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A Study on the Construction of an Integrated Intelligent Curriculum System for Basic Anatomy Based on the Integration of Teaching, Learning, Assessment, and Improvement

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Abstract

Objective To explore the construction and effectiveness of the basic anatomical wisdom curriculum system based on the integration of teaching, learning, evaluation and reform. Methods A total of 303 students majoring in higher vocational nursing were randomly selected for the 2023 fall class as the survey objects, and the independent learning ability, critical thinking ability, and learning of smart courses, offline final theoretical results, and teaching satisfaction were evaluated before and after teaching. Results 97% of the students had a completion rate of 100% in the browsing of teaching materials, and the total learning score of the digital human stem7.0 platform was (83.09±5.48). The final theory test score is (86.70±6.87); After teaching, the scores of learning motivation, self-management, learning cooperation, and information literacy in students' self-directed learning ability were higher than those before teaching, and the differences were statistically significant(P<0. 05）. After the teaching of the basic anatomy curriculum system based on the integration of teaching, learning, evaluation and reform, the scores of truth-seeking, open-mindedness, analytical ability, systematization ability, self-confidence, intellectual curiosity and cognitive maturity of critical thinking were higher than those before teaching, and the differences were statistically significant (P). <0. 05）. 97% of the students gave a high level of satisfaction. Conclusion The basic anatomy wisdom curriculum system based on the integration of teaching, learning, evaluation and reform can effectively improve students' learning interest and participation in the basic anatomy course, and promote the improvement of their independent learning ability and critical thinking ability. At the same time, the students were also satisfied with the exploration of the construction of the intelligent curriculum system of the basic anatomy course. Therefore, this study believes that the basic anatomy wisdom curriculum system based on the integration of teaching, learning, evaluation and reform has significant promotion value, which can provide a useful reference for the teaching reform of smart anatomy.

Keywords

Wisdom anatomy; Wisdom Courses; Basic anatomy courses; Curriculum system.

In recent years, the state has vigorously promoted the reform of smart teaching in nursing education, aiming to cultivate more talents with innovative spirit and practical ability. In 2019, the State Council issued the "Modernization of Education in China 2035", which put forward the guiding ideology, basic principles and main tasks of promoting the modernization of education, and is a programmatic document for the intelligent development of education (including nursing education) in China. The "Guiding Opinions on Further Promoting the Development of "Internet + Education" issued in 2021 encourages colleges and universities to

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use information technology to improve the quality of teaching, and gradually leads the development of smart teaching in colleges and universities [1]. As an important part of education informatization, smart classroom is helpful to realize the optimal allocation of teaching resources and the efficient management of the teaching process. Looking back at the basic anatomical wisdom teaching of nursing education, a series of smart curriculum systems have provided rich teaching resources through digital teaching platforms, including teaching materials, maps, videos, cases, etc., so that students can learn anytime and anywhere, get rid of the limitations of time and space, and help to improve the improvement of students' independent learning and the accumulation of professional quality [2-3]. In the past three years, the reform of the basic anatomy curriculum in our school has explored and formed a set of effective teaching-learning-evaluation-reform integrated intelligent teaching system based on the digital human STEM7.0 platform, which fully considers the individual differences of students and the needs of online learning. However, the specific effectiveness of its teaching still needs to be further verified. To this end, this paper will explore the construction and effectiveness of the basic anatomical wisdom curriculum system based on the integration of teaching, learning, evaluation and reform.

1. Exploration of the construction of basic anatomy curriculum system based on the integration of teaching, learning, evaluation and reform

1.1. Paradigm Integration: A New Path for Online and Offline Wisdom Teaching

The traditional anatomy teaching model tends to focus on theoretical teaching, while modern educational technology provides a more diversified teaching method for basic anatomy courses. In this context, the basic anatomy course based on the digital human STEM7.0 platform combines the traditional model with modern technology to form a new teaching paradigm in which online and offline complement each other. This paradigm not only retains the teacher-student interaction and practical operation in the traditional curriculum, but also provides richer learning resources and self-directed learning space through the digital human STEM7.0 platform. Students deepen their understanding of anatomical knowledge through practical operations in the course, and at the same time carry out independent learning and consolidation in the online platform, achieving a perfect combination of theory and practice.

