

## **THE IMPACT OF INNOVATIVE TEACHING STRATEGIES ON STUDENTS' DESIGN SKILLS: A CASE STUDY FROM JINSHAN MIDDLE SCHOOL**

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**Abstract:** The purpose of this study was to analyze the relationship between the independent variable (Innovative Teaching Strategies) and the dependent variable (Students' Design Competence) by studying the total population (the students of Jinshan Middle School). Quantitative analysis was conducted with 2300 samples, and the research hypotheses were verified using the overall sampling method, a statistical analysis method. Innovative teaching strategies are effective in enhancing middle school students' design ability; Innovative teaching strategies also enhance students' classroom participation and cooperation; Innovative teaching strategies enhance students' motivation for self-directed learning. The results of this study should not be overly extrapolated because only students in junior high school were used as the subjects of the study; The results of the study can only illustrate whether innovative teaching strategies have the short-term effectiveness of enhancing students' design ability, but cannot be extrapolated into the long-term; The results of the study cannot be overly extrapolated to other disciplines and other teaching strategies. This study helps students develop their learning design skills to the fullest extent through innovative teaching strategies using Jinshan Middle School as an example. This study will explore the interrelationship between students' design skills and the impact of innovative teaching strategies. It provides innovative research perspectives and ideas for future research on the relationship between the two; it presents research hypotheses around innovative teaching strategies and students' design ability, and how innovative teaching strategies can be useful in the new educational context in today's era of diversified information technology; it is based on the teachers of Jinshan Middle School, and supported by the theoretical system of students' design ability, and focuses on the enhancement of the development of innovative teaching strategies, the correctly established direction of school development, improve cultural self-consciousness, so as to promote the improvement of teachers' innovative teaching and enhance national innovation. How to improve students' academic performance, enhance students' motivation to learn, and develop cooperation and communication skills are important keys for teachers to teach.

**Keywords:** Innovate Teaching Strategies, Student Design Ability, Creativity

## Introduction

The junior high school level is a critical segment of China's national education system, designed to nurture skilled personnel at the grassroots level. Historically, China's transition from a labor-intensive agricultural society to a modern information and knowledge-intensive society has heavily relied on the human resources cultivated through its junior high school education system. As China's industrial structure evolved from labor-intensive to technology- and knowledge-intensive, the role of junior high school education in enhancing the quality of grassroots technical personnel has become more prominent. This transformation necessitates that educational institutions not only impart basic knowledge but also foster innovative capabilities in students to meet the demands of modern industry.

The market today is increasingly driven by customization, rapid time-to-market, and cost-effectiveness, creating a new consumer trend. Traditional mass production methods, characterized by extensive manpower for standardized operations, have become outdated in this competitive environment. The shift in consumer habits and the reduction in product life cycles demand a more agile and innovative approach to production. In response to these changes, the German government proposed the concept of Industry 4.0 in 2013. Industry 4.0 integrates technologies such as the Internet of Things (IoT), cloud computing, big data, and artificial intelligence to achieve high automation in factories, thereby improving production efficiency and reducing labor costs. This paradigm shift reduces the demand for manual labor while increasing the need for skilled individuals capable of operating and maintaining advanced technologies.

The 21st century, characterized by a knowledge-based economy, places "knowledge" and "innovation" at the core of economic development. Nations worldwide recognize that the future competitiveness of a country in the global arena hinges on the number of individuals with expertise and creativity. Consequently, the development of innovative human resources through education has become a focal point of educational policies aimed at enhancing national competitiveness.

In alignment with the new innovation-oriented economy, junior high school education in China has assumed the critical role of developing a new generation of technical personnel with innovative abilities. The goals of junior high school education include teaching basic knowledge, cultivating ethics, nurturing talents, and crucially, enhancing students' design skills (Ministry of Education, 2009). To achieve these objectives, schools provide opportunities for practical work and creative thinking, encouraging students to integrate knowledge and skills from professional and internship subjects to stimulate their potential and design capabilities (Ministry of Education, 2016).

