

# Enhancing the Skills of Medical Imaging Technology Through Situational Teaching Method for University Students

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## *Abstract*

*The purpose of this study is 1) to study the effect of the situational teaching method on enhancing the skills of students majoring in medical imaging technology for university students; 2) to compare students' medical imaging technology skills pre-test and post-test; 3) to measure students' attitudes towards the situational teaching method to improve the skills of medical imaging technology for university students. This study adopted the quantitative research method. There were 35 valid questionnaires. This study focuses on second-year students majoring in medical imaging technology at Haibin Medical College. The study covers one class, totaling 35 students. In this research, students undertook medical imaging technology skills learning using the situational teaching method. Pre-test and Post-test assessments were conducted on their attitudes toward situational teaching as a method to enhance medical imaging technology skills. This study finds that 1) The students perceive the situational teaching method as effective and positively impactful; 2) The students achieve skills of medical imaging technology from moderate to very high and has a significant at .01 of pre-test and post-test mean ( $t$ -value = 16.8); 3) The students' attitudes towards the situational teaching method to improve the skills of medical imaging technology ( $X$  3.79,  $S.D.$  0.99), all items are high level. This indicates that students hold a positive attitude toward the scenario-based teaching method. This research guides educators in optimizing teaching strategies and refining evaluation methods, thereby contributing positively to the development of high-quality talent in medical imaging technology.*

**Keywords:** *Medical Imaging Technology Skills / Situational Teaching Method / Medical University*

## Introduction

With the rapid development of medical imaging technology, universities face increasing demands for practitioners with advanced professional skills. However, many still primarily rely on traditional theoretical instruction, with limited practical teaching, leading to a gap in students' clinical application skills and practical abilities (Sehrawat & Gupta, 2022). Outdated teaching methods compound this issue, as the focus on knowledge transfer, application, and innovative practice remains insufficient in the medical imaging technology curriculum. Integrating theory with practice through situational teaching, which involves simulating real-life clinical scenarios, can enhance students' problem-solving abilities and prepare them for the practical demands of the industry (Zhang et al., 2024; Kauthankar, 2023). The importance of vocational education has been

highlighted in national reforms that call on universities to adapt to technological trends and meet regional economic needs (Zhou et al., 2024; Guan & Scott, 2024). Despite these efforts, the field of medical imaging technology still faces challenges, including limited talent development, limited employment opportunities, and a misalignment between students' skills and job-market needs (Chick et al., 2020). Thus, reforming educational practices to integrate industry is crucial to improving students' employability and professional readiness.

The medical imaging technology major faces significant challenges due to outdated and inadequate teaching equipment and limited resources for practical training (Arruzza, 2022). Traditional teaching methods, which prioritize theoretical instruction over practical application, fail to meet the field's growing demands. Teachers, who must possess both high professional qualifications and profound teaching skills, often rely heavily on the lecture method, leading to a classroom dynamic in which the teacher dominates, and students remain passive. This results in reduced student engagement, initiative, and enthusiasm, ultimately impacting the effectiveness of the learning process.

The situational teaching method offers a promising solution to these issues by integrating real-world professional contexts into the curriculum. This method involves designing simulated work scenarios that enable students to apply theoretical knowledge through practical exercises (Joshi et al., 2020). By shifting the focus from theory to practice, situational teaching enhances the applicability of lessons and prepares students for the demands of the workplace. It helps overcome the limitations of traditional teaching models by fostering active learning, increasing student engagement, and encouraging problem-solving and critical thinking skills (Joshi et al., 2020; Gan et al., 2021). Moreover, situational teaching supports skill development and allows students to practice in virtual or simulated environments, improving their innovative abilities and clinical judgment (Oleksiy, 2020). By transforming the classroom dynamic, where teachers act as guides and students take the lead in solving real-world problems, situational teaching enhances students' adaptability and professional competence, equipping them to navigate the challenges of the medical imaging field.