1.2. Data aggregation: Build a rich new resource library for smart learning

In order to support this new teaching model, the basic anatomy course first needs to build a rich teaching resource library. This includes collecting and organizing a variety of teaching resources for basic anatomy courses, such as classic textbooks, detailed maps, high-definition videos, and practical examples. These resources will be centrally managed through a professional teaching platform to form a systematic and comprehensive teaching database. At the same time, the basic anatomy course will also collect students' learning data in real time through the digital human STEM7.0 platform, such as learning duration, interaction frequency, test scores, etc., so as to conduct more in-depth data analysis and provide strong support for teaching optimization.

1.3. Mixed intervention: a new attempt to carry out personalized wisdom evaluation

Based on the digital human STEM7.0 platform, the basic anatomy course combining online and offline has begun to take shape. In the online part, students can use the rich teaching resources for independent learning and testing, and the teacher will be prompted to review and correct in the system as soon as possible. In the offline part, through practical operations, group discussions, and face-to-face guidance from teachers, the knowledge learned will be further

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consolidated and deepened. Teachers interpret the learning situation based on the data and structured graphics of the STEM7.0 platform, and carry out personalized teaching interventions on the basis of digital empowerment, such as providing targeted tutoring materials and setting additional learning tasks, to ensure that each student can receive the most suitable teaching support for themselves.

1.4. Applied Representation: Make abstract knowledge vivid and concrete

Basic anatomical knowledge is often abstract and complex. This poses no small challenge for students who are just starting out. In order to help students better understand and remember, the basic anatomy course will make full use of multimedia technology, such as 3D models, animation demonstrations, etc., to present abstract anatomical structures in a concrete form. At the same time, through the teaching platform, the basic anatomy course can also display students' learning achievements, such as assignments, test scores, discussion content, etc., which can not only stimulate students' enthusiasm for learning, but also cultivate their sense of competition, and further promote the improvement of learning effectiveness.

1.5. Integration of digital intelligence: the bold integration of precise and intelligent teaching

With the continuous development of big data and artificial intelligence technology, the application of the digital human STEM7.0 platform in the field of teaching is becoming more and more extensive. The basic anatomy wisdom teaching will make full use of these advanced technologies to analyze and mine students' learning data. Through these accurate data analysis, teachers can obtain more accurate teaching feedback and strategic suggestions, so as to continuously optimize teaching content and methods [4] . At the same time, the basic anatomy course will also combine the cutting-edge technology and research results in the field of anatomy, and constantly update and improve the dynamic digital teaching resources to ensure the close integration of anatomy teaching and medical development.

2. Information and Methodology

2.1. Information

2.1.1 General Information 175 students of the 2021 class and 128 of the 2022 higher vocational nursing students of our hospital were randomly selected as the survey subjects. There was no difference in students' enrollment score, age, and gender composition ratio (P>0.05). The syllabus and teaching hours are the same, with only differences in teaching modes. The total number of hours of this course is 70 hours, including 48 hours of theory courses and 22 hours of laboratory courses.

2.1.2 Observation Indicators Before the start of the course, the students' self-directed learning ability and critical thinking ability were surveyed through the questionnaire star, and after the course, the students' independent learning ability, critical thinking ability and blended teaching evaluation were investigated through the questionnaire star. At the end of the course, the teacher will assess the students' theoretical knowledge and experimental operation, and the final comprehensive score = theoretical test paper score * 60% + experimental operation score * 40%.

2.1.3 Statistical processing SPSS25.0 statistical software was used for statistical analysis, and the mean ± standard deviation ($\bar{x} \pm s$) indicates that the count data is expressed in the number of cases and percentages. Comparison before and after teaching t Inspection P<0.05. The difference was statistically significant.

