On the STEAM Concept-Based Design Instructional Case for Junior High Students in Information Technology Courses

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ABSTRACT

The current research in STEAM education is focused on fundamental concepts and instructional design. Although its direct influence on information technology (IT) courses remains ambiguous, there is a potential for enhancing learning across K–12 education levels, including advancements in IT teaching methodologies. This study aims to address concerns regarding the monotonous, repetitive, and inconsistent interpretation of the current IT curriculum by embracing the STEAM education paradigm. By leveraging the STEAM framework, this study has designed an instructional design for junior high school IT courses. Through case studies grounded in the updated IT curriculum standards, the findings show that the STEAM education concept effectively boosts teaching outcomes in IT courses for junior high students.

Key words: Design Instructional, Information technology course, Junior high students, STEAM education

1. Introduction

STEAM education, an innovative educational model, emerged from the STEM education framework in the United States(Peng & Guo, 2018). Since the 1980s, amidst the globalization of the economy, the competition in science and technology has intensified, leading to a surge in the demand for skilled talent in these fields (Zhan et al., 2020). To ensure a steady supply of scientific and technological expertise, the National Science Board (NSB) of the United States introduced the concept of integrating science, mathematics, engineering, and technology education in 1986, aiming to dismantle disciplinary barriers (Qin & Fu, 2018; Fan et al., 2018). The evolution of STEAM education in the United States has progressed through three distinct stages: STS, STEM, and ultimately STEAM (Yu & Hu, 2015). This transition reflects a shift in teaching focus, evolving from a mere integration of subjects and an emphasis on scientific literacy to a more comprehensive and inclusive approach (Wang et al., 2017). In China, the 13th Five-Year Plan for Educational Informationization has explicitly called for exploring the integration of information technology in novel educational paradigms such as mass creation spaces, interdisciplinary learning (STEAM education), and maker education. In line with this directive, the Ministry of Education issued several documents in 2017, including the "Compulsory Education Primary School Science Curriculum Standards," "Comprehensive Practical Activity Curriculum Guidelines for Primary and Secondary Schools," "High School Information Technology Curriculum Standards," and "General Technology Curriculum Standards." These documents not only acknowledge the importance of STEAM education but also provide guidelines for its implementation in Chinese educational institutions(Chinese Ministry of Education, 2022).

In March 2022, the Chinese Ministry of Education released the "Compulsory Education Information Technology Curriculum Standards (2022 Edition)", which marked a significant shift by renaming "information technology" to "digital technology" and incorporating it into the compulsory curriculum. The Standards emphasized the need to innovate educational approaches, emphasizing the creation of authentic learning environments through the lens of real-world problems or project-based learning. Additionally, it advocated the utilization of diverse digital resources to enhance student engagement. Central to these Standards was the promotion of learning-by-doing, learning-by-using, and creating methodologies, all aimed at highlighting the agency and subjectivity of students. In response to these new curriculum requirements, it is imperative to identify and implement novel teaching strategies for information technology courses that align with the developmental needs of middle school students, as this holds immense significance for their lifelong learning and growth.

The core essence of STEAM education aligns closely with the objectives outlined in the compulsory education information technology curriculum standards for talent cultivation. Prior to this alignment, the information technology course was categorized as a component of comprehensive practical education without a standalone curriculum standard. Existing literature indicates that there is a paucity of research exploring the integration of STEAM education into the information technology curriculum of junior high students, with STEAM education in China still in its nascent stages. Against this backdrop, the present study delves into the teaching status of information technology courses in junior high schools. By combining this analysis with the actual situation, we identify the primary challenges. Leveraging the STEAM education philosophy and focusing on the information technology course in junior high schools, we devise a framework for teaching activities that align with STEAM education principles. Subsequently, we develop case designs based on this framework and implement them in practice. This study aims to provide practical enlightenment for improving the teaching effect of information technology course in junior high school.