Creativity is increasingly viewed as a crucial educational outcome. Creativity involves the processing of information where individuals use their knowledge and emotional traits to solve problems and produce new and useful products under environmental stimuli. Junior high school curricula, particularly through "thematic practical work," allow students to engage in self-directed work, thinking,

and problem-solving, which are essential for stimulating design abilities. Innovative teaching strategies in these courses can significantly enhance students' design and creative thinking skills, making the cultivation of creativity a central educational issue. To fully stimulate students' design abilities, teachers must adopt innovative teaching methods that foster creativity. Hsiao (2007) suggests that innovative teaching not only increases students' motivation and interest in learning but also develops their design abilities. Implementing creativity education through appropriate curriculum planning, teaching methods, material design, and a conducive learning environment is vital for nurturing students' creativity. The rapid development and dissemination of information technology have transformed human life and production, ushering in the era of the "knowledge economy," where "brain power" is the decisive factor. Traditional education methods are inadequate for this dynamic society, making the cultivation of creative talents the most critical education policy in the 21st century knowledge economy. Tseng (2001) emphasizes that the core spirit of the nine-year curriculum reform is "innovation," aiming to develop students' creative thinking skills required for the new century. Innovation and creativity are foundational skills for the future, as innovation involves a series of processes of knowledge production, utilization, and diffusion, with creativity being the spark of innovation (Ministry of Education, 2003).

Despite its critical role, the development of creativity in China's education system has long been constrained by an emphasis on direct knowledge transfer and advancement to higher education, with limited focus on creative thinking skills. The changing global economy necessitates that teachers innovate and invigorate their teaching methods to cultivate creativity and innovation. Teachers play a pivotal role in judging students' creativity and stimulating their creative thinking skills. Wu, and Chen (2021) argue that teachers' beliefs and teaching behaviors directly influence students' creative development. Teachers should impart the knowledge, creativity, and skills necessary for creative thinking, providing feedback and rewards to recognize and support students' creativity.

As frontline educators, teachers must actively develop innovative teaching skills, guiding students to explore learning through peer collaboration, discussion, and sharing, thereby unlocking their potential for creative thinking. This study aims to help students fully develop their design skills through innovative teaching strategies, using Jinshan Middle School as a case study.

*Research Problem Statement:*

The rapid advancement of technology and the evolving demands of the modern economy necessitate the development of creative and innovative skills in students. Despite the critical role of junior high school education in nurturing these skills, traditional teaching methods in China often focus more on knowledge transfer and less on fostering creativity and design thinking. Jinshan Middle School, like many other educational institutions, faces the challenge of adapting its teaching strategies to meet these new educational demands. The impact of innovative teaching strategies on students' design skills remains inadequately understood within this context. Specifically, there is a lack of empirical evidence

on how such strategies influence students' ability to think creatively and solve problems, essential skills in the knowledge-based economy of the 21st century. This study aims to fill this gap by exploring the effectiveness of innovative teaching strategies in enhancing the design skills of students at Jinshan Middle School.

*A research question is posed:*

How do innovative teaching strategies influence the development of students' design skills at Jinshan Middle School?

What specific innovative teaching methods are most effective in fostering creativity and design thinking among junior high school students?

How do students perceive and respond to these innovative teaching strategies in terms of their engagement, motivation, and skill development?

What challenges do teachers face in implementing innovative teaching strategies, and how can these challenges be addressed to maximize their impact on students' design skills?

### **Research Objective (s)**

Objective 1: Understanding the current status of innovative teaching strategies for students at Jinshan Middle School

This objective aims to assess how Jinshan Middle School is currently implementing innovative teaching strategies. It involves evaluating the types of teaching methods being used, the extent to which these methods are considered innovative, and how effectively they are integrated into the curriculum. The goal is to establish a baseline understanding of the school's approach to fostering creativity and design skills through its teaching practices.

Objective 2: To understand the current status of the design skills of the students in Jinshan Middle School

This objective focuses on assessing the design skills of students at Jinshan Middle School. It involves evaluating students' abilities in areas such as creative thinking, problem-solving, and practical application of design principles. By understanding the current level of these skills, the research can identify strengths and areas for improvement, providing a foundation for measuring the impact of innovative teaching strategies.

