case studies but lack depth in technology and market-oriented integration. One teacher stressed,

> *"I incorporate real-world application cases and industry reports from enterprises."* **(T4)**

However, Teacher 4 noted that textbooks lack technical depth and real-world cases. Existing research asserts that multimedia and case-based content boost student engagement and performance in vocational education (Li et al., 2020). Authentic cases and practical projects help connect theory with practice. Hence, curriculum designers should integrate more multimedia resources and industrial cases, combining digital and interactive materials.

4.2.2. Alignment to standards

Consistent with national/industry standards. Experts agreed the materials align with national and NEV industry standards. Two teachers stated,

> *"The teaching materials closely follow new curriculum standards."* **(T1)**
>
> *"The content structure and module settings align with national and industry goals."* **(T2)**

This alignment ensures materials foster standardized competency and meet industry-oriented goals. Incorporating policy and professional standards into course design maintains consistent learning outcomes and strengthens career readiness. Studies confirm industry-based content improves employability (Fatah et al., 2025), and NEV maintenance competency standards provide clear learning benchmarks (Wang et al., 2024).

Gaps in newer fields (e.g., battery recycling). Some gaps remain in emerging areas such as battery recycling and intelligent connectivity. One teacher added,

> *"There is a gap between the depth of textbooks and the standards in areas such as battery recycling."* **(T4)**

Alignment with formal standards ensures consistent, relevant skills training (Biggs, 1996). However, research underscores the need for dynamic mechanisms to synchronize educational content with evolving industry standards (Wang & Mai, 2024). Therefore, institutions should implement regular review and update systems for instructional materials to keep pace with current standards. Industry collaboration is also advised to address gaps in emerging technologies.

4.2.3. Timeliness

Textbooks lag in updates. Most participants noted that textbook updates lag rapid technological and policy changes in the NEV sector. The two teachers pointed out that,

> *"While some data and examples have been updated, diagrams and technical content often remain outdated."* **(T1)**
> *"Due to the swift pace of innovation, printed materials cannot be revised frequently enough to stay current..."* **(T2)**

Online resources and digital platforms (e.g., MOOCs, industry forums) bridge this gap by providing real-time updates and supplementary materials.

> *"I incorporate the latest company releases and policy interpretations."* **(T4)**

The findings reveal a conflict between textbook stability and the fast-changing NEV industry. Textbooks offer structured content, but long revision cycles prevent them from keeping pace with new technologies, standards, and policies, creating a gap between classroom teaching and industrial practice. Teachers thus supplement textbooks with MOOCs, industry platforms, and policy updates. Previous studies confirm that outdated textbooks are a major obstacle to industry-education integration (He, 2025), and a "loose-leaf + digital" hybrid model has been proposed to address textbook lags and weak practicality (Tian, 2025).

Online materials are more current. To mitigate the limitation, experts leveraged online resources such as MOOCs, teacher-built libraries, and third-party platforms. One teacher said,

> *"Platforms like 'Wisdom Tree' enable teachers to upload new materials aligned with recent developments."* **(T3)**

Online platforms provide timely updates on technological innovations, policy shifts, and industry trends. By complementing static textbooks, these digital resources help students learn up-to-date knowledge, stay connected to industrial practice, and support flexible teaching. This underscores the key role of online materials in narrowing the gap between curriculum and rapidly advancing NEV technologies. Studies confirm digital resources improve vocational learning (Wang et al., 2023; Hadi et al., 2025).

Supplementing with external sources. Supplementing textbooks with up-to-date digital resources creates a blended learning model that overcomes traditional publishing cycle limitations. As teacher argued,

> *"My lectures with real-time materials from industry exhibitions, company whitepapers, and policy briefings to maintain teaching relevance."* **(T4)**

The static nature of traditional textbooks limits technical education. In China, online platforms have improved the relevance and responsiveness of vocational education (Zhu et al., 2025). Teachers should adopt blended learning models to quickly incorporate emerging technologies and industry trends. Institutions should promote online supplementary materials.

4.2.4. Accessibility

Lack of materials for visually impaired. Accessibility emerged as a key gap. Most materials are accessible to general students, but significant gaps remain for those with visual impairments. Some online resources offer subtitles and text-to-speech, but Braille and adaptive formats are lacking. Three teachers explained,

> *"The textbook lacks Braille and auxiliary reading versions."* **(T1)**
> *"Although some audio materials are available online, traditional printed textbooks do not provide the necessary adaptations for blind or low-vision learners."* **(T2)**
> *"No suitable resources have been developed for students with visual impairments."* **(T3)**

Current materials meet general needs but lack support for visual impairments, limiting equitable access. Improving accessibility supports inclusive education and equity policies and highlights the urgency of developing adapted resources for NEV programs. Studies confirm these challenges: inaccessible content as a major barrier in TVET learning (Mutie & Makato, 2025), and the potential for accessible online resources with intentional design (Almeida et al., 2020).