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2.2. Methodology

2.2.1 Pre-class preparation stage (1) Resource integration and release: In the pre-class preparation stage, teachers need to carefully integrate the teaching resources of the basic anatomy course, which covers detailed courseware, vivid videos and clear maps. With the help of an advanced digital teaching platform, these valuable teaching resources can be quickly and widely released for students to learn anytime, anywhere. In the lesson preparation stage, teachers fully access AI artificial intelligence technology to accurately label and scientifically classify teaching resources. This innovative measure greatly facilitates the rapid retrieval and hands-on practice of anatomical resources according to students' individual learning needs and interests, thereby improving the efficiency and pertinence of self-directed learning. (2) Assignment of pre-study tasks: Teachers will assign specific pre-study tasks in advance through the digital human stem7.0 platform, and clearly point out the learning objectives and difficulties of each chapter. This way, students have a general idea and anticipation of what they are going to learn before class. Once students have received the pre-study assignments, they can use the published teaching resources for in-depth self-directed learning. In the process, they record their doubts and confusions to prepare them for classroom learning, discussions, and experiments. This pre-class preview mechanism not only exercises students' independent learning ability, but also lays a solid foundation for subsequent classroom interaction and troubleshooting.

2.2.2 Classroom Teaching Stage (1) Interactive Teaching: In the classroom teaching stage, teachers use the advanced teaching platform of Digital Human STEM7.0 platform to comprehensively and deeply display basic anatomy knowledge in the form of multimedia. Through the presentation of pictures and texts, the combination of audio and video makes the abstract and complex anatomical concepts intuitive and easy to understand. In order to further enhance students' understanding and memory, real-time interactive sessions such as impromptu questions and group discussions are also set up in the classroom, which not only effectively enhances students' participation in class, but also stimulates their enthusiasm for active thinking and communication, thereby consolidating and deepening their mastery of anatomical knowledge. (2) Virtual reality practice: The virtual digital human technology and virtual reality (VR) technology have been innovatively introduced, and the virtual anatomy laboratory has been successfully constructed. In this virtual environment, students can perform anatomical simulations to deepen their understanding and memorization of the human body.

2.2.3 After-school consolidation stage (1) Learning outcome assessment: In the after-school consolidation stage, teachers make full use of the digital human stem7.0 platform to release targeted review materials and online test questions, and students can obtain professional growth points by taking photos and uploading their own anatomical works, so as to form a wisdom resource library that is visible to classmates and can be evaluated by teachers. These online resources not only cover basic theoretical content, but also include case studies of practical application scenarios, aiming to deepen students' understanding and memory of knowledge points. By completing these online tests and sharing them online, students are able to independently test their learning effects and identify and make up for their knowledge blind spots in a timely manner, so as to ensure a comprehensive grasp of anatomy. (2) Teaching improvement and optimization: Teachers will provide personalized tutoring resources and learning suggestions for each student according to their learning progress and online test scores. This teaching method of teaching students according to their aptitude helps students to make special breakthroughs in their personal weaknesses. At the same time, when students encounter problems or doubts, they can ask questions or ask teachers for help through the digital platform at any time. Teachers will respond in a timely manner, provide detailed answers and guidance to ensure that students' learning progress is not hindered, and effectively improve the efficiency and quality of students' anatomy learning.

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2.2.4 Assessment and Feedback Phase (1) Assessment of Learning Outcomes: In the Assessment and Feedback Phase, teachers will conduct regular and comprehensive assessments of students' anatomical learning outcomes. This assessment focuses not only on students' online engagement, but also on their test scores and practical skills. In order to analyze the learning status of students more scientifically, combined with the labeled learning information of the digital human STEM7.0 platform to dig deep into the learning data of students at each stage, and provide accurate and comprehensive teaching feedback for the specific progress of the anatomy experiment. (2) Teaching improvement and optimization: Based on the evaluation and feedback of students' learning outcomes, teachers will adjust the integrated teaching-learning-evaluation-modification scheme based on the digital human STEM7.0 platform, and optimize the teaching content in a timely manner according to the differences in learning conditions. This kind of smart teaching can not only better meet the personalized learning needs of students, but also effectively improve the quality of smart teaching, making the digital teaching of basic anatomy more efficient, accurate and diverse.