2. Background

A questionnaire survey was conducted to investigate the status of information technology courses among junior middle school students, aiming to comprehend their current learning circumstances. A total of 367 questionnaires were collected, with 37 being discarded due to completion time less than 20 seconds, resulting in 330 valid questionnaires, representing an effective rate of 89.9%. Descriptive statistics were performed using SPSS 25.0. The questionnaire sample comprised 146 male and 184 female students, with a distribution across grades as follows: 33.3% in the seventh grade, 27.3% in the eighth grade, and 39.4% in the ninth grade. The gender and grade ratios were balanced, facilitating a thorough analysis of the learning situation in information technology courses within junior high school. Based on this analysis, the following conclusions were drawn:

2.1 The content of the information technology course is often perceived as being bland and unengaging.

Based on the survey, approximately 38.2% of students expressed a profound liking for information technology courses, indicating a significant interest in learning this subject. However, concerns were raised by 22.7% of the students regarding the lack of enthusiasm among teachers in the IT classroom, while 24% expressed dissatisfaction with the course content. They perceived the course as monotonous and boring, with abstract and challenging knowledge points.

Prior to the introduction of the new curriculum standards, the information technology curriculum in junior high schools was governed by the 2011 edition of the Information Technology Curriculum Standards for Compulsory Education Stage. This curriculum was not considered a compulsory subject but rather fell under the umbrella of a comprehensive practical course aligned with labor education. Consequently, the content of the IT course was outdated, with a significant disconnect between the outlined curriculum and actual teaching practices. The focus of learning was narrowly confined to machine operations, leading to a low level of student engagement and interest in the subject.

The implementation of the new curriculum standards for junior high school information technology has provided a clear direction for its development. Guided by these standards, a redesign of the IT curriculum in junior high schools is urgently needed to address these issues and enhance the quality of education in this crucial area.

2.2 Students' perceptions towards information technology courses vary widely, ranging from positive to negative.

Based on the survey findings, it was revealed that 17.6% of students perceived the information technology course as unimportant, 26.3% believed that the content taught in the course lacked practical application in daily life, 29% considered it unhelpful for studying other subjects, and 18.7% expressed dislike towards the course. Despite this, approximately 50% of students recognized the significance of IT in enhancing other subjects and its utility in daily life.

Evidently, the status of information technology in primary and secondary schools remains relatively low, with inadequate attention given to the curriculum. Junior high school students exhibited varying levels of comprehension towards the information technology curriculum, reflecting individual differences. Additionally, a formalistic approach was observed in the teaching of information technology by frontline teachers.

The inclusion of the information technology course in the compulsory curriculum under the new curriculum standard underscores its importance. Frontline teachers must prioritize this subject, adapt their teaching methods, effectively implement the curriculum objectives, and strive to enhance the overall teaching effectiveness.

2.3 The STEAM educational philosophy plays a catalytic role in facilitating the implementation of information technology courses.

Based on the survey findings, approximately 51.2% of the students grasped the fundamental principles of STEAM education while engaging in other courses, with over 50% acknowledging its stimulatory effect on information technology learning. This positive influence manifests in heightening student interest in information technology, broadening their horizons, and fostering an understanding of the practical applications of this field. Additionally, STEAM education enhances students' ability to solve real-world problems and encourages a dialectical approach to problem-solving.

Furthermore, 47.9% of the students concurred that STEAM education strengthens their societal awareness and elevates their sense of responsibility, while only 5.5% believed it had no impact. Regarding the integration of STEAM principles into information technology courses, 72.1% of students saw it as a means to enhance interdisciplinary connections. Additionally, 76.4% viewed it as simplifying the learning process, and 76.7% found it improved their interest in information technology learning. Approximately 49.1% believed it bolstered their problem-solving abilities.

Notably, 89.1% of students expressed a desire for the integration of knowledge from other subjects into information technology instruction, while 86.1% wished for teachers to adopt STEAM teaching methods in their information technology classes. These findings underscore the pivotal role of information technology in fostering students' interdisciplinary literacy. Consequently, as a critical teaching philosophy in interdisciplinary education, STEAM should be seamlessly integrated into the teaching of information technology.

