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A Study on Improving the Effectiveness of Primary School ITC Classroom Teaching under the New Curriculum Standard

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ABSTRACT
The promulgation of the "ITC Curriculum Standards for Compulsory Education (2022 Edition)" marks a fundamental shift in primary school Information Technology and Science(ITC)teaching from a technology-operation-focused approach to a competency-cultivation-centered one. Based on the concepts of the new curriculum standards, this paper systematically explores the theoretical basis and practical pathways for improving the effectiveness of primary school ITC classroom teaching. The article first analyzes the main gaps between current classroom teaching and the requirements of the new curriculum standards, and finally proposes specific strategies to enhance teaching effectiveness from five dimensions: teaching objectives, teaching models, teaching methods, teaching evaluation, and the teaching environment.

KEYWORDS
New curriculum standard; Primary school; Information technology and science; Teaching effectiveness; Core competencies; Teaching strategies

1 Introduction

ITC literacy has become an essential quality for every citizen to adapt to social development. In 2022, the Ministry of Education issued the "ITC Curriculum Standards for Compulsory Education," changing the subject name from "Information Technology" to "ITC," reflecting a fundamental transformation of the curriculum concept from instrumental application to competency-based. The new curriculum standards establish curriculum goals centered on core competencies including information awareness, computational thinking, digital learning and innovation, and information social responsibility, aiming to build a teaching system that aligns with students' cognitive development. The update of curriculum concepts urgently requires synchronous transformation in classroom teaching practices. How to translate the concepts of the new curriculum standards into tangible and effective teaching behaviors has become a key issue for the further advancement of the current curriculum reform. Based on the context of the new curriculum standards, this paper systematically analyzes practical teaching problems and explores the construction of a theoretical framework and practical pathways to enhance classroom teaching effectiveness, thereby promoting the realization of the educational goals of the ITC curriculum.

2 Practical Problems in Primary School ITC

Classroom Teaching Primary school ITC teaching is in a transitional stage, revealing several prominent issues in practice that affect teaching effectiveness.

2.1 Teaching Objectives Deviate from Core Competencies

Some teachers' understanding of core competencies remains at the conceptual level and has not been translated into specific teaching behaviors. Teaching often focuses on the instruction of fragmented knowledge points and the training of isolated skills, neglecting the cultivation of students' information concepts and thinking abilities. For example, in teaching the "Data and Encoding" module, teachers often focus on the mastery of data entry and simple processing skills, failing to guide students to deeply understand the meaning and value behind data, resulting in inadequate implementation of competency goals.

2.2 Difficulty in Achieving Effective Group Work

The new curriculum advocates student-centered autonomous, cooperative, and inquiry-based learning, emphasizing the cultivation of students' teamwork and digital innovation capabilities. However, in the practice of primary school ITC classrooms, group work often remains merely at the physical level of "grouping" and "sitting together." After the teacher assigns tasks, although students sit in groups, their learning behaviors are still isolated individual efforts; group discussions in the classroom often lack in-depth exploration and intellectual exchange around core issues such as project goals, algorithmic logic, and creative thinking, easily leading to a situation where "the strong get stronger, and the weak stand by"; cooperative task design lacks challenge and necessity, leading to cooperation for its own sake; and there is a lack of effective guidance on group work processes and evaluation mechanisms.

2.3 Single Teaching Method Lacking Interaction

The traditional "demonstration-imitation-practice" teaching model still dominates the classroom. This one-way, indoctrinating teaching method places students in a passive reception position, making it difficult to stimulate their

higher-order thinking activities. Although new teaching methods such as task-driven learning and project-based learning have been widely advocated, their practical application remains insufficient. Even when task-driven approaches are used, phenomena such as "having tasks without drive" and "having activities without thinking" often occur, where task design lacks genuine challenge and inspiration. Furthermore, teacher-student and student-student interactions in the classroom often become formalities, lacking deep brainstorming.

2.4 One-sided and Singular Teaching Evaluation Methods

Current teaching evaluation exhibits a "triple emphasis, triple neglect" tendency: emphasis on results over process, focusing excessively on final products or scores while neglecting students' thinking development and ability formation during the learning process; emphasis on skills over competencies, evaluating technical operational proficiency excessively while paying insufficient attention to competency dimensions such as information awareness and social responsibility; emphasis on uniformity over diversity, using the same standard to measure all students, ignoring individual differences and progress. This one-sided evaluation fails to comprehensively reflect the development level of students' core competencies and is not conducive to stimulating learning confidence and motivation.

2.5 Insufficient Hardware Equipment Support The new primary school Information

Technology and Science curriculum standards propose requirements for cutting-edge content such as artificial intelligence and the Internet of Things. However, "inadequate teaching equipment and environment" has become a rigid bottleneck restricting the improvement of classroom teaching effectiveness. Firstly, hardware equipment is often outdated. Traditional computer labs lack dedicated hardware support, such as open-source hardware, smart robot kits, teaching tablets, sensors, etc., making it impossible to implement practical content advocated by the new standards, such as intelligent sensing, robot programming, and the Internet of Things. Secondly, outdated software ecosystems and network environments limit the innovation of teaching models. Even with limited hardware conditions, teaching software platforms suitable for the primary school stage are relatively scarce. Many schools have not unified virtual simulation platforms or online programming environments. Finally, the layout of the teaching environment is unable to adapt to the needs of project-based learning. The fixed arrangement of computers in traditional labs, with eyes oriented towards the lectern, is suitable for demonstration-imitation-style operational training but severely hinders learning methods that require flexible interaction and communication, such as group work and project discussions.