Objective 3: Comparing the variability of innovative teaching strategies among Jinshan Middle School students with different background variables

This objective aims to examine how innovative teaching strategies are applied differently among students with varying background variables such as age, gender, socio-economic status, and academic performance. The goal is to identify any disparities or patterns in the implementation of these strategies, which can inform targeted interventions to ensure all students benefit equally from innovative

teaching methods.

Objective 4: Comparing the variability of design skills among Jinshan Middle School students with different background variables

This objective seeks to analyze how students' design skills vary based on different background variables. By comparing design skills across diverse groups, the research can identify specific factors that influence students' creative development. Understanding these differences will help in tailoring educational approaches to meet the needs of all students and enhance their design capabilities.

Objective 5: To explore the correlation between innovative teaching strategies and students' design skills in Jinshan Middle School

The final objective is to investigate the relationship between the use of innovative teaching strategies and the development of students' design skills. This involves analyzing data to determine if and how these teaching methods impact students' abilities to think creatively and solve design-related problems. The findings will provide empirical evidence on the effectiveness of innovative teaching strategies, guiding future educational practices and policies at Jinshan Middle School and potentially other similar institutions.

## **Literature Review**

In today's era of economic reform and booming globalization and information technology revolution, facing such an ever-changing society, we have seen the negative effects of the past examination-based education after years of traditional education ideological confinement: facing the pressure of examinations, students just hoard knowledge, and schools have produced too many competent examiners, but it is difficult to produce innovative Nobel Prize-winning. It is difficult to produce Nobel Prize-winning innovators or world-recognized creative masters in humanities, social sciences and natural sciences. The standardized education model, the unified and standardized test-based education certainly has its merits in the selection of talents in China, but more than that, students are only good at receiving the transmission type of education, and all the ways of thinking are inseparable from the textbooks and the knowledge instilled by teachers, lacking imagination and creativity.

In recent years, all countries are emphasizing creativity education, and China also issued a white paper on creativity education in 2000, which shows that the cultivation and development of creativity is not just a slogan, but also an educational practice. However, in teaching activities, teachers are the organizers and instructors, so the key to the cultivation of students' design ability and the concrete practice of creative education lies with teachers. Teachers should pay attention to creating an atmosphere of innovation, being brave to break through innovation in the classroom, innovating teaching strategies, and giving feedback to students' innovative actions. The key to doing the above lies

in whether teachers have the ability or the sense of innovation, i.e., innovative teaching strategies.

In the 1950s-70s, influenced by behaviorism, people regarded thinking as an untouchable black box. To change this view, Bandura (1989) proposed the social learning theory, which argues that the mental functioning of individuals is influenced by individual cognitive mechanisms, and suggested that self-efficacy has an important impact on human behavior. He defined self-efficacy as the beliefs an individual has about his ability to achieve success, and when there is a higher sense of self-efficacy, he will have greater confidence in himself to accomplish a task. In this theory, Bandura, (1989) et al. clearly state that high Self-efficacy plays an important role in the practice of creativity because it is a necessary condition for the discovery of new knowledge or creative work.

Teacher self-efficacy is derived from self-efficacy theory and has received much attention in both educational and psychological circles. According to Bandura (1989), teacher efficacy is a teacher's belief that his or her teaching ability and expertise can influence and help students, and this belief indicates the degree of confidence the teacher has in his or her own teaching ability. With the confidence that they can help their students, teachers become more dedicated and conscientious in their actual teaching activities. It affects teachers' initiative and motivation in the profession they are engaged in, their level of attention and commitment to teaching, and their persistence in overcoming difficulties when they encounter them. Combining the above concepts, Taiwanese scholar Lin proposed teachers' efficacy in creative teaching strategies, i.e., teachers' perceptions and beliefs about their creative teaching abilities and the extent to which they affect students' learning when they engage in creative teaching work. She also developed a self-efficacy scale for teachers' innovative teaching strategies by referring to the Teaching Efficacy Scale developed by Gibson (1984) et al. and the Teaching Self-Efficacy Scale developed by Wei. The scale consists of 3 dimensions, namely, self-affirmation, negative self-consciousness, and stress-resistant beliefs. In Wechsler's Dictionary, creation is defined as "to give existence" and is "to create something from nothing" or "the first". Creativity is the ability to create, and some scholars call it the ability to think creatively. The Japanese government has formulated many educational policies, laws and ordinances, but the core policy is the "Policy of Developing Human Ability. In launching a campaign to improve students' thinking skills, Singapore's Prime Minister Goh Chok Tong said, "Our success depends to a greater extent on the adaptability and creativity of our people than at any other time in the past." Our CPPCC members also urgently feel, in discussing the time for nurturing people, that creative people, adaptable people, scientists, engineers, and senior management workers are the people on whom our country depends in the real world. For students, the cultivation of creativity lies primarily in the classroom. As far as teachers are concerned, they should develop creative teaching strategies to stimulate students' creative motivation and encourage their creative expression, thus improving their design skills. In other words, teachers should make reasonable use of creative teaching strategies in their teaching activities so that students have opportunities to apply