3. Instructional Case Design for Junior High Students "Information Technology" Course Based on the STEAM Concept

In April 2022, the information technology course in junior high school underwent a significant reform, being separated from the comprehensive practice course and granted an autonomous "Information Technology Curriculum Standard for Compulsory Education Stage." This standard was formulated in accordance with the core literacy and learning phase objectives, taking into account the cognitive characteristics of students and the intricacies of the information technology knowledge system. It centered its focus on six pivotal and logically interconnected themes: data, algorithm, network, information processing, information security, and artificial intelligence. By meticulously designing the content modules for the entire learning stage of compulsory education and organizing the course content in a coherent manner, this standard ensures a gradual and spiral development, allowing students to progressively build upon their knowledge and skills in information technology.

3.1. Objectives of Instructional Case Design for Junior High Students "Information Technology" Course Based on STEAM Educational Philosophy

Drawing inspiration from the STEAM education concept, the objective of teaching case design for the Information Technology course in junior high school aligns closely with the "Information Technology Curriculum Standard for Compulsory Education Stage (2022 Edition)" (hereinafter referred to as the new curriculum standard). This design is centered on the specific requirements pertaining to information awareness, computational thinking, digital learning and innovation, as well as information responsibility, ensuring that it encapsulates the essence of the curriculum and reflects its underlying philosophy.

3.2. The teaching case design mode of Information Technology course in junior high students based on STEAM education concept

Drawing upon the aforementioned teaching case design objectives and referring to the general framework of teaching design, the process framework for teaching design is outlined as follows, with a focus on projects grounded in real-world problems: conducting a thorough analysis of the learning situation, elucidating the teaching objectives, determining the appropriate content, selecting effective teaching strategies, designing an engaging teaching process, and preparing the necessary teaching environment and resources. This comprehensive approach ensures that the teaching design is tailored to meet the specific needs and objectives of the course, while fostering a learning environment that is conducive to student engagement and mastery of the subject matter.

（1） Learning situation analysis

Junior high school students possess remarkable creativity and imagination. Contrary to traditional lecture-based classrooms, they prefer hands-on practice and possess the capacity for abstract logical and systematic thinking, coupled with strong practical abilities. After several lessons, students have gained a solid foundation in the basic knowledge related to the teaching content, resulting in greater interest in the subject matter. Course learning guides students to engage in independent practice, fostering the socialization and contextual application of acquired knowledge and facilitating knowledge transfer. Furthermore, students are proficient in utilizing computers for data collection and employing corresponding Internet of Things software to complete the production of basic works. Based on this research, the case design of the information technology course in junior high school is meticulously carried out.

（2） Teaching objectives

Drawing upon the STEAM education concept, the teaching objectives of the information technology course in junior middle school ought to be firmly grounded in the curriculum's core information technology knowledge while fostering interdisciplinary connections. These objectives should be decomposed into overarching goals and subsidiary targets, building upon and enhancing previous teaching methodologies to keep pace with the rapid advancements in information technology. By doing so, we ensure that the course remains relevant and responsive to the evolving landscape of technology.

（3） Teaching content

In the new curriculum standard, the teaching content of grades 7-9 in the fourth learning paragraph (Figure 1).

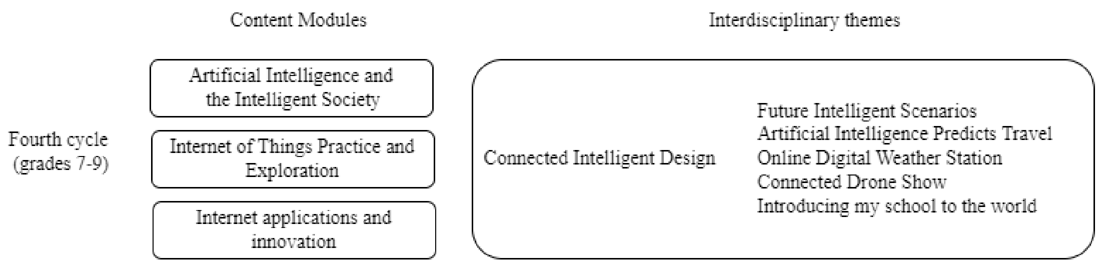

Figure 1 Organization of teaching content for grades 7-9 of the new standards

Starting from the distinctive features of STEAM education and integrating them with the core content of contemporary information technology course teaching, it is hereby proposed that the teaching design of the information technology course, grounded in the STEAM education concept, ought to adhere to the following three principles:

