ISSN: 1813-4890

Exploration of a Teaching Model for New Energy Vehicle Practical Training Courses in Secondary Vocational Schools Based on AIGC

Xu Dai, Xiaoyu Han

Tianjin University of Technology and Education, Tianjin 300222, China

Abstract

Currently, the practical training of new energy vehicles in secondary vocational schools faces several challenges, including abstract teaching content, limited training equipment, high safety risks, and significant equipment wear and tear. These issues negatively impact teaching quality and students' skill development. The rapid advancement of AIGC technology presents new opportunities for enhancing the teaching of new energy vehicle practical training courses. AIGC technology offers innovative solutions through personalized learning paths, intelligent tutoring, virtual simulation, and other approaches. This paper analyzes the current state of teaching in secondary vocational new energy vehicle practical training courses, explores the advantages of integrating AIGC into teaching, and proposes a teaching model based on AIGC: "intelligent preview and scientific lesson preparation before class--intelligent interaction and dynamic teaching during class -- intelligent feedback and continuous optimization after class." Additionally, implementation suggestions are provided to serve as a reference for the reform of secondary vocational new energy vehicle practical training courses and to promote the digital transformation of vocational education.

Keywords

AIGC, new energy vehicle training course, vocational education.

1. Introduction

Generative artificial intelligence is a branch of AI technology based on deep learning. This technology utilizes reinforcement learning by processing large-scale data, simulating human creative thinking, and generating logically coherent content such as text, images, audio, and code[1]. Generative artificial intelligence, exemplified by ChatGPT, has gained widespread attention from academia and industry since its release by OpenAI in 2022. Equipped with advanced natural language processing capabilities, AIGC demonstrates strong contextual learning and comprehension, interactive dialogue generation, question-answering, summarization, and information extraction. Its application in education offers various benefits, including, but not limited to, facilitating personalized and interactive learning, generating prompts for formative assessments, and providing continuous feedback to enhance teaching and learning[2]. Although the integration of AIGC in vocational education remains in the exploratory phase, some preliminary practical implementations have already emerged. For instance, several institutions have begun leveraging AIGC to create personalized learning resources for vocational skills courses [3]. While these explorations are still in their early stages, they have demonstrated AIGC's potential to enhance vocational education.

With the acceleration of global energy transitions and the rapid advancement of new energy vehicle technology, the new energy vehicle industry has become a key strategic sector worldwide. As a global leader in new energy vehicle production and sales, China faces an increasing demand for skilled professionals in this field. Secondary vocational education plays a crucial role in cultivating highly skilled professionals to support the new energy vehicle

ISSN: 1813-4890

industry's growth. Currently, secondary vocational new energy vehicle practical training courses primarily follow traditional teaching models, which typically include theoretical instruction, hands-on training, and assessments. However, these conventional approaches present several challenges, such as limited teaching resources, insufficient individualized learning support, and a constrained practical training environment.

In this context, AIGC presents a significant opportunity to enhance the teaching model of new energy vehicle practical training courses. AIGC can automatically generate personalized learning content, including technical documents, instructional videos, and case studies, while also providing real-time feedback through intelligent dialogues and automated assessments to improve students' learning experiences. Additionally, the integration of AIGC with virtual simulation and augmented reality (AR) technologies can create highly immersive practical training environments, allowing students to engage in simulated hands-on experiences. This enhances the flexibility and effectiveness of practical training instruction. Therefore, developing an AIGC-based teaching model for secondary vocational new energy vehicle practical training courses holds great significance in improving vocational education quality and fostering a skilled workforce for the new energy vehicle industry.

2. Current Teaching Situation of New Energy Vehicle Practical Training Courses in Secondary Vocational Schools

In the current teaching process of secondary vocational new energy vehicle practical training courses, various constraints, including teaching space, funding, equipment availability, safety risks, and time allocation, hinder the effective implementation of key instructional components. These limitations negatively impact teaching quality and students' skill development. Overall, new energy vehicle practical training faces the following key challenges:

2.1. Abstract Teaching Content That Is Difficult for Students to Understand

New energy vehicle practical training courses integrate multiple disciplines, such as digital electronics, motor control, power electronics, and vehicle maintenance fundamentals. This complex and theoretical knowledge system often presents a high degree of abstraction. However, many secondary vocational students have a relatively weak foundation in subjects like mathematics and physics, making it challenging for them to grasp complex theoretical concepts and technical principles.