Students internalize knowledge and master skills through hands-on practice (Whittle et al., 2020). This learning approach enhances classroom engagement and increases students' initiative and sense of responsibility. Situational teaching method addresses issues such as the disconnection between theory and practice and insufficient teaching resources by constructing teaching scenarios that closely align with job demands. Situational teaching method improves teaching effectiveness and students' professional competencies. This methodology better aligns with the needs of cultivating talent in medical imaging technology and lays a solid foundation for students' future career development.

### **Situated Cognition Theory**

Situated Cognition Theory (SCT) argues that knowledge is not fixed or simply a reflection of reality, but is dynamically constructed as learners interact with real situations. Knowledge and action are inseparable, and learners must immerse themselves in authentic contexts to acquire and apply what they learn (Roth & Jornet, 2013). Based on this theory, situational teaching creates realistic scenarios that allow students to perform hands-on tasks, understand future job roles, and develop practical skills (Dew et al., 2015). By embedding learning in real and complex situations, SCT helps students internalize knowledge, transfer understanding across contexts, and develop problem-solving abilities (Cheng, 2018). Creating authentic learning environments in schools enhances teaching effectiveness (Pritchard, 2018) and positions students—rather than teachers—as

the center of learning (Wortham, 2001). SCT also emphasizes that learning without context is less effective, so teachers should design realistic and profession-relevant scenarios that match students' cognitive levels to increase engagement, stimulate positive emotions, and support meaningful learning (Brown et al., 1989; Mayer, 2009).

### **Constructivist Learning Theory**

Constructivist Learning Theory (CLT) emphasizes that learning is centered around students, with teachers acting as guides rather than knowledge transmitters. CLT identifies four key elements for an effective learning environment: context, collaboration, conversation, and meaning construction (Ardiansyah & Ujihanti, 2018). Unlike traditional teaching, which is a one-way transfer of knowledge, CLT values each student's unique perspective, encouraging respect for their ideas and fostering their independent thinking (Afify, 2018). Teachers are encouraged to support students in constructing their own understanding, rather than simply delivering content.

In situational teaching, CLT advocates for a student-centered classroom, where teachers do not dominate but instead create opportunities for students to engage in active learning. This approach allows students to explore, experiment, and construct meaning through authentic situations (Suhendi & Purwarno, 2018). Knowledge acquired through active, hands-on experiences is considered more meaningful than passive reception of information (Wang, 2011). By providing real-world scenarios for students to navigate, teachers help them develop concrete understandings and intrinsic motivation (Wang, 2011).

CLT aligns with situational teaching, as both emphasize the importance of authentic contexts in learning. Knowledge is seen as dynamic and co-created through social interactions and activities within specific contexts (Nikitina, 2011). Situational teaching provides simulated environments where students can apply knowledge to solve real problems, deepening their understanding and motivation (Navarro et al., 2024). By integrating CLT with situational teaching, educators can better meet students' needs, fostering a deeper integration of knowledge and skills (Navarro et al., 2024; Nikitina, 2011; Suhendi & Purwarno, 2018).

### **Situational Teaching Method**

The situational teaching method, first proposed by Brown et al. (1989), emphasizes that knowledge gains meaning only when situated in real-world contexts. This approach integrates theoretical learning with practical application by creating scenarios that reflect actual work situations, thereby engaging students emotionally and cognitively. The method follows a structured process, starting with developing a problem, which involves designing realistic learning environments that bridge the gap between abstract theoretical knowledge and its real-world application. This can include using case studies, simulations, and virtual systems to help students understand the relevance of what they are learning (Hyvärinen et al., 2010; Jao, 2016).

The next step, questioning, involves guiding students to think critically about the material. Through carefully designed, heuristic questions, teachers encourage students to connect new knowledge with their existing understanding, stimulating deeper learning and problem-solving skills (Jao, 2016; Shan et al., 2022). Following this, student engagement focuses on hands-on practice and teamwork. By actively participating in tasks and collaborating with peers, students reinforce their knowledge and develop practical skills such as communication and teamwork (Germain et al., 2021).