① Integration

STEAM education, an interdisciplinary subject, serves not only as an educational philosophy but also as an innovative educational tool and methodology. Despite information technology being taught as a standalone course, under the STEAM education framework, content from multiple disciplines can be seamlessly integrated into the teaching design.

② Hierarchy

The instructional design of the information technology course typically revolves around a teaching project or task. The content is structured in a gradual manner, from basic to advanced, ensuring a solid foundation is established before further expansion. Hence, the instructional design should build upon previous knowledge and exhibit a clear hierarchical structure.

③ Engaging

STEAM education is a student-centered approach, guided by teachers, where students actively construct meaningful knowledge. If the teaching content lacks diversity and excitement, it may fail to effectively spark students' initiative in seeking knowledge and could even dampen their interest in the information technology course itself. Therefore, it is crucial for the teaching content to possess an intriguing quality that captivates students' attention.

（4）Teaching strategies

Teaching strategy serves as a pivotal tool for teachers and students to collaboratively accomplish the content of teaching activities. In accordance with the distinctive features of information technology courses and the principles of STEAM education, the design of teaching should adhere to the "student-centered" approach and embrace a blend of methodologies to effectively carry out instruction.

（5）Teaching process

STEAM courses primarily adopt project-based learning as their core content, with a strong emphasis on the "learning by doing" philosophy. Central to these courses is the fostering of students' practical abilities and problem-solving skills. Consequently, prior to the implementation of any project, it is crucial for teachers to cultivate an optimal learning environment for their students. This ensures that students have a clear understanding of the authentic problems the project aims to address, thereby facilitating their seamless integration into the project. In the following sections, we will delve into the teaching case process of junior high school information technology courses, drawing upon the STEAM education concept, and present a detailed overview of its implementation.

① Engagement

Engagement entails teachers crafting intriguing scenarios rooted in authentic problems that resonate with students' lived experiences. This approach ignites students' enthusiasm for learning, enabling them to promptly engage in the project's learning objectives.

② Exploration

Exploration involves teachers affording students ample time and opportunities to delve into the subject matter through direct participation, hands-on exploration, and various other methods based on their prior learning experiences. This process allows students to acquire perceptual understanding and further deepen their exploration activities under the guidance of teachers.

③ Explanation

Explanation occurs when teachers guide students in transforming the perceptual knowledge gained through exploration into rational understanding. This involves abstracting and theorizing their own experiences within the framework of their existing knowledge structures.

④ Elaboration

Elaboration builds upon the previous stages, enabling students to transfer their newly constructed understanding and apply the knowledge they have acquired to novel problem scenarios. This process facilitates problem-solving and delves into knowledge exploration at a deeper level (Wei et al., 2013).

⑤ Evaluation

Within the STEAM education framework, the evaluation of information technology courses in junior high school must exhibit diverse characteristics, encompassing both formative and summative assessments. Formative evaluation encompasses the observation and documentation of students' progress throughout the teaching process, evaluating their emotional responses, attitudes, and problem-solving strategies. Students can demonstrate their understanding through various methods such as diaries, drawings, models, and performances. On the other hand, summative evaluation includes assessments of achievements, works, and teachers' overall evaluations. Additionally, students engage in peer-to-peer and self-evaluations, reflecting on their performance in the class and drawing lessons for future learning.