Traditional teaching models, which primarily rely on the sequence of "teacher explanation–teacher demonstration–student imitation", often lead students into hands-on practice without a solid understanding of the underlying theories. As a result, their comprehension of technical principles remains superficial, hindering the development of critical thinking and problem-solving skills. Additionally, this one-way instructional approach limits students' exploratory learning, impedes the cultivation of independent learning abilities, and fails to effectively stimulate their interest in new energy vehicle technology.

2.2. Limited Training Equipment and Insufficient Hands-On Practice Opportunities

Due to the high technological complexity and expensive procurement costs of new energy vehicle training equipment, many vocational schools struggle to provide each student with adequate training stations within budgetary constraints. To mitigate equipment shortages, some institutions adopt a group-based practice model, where students take turns operating equipment while others observe. However, this method often results in unequal hands-on practice opportunities, leaving some students reliant solely on observation rather than direct engagement. Consequently, their practical skills remain underdeveloped, impacting their overall competence in new energy vehicle maintenance and diagnostics. Alternatively, schools

ISSN: 1813-4890

that implement a single-student operation model face extended training cycles, which disrupt teaching progress. Additionally, increased equipment usage frequency accelerates wear and tear, leading to higher maintenance costs and placing a heavier management burden on instructors.

2.3. High-Voltage Safety Risks and Intensive Supervision Requirements

New energy vehicle practical training courses involve working with high-voltage systems, such as battery management systems (BMS), drive motors, and DC/DC converters. The high-voltage nature of these systems poses significant safety risks, requiring students to adhere strictly to safety protocols during operations. However, in real-world teaching settings, the large student-to-instructor ratio makes comprehensive real-time supervision challenging, increasing the likelihood of safety incidents.

For instance, some students, due to nervousness or inexperience, may struggle to perform tasks correctly or even make critical operational mistakes. Others, lacking a full understanding of new energy vehicle high-voltage systems, may underestimate potential hazards, leading to weak safety awareness and an increased risk of accidents such as electric shocks. These safety concerns not only heighten instructors' workload in managing training sessions but also create significant challenges in ensuring the smooth implementation of practical training.

2.4. High Equipment Wear and Maintenance Costs

During new energy vehicle training, students with varying levels of proficiency may inadvertently mishandle equipment, leading to frequent malfunctions or damage. Given that new energy vehicle core components are costly and require complex repairs, maintenance expenses are substantial. Moreover, lengthy repair cycles disrupt training schedules, further affecting the efficiency of practical instruction.

Additionally, the rapid evolution of new energy vehicle technology means that industry applications frequently adopt cutting-edge innovations. However, vocational schools, constrained by procurement costs and long equipment update cycles, often struggle to upgrade training facilities in a timely manner. This disconnect between training content and industry advancements results in outdated learning experiences. Consequently, students require extensive on-the-job training after entering the workforce, making it difficult for them to meet the new energy vehicle industry’s demand for highly skilled professionals.

3. Advantages of AIGC in Teaching New Energy Vehicle Practical Training Courses in Secondary Vocational Schools

The application of Artificial Intelligence-Generated Content (AIGC) in new energy vehicle practical training courses at secondary vocational schools offers several advantages, as shown in Fig. 1.

3.1. Providing Personalized Learning Paths

From the perspective of computational pedagogy, Zheng Yonghe et al. suggest that artificial intelligence, functioning as a "private tutor," can cater to students' diverse learning needs [4]. In this context, AIGC technology, with its robust data analysis and learning behavior modeling capabilities, can accurately identify students' knowledge gaps, comprehension difficulties, and individual learning preferences. Based on this data, AIGC can provide targeted learning resources and dynamically adjust learning paths to match each student's cognitive level and study habits. Furthermore, its real-time feedback mechanism enables students to correct mistakes immediately while also offering teachers detailed learning analytics. This facilitates the optimization of teaching strategies, effectively implementing "adaptive learning." This personalized teaching model not only enhances learning efficiency but also boosts students'

ISSN: 1813-4890

motivation, allowing them to progress at a pace tailored to their needs, ultimately improving their overall learning experience.