The analysis and discussion phase allows students to reflect on what they have learned, engage in collaborative problem-solving, and deepen their understanding of real-world applications. This stage helps them develop professional judgment and gain insights into the impact of their skills in practical settings (Hou, 2024). Finally, the summarization step helps students consolidate their learning by reviewing key knowledge and skills, making connections to future professional scenarios and ensuring the transfer of knowledge to long-term memory (Jonas & Cesario, 2013).

The situational teaching method is supported by technology and multimedia, such as virtual simulations and video demonstrations, which enhance the realism of the scenarios and make learning more interactive. It has been shown to improve learning outcomes by fostering deeper engagement, emotional involvement, and practical skill development, preparing students for real-world professional roles (Shan et al., 2022). The key characteristics of the method, vividness, emotional engagement, and a connection to real-life situations, ensure that students not only acquire knowledge but also gain the practical abilities needed in their future careers (Germain et al., 2021; Hou, 2024).

### **Medical Imaging Technology Skills**

Medical imaging technology skills are a critical set of competencies required of professionals in the field, encompassing specialized techniques such as equipment operation, image acquisition, optimization, post-processing, and radiation protection (Bakhtiary, 2014). These skills focus on using imaging equipment and technology to provide accurate and high-quality diagnostic support in clinical settings (Delaney, 2016). The core skills include the efficient operation of imaging equipment, image optimization, and mastery of advanced software for image post-processing, all of which enhance diagnostic value and reduce unnecessary repeat exams (Starkey, 2012). Additionally, radiation protection is vital to ensure the safety of both patients and staff, and low-dose imaging strategies are becoming increasingly important (Kalchev, 2024). As technology advances, the definition and scope of medical imaging technology skills continue to evolve, requiring ongoing adaptation to meet changing clinical needs (Xie, 2021).

The steps involved in acquiring medical imaging technology skills are critical for effective practice. Imaging equipment operation forms the foundation, requiring technicians to understand equipment parameters and adapt them to meet the diverse clinical demands (Yuwat, 2022). Image acquisition and optimization skills focus on setting appropriate parameters and identifying artifacts to produce high-quality images (Alipio, 2024). Image post-processing skills, such as noise reduction and contrast enhancement, are essential for improving diagnostic accuracy and reducing patient radiation exposure (Xie, 2021). Finally, radiation protection skills are fundamental to maintaining patient and technician safety, especially during high-risk procedures such as CT and nuclear medicine (Kalchev, 2024; Shan et al., 2022). Together, these skills ensure that medical imaging professionals can effectively support clinical decision-making and patient care.

## **Method**

This study adopted an experimental design to investigate the effects of situational teaching methods on the skills of university students in medical imaging technology. This study compared one group's pre-test and post-test scores on the medical imaging technology skills test. It assessed students' attitudes toward situational teaching methods for improving their skills in medical imaging technology. The research will design questionnaires, lesson plans, and tests of

medical imaging technology skills. The independent variable in this study is the situational teaching method. The dependent variable is medical imaging technology skills. The sample is 35 second-year students majoring in medical imaging technology at Haibin Medical College. These students will undertake medical imaging technology skills learning using the situational teaching method. Pre-test and Post-test assessments will be conducted on their attitudes toward situational teaching as a method to enhance medical imaging technology skills.

The research instrument includes three key components to evaluate the situational teaching method in medical imaging technology. First, lesson plans are designed around situational teaching, focusing on real-world scenarios, student engagement, and hands-on practice. Second, a skills test is administered before and after the intervention to assess students' proficiency in equipment operation, image acquisition, post-processing, and radiation protection. Third, a questionnaire measures students' satisfaction with the situational teaching method, using a Likert scale to evaluate their attitudes. The combination of pre- and post-tests, along with the questionnaire, allows for a comprehensive assessment of both skill improvement and student perceptions of the teaching method.