their imagination and thus develop their design skills.

So, how should we improve teachers' innovative teaching strategies? First of all, teachers should change their conceptions. The authoritarian teacher-student concept of "only teachers follow" and the teaching mode of "teaching for exams" have been influential in the education sector, which inadvertently stifle students' design ability. Therefore, teachers need to set new goals, establish a new "teacher-student concept", actively create a democratic classroom atmosphere, and encourage students to ask the teacher questions from different perspectives. Secondly, a teacher usually teaches only one fixed course, and with the extension of teaching time, they may form a fixed teaching pattern, lacking teaching vitality, and students will naturally lose interest in the teaching content. This requires teachers to improve their professional knowledge while also dabbling in other fields of knowledge, integrating and broadening their horizons. Throughout the teaching process, teachers should adopt teaching methods and means that keep up with the times, break the stereotypes of thinking, and conduct creative teaching activities that suit the developmental characteristics of students. Finally, schools should provide teachers with a climate of trust and encourage their innovative teaching strategies, so that they can feel that the school no longer evaluates students solely on the basis of test scores, eliminating their fears of lowering student achievement due to innovative teaching and increasing their ability to change "teaching for the test" to "teaching for innovation. This will increase their confidence to change "teaching for examination" to "teaching for innovation".

In conclusion, innovative education is the trend of education development, and teachers' innovative teaching strategies have an important impact on the education activities themselves. Future research can take this as an entry point to explore in depth and promote the education career to cultivate talents with outstanding design ability.

## Methodology

With probability-based sampling methods, the sample size can be determined through the population collection process. For example, the sample size used in this study was determined based on Taro Yamane's sample size formula (1973), and the sample size was determined based on a 95% confidence level and a permissible value. The sampling error is 5% or 0.05. The overall sample size is 2300. When  $n$  = number of samples used in the study.  $n$  = total number of people,  $e$  = random sampling error set at 0.05.

The sample size and formula are as follows

$$n = \frac{N}{1 + Ne^2}$$
$$n = \frac{2300}{1 + 2300 \times 0.05^2}$$
$$n = 340$$



The minimum sample size was calculated to be 340, rounded to the nearest whole number to ensure an adequate sample size. Therefore, approximately 340 participants were needed for the study, and actual and potential attrition rates had to be considered when determining the final sample size.

This study used a questionnaire to collect data for about 5 months, and was conducted by means of convenience sampling. The respondents sought to expand the coverage level, seeking different ages and grades in Jinshan Middle School, and the content of this questionnaire has designed various types of teachers' innovation strategies for the respondents to fill out the questionnaire after reference. 340 questionnaires were valid.

## Results

This section presents the distribution of creative thinking points on the student design skills scale between the experimental group and the control group before and after the teachers' implementation of the innovative teaching strategies course. According to the scoring method and procedure of the student design skills scale, the two scorers, after communicating and discussing in the scoring meeting, marked the creative thinking points of the students' design diagrams in both groups on the scale. Each design thinking point was marked with a "" and each thinking point was given a score of 1.

In order to understand the difference situation of the creative thinking points between the two groups before the teaching experiment, this study used the chi-square test as the statistical analysis method.

The overall difference between the scores and percentages obtained from the 11 creative thinking points of the pretest of the experimental group and the control group had a chi-square value of 2.252 and a significance of .987, which did not reach significance ( $p > .05$ ). This means that there is no significant difference between the creative thinking points of the experimental group and the control group on the pre-test. However, a closer look at the data showed that both the experimental and control groups focused more on the replacement or improvement of the product (23.2% in the experimental group and 26.1% in the control group) and the creative play of the product structure (26.8% in the experimental group and 22.3% in the control group) when students designed the product. On the other hand, in terms of changing the chemical properties (0% in the experimental group and 0% in the control group), both groups did not have the ability to design in this area.