（6）Preparation of teaching environment and resources

Prior to the commencement of teaching activities, it is imperative to meticulously prepare teaching resources. This encompasses the anticipatory printing of auxiliary tools such as learning task lists, learning record sheets, and work evaluation sheets. Additionally, learning materials must be curated, encompassing learning guide plans, courseware PPTs, and micro-videos. The venues for information technology courses typically revolve around computer classrooms and maker classrooms, necessitating a comprehensive digital environment. This environment comprises computer hardware and software, along with the proficient utilization of multimedia equipment, encompassing projection systems, 3Done software, slicing software installation and operation, whiteboards, 3D printers, Arduino software installation and operation, and Internet of Things sensor-related modules. Ensuring the readiness of these resources ensures a seamless and effective learning experience for students.

4. Instructional Design of "Smart Agricultural Greenhouse System"

4.1 Content of courses

Drawing upon the content specifications outlined in the eighth grade's "Practice and Exploration of the Internet of Things" segment of the new curriculum standard, and aligning with the interdisciplinary theme of "Interconnected Intelligent Design," we have designed the "Intelligent Agricultural Greenhouse System." This system embodies the integration of Science, Technology, Engineering, Art, and Mathematics (STEAM) disciplines, as exemplified in Figure 2, which depicts the STEAM element structure within the case design of the "Intelligent Agricultural Greenhouse System." By integrating the STEAM educational philosophy with the Bloom's Taxonomy teaching goal classification system, we have constructed a two-dimensional matrix model for junior high school information technology curriculum teaching objectives. This model aims to consolidate students' interdisciplinary knowledge and skills, thereby enhancing their digital literacy comprehensively. Please refer to Table1 for further details.

Table 1 content of courses

Disciplines	Teaching objectives		
	Knowledge and skills	**Processes and methods**	**Emotional attitudes**
Science (S)	Use soil moisture sensors, waterproof temperature sensors, and obtain agricultural environmental data	Through the teaching method, students consulted relevant materials, learned and explored the steps of the	Through the scenarios based on real problems,

		design, construction and programming of the intelligent agricultural greenhouse system	students exercised interdisciplinary thinking and problem solving skills.
Technology（T）	1 Synchronize the data to the iot cloud platform, and obtain the most suitable soil moisture for seed germination through data analysis 2. Use the blank board to program and control the sensor	Through teaching method, demonstration method and group collaborative experiment method, master Mind+ module programming, intelligent agricultural greenhouse system construction and other processes	
Engineering（E）	Build the "greenhouse equipment automatic control system" to realize the control and feedback of the equipment, such as automatic watering and automatic switching of the sunshade.	Through the demonstration method and group collaborative inquiry method, the intelligent agricultural greenhouse system project was refined and the flow chart was drawn by division of labor, and the framework was built to connect with sensors	
Art（A）	Create a colorful and unique intelligent agricultural greenhouse system shape	Through the group collaborative inquiry method, a beautiful and delicate intelligent agricultural greenhouse system model is designed to complete the connection of sensors	
Mathematics（M）	Can reasonably set the preset value of soil moisture, and use the intelligent agricultural greenhouse system device to replenish water for fruit seedlings.	Through inquiry and learning, Mind+ was used to control the hardware	

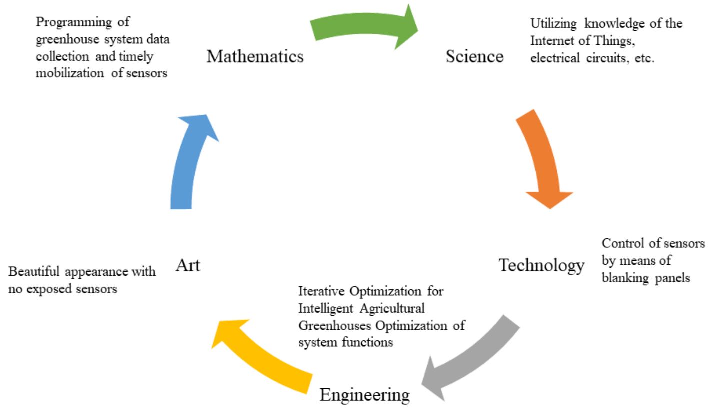

Fig. 2 Structure of the STEAM elements of the "Smart Agricultural Greenhouse System".