## Findings and Discussion

### Findings

**To examine the effect of the situational teaching method on the development of university students' medical imaging technology skills.**

This study collected 35 questionnaires and assessed medical imaging technology skills using pre- and post-tests to evaluate the effectiveness of the scenario-based teaching method. The sample consisted of second-year students at Medical College, with a gender distribution of 54.3% male and 45.7% female. Most students (60%) were aged 21- 24, with 37.1% aged 18-20. GPA distribution: 22.9% of students have a GPA between 3.1 and 3.5, which is below 2.0.

This study assessed the impact of the situational teaching method on second-year medical imaging technology students by administering pre- and post-tests. The results showed improvement in students' skills across all key areas, including imaging equipment operation, image acquisition and optimization, image post-processing, and radiation protection. Reflecting enhanced practical proficiency. Hands-on tasks, such as CT scan simulations, demonstrated students' ability to operate imaging equipment confidently and adjust parameters correctly with minimal guidance. Reflective journals and peer feedback further confirmed this growth, highlighting the relevance of technical skills to clinical practice and the value of collaborative learning. These findings support the effectiveness of situational teaching in improving medical imaging technology skills and suggest its integration into similar technical curricula.

**To compare students' pre-test and post-test scores in medical imaging technology skills before and after the implementation of the situational teaching method.**

**Table 1:** Mean, Standard Deviation, and Interpretation of Students' Medical Imaging Technology Skills Pre-test and Post-test (N = 35)

Test No	Pre-test			Pro-test		
	Mean	Std. Deviation	Interpretation	Mean	Std. Deviation	Interpretation
Q1	3.17	1.18	moderate	4.43	1.14	high
Q2	3.09	1.01	moderate	4.40	1.17	high

Test No	Pre-test			Pro-test		
	Mean	Std. Deviation	Interpretation	Mean	Std. Deviation	Interpretation
Q3	3.29	1.15	moderate	4.09	1.09	high
Q4	3.14	1.03	moderate	4.43	0.98	high
Q5	2.97	1.15	moderate	3.86	1.24	high
<b>IEOS</b>	<b>3.13</b>	<b>1.10</b>	<b>moderate</b>	<b>4.24</b>	<b>1.14</b>	<b>high</b>
Q6	3.20	1.32	moderate	4.83	0.75	very high
Q7	2.89	1.16	moderate	4.83	0.71	very high
Q8	3.14	1.12	moderate	4.40	0.60	high
Q9	3.09	1.38	moderate	4.89	0.47	very high
Q10	2.86	1.06	moderate	4.43	0.61	high
<b>IAOS</b>	<b>3.03</b>	<b>1.21</b>	<b>moderate</b>	<b>4.67</b>	<b>0.66</b>	<b>very high</b>
Q11	2.91	1.17	moderate	4.74	0.78	very high
Q12	3.09	1.20	moderate	4.77	0.77	very high
Q13	2.86	0.97	moderate	4.23	0.94	high
Q14	3.11	1.23	moderate	4.74	0.78	very high
Q15	3.20	1.02	moderate	4.34	0.64	high
<b>IPS</b>	<b>3.03</b>	<b>1.12</b>	<b>moderate</b>	<b>4.57</b>	<b>0.81</b>	<b>very high</b>
Q16	3.17	0.92	moderate	4.49	0.85	high
Q17	3.11	0.96	moderate	4.83	0.51	very high
Q18	3.17	0.89	moderate	4.49	0.70	high
Q19	3.09	1.38	moderate	4.69	0.72	very high
Q20	3.37	0.84	moderate	4.49	0.56	high
<b>RPS</b>	<b>3.18</b>	<b>1.01</b>	<b>moderate</b>	<b>4.59</b>	<b>0.69</b>	<b>very high</b>
<b>Total Average</b>	<b>3.10</b>	<b>1.11</b>	<b>moderate</b>	<b>4.52</b>	<b>0.86</b>	<b>very high</b>