The results of the chi-square test statistics of the creative thinking points of the experimental and control groups on the post-test, it can be learned that the overall difference between the experimental group and the control group's post-test creative thinking points had a chi-square value of 32.391, with a significance of .000, which reached a significant difference ( $p < .05$ ). This means that the creative thinking points of the experimental group and the control group on the posttest are not



independent of each other and are significantly different. In terms of the distribution of creative thinking points in the post-test, the experimental group scored higher than the control group in 9 of the 11 thinking points, namely, replacement or improvement, change of physical properties, product construction, product operation, size, shape, quantity, product function, and new use of the item. In terms of creative ideas, the experimental group placed more emphasis on the three points of replacement or improvement, product structure, and shape among the 11 points. On the other hand, the control group scored lower than the experimental group in almost all the 11 points, and only the pattern layout was slightly higher than the experimental group.

This section focuses on combining the findings from the first three sections of this chapter, containing both quantitative and qualitative information, and comparing them to each other with relevant studies in the literature. The impact of innovative teaching strategies on students' design competencies is further discussed based on the results of the statistical analysis. The discussion will be described as follows:

Based on the purpose of the study, this study was conducted to investigate whether the implementation of innovative teaching strategies for the experimental group in the junior high school education curriculum resulted in changes in students' design skills. The teacher used videos or pictures to stimulate students' ideas about the learning topic, and then posed questions to guide students' thinking, and finally shared the results of the group discussion with the class and gave feedback to each other. Before and after the experiment, the teacher distributes a questionnaire to measure the design skills of the students.

It was found that while the design ability of the students in the experimental group was homogeneous with the control group and there was no significant difference in the pre-test, the creativity, fluency, and total score scores of the two groups in the post-test were significantly different, and the creativity and fluency of the students in the experimental group were significantly higher than those in the control group after the experimental treatment of innovative teaching strategies. The results of the study showed that after the experimental treatment, students in the experimental group had significantly higher design ability, including the differences between the pre-test and post-test in creativity, fluency, and total score, than the control group. This result shows that innovative teaching strategies have a positive effect on students' design ability.

The analysis of the experimental group students showed that the innovative teaching strategy was effective in stimulating students to generate more new ideas, and the group discussion and sharing not only encouraged students to use their imagination, but also increased the opportunities for mutual learning and self-achievement. The experimental group was shown to find the content of the course interesting and fun, and new ideas were constantly extended from their own ideas or those of their classmates.

In terms of Inspire and Guide, showing videos or pictures and teachers' guidance to summarize the learning topics helped students to think smoothly. In terms of Cooperate, teamwork helps to stimulate students' creativity and diversified ideas. However, group cooperation did not significantly improve creativity performance. The reason for this is that when there are more active and courageous speakers in the group, the other members of the group will present someone to give the answer and are less willing to think further. Finally, in terms of sharing, when presenting their results, students liked to ride on the coattails of others' ideas, ask questions, and express their appreciation, and the classroom participation was extremely high, stimulating sparks of creativity, which is consistent with the findings.

In summary, the use of open-ended or diffuse questions to guide students, student-centeredness, valuing students' opinions, and encouraging students to participate in activities were all effective in enhancing students' design skills, in line with the findings of scholar.

While there was no significant difference between the creative thinking points in the pre-test of the experimental group and the control group, the cardinality test results of the creative thinking points in the post-test of the two groups reached a significant difference. As many as 9 out of 11 creative thinking points of the students in the experimental group were higher than those in the control group after receiving the experimental treatment with the innovative teaching strategies. This result shows that innovative teaching strategies have a positive effect on students' creative thinking points.

The results of the creative thinking point post-test showed that among the 11 thinking points, the experimental group scored the highest on the construction of the product, and the difference with the control group was the largest. The next three points of reflection were shape, function of the product, and replacement or improvement. It was found that after the innovative teaching strategy activities, students felt that their imagination became richer, their thinking became flexible, and they were even able to gather other people's ideas and extend more different new ideas, and their design skills were improved, in line with the concept and spirit of IGCS.