3 Practical Pathways to Improve the Effectiveness of Primary School ITC

Classroom Teaching In response to the aforementioned problems, it is necessary to build a systematic framework for teaching improvement, advancing synergistically from the five dimensions of objectives, collaboration, interaction, evaluation, and environment to comprehensively enhance classroom teaching effectiveness.

3.1 Goal Orientation: From Knowledge and Skills to Core Competencies

The primary pathway to improving teaching effectiveness is to rebuild teaching objectives, placing the cultivation of core competencies at the core of instructional design. In setting objectives, one should transcend the mere dimensions of knowledge and skills, explicitly competency cultivation requirements. Teachers need to refine and decompose competency goals based on a deep understanding of the four core competencies and in combination with specific teaching content. Teaching objective design should reflect hierarchy and progression, differentially implementing core competencies according to the cognitive characteristics of students at different grade levels. Lower grades can focus on information awareness and basic digital operational abilities, middle grades can strengthen the cultivation of computational thinking and online learning capabilities, while higher grades can further focus on innovative application and social responsibility. This spiral ascending objective system helps ensure the continuity and adaptability of competency cultivation.

3.2 Role Division: From Physical Grouping to Intellectual Collaboration

Teachers need to assign unique and indispensable roles to each member within a group based on task characteristics, such as "Project Manager" (responsible for coordination), "Algorithm Designer" (leading logical flow), "Interface Engineer" (responsible for interface and interaction), and "Quality Inspector" (responsible for testing and optimization), accompanied by clear "Role Responsibility Cards." This gives each student a clear entry point for tasks and a sense of responsibility, institutionally avoiding situations of "the strong dominate" and "the weak observe." The final group score can be broken down into "Project Outcome Score" and "Individual Contribution Score." The contribution score is determined based on the "Collaboration Process Record Sheet," peer evaluation within the group, and teacher observation. This makes the collaboration process visible and quantifiable, ensuring that each member's efforts are seen and recognized, thereby effectively stimulating the internal drive for participation among all students and fundamentally enhancing the effectiveness of group work.

3.3 Method Innovation: From One-way Transmission to Diverse Interaction

Innovation in teaching methods is a key driver for improving effectiveness. According to the concepts of the new

curriculum standards, flexible use of various methods such as task-driven learning, project-based learning, and inquiry-based learning should be employed to guide students in constructing knowledge and developing thinking through active participation. Task-driven teaching should focus on the authenticity and challenge of tasks, designing driving questions with intellectual substance to stimulate students' desire for inquiry. High-quality tasks should possess the following characteristics: first, closeness to students' experiences; second, being challenging, requiring students to comprehensively use multi-disciplinary knowledge to solve; third, being open and diverse, allowing for multiple solutions to coexist. Project-based learning should emphasize the complete learning journey, from information acquisition to solution design, then to production, debugging, reflection, and improvement, allowing students to experience the complete problem-solving process. Additionally, interactive teaching methods such as cooperative learning, debates, and role-playing are also conducive to creating an active classroom atmosphere and promoting deep brainstorms.

3.4 Evaluation Reform: From Singular Judgment to Pluralistic Assessment

Teaching evaluation should transcend the traditional function of selection and screening, turning towards formative assessment that promotes student learning and development. Based on the SOLO taxonomy theory, a multi-level evaluation system should be constructed, focusing on the development process of students' thinking from quantitative change to qualitative change. Evaluation implementation should combine process and summative assessment, using various methods such as learning portfolios, observation records, and product evaluation to comprehensively track student development trajectories. Simultaneously, actively promote the diversification of evaluation subjects, introducing mechanisms such as student self-assessment and peer assessment to cultivate students' metacognitive abilities and collaborative awareness. Establishing a multi-dimensional evaluation mechanism is an important guarantee for implementing scientific evaluation. An evaluation system involving multiple subjects, including student self-assessment, group peer assessment, and teacher evaluation, can be constructed, utilizing tools such as evaluation rubrics, learning portfolios, and product displays to comprehensively record students' growth journeys. This evaluation method, focusing on individual progress and thinking development, can truly release the function of evaluation in promoting student development.

3.5 Environment Enhancement: From Hardware Equipment to Software Platforms

Simply "waiting, relying on, asking for" hardware investment is not the only way forward. A hybrid teaching path of "combining virtual and real, complementing software and hardware" should be promoted. By deeply digging the potential of existing equipment and creatively utilizing free online resources, high-end teaching content can be "dimensionally reduced" for implementation. Specifically: In areas lacking hardware, vigorously introduce virtual simulation software. For example, when unable to purchase physical robots, use virtual robot platforms like VEXcode VR, CoSpaces Edu, etc. Students can similarly write programs in realistic 3D scenes to control virtual robots to complete various tasks, and the training effect on computational thinking is very close to that of physical operation.

4 Conclusion

Improving the effectiveness of primary school ITC classroom teaching under the new curriculum standard is a systematic and complex project. Only by fundamentally changing teaching concepts, adhering to a competency orientation, and promoting the precision of teaching objectives, the contextualization of teaching content, the diversification of teaching methods, and the scientization of the evaluation system, can teaching quality be substantially enhanced, and students' core competencies effectively developed. Future primary school ITC teaching should pay more attention to the organic integration of cutting-edge content such as AI education, while further strengthening information social responsibility education. With the continuous deepening of the digital transformation in education, the ITC curriculum will undoubtedly better shoulder the mission of cultivating qualified citizens for the digital age, laying a solid foundation for students' lifelong development.

About the Author

Huaming Zhou, born in November 1987, male, Han ethnicity, with the title of associate researcher. His research interests lie in the development of university teaching staff and educational technology.

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