Note: IEOS is Imaging Equipment Operation Skills. IAOS is Image Acquisition and Optimization skills. IPS is Image Post-Processing Skills. RPS is Radiation Protection Skills

Table 1 compares students' proficiency in medical imaging technology before and after the situational teaching method. The overall average mean increased from 3.09 ("moderate") in the pre-test to 4.52 ("very high") in the post-test, with a notable improvement in skill levels. In the core skill areas, "Imaging Equipment Operation Skills" increased from 3.13 ("moderate") to 4.24 ("high"), while "Image Acquisition and Optimization Skills" jumped from 3.03 ("moderate") to 4.67, 4.57 ("very high"). Both "Image Post-processing Skills" and "Radiation Protection Skills" also moved from "moderate" to "very high". The pre-test average is 3.10, S.D. 1.11, which is at a moderate level, and every item is at a moderate level, whereas the post-test is 4.52, S.D. 0.86, which is at a very high level, reflecting student progress. Overall, the data show that the situational teaching method effectively enhanced students' practical and cognitive skills in medical imaging technology.

**Table 2:** Compare Medical Imaging Technology Skills of Pre-test and Post-test

Medical Imaging Technology Skills	N	Mean	Variance	df	t
Pre-test	35	61.91	51.32	34	16.38
Post-test	35	90.37	54.30	34	

$$t_{0.01,34} = 2.443$$

$$t_{compute} = 16.38 > t_{0.01,34} = 2.443$$

The result showed that the null hypothesis is rejected at the .01 level, indicating that the post-test mean is significantly higher than the pre-test mean. t-value is 16.38. The post-test scores of students after exposure to the situational teaching method are notably higher than the pre-test scores. Based on the hypothesis test results, leading to the rejection of the null hypothesis. This indicates that the situational teaching method significantly enhances medical imaging technology skills, with students demonstrating higher proficiency after the intervention.

**To assess university students' attitudes toward the use of the situational teaching method in enhancing their medical imaging technology skills**

**Table 3:** Mean, Standard Deviation and Interpretation of Students' Attitudes Towards Situational Teaching Method (N=35)

Questions	Mean	Std. Deviation	Interpretation
Q1	3.83	0.75	high
Q2	3.69	0.93	high
Q3	3.57	1.07	high
Q4	3.71	0.99	high
Q5	3.86	1.00	high
<b>Creating A Situation</b>	<b>3.73</b>	<b>0.95</b>	<b>high</b>
Q6	3.89	0.80	high
Q7	3.80	1.02	high
Q8	3.86	0.88	high
Q9	3.69	1.11	high
Q10	3.94	0.76	high
<b>Questioning</b>	<b>3.83</b>	<b>0.92</b>	<b>high</b>
Q11	3.83	0.92	high
Q12	3.66	1.06	high
Q13	3.57	1.40	high
Q14	3.63	1.17	high
Q15	3.80	0.93	high
<b>Student Engagement</b>	<b>3.70</b>	<b>1.10</b>	<b>high</b>
Q16	3.71	0.96	high

Questions	Mean	Std. Deviation	Interpretation
Q17	4.00	1.14	high
Q18	3.69	0.96	high
Q19	4.09	0.85	high
Q20	3.66	1.16	high
<b>Analysis and discussion</b>	<b>3.83</b>	<b>1.03</b>	<b>high</b>
Q21	3.80	0.80	high
Q22	4.17	1.07	high
Q23	3.86	0.77	high
Q24	3.77	1.03	high
Q25	3.80	1.05	high
<b>Summarize</b>	<b>3.88</b>	<b>0.95</b>	<b>high</b>
<b>Total Average</b>	<b>3.79</b>	<b>0.99</b>	<b>high</b>

The data show a positive student attitude toward the scenario-based teaching method, with a mean of 3.79 (high) and relatively consistent opinions. All five dimensions, creating a situation, questioning, student engagement, analysis and discussion, and summarizing, achieved high ratings, indicating students perceive the method as effective and impactful. In particular, students highly value the authenticity of the scenarios, the guidance provided by teacher questions, and the promotion of critical thinking through analysis and discussion. The summarize dimension also received strong support, with students recognizing its role in consolidating knowledge and skills. The data suggest that scenario-based teaching enhances student engagement and learning outcomes in medical imaging technology courses, making it a teaching method worth further promotion.