3. Results

3.1. Basic Performance

3.1.1 Basic learning data from the Digital Human STEM7.0 platform integrating teaching, learning, evaluation and reform shows that most students can embrace the smart anatomy classroom, have a positive learning attitude, and show good integrated learning results. According to the statistics of the course management background, 100% of the students checked the course announcements and chapter information, showing a high degree of attention. In the self-learning of teaching materials such as videos and courseware, 97% of the students completed the browsing of all the resources, and the total learning score of the digital human stem7.0 platform was (89.09±5.48), which showed that the students were invested and concerned about smart teaching. At the same time, the scores of task points, chapter detection and course discussion also reached (79.14± 4.21), (96.41±6.18) and (17.63±5.79) respectively, and the average total score of students in the basic anatomical wisdom course was (91.70±3.32) points, reflecting the good effect of the construction of the basic anatomical wisdom course.

3.1.2 Final Comprehensive Score The final comprehensive score of the students was (86.70±6.87), which further verified the solid results achieved by the students in the course learning.

3.1.3 Students' self-directed learning ability before and after teaching Through the teaching practice of the basic anatomy wisdom course, students' self-learning ability in learning motivation, self-management, learning cooperation and information literacy has been significantly improved. Compared with the pre-teaching period, the progress in these aspects was statistically significant (P<0.05), which fully demonstrated the positive effect of the basic anatomy wisdom course model in improving students' self-directed learning ability (see Table 1).

Table 1: Comparison of Students' Self-Directed Learning Ability Scores Before and After Teaching ($\bar{x} \pm s$, points)

Dimension	Before teaching	After teaching	t	P
Learning Motivation	27.89±4. 12	29.00±3.80	3.447	0.001
Self-Management	37.36±4.23	39.49±4.90	5.002	<0.001
Collaborative Learning	16.54±3.05	17.76±2.27	5.586	<0.001

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Information Literacy	19.75±2.42	21 .66±2.82	8.897	<0.001
Self-Directed Learning Ability	104.84±10.26	107.91±11 .74	3.429	0.001

3.1.4 Comparison of Critical Thinking Ability Scores Before and After Teaching After blended wisdom anatomy teaching, students' critical thinking ability has been significantly improved. Compared with the pre-teaching period, the students showed higher levels of truth-seeking, open-mindedness, analytical ability, systematization ability, self-confidence in critical thinking, intellectual curiosity, and cognitive maturity, and these differences were statistically significant (P<0.05). This suggests that blended anatomy teaching has a positive impact on students' thinking skills (see Table 2).

3.1.5 Student Satisfaction Evaluation Students' satisfaction with blended smart anatomy teaching is also very high, with more than 97% of students approving the combination of online and offline smart teaching, which further proves the effectiveness and popularity of the newly constructed blended smart anatomy teaching (see Table 3).

Table 2: Comparison of students' critical thinking ability scores before and after teaching ($\bar{x} \pm s$, points)

Dimension	Before teaching	After teaching	t	P
Pursuit of Truth	31.96±4.85	33.79±5.71	4.601	<0.001
Open-mindedness	37.11±4.94	38.38±4.81	3.206	<0.001
Analytical Proficiency	40.46±5.21	42.10±4. 13	4.294	<0.001
Systematization Capability	36.45±4.12	37.95±4.05	4.520	<0.001
Confidence in Critical Thinking	40.12±3.56	41.69±3.94	5.147	<0.001
Intellectual Curiosity	40.85±4.82	42.83±4.61	5.168	<0.001
Cognitive Maturity	35.89±6.24	37.36±6.98	2.733	<0.001
Critical Thinking Competence	267.14±22.24	274.08±23.78	3.710	<0.001

Table 3 Satisfaction with online and offline blended teaching [n(%), n=303]

Project	Totally agree	Most agreed	Basically agreed	Not quite agree	Completely disagree
During the internalization and absorption phase, participants demonstrated consistent engagement with online learning platform videos and completed	72(23.8)	96(31.7)	117(38.6)	15(5.0)	3(1.0)