4.2 Important and difficult points in teaching

The key points are: understanding and learning to use soil moisture sensors and waterproof temperature sensors.

The difficulty is: the design and production of intelligent agricultural greenhouse system.

4.3 Teaching process

①Participation: creating scenarios and introducing projects

Teaching activities:

Activity 1: Context introduction

During this semester, our labor education course entailed planting tomatoes. Many students chose their preferred tomato varieties and embarked on cultivation using their own 3D-printed pots. However, they soon encountered challenges. During holidays, the absence of students to water the plants resulted in the tomatoes being unable to receive timely hydration, leading to wilted seedlings upon their return. Furthermore, during periods of extreme heat, the lack of prompt ventilation and relocation to cooler areas caused the tomatoes to become limp.

Activity 2: Guide students to solve problems by using what they have learned

In this unit, we delved into the realm of open-source hardware sensors, sparking a question: Can we harness the power of open-source hardware to devise an intelligent agricultural greenhouse system tailored to our tomato seedlings? Could we transform our plantation into a cutting-edge intelligent agricultural greenhouse system, brimming with scientific and technological advancements?

Student activities:

A. Share and exchange feelings

B. Observe and think about the feasibility of intelligent agricultural greenhouse system, and answer the questions raised by teachers

② Exploration: cooperative exploration to solve problems

Teaching activities:

Activity 1: Guide students to analyze the intelligent agricultural greenhouse system

It is mainly to achieve two functions: to replenish water in time when the little tomato is short of water, and to reduce the room temperature when the room temperature of the little tomato is high.

Activity 2: Explain the new knowledge used in the realization of the function

The soil moisture sensing probe must possess the capability to accurately detect soil moisture levels, with the obtained data subsequently transmitted to the control board. Upon receiving the data, the board employs a relay mechanism to activate the motor based on a preset moisture threshold. The motor driver, in turn, powers the pump motor, facilitating the flow of water through a dedicated pipeline. Once the soil moisture detector's probe reaches the designated threshold, the system resets to its initial state, halting the water flow. This entire cycle is orchestrated by the control board.

The soil moisture sensor boasts user-friendly features, highlighted by its four conveniently labeled connection pins: AO (Analog Output) pin, DO (Digital Output) pin, VCC pin, and GND pin. (To enhance comprehension, pose questions that guide students in reviewing the functions of each pin and their respective connections.)

The waterproof temperature sensor exhibits several notable features, including a compact size, low power consumption, robust anti-interference capabilities, and high measurement accuracy. Its read data can be transmitted to the blank board in real-time, facilitating seamless integration into various systems. For connectivity, it features three pins: a DO (digital output) pin, a VCC pin, and a GND pin, providing straightforward and reliable interfacing options.

Activity 3: Teachers demonstrate programming to control the soil moisture sensor, waterproof temperature sensor.

Student activities:

A. Listen to the teacher carefully and make relevant notes.

B. observe the

teacher's presentation carefully and think about the problem

③ Explain: construct knowledge and solve problems

Teaching activities:

Activity 1: Students hands-on practice, teachers tour guidance

Student activities:

Students program to achieve precise control of both the soil moisture sensor and the waterproof temperature sensor, demonstrating their proficiency in the application of computer technology to agricultural automation.

④Migration: migration application, innovative practice

Teaching activities:

Activity 1: Identify and explain the prevalent challenges encountered by students in the previous exercise, highlighting key areas of concern that require particular attention.

Activity 2: Assist students in leveraging their prior knowledge to innovate and enhance the functionalities of the intelligent agricultural greenhouse system. Encourage them to think outside the box and propose novel ideas.

Activity 3: Facilitate collaborative efforts among student groups in designing an intelligent agricultural greenhouse system. Guide them in creating a detailed flowchart of the system using scratch paper, ensuring that they select appropriate hardware components based on their prior learning. Promote teamwork and critical thinking skills throughout the process.

Student activities:

A. Students engage in a thorough analysis of the project topic, meticulously collecting pertinent information related to the smart agricultural greenhouse system. They then proceed to screen and analyze this data, ensuring its relevance and accuracy.