## Discussion

The research findings indicate that the situational teaching method significantly improves students' skills in medical imaging technology. By simulating real-world scenarios, this method allows students to apply theoretical knowledge in practical contexts, thereby enhancing their technical proficiency and problem-solving abilities. Unlike traditional teaching, which focuses primarily on theory, situational teaching integrates hands-on practice with equipment operation, image processing, and radiation protection. It boosts students' engagement and learning initiative through interactive methods like case analysis and role-playing. Teachers play a key role as guides and feedback providers, offering personalized support to help students refine their skills. Additionally, the method fosters teamwork and collaboration, which are crucial in medical imaging. The situational teaching method effectively enhances students' skills, learning motivation, and practical problem-solving abilities, making it a valuable approach for improving medical imaging technology education.

Research data show a significant improvement in students' medical imaging technology skills at the 0.01 level after using the situated teaching approach. The pre-test score was 61.91, indicating a "moderate" level, while the post-test score increased to 90.37, reaching the "very high" level. This reflects a substantial improvement in students' technical proficiency. The situated teaching approach effectively bridges the gap between theory and practice. Traditional methods focus

primarily on lectures and theory, whereas the situated approach simulates real-world clinical scenarios, enabling students to apply knowledge in authentic contexts (Lu et al., 2021). This hands-on experience improved key skills, including equipment operation, image acquisition, post-processing, and radiation protection, advancing students from basic knowledge to practical ability (Yu et al., 2022). The situated teaching approach has significantly boosted students' engagement, motivation, and practical competence, preparing them for future professional tasks. The marked improvement in pre-test and post-test scores confirms that the situated teaching method is an effective strategy for enhancing medical imaging technology skills and improving course outcomes (Fanning & Gaba, 2021).

Research data reveal that students have a positive attitude toward the situated teaching approach, with high ratings across all surveyed dimensions. The total average places students in the "high" category, indicating strong recognition of the learning outcomes facilitated by this approach (Germain et al., 2021). The situated teaching approach includes five key phases: "creating a situation," "questioning," "student engagement," "analysis and discussion," and "summarizing." All phases received high ratings, with students appreciating the contextualization of knowledge, the enhancement of critical thinking, and the encouragement of active participation. These phases fostered comprehensive skill development and improved students' understanding and motivation. The positive feedback reflects not only the approach's effectiveness in teaching but also its impact on students' attitudes, learning motivation, and professional identity. This reinforces the value of the situated teaching method in medical imaging education, highlighting its role in improving both technical skills and overall learning experiences (Xie, 2021; Nian, 2020).

## Conclusion

The study examined the impact of the situational teaching method on university students' medical imaging technology skills, comparing pre-test and post-test scores, and assessing students' attitudes towards the process. Results showed significant improvement in students' technical skills, self-awareness, and collaborative learning, with post-test scores increasing from a "moderate" level (3.10) to a "very high" level (4.52), demonstrating the method's effectiveness. Statistical analysis confirmed a significant impact at the .01 level, with a t-value of 16.38, well beyond the critical value of 2.443, rejecting the null hypothesis and confirming the method's positive effect. Additionally, students expressed a positive attitude towards the situational teaching method, with a total average of 3.79 and a standard deviation of 0.99, indicating high levels of satisfaction and recognition of its value in enhancing their skills. These findings support the integration of situational teaching into technical education curricula.

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