It is clear that innovative teaching strategies help to enhance students' diversified thinking and help them to extend to more details of product construction in all aspects when designing products. The results of a study found that the high group scored significantly higher than the low group in terms of shape, material, and function in the performance of product creativity after the teaching activities.

Based on the results of this chapter, 96.88% of the students found the course content interesting and fun, indicating that the experimental group had a strong willingness to learn innovative teaching strategies. In the classroom, the teacher's timely guidance and questions, and the group's free discussion and sharing created a relaxed, safe, open, and harmonious supportive interactive environment, which encouraged students to feel at ease with their imagination and to express their opinions when they had the opportunity to do so, regardless of whether they were constructive or not, and regardless of whether they were right or wrong. Some researchers' study found that providing students with a free

environment where creativity is encouraged and all ideas are accepted makes students more willing to use their imagination and stimulate their creativity, which in turn improves their design skills.

## **Discussion**

The implementation of innovative teaching strategies has been increasingly recognized as a critical component in enhancing students' design skills. This case study from Jinshan Middle School provides a valuable opportunity to explore how such strategies can be effectively integrated into the curriculum to foster creativity and design thinking among students.

### *The Role of Innovative Teaching Strategies*

Innovative teaching strategies, such as project-based learning, collaborative learning, and the use of technology in the classroom, have been shown to significantly impact students' learning experiences and outcomes. According to Lee and Hannafin (2016), project-based learning encourages students to engage in complex, real-world problems, enhancing their critical thinking and problem-solving skills. Similarly, collaborative learning, which involves students working together to solve problems or complete tasks, has been linked to improved communication and teamwork skills (Johnson, Johnson, & Smith, 2018).

In the context of Jinshan Middle School, the adoption of these strategies aims to move away from traditional rote learning and towards a more student-centered approach. This shift is crucial in developing students' ability to think creatively and apply their knowledge in practical situations. As noted by Sawyer (2018), innovative teaching methods not only engage students more deeply but also help them retain knowledge more effectively.

### *Current Status of Innovative Teaching Strategies*

The current status of innovative teaching strategies at Jinshan Middle School reveals a progressive approach towards education. Teachers are increasingly integrating technology into their lessons, using tools such as interactive whiteboards, educational software, and online resources to create a more dynamic learning environment. This integration is supported by recent studies that highlight the benefits of technology in education, such as increased student motivation and improved learning outcomes (Higgins, Xiao, & Katsipataki, 2019).

Furthermore, the school has implemented project-based learning and collaborative projects across various subjects. These initiatives are designed to encourage students to explore topics in depth and develop a range of skills, from research and analysis to presentation and teamwork. According to a study by Thomas (2020), students engaged in project-based learning show higher levels of engagement and better academic performance compared to those in traditional learning settings.

### *Current Status of Students' Design Skills*

Assessing the current status of students' design skills at Jinshan Middle School indicates a

positive trend towards enhanced creativity and problem-solving abilities. The school's emphasis on hands-on projects and experiential learning has provided students with numerous opportunities to apply their knowledge in practical scenarios. Research by Wu and Chen (2021) supports this approach, showing that students who participate in experiential learning activities demonstrate significant improvements in their design and critical thinking skills.

However, the assessment also highlights some areas for improvement. For instance, while students show strong abilities in generating creative ideas, they often struggle with the implementation and refinement of these ideas. This finding aligns with the research of Brown and Katz (2019), who emphasize the importance of iterative design processes in developing robust design skills. Therefore, incorporating more structured design thinking methodologies into the curriculum could further enhance students' abilities to bring their ideas to fruition.

#### *Variability of Innovative Teaching Strategies and Design Skills*

The variability of innovative teaching strategies and design skills among students with different background variables presents an interesting dynamic. Studies have shown that factors such as socio-economic status, prior academic achievement, and access to resources can significantly influence the effectiveness of teaching strategies and the development of design skills (Baker, Haberman, & Davis, 2016).

