Research on the Teaching Model of Introduction to Digital Media in Vocational Colleges Driven by MR

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Abstract. This study targets the problems of theory-practice disconnection, abstract concepts, and the lack of systematic models in the basic course Introduction to Digital Media in vocational colleges. Guided by constructivist, situated learning and flow theories, it constructs an MR-driven three-stage "Experience–Deconstruction–Creation" teaching model with a three-tier technical architecture. Empirical experiments on the 3D modeling chapter show that the experimental class performs significantly better in learning interest, concept comprehension, practical ability and classroom interaction ($p<0.001$). The model effectively integrates virtual and real teaching, improves students' digital media literacy, and provides a replicable paradigm for the digital transformation and teaching innovation of vocational basic courses.

Keywords: MR technology; vocational colleges; Introduction to Digital Media; teaching model; 3D modeling; immersive teaching

1 Introduction

Driven by Internet+, AI and big data, the digital media industry requires versatile talents with cross-border thinking and practical capabilities. Meanwhile, educational digitalization has become a national strategy, with recent multi-ministry policies emphasizing accelerated development of virtual simulation resources in vocational education, guiding teaching reform and creating new opportunities for emerging technology applications.To tackle problems in the *Introduction to Digital Media* course—such as the separation of theory and practice and the abstractness of concepts—this study constructs an MR-based three-stage teaching model: "Experience–Deconstruction–Creation". By integrating industrial projects and technical standards into MR scenarios, the model effectively enhances students' professional interest and practical skills, provides a replicable framework for cultivating industry-adapted talents, and offers new references for the digital transformation of basic vocational education courses.

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2 Research Foundation and Current Situation Review of MR-Driven Teaching Model

2.1 Theoretical Foundation

The MR-driven teaching model is supported by constructivist theory, situated learning theory, and flow theory. Constructivism emphasizes active knowledge construction; MR turns abstract concepts into interactive virtual scenarios, shifting students from passive listening to active exploration. Situated learning theory highlights context-based learning; MR simulates real working environments and role interactions, enabling on-the-job practice in virtual studios. Flow theory focuses on skill-challenge balance; MR provides real-time visual feedback and interactive operation, promoting deep immersion and focused learning. This model is an organic integration of the three theories, forming a closed-loop mechanism: situation-induced construction, construction-triggered immersion, and immersion-enhanced cognition (Figure 1).

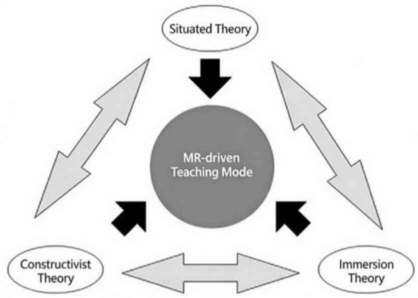

Fig. 1. MR-Driven Mechanism Integrating Teaching Theories

2.2 Technical Support

The MR teaching system adopts a three-tier architecture: Hardware Layer, Software Layer, Teaching Application Layer.

The Hardware Layer includes MR terminals, high-performance servers and multimedia classrooms, supporting immersive collaboration, environmental perception, motion capture and real-time computing. Key indicators include resolution, compatibility and battery life; devices like Insta360 One R are suitable for virtual resource production.

The Software Layer relies on MR platforms for resource scheduling and learning analysis, supported by school-enterprise cooperation for stable operation and updates. It generates virtual resources, controls teaching processes and collects learning data. SWOT analysis shows that easy-to-use yet functional platforms better meet vocational teaching needs[1].

The Teaching Application Layer develops MR-integrated course materials, supports online resource sharing and self-learning, and realizes visualized theory, simulated operation, contextual creation and precise evaluation.

2.3 Current Teaching Situation of Introduction to Digital Media in Vocational Colleges

Introduction to Digital Media is technology-oriented and art-integrated[2]. Traditional teaching based on PPT and lectures lacks practice, leading to weak technical ability and poor knowledge transfer[3]. Digital media requires hands-on, situational training[4], making MR an effective tool for integrated teaching[5]. At present, MR applications in China are still in the pilot stage, lacking systematic models for basic courses. Internationally, immersive learning faces uneven implementation and limited disciplinary coverage[8], highlighting the need for MR teaching innovation in vocational education.