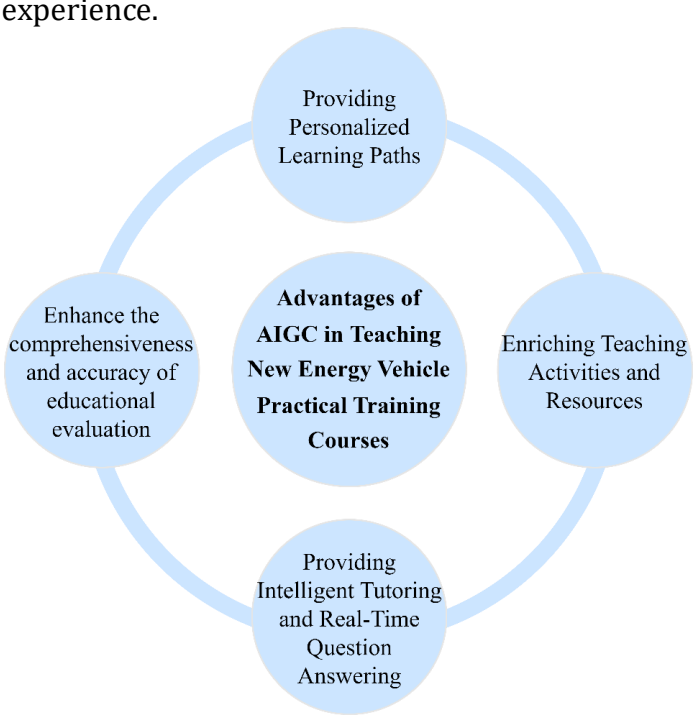

Fig. 1 Advantages of AIGC in Teaching New Energy Vehicle Practical Training Courses

3.2. Enriching Teaching Activities and Resources

AIGC technology combined with VR,AR and other technologies provides a wealth of teaching activities and resource support for new energy vehicle practical training courses in secondary vocational education. Traditional teaching methods often suffer from limited resources and standardized content, making it difficult to address the diverse learning needs of students. By leveraging deep learning and natural language processing, AIGC can generate dynamic teaching content, including case analyses, interactive Q&A sessions, and virtual demonstrations, creating a more engaging and immersive classroom experience. Additionally, AIGC can automatically collect, integrate, and update the latest advancements in new energy vehicle technology, maintenance cases, policies, and regulations, significantly enhancing lesson preparation efficiency. The technology also intelligently recommends relevant learning materials based on teaching progress and students' mastery levels, ensuring that resources are precisely aligned with instructional needs. By dynamically adapting content delivery, AIGC enhances classroom flexibility and engagement, ultimately fostering a more stimulating learning environment.

3.3. Providing Intelligent Tutoring and Real-Time Question Answering

Yang Xiaozhe et al. propose that generative artificial intelligence can function as an intelligent learning assistant, providing timely support and resolving students' doubts [5]. The AIGC-powered intelligent tutoring system, supported by a vast knowledge base and advanced natural language processing capabilities, can instantly generate accurate answers, concept explanations, and supplementary materials when students pose questions. Beyond direct responses, AIGC contextually adapts its explanations, offering personalized, in-depth clarifications that align with students' learning progress. This feature effectively addresses a key limitation of traditional teaching—where teachers struggle to provide individualized support due to time constraints and class sizes. By ensuring that every student receives on-demand, AI-driven tutoring, AIGC fosters self-directed learning and encourages deeper conceptual understanding, ultimately enhancing students' problem-solving abilities.

ISSN: 1813-4890

3.4. Enhance the comprehensiveness and accuracy of educational evaluation

Lu Yu et al. argue that AI-driven educational tools, such as ChatGPT, can deliver fine-grained feedback, data-driven assessments, and tailored improvement strategies, enhancing the reliability and validity of educational evaluations[6]. Through real-time data analysis, AIGC systematically monitors students' learning progress and evaluates their performance through diagnostic, formative, and summative assessments. Specifically, AIGC can analyze classroom interactions, task completion rates, and hands-on training records, applying big data analytics to assess students' knowledge retention and technical proficiency. This enables teachers to dynamically adjust instructional strategies based on precise, objective insights. Unlike traditional grading, which may be subjective, AIGC minimizes human bias and ensures scientific, fair, and data-backed assessments. Moreover, AIGC enhances personalized feedback mechanisms, providing automated assignment grading, error pattern analysis, and customized resource recommendations. These insights help students identify and address learning gaps efficiently, promoting the realization of personalized learning goals.