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post-class assignments.					
Video lectures and chapter quizzes effectively facilitated knowledge acquisition and mastery.	76(25.1)	106(35.0)	104(34.3)	15(5%)	2(0.7)
The online learning platform demonstrated efficacy in monitoring and facilitating academic progress.	81(26.7)	94(31.0)	102(33.7)	21(6.9)	5(1.7)
This modality contributed to enhanced learning motivation.	66(21.8)	78(25.7)	112(37.0)	42(13.9)	5(1.7)
The system showed potential for optimizing learning efficiency.	67(22.1)	83(27.4)	114(37.6)	33(10.9)	6(2.0)
Significant improvements in information retrieval capabilities were observed.	80(26.4)	90(29.7)	114(37.6)	16(5.3)	3(1.0)
The intervention positively impacted self-directed learning abilities.	77(25.4)	94(31.0)	112(37.0)	16(5.3)	4(1.3)
Notable increases in classroom engagement and proactive participation were documented.	62(20.5)	84(27.7)	117(38.6)	35(11 .6)	5(1.7)
Implementation of the online learning	85(28.1)	84(27.7)	119(39.3)	12(4.0)	3(1.0)

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platform for post-instructional review yielded substantial pedagogical benefits.					
Please rate your satisfaction level with the foundational anatomy intelligent curriculum.	116(38.3)	87(28.7)	89(29.4%)	9(3.0%)	2(0.7%)

4. Discussion

4.1. Discussion on the effectiveness of the basic anatomy curriculum system based on the integration of teaching, learning, evaluation and reform

Through teaching practice and data analysis, the basic anatomy curriculum system based on the integration of teaching, learning, evaluation and reform has achieved remarkable results. The final comprehensive score of the surveyed students was (86.70±6.87) points, which shows that this model provides a rich and diverse learning path and interactive way for basic anatomy teaching through the integration of online and offline teaching resources, digital teaching platform of digital human stem7.0 platform, AI technology, virtual reality technology, etc., which improves students' learning interest and participation, and effectively promotes the improvement of students' independent learning ability and critical thinking ability in basic anatomy courses [5]. According to the results of the learning outcome evaluation, the students achieved excellent results in video learning, task point completion, chapter testing, and course discussion, and the average overall score reached a high level. After the teaching of basic anatomical wisdom, students' critical thinking ability has been significantly improved, which further verifies the effectiveness of the model.

4.2. Recommendations

4.2.1 Improving Teachers' Smart Education Technology With the continuous development and application of smart education technology, teachers need to constantly update their knowledge and skills to meet new teaching needs. It is suggested that teacher training should be strengthened, and teachers' application ability in smart education technologies such as digital interactive microscopy systems, integrated signal acquisition and processing, and human digital images and models should be improved, and basic anatomy wisdom teaching resources should be further innovated and promoted [6-7] .

4.2.2 Pay attention to students' performance in the whole process of smart teaching Students' digital learning level is one of the key indicators of the success of smart teaching. Teachers should pay close attention to students' academic performance in the whole process of basic anatomy wisdom teaching, keep abreast of students' needs and confusions in online learning, and provide personalized guidance and support on the use of the digital human stem7.0 platform system and its equipment, so as to help students solve problems in basic anatomy digital learning in a timely manner. At the same time, combined with the big data monitoring of the digital human STEM7.0 platform, the analysis and mining of students' learning data are strengthened, and accurate teaching suggestions are provided for the application of anatomical experiments and anatomical resources [8].

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4.2.3 Continuous optimization of smart teaching mode With the iterative update of smart education equipment and the development of medical education, the smart teaching mode of basic anatomy course also needs to be continuously adjusted and optimized. It is suggested that teachers should continuously update and improve the production of digital teaching courseware for human anatomy according to students' learning needs and feedback, combined with cutting-edge technologies and research results in the medical field, so as to ensure the close integration of teaching and medical development. At the same time, compared with the current teaching software, specimens and physical specimens on digital platforms, the collection, editing and application of clinical digital data on anatomy need to be continuously connected to more diversified smart teaching platforms, so as to inject new vitality and impetus into basic anatomy teaching [9] .

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