Use of subtitles, QR codes, text-to-speech. Despite these shortcomings, some efforts have been made to improve accessibility for students with hearing impairments. Two teachers said,

> *"Online video materials are equipped with subtitles."* **(T1)**
> *"Online resources provide features like subtitles and text-to-speech."* **(T4)**

Zheng (2026) noted that digital resources can enhance accessibility, yet challenges persist, such as insufficient Braille and audio materials, limited adaptive technologies, and high internet costs. Institutions should develop inclusive materials and adaptive tools, including Braille and audio resources.

4.2.5. Ease of use

Clear organization and layout. All participants affirmed that the instructional materials are clear and logically structured, with clear chapters, learning objectives, and modular design. Three teachers shared,

> *"There are hints such as 'learning objectives', 'learning methods', and 'inquiry tasks'."* **(T1)**
>
> *"The logical flow and visual clarity of the materials, with two-color printing and structured layouts aiding student orientation."* **(T2)**
>
> *"The content is clearly classified and written in a modular way."* **(T3)**

However, some suggested improvements in indexing and modularity, as certain content remains scattered or lacks comprehensive indexes. One teacher added,

> *"Some contents are scattered and indexes are incomplete."* **(T4)**

Well-organized, modular materials with clear navigation and indexes improve information searching and learning experience (Mayer, 2014). Structured modular content also enhances learning efficiency and satisfaction in Chinese education; specifically, outcome-based modular teaching clarifies course structure, increases motivation, and strengthens problem-solving skills (Li & Li, 2024). Instructional materials should emphasize clear navigation, complete indexing, and visual supports to improve usability and engagement. Student feedback should be collected continuously.

4.3. Recommend Strategies for Textbook Evaluation

4.3.1. Selection process

Based on curriculum standards, school policy. Teachers indicated that textbook selection is typically guided by institutional policies and curriculum standards. Two teachers described in detail,

> *"The selection of teaching materials is generally based on curriculum standards... and peer recommendations."* **(T1)**
>
> *"A multi-step procedure that begins with instructors identifying potential textbooks from publisher catalogs, followed ... such as content accuracy, publication date (preferably within five years), pricing (not exceeding 50 RMB), and publisher reputation."* **(T2)**

The importance of evaluating textbook alignment with core curricular goals and job competency requirements. Another teacher added,

> *"Referencing multiple versions of textbooks to compare the quality of content, illustrations, and technical accuracy."* **(T4)**

He (2025) also examines authors' professional backgrounds, favoring those with industry experience or higher education expertise to ensure practical relevance and pedagogical rigor. Thus, textbook selection for NEV courses follows a structured process ensuring curricular alignment and practical relevance. Teachers prioritize materials meeting curriculum standards, industry competency requirements, and institutional rules, while verifying authors' expertise. Peer review and departmental supervision maintain consistency and quality. Existing studies support systematic, standards-aligned selection (Chang & Sun, 2025; Yun & Nasir, 2025).

Multi-step review process (personal + committee). Several teachers stressed that textbook selection is closely tied to the broader teaching ecosystem. Three teachers said,

> *"First... teachers selecting suitable textbooks... then... textbook committee reviews the selections."* **(T2)**
>
> *"Online course resources, such as videos and teaching plans, are evaluated alongside textbooks to ensure consistency and complementarity."* **(T3)**
>
> *"I will also compare multiple versions of the textbooks, focusing on the richness of content."* **(T4)**

The findings show that textbook selection follows a structured, multi-level process combining teacher evaluation and departmental oversight. Teachers review content quality and relevance, while committees verify alignment with curriculum standards and resource compatibility. Comparing multiple versions supports comprehensive assessment that improves resource diversity and teaching consistency. This model integrates peer expertise and institutional management to ensure high-quality materials.

Author credibility and content comparison. Author credibility and professional background strongly affect textbook choices. Teacher 4 noted that authors with industry or technical teaching experience provide more practical examples and clearer explanations. Content accuracy, standardized terminology, and appropriate technical depth are also key criteria for vocational training.

To improve instructional quality, institutions should establish evidence-based selection protocols focusing on curricular alignment, practical relevance, and author expertise. Structured procedures are supported (Anderson et al., 2025), yet teacher training remains insufficient.