4. Exploration of AIGC-Based Teaching Mode for Secondary Vocational New Energy Vehicle Practical Training Courses

4.1. Teaching Model Framework

The AIGC-based teaching model for secondary vocational new energy vehicle practical training courses is structured to enhance teaching efficiency, student engagement, and personalized learning experiences. It integrates intelligent lesson preparation, interactive classroom teaching, and adaptive post-class feedback, as shown in Fig. 2.

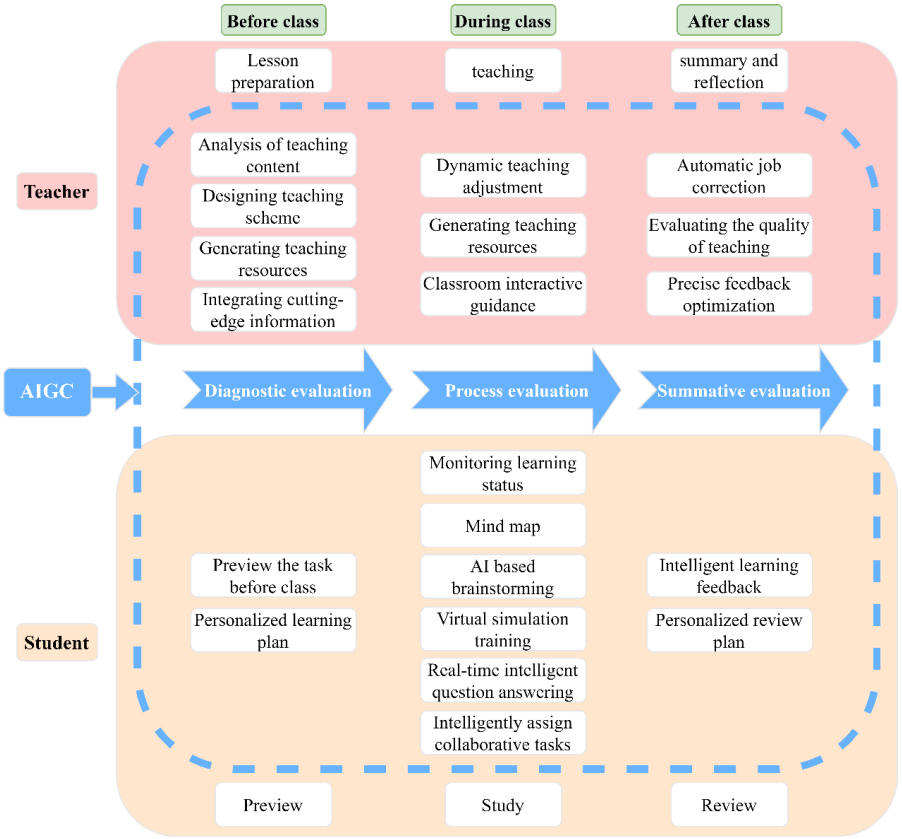

Fig. 2 A Teaching Model for New Energy Vehicle Practical Training Courses in Secondary Vocational Schools Based on AIGC

ISSN: 1813-4890

4.1.1. Before Class: Intelligent Preview and Scientific Lesson Preparation

The pre-class phase involves lesson planning and resource preparation to ensure a smooth teaching process. AIGC serves as an intelligent teaching assistant, significantly enhancing lesson preparation efficiency and resource quality. Specifically, it contributes in the following ways:

(1)Intelligent Generation of Teaching Resources: AIGC assists teachers in creating test questions, multi-modal teaching materials, and interactive content to improve the intuitiveness and appeal of the course.

(2)Optimization of Teaching Design: AIGC analyzes previous teaching data to recommend optimal teaching strategies, such as adopting Problem-Based Learning (PBL) or task-driven learning models, tailored to course objectives.

(3)Rapid Integration of Cutting-Edge Industry Trends: Given the rapid evolution of new energy vehicle technology, AIGC continuously updates industry developments and case studies (e.g., the latest applications of intelligent driving systems), ensuring the timeliness and relevance of the curriculum.