B. A group discussion is conducted, where members exchange their viewpoints and perspectives, collectively collating the results of the discussion to form a cohesive understanding of the project requirements.

C. Group members allocate tasks reasonably, clarifying individual project responsibilities and formulating a comprehensive project plan. They also create detailed project flowcharts to visualize the steps involved in the project's execution.

D. Team members divide their labor and execute the project plan, working collaboratively to complete the production of project works. This ensures that all aspects of the project are addressed efficiently and effectively.

⑤Evaluation: brainstorming, reflection and improvement

Teaching activities:

Activity 1: Guide students to perform self-evaluation and peer-evaluation based on the established work evaluation table, fostering a culture of critical reflection and learning from one another.

Activity 2: Invite outstanding teams to present their design processes and share their valuable experiences. Conclude the teaching activities with a summary from the teachers, emphasizing the application of this problem-solving mindset in real-life scenarios and encouraging students to continue to explore and innovate.

Student Activities:

A. Students present and deliver reports on their completed works, highlighting the key features and innovations of their intelligent agricultural greenhouse system.

B. Students provide feedback and grade both their own performance and the performance of other groups in the production of the intelligent agricultural greenhouse system, utilizing the grading table as a reference.

C. Students are encouraged to learn from outstanding works and to draw inspiration from each other's efforts, fostering a collaborative and growth-oriented learning environment.

5. Discussion

In exploring the teaching effectiveness of an information technology course in junior high school grounded in the STEAM education concept, the author examines students' learning outcomes from interdisciplinary projects, their advancements in practical skills, classroom atmosphere, and the overall impact on the information technology curriculum. Specifically, taking the study of "creative flowerpot" as a case in point, the analysis demonstrates how students are able to address challenges encountered in labor education through their acquisition of 3D printing knowledge. This approach not only enhances students' interdisciplinary capabilities but also surpasses traditional teaching methods.

Furthermore, the case teaching methodology strengthens student communication and collaboration, fostering a sense of teamwork. It also empowers students to take ownership of their learning, encouraging them to explore knowledge independently. However, it is noteworthy that students with weaker learning abilities may encounter difficulties and even lose motivation when faced with challenging tasks, potentially limiting their overall learning benefits.

Therefore, in implementing the STEAM-based information technology course in junior high school, it is crucial to prioritize student-centeredness and provide additional support to those with learning challenges. By doing so, we can enhance their classroom participation, gradually cultivate their autonomous learning abilities, and ensure that all students benefit from the rich and engaging learning experiences offered by this innovative approach.

6. Conclusions

With the advancement of intelligent technologies and the implementation of novel curriculum standards, the reform of information technology education in junior high schools has become paramount. This study initially delves into the present condition of information technology courses in junior high schools, revealing issues such as the blandness of course content and mixed student perceptions towards the subject. Notably, the STEAM education concept offers a promising avenue for enhancing the development of information technology courses.

Guided by the STEAM concept and informed by the 5E teaching approach, we have constructed a model for information technology curriculum design in junior high schools. Leveraging this model, we have undertaken the case design of teaching content for grades 7-9 in junior high schools, aligned with the new curriculum standards. This endeavor aims to facilitate the seamless integration of the STEAM education concept into information technology teaching practices.

The STEAM teaching philosophy, which emphasizes "learning by doing," has been effectively implemented, igniting students' imaginations and bringing their creative designs to life. This approach not only enhances the fun and engagement of learning but also merges the aesthetic beauty of art with the creativity of student works, opening up a novel realm of exploration for learners. It sharpens students' practical skills, bolsters their interdisciplinary abilities, and refines their computational thinking.

Practical evidence demonstrates that the case design of the information technology curriculum in junior high schools, grounded in the STEAM education concept, is in harmony with the new curriculum standards for information technology. Furthermore, it plays a pivotal role in nurturing students' scientific, technological, engineering, artistic, and mathematical literacies. By fostering the integration of interdisciplinary knowledge, it cultivates students' innovative capabilities, preparing them for the challenges and opportunities of the future.

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