4.3.2. Evaluation Strategies

Student/teacher feedback mechanisms. The top recommendation was a formal, two-way feedback loop involving teachers and students. Three teachers mentioned,

> *"It is suggested to establish a diversified teaching material evaluation mechanism... and carry out systematic evaluation."* **(T1)**
>
> *"Evaluation can be carried out from the two subjects of teachers and students."* **(T2)**
>
> *"The textbook should be continuously optimized through student evaluations and teaching reflections."* **(T4)**

This dual-input strategy (teacher and student perspectives) triangulates textbook effectiveness, forming a comprehensive evaluation loop. Teachers assess curriculum alignment, content coherence, and pedagogical value, while students highlight usability, clarity, and engagement. This enables continuous, evidence-based revision, especially valuable in vocational education, where materials must be both theoretically sound and practically applicable. Dual-perspective feedback optimizes material relevance, clarity, and engagement, which is critical for technical fields like NEVs where practicality and adaptability are key (Nugrah et al., 2024).

Scientificity, adaptability, and interactivity. Teachers highlighted three foundational dimensions of textbook quality: scientific rigor, cognitive adaptability, and learner interactivity. The two teachers explained,

> *"Scientific content and teaching adaptability were cited as selection criteria."* **(T1)**
>
> *"I will also compare multiple versions of the textbooks, focusing on the richness of content, the quality of illustrations and text, and the diversity of case studies"* **(T4)**

High-quality instructional materials must integrate factual accuracy, pedagogical flexibility, and learner engagement. Scientificity ensures alignment with current technical

knowledge (Ramli & Borhan, 2024); adaptability caters to diverse learners (Abrami, 2001); interactivity boosts engagement and skill acquisition (Krajcik & Czerniak, 2018). Evaluating multiple textbook versions helps select materials that balance rigor, accessibility, and practicality.

Link to job competencies and national standards. Another key strategy evaluates instructional materials against industry-required competencies and national education standards.

> *"The selection of teaching materials should follow the school's relevant regulations... prioritizing those planned by the state."* **(T2)**
> *"We should see whether the content of the textbook conforms to the national teaching standards, and then whether it can be connected with the post."* **(T3)**
> *"The textbook should align with current teaching standards and job competency requirements."* **(T4)**

High-quality instructional materials must meet both curricular and vocational demands. Alignment with national standards ensures consistent knowledge delivery and policy compliance, while industry competency integration provides job-ready skills. Teachers prioritize relevance, practicality, currency, usability, and engagement. This dual alignment connects theory with practice and improves graduate employability. Materials aligned with national and industry requirements enhance learning outcomes and workforce readiness (Liu & Paramalingam, 2025).

Continuous optimization and data-driven revisions. Given the rapid pace of technological change in NEVs, experts recommended a cyclical, data-informed process for continuous improvement of instructional materials.

> *"Through the corresponding Wisdom Tree platform, the latest technology of energy vehicles in the department is uploaded."* **(T3)**
> *"As a textbook author, I recommend that publishing units and college teachers establish a dynamic update mechanism."* **(T4)**

These practices align with adaptive curriculum trends, including industry-aligned "living textbooks" (Gordon et al., 2021). Regular updates based on feedback and societal changes are essential (Dorado, 2024). For vocational programs, formalized evaluation systems, integrating student feedback, job relevance, and educational standards, are vital. Diverse

evaluation methods (self, peer, student feedback) enhance program quality, though challenges like classroom overcrowding hinder material development (Li & Guzman Jr., 2024).

5. Conclusion

This qualitative descriptive study examined NEV instructional materials with four experienced instructors. Grounded in three learning theories, the research evaluated the blended material system across five quality dimensions. Results showed that the blended material system effectively aligns with national standards and supports blended learning. Textbooks provide a structured framework, PPTs enhance visualization, videos and animations simplify abstract concepts, online platforms enable flexible learning, and simulations bridge theory-practice gaps. However, the study identifies three critical gaps: content timeliness lags behind rapid NEV advancements (e.g., battery recycling, intelligent connectivity); accessibility lacks support for diverse learners (e.g., no Braille or audio versions); and no structured collaborative evaluation framework exists.

To address the identified issues, the study proposes targeted strategies.

Timeliness. Establish dynamic updates through publisher-educator collaboration.

Accessibility. Develop diversified formats (Braille, audio).

Evaluation. Construct a multi-stakeholder framework (instructors, students, industry experts) with scientific indicators.

A key limitation of this study is its reliance solely on expert perspectives. Students' perceptions are critical for comprehensive evaluation, yet remain underrepresented in NEV material research (Jiang, 2025). Future research should center student perspectives on content relevance, usability, and practical value. However, this study provides a targeted improvement blueprint for NEV instructional materials. By prioritizing timeliness, accessibility, and systematic evaluation, educators and publishers can enhance alignment with industry demands and improve teaching effectiveness in higher vocational colleges.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was not supported by any funding.

Institutional Review Board Statement

This study was conducted in accordance with the ethical guidelines set by the Research Ethics Committee of the University of Baguio.

Declaration

The authors utilized Grammarly and QuillBot to improve readability. Consensus AI and Elicit AI were used for literature review; Scribbr was used for reference formatting.

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