For students, AIGC facilitates personalized pre-class learning plans by analyzing their learning progress, knowledge gaps, and task completion. This enables students to identify key learning points, adjust their study pace, and receive diagnostic evaluations, assisting teachers in delivering adaptive instruction.

4.1.2. During Class: Intelligent Interaction and Dynamic Teaching

AIGC enables flexible, real-time adjustments to teaching content based on students' pre-class performance. Acting as an "intelligent teaching assistant", AIGC dynamically organizes course content into structured mind maps, helping students grasp complex concepts efficiently. Besides, AIGC, combined with virtual reality (VR) and augmented reality (AR), offers high-fidelity new energy vehicle training simulations (e.g., power battery disassembly, charging system operation), allowing students to practice risk-free, cost-effective operations. Moreover, During class discussions, AIGC dynamically generates relevant case studies, expanding students' critical thinking and problem-solving abilities. AIGC collects student interaction data (e.g., question-asking frequency, response rates, engagement levels) to generate formative assessments and suggest real-time adjustments to the lesson plan.

For students, AIGC acts as a real-time Q&A assistant, answering questions instantly and fostering interactive, AI-assisted brainstorming sessions to stimulate innovative thinking. Additionally, AIGC intelligently assigns study groups based on learning styles and proficiency levels, encouraging collaborative problem-solving and strengthening teamwork skills.

4.1.3. After Class: Intelligent Feedback and Continuous Optimization

The post-class phase focuses on comprehensive assessment, personalized tutoring, and iterative teaching improvements. AIGC automatically grades assignments, providing teachers with detailed performance analytics (e.g., individual progress tracking, learning patterns, and error analysis).Besides, By analyzing classroom interactions, assignment completion, and student engagement metrics, AIGC helps refine future lesson plans, ensuring continuous course improvement. Moreover, AIGC tailors after-class exercises, knowledge reinforcement tasks, and review materials based on individual students' learning progress. It tracks learning trajectories and offers targeted study recommendations, ensuring long-term knowledge retention.

4.2. Suggestions for Mode Implementation

4.2.1. Strengthening Technical Training for Teachers to Enhance Proficiency in AIGC Technology

Enhancing teacher training and improving proficiency in AIGC technology form the foundation for effective implementation. In the AIGC-based teaching model for secondary vocational new

energy vehicle practical training courses, teachers are not only imparters of knowledge but also guides and facilitators of technology application. To ensure the effective integration of AIGC technology into teaching, teachers must possess a solid technical foundation and be able to flexibly utilize AIGC tools to optimize the teaching process.

Therefore, schools and relevant educational institutions should establish a systematic teacher training program with tiered and categorized practical training courses, catering to teachers of different ages and technical backgrounds. The curriculum should cover basic operations to advanced applications, focusing on the fundamental principles, core functions, and instructional applications of AIGC. Training activities should include specialized workshops, case studies, and hands-on practice sessions. Additionally, industry experts and R&D professionals should be invited to provide in-depth guidance, helping teachers understand AIGC applications across various professional fields and explore innovative teaching strategies using AIGC technology. Through continuous learning and practice, teachers can not only enhance their proficiency in AIGC technology but also fully leverage its advantages in lesson planning and implementation, ultimately optimizing classroom instruction and enhancing students' learning experiences.

4.2.2. Establishing a Practical Teaching Platform to Strengthen AIGC Application

Building a practical teaching platform and enhancing the application of AIGC technology are crucial for improving students' competencies. The integration of theoretical learning with hands-on practice is key to enhancing students' professional skills. To promote the application of AIGC technology in vocational education, a multi-faceted practice platform should be established, integrating experimental teaching, project-based training, and industry collaboration.

On one hand, colleges and universities should develop AIGC technology laboratories equipped with intelligent content generation tools, virtual simulation training systems, and other advanced equipment to support students in practicing in simulated environments. On the other hand, training bases in collaboration with enterprises should be established to offer real-world project experience in areas such as intelligent new energy vehicle diagnostics and AI-assisted design. This hands-on exposure will help students deepen their understanding of AIGC technology and its applications. Additionally, institutions should organize AIGC innovation competitions, workshops, and industry exchange events to stimulate students' creativity, enhance their problem-solving skills, and improve their competitiveness in the job market.