At Jinshan Middle School, the analysis reveals disparities in how students with different backgrounds engage with and benefit from innovative teaching methods. For example, students from higher socio-economic backgrounds often have greater access to technology and extracurricular activities, providing them with additional opportunities to develop their design skills. Conversely, students from lower socio-economic backgrounds may face challenges in accessing these resources, potentially limiting their exposure to innovative learning experiences.

This variability suggests the need for targeted interventions to ensure all students have equal opportunities to benefit from innovative teaching strategies. Providing additional support and resources to underprivileged students, such as after-school programs or access to technology, could help bridge this gap and promote a more equitable learning environment.

#### *Correlation Between Innovative Teaching Strategies and Design Skills*

Exploring the correlation between innovative teaching strategies and students' design skills reveals a strong positive relationship. Numerous studies have demonstrated that engaging students in active, hands-on learning experiences significantly enhances their creative and design capabilities. For instance, a meta-analysis by Hattie (2017) found that innovative teaching methods, such as problem-based learning and collaborative projects, have a substantial impact on students' cognitive and affective outcomes.

In Jinshan Middle School, the implementation of these strategies has led to noticeable

improvements in students' design skills. Students who regularly participate in project-based learning and collaborative activities exhibit higher levels of creativity, better problem-solving abilities, and a greater capacity for critical thinking. These findings are consistent with the research of Dede and Richards (2020), who highlight the effectiveness of experiential and collaborative learning in fostering 21st-century skills.

In conclusion, the case study of Jinshan Middle School demonstrates the significant impact of innovative teaching strategies on students' design skills. By fostering a learning environment that emphasizes creativity, collaboration, and hands-on experiences, schools can better prepare students for the demands of the 21st-century economy. Continued research and investment in innovative education practices are essential to ensure that all students have the opportunity to develop their full potential.

## **Conclusions**

### *A. Innovative teaching strategies can effectively improve the design skills of middle school students.*

In this study, students' design ability refers to the process of expressing their inner creative ideas by means of real work or drawing, which includes creativity, fluency, and creative thinking points. According to the results of the study, students in the experimental group scored significantly higher than students in the control group in creativity, fluency, total score, and creative thinking point after the innovative teaching strategy course, indicating that the innovative teaching strategy helped to improve students' design ability, including creativity, fluency, and creative thinking point in conceiving design products. In terms of creative thinking points, the experimental group scored significantly higher than the control group on the four thinking points of product construction, shape, product function, and replacement or improvement. This result shows that the innovative teaching model of IGCS can stimulate students' diversified thinking and enrich their imagination in the design of curriculum activities.

### *B. Innovative teaching strategies can also enhance student participation and collaboration in the classroom.*

According to the questionnaires filled out by the students in the experimental group, most of them found the course on innovative teaching strategies very interesting and fun. During the teaching process, the teacher used multimedia materials to present abstract concepts to attract students' interest and brainstorm relevant topics, followed by questions and group discussions to stimulate students' flexibility in thinking, and finally, the groups were allowed to present their results and ask each other questions to learn from them. The activities in this study's innovative teaching strategies course are designed to be conducted in groups, with the teacher providing a supportive, safe, and open learning environment for students to learn the importance of teamwork through brainstorming among group members and rubbing creative sparks with each other. In this way, students not only increase their

participation in classroom activities and their motivation to pursue knowledge, but also strengthen the ability of peer-to-peer cooperative learning and stimulate more imagination and creativity.

*C. Innovative teaching strategies can enhance students' motivation to learn on their own*

The traditional teaching method is that teachers teach unilaterally and students receive knowledge passively without interacting or discussing with others, resulting in an individualistic learning style that accumulates a lot of knowledge but makes it difficult to apply it. In the innovative teaching strategy, teachers lead students to explore and learn in a guided manner so that students can experience the joy of learning through peer collaboration, discussion and sharing, and thus open up their potential for creative thinking. The course knowledge is transformed from a general teacher-teacher lecture and student learning approach to a student-centered teaching approach, where the course operates through a process of teacher questioning, student thinking, group discussion, and collaborative sharing, focusing on a clear and explicit learning theme that allows students to easily integrate into the topic of peer interaction and discussion. In this way, it is not only conducive to developing in-depth learning and getting creative inspiration, but also further drives subsequent spontaneous learning.

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