3 Analysis of Teaching Models Applying MR Technology and Path Construction

3.1 Analysis of the Current Application Modes of MR Mixed Reality Technology

Global MR application in vocational education is shifting from single-point simulation to systematic reconstruction, supported by school-enterprise cooperation and “MR + AI”[5][6]. Indonesian practices confirm that AR improves learning interest and intuition by converting 2D drawings into 3D interactive models[7]. However, most research focuses on STEM in higher education, leaving vocational basic courses understudied[8][9]. A complete closed-loop “theory-practice-innovation” model remains to be built.

3.2 Construction of the Teaching Model of Introduction to Digital Media Integrating MR Technology

This study integrates MR into Introduction to Digital Media and forms a closed-loop “Experience-Deconstruction-Creation” model to solve abstract understanding and theory-practice disconnection, ultimately improving students’ digital media literacy.

Design Concepts and Principles.
The model takes MR as a high-fidelity cognitive medium, following three principles: metacognitive consistency, embodied cognition, and constructivist progression. It aligns content and goals, connects physical perception with virtual environments, and guides students from passive acceptance to active creation.

Three-Level Progressive Model of "Experience-Deconstruction-Creation".
A three-stage closed-loop model is established (Figure 2). The experience stage builds intuitive cognition; the deconstruction stage internalizes core knowledge; the creation stage supports knowledge transfer. MR visualizes concepts, operational logic and creative processes throughout, effectively bridging theory and practice.

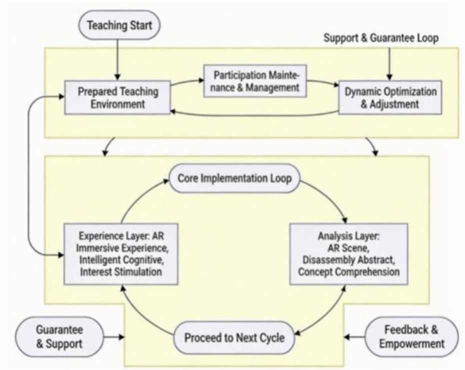

Fig. 2. Three-Level Progressive Teaching Model

Three-Stage Teaching Design Driven by MR.
This teaching framework integrates MR technology in three progressive stages: the experience layer visualizes abstract concepts and industry scenarios for intuitive cognition; the deconstruction layer uses interactive operations to explore technical principles and master internal logic; the creation layer guides students through "replication–adaptation–original creation" to complete projects. MR runs through all stages, addressing abstract understanding and theory-practice disconnection, and promoting the transition from knowledge internalization to innovative capacity.

4 Case Analysis: 3D Modeling Chapter

The three-stage model is applied to 3D modeling teaching, addressing abstract spatial concepts, complex operations and unclear creative logic (Table 1).

Table 1. Application of the Three-Stage Teaching Model in the 3D Modeling Chapter

Teaching Link	Core Objective	Core Content	Implementation Process
Stage 1: Immersive Experience	Establish basic 3D modeling cognition and cultivate spatial imagination.	Visualize concepts via industry scenarios (game character/industrial product modeling).	Teacher explains core concepts → 15–20 min independent MR experience (e.g., gesture disassembly) → group sharing → teacher summarizes knowledge framework.
Stage 2: Interactive Deconstruction	Deepen modeling principles and tool logic, shift from perceptual to rational cognition.	1. Deconstruction of technical principles 2. Deconstruction of model structure 3. Deconstruction of process links	Teacher assigns deconstruction tasks → group exploration via MR (trace steps, adjust parameters) → MR projection displays results → teacher comments and summarizes logic.
Stage 3: Creative Practice	Improve 3D modeling operation ability and spatial creative expression.	1. Basic replication tasks; 2. Creative adaptation tasks; 3. Thematic creation tasks	Teacher explains requirements and MR platform use → independent/group MR creation (with real-time guidance) → virtual-real display → peer evaluation + teacher optimization.

An experiment was conducted on 56 students from two parallel classes: 28 in the experimental class (MR model) and 28 in the control class (traditional teaching). The questionnaire (Likert 5-level) had good reliability (Cronbach's $\alpha=0.89$) and validity (KMO=0.83, $p<0.001$).Results (Table 2) show the experimental class was significantly higher in learning interest, concept comprehension, practical confidence and collaboration willingness (all $p=0.000$). The average score of 3D modeling works was 86.7 in the experimental class vs. 73.4 in the control class ($t=7.82$, $p<0.001$). Classroom interaction and group collaboration time were also significantly higher.The MR-driven three-stage model effectively improves learning performance and solves traditional teaching pain points, providing a practical paradigm for course reform. Limitations include a small sample and single-module validation; future research will expand samples and verify cross-course universality.