4.2.3. Developing Comprehensive Evaluation Criteria for Scientifically Assessing AIGC-Enabled Teaching

Establishing comprehensive evaluation criteria is essential for scientifically assessing the effectiveness of AIGC-assisted teaching. To accurately measure the impact of AIGC technology in education, a scientific and well-structured teaching evaluation system should be developed. This system should enable a holistic assessment of students' learning outcomes, teachers' instructional innovations, and overall course effectiveness.

Unlike traditional examination methods, AIGC-enhanced teaching evaluation should focus on students' practical skills, creative thinking, and interdisciplinary competencies. A multi-dimensional assessment approach, combining formative evaluation, summative evaluation, and intelligent feedback, should be adopted. By leveraging learning behavior analytics, AIGC-based assessment systems, and adaptive assignment recommendations, students' knowledge mastery, hands-on skills, and teamwork abilities can be effectively evaluated. Furthermore, AIGC technology can be utilized for intelligent teaching analysis, providing real-time feedback on weak areas, optimizing course content and instructional methods, and ensuring that AIGC-driven teaching remains accurate and effective.

ISSN: 1813-4890

4.2.4. Strengthening Data Security Management to Ensure Compliance in AIGC Applications

Ensuring data security management and regulatory compliance is critical for the responsible deployment of AIGC applications. As AIGC involves processing student learning data, operational records, and AI-driven assessments, educational institutions must establish strict data security protocols to ensure that data collection, storage, and usage comply with relevant laws and regulations.

Firstly, a hierarchical access control system should be implemented to ensure that users can only access authorized data. Additionally, encrypted storage technologies should be adopted to prevent data breaches. Secondly, AIGC algorithms must be optimized for fairness and transparency to avoid bias caused by data distortion and ensure objective and equitable evaluation results.

Moreover, schools should establish an AI ethics oversight mechanism to monitor AIGC applications in teaching and develop ethical compliance guidelines. Raising awareness of data security among teachers and students through training programs and case studies is also essential. By enhancing data management frameworks, implementing transparent algorithm rules, and enforcing strict ethical oversight, the healthy development of AIGC technology in education can be ensured, providing robust support for intelligent teaching models.

5. Conclusion

The application of AIGC technology has brought transformative changes to the teaching model of new energy vehicle practical training courses in secondary vocational schools. Through intelligent preview, dynamic teaching, and personalized feedback, AIGC effectively compensates for the shortcomings of traditional teaching models, optimizes teaching resource allocation, improves instructional efficiency, and enhances students' autonomous learning capabilities. Particularly in the context of rapid technological advancements in the new energy vehicle industry, AIGC integrates virtual simulation and other digital tools to provide students with a more intuitive and effective practical training experience, thereby strengthening their technical skills and professional literacy.

However, the application of AIGC in vocational education is still in its early exploratory stage. Key challenges remain, including balancing AI-driven automation with teacher-led instruction and ensuring the accuracy and practical relevance of AIGC. Moving forward, it is essential to enhance teacher training, refine course design, and improve intelligent evaluation systems to fully unlock AIGC’s potential and establish a more effective and intelligent teaching model for vocational education.

References

[1] Tan Jianchuan. National policies and future responses to the application of generative AI in education [J/OL]. Education and teaching research,1-14[2025-03-17].https://doi.org/10.13627/j.cnki.cdjy.20241224.001.

[2] Baidoo-Anu D, Ansah L O. Education in the era of generative artificial intelligence (AI): Understanding the potential benefits of ChatGPT in promoting teaching and learning[J]. Journal of AI, 2023, 7(1): 52-62.

[3] Zhang Hailong, Li Wei. AIGC technology enables higher vocational computer basic practical teaching research[J]. Computer education,2024,(10):164-168.

[4] Zheng Yonghe, Zhou Danhua, Zhang Yonghe, et al. ChatGPT from the perspective of computational pedagogy: Connotation, themes, reflections and challenges [J].Journal of East China Normal University (Education Science Edition),2023,41(07):91-102.

ISSN: 1813-4890

[5] Yang Xiaozhe, WANG Qingqing, Wang Ruoxin. The Limited capabilities of generative artificial Intelligence and educational change [J]. Global Education Perspectives,2023,52(06):3-12.

[6] Lu Yu, Yu Jinglei, Chen Penghe, et al. Application and prospect of Generative Artificial Intelligence in education: A case study of ChatGPT system [J]. Distance education in China,2023,43(04):24-31+51.