Table 2. Comparison of Questionnaire Scores between the Experimental Class and the Control Class

Evaluation Dimension	**Experimental Class (n=28) Mean (M)**	**Experimental Class (n=28) Standard Deviation (SD)**	**Control Class (n=27) Mean (M)**	**Control Class (n=27) Standard Deviation (SD)**	**t-value**	**p-value**
Learning Interest	4.32	0.51	2.78	0.63	10.24	0.000
Concept Comprehension	4.18	0.47	2.65	0.58	9.87	0.000
Practical Confidence	4.05	0.53	2.52	0.61	9.13	0.000
Collaboration Willingness	4.23	0.49	2.81	0.59	10.01	0.000

To objectively evaluate the learning outcomes, the scores of 3D modeling works of the two groups of students were additionally collected. Two teachers scored independently according to dimensions such as modeling accuracy, structural rationality and creative performance (full score of 100 points), and the average value was taken as the final score. The results show that the average score of the experimental class is 86.7 (SD=5.2), and that of the control class is 73.4 (SD=6.8), with $t=7.82$ and $p<0.001$, indicating that the experimental class is significantly better than the control class in skill mastery and creation quality. Classroom behavior data also show that the experimental class has higher interaction enthusiasm: the number of active speeches is 2.12 times that of the control class (Figure 3); the proportion of group collaboration time in the class is 71.25%, 1.76 times that of the control class (Figure 4); the proportion of core MR operations reaches 82%, reflecting highly goal-oriented participation (Figure 5).

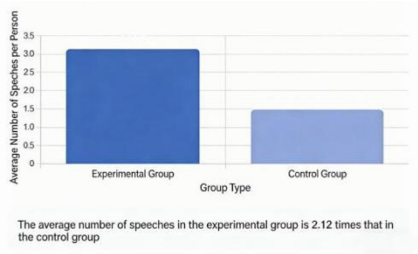

Figure 3 Classroom Interaction Enthusiasm

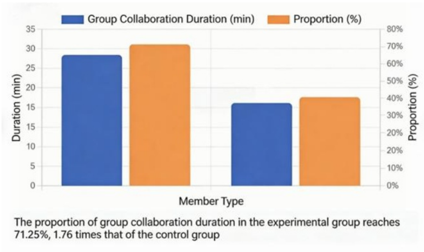

Figure 4 Group Cooperation Duration

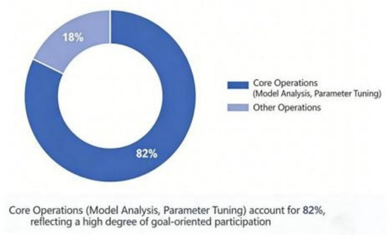

Figure 5 Frequency of MR Interactive Operations

In summary, the data show that the MR-driven three-stage teaching model of "Experience-Deconstruction-Creation" has significantly improved students' learning interest, concept comprehension and practical confidence in the 3D modeling module. It has strengthened classroom interaction and independent exploration through immersive and hierarchical design, effectively solving the pain points of traditional teaching, and providing a practicable practical paradigm for the reform of basic digital media courses. The sample size of this research is 28, and the conclusion is only valid for the verification of the 3D modeling module and holds in the current teaching scenario. In the follow-up, the sample size needs to be expanded to multiple schools and majors to improve the popularizability, and comparative experiments will be carried out in units such as "Basic Graphic Design" and "Audio and Video Editing" to further verify the universality of the model.

5 Conclusion

This study verifies the effectiveness of the MR three-stage teaching model in Introduction to Digital Media, optimizing immersive experience and enriching MR application theory in vocational education. Challenges such as incomplete resources and cross-course mechanisms remain. Future research will explore MR+AI adaptive learning, improve resource sharing, and extend the model to full courses and core modules to support innovative talent training.The in-depth integration of virtual reality (VR) technology into practical operation courses in secondary vocational education can drive the transformation of vocational education and foster continuous breakthroughs and innovation in this field[10].

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