

Exploration and Implementation of Values Education in Medical Cell Biology Courses

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Abstract: Medical Cell Biology is a discipline arising from the profound integration of medicine and cell biology, serving as a required foundational course in modern medical education. Curriculum Ideological and Political Education (CIPE) is an educational strategy for systematically incorporating values education into the diverse disciplines. In China, it serves as a crucial pathway for implementing the core goal of fostering moral character at higher education institutions, as well as a key measure for achieving the all-round education. In recent years, we have steadily advanced the systematic construction of CIPE instructional design, addressing the challenges and difficulties encountered in the values education of the Medical Cell Biology course. These approaches are based on the unique curricular features, the professional orientation and student characteristics of our institution. Throughout this process, we have built a "Three-Three-Three" CIPE model, developed a diverse and comprehensive evaluation system, and focused on improving teachers' capacities in values education. This has organically unified the value guidance and professional knowledge transfer.

1. Introduction

In international higher education, the "educational island" phenomenon—the structural separation between professional training and values education—remains a persistent challenge [1]. Depending on their governance contexts, nations respond in significantly different ways. A centralized governmental initiative called "Curriculum Ideological and Political Education" (CIPE) is systematically addressing this worldwide issue in the Chinese context [2]. In contrast to conventional independent political courses, CIPE policy requires values education to be incorporated into all academic fields, covering a variety of topics from national identity to professional ethics [3-5]. Consequently, in the broader context of China's new medical education reform, the fundamental task of fostering moral character and the comprehensive reform of all-round education, as well as guided by the professional spirit of healthcare in the new era, CIPE has

inevitably become a developmental trend in China's higher education. This trend also imposes new requirements and tasks on the instruction of medical professional courses.

We are dedicated to developing high-quality application-oriented medical talents with solid foundational medical knowledge, competent clinical skills and sound professional ethics in line with our institution's developmental orientation, disciplinary traits and educational principles. In light of this goal, professional instructors now urgently need to address how to improve design innovation in professional course instruction, transform professional content into vivid or concrete teaching vehicles for values education based on the course's perspective, theories and methodologies, and thus subtly integrate ideal-belief spiritual guidance within the knowledge transmission process.

In light of this, we have actively explored the incorporation of values education into the teaching of Medical Cell Biology. The orientation and objectives of our institution's Medical Cell Biology course are explained in this paper, along with the challenges of CIPE considering actual student profiles and disciplinary characteristics, specific exploratory pathways for integrating CIPE, and a summary of the results, flaws and future directions for improving CIPE implementation within professional courses. Additionally, this study proposes specific recommendations for the application of CIPE, which can serve as a useful reference for medical cell biology instructors seeking to effectively integrate values education into lesson plans.

2. Orientation and Objectives of Our Institution's Medical Cell Biology Course

Cell biology is a discipline that studies various life activities of cells at the microscopic, submicroscopic and molecular levels. It is also one of the areas of the life sciences which has advanced the fastest. Medical Cell Biology is a discipline arising from the integration of medicine and cell biology. It studies the principles governing different life processes in the human body, as well as their pathogenesis and prevention/treatment strategies, and is based on theoretical knowledge of cell biology. Medical cell biology's theories and knowledge have permeated every facet of the medical sciences, providing an essential basis for comprehending extensive human life phenomena and resolving various medical issues. Therefore, it is a fundamental professional course in modern medical education.

This course enables students to systematically master the pertinent theoretical knowledge of Medical Cell Biology and comprehend the disciplinary achievements or frontier trends via lectures on the fundamental structural characteristics of cells, the principles governing life processes and their underlying mechanisms. Thus, it establishes the prerequisites for taking advanced basic or clinical medical courses, conducting scientific research and practicing medicine. The course content stresses staying up to date, has clear modern elements, as well as closely combines country conditions, student profiles and disciplinary characteristics. Concurrently, it delves deeply into the CIPE components that can be embedded in professional knowledge, and then effectively and implicitly incorporates them into the teaching process. We aim to gently assist students in developing appropriate learning attitudes and optimistic perspectives on life, values, and the world through the excellent instruction of faculty members and the accumulation of pertinent knowledge both within and beyond the classroom. Our goals are to improve medical undergraduates' comprehensive competencies, health awareness, creative abilities and teamwork skills, as well as to instil the demands of the modern healthcare professional spirit. We work to improve their sense of mission and responsibility in medicine as well as their professionalism, which is marked by benevolence and clinical competence, saving lives and alleviating suffering, boundless love and selfless devotion. These provide a strong basis for building the "Knowledge—Ability—Quality" trinity system for developing exceptional medical talent.

3. CIPE's Special Value and Inherent Logic in Medical Cell Biology

China's CIPE is a methodical educational endeavour based on socialist core values, in contrast to the western general education model that stresses the internalization of professional ethics. Its essential ability to unite the healer's innate duty of "saving lives and alleviating suffering" with the political belief of "Serving the People" within the strategic framework of the "Healthy China" mission makes it irreplaceable in China's medical talent cultivation. By methodically bridging the gap between professional training and value shaping in traditional medical education, this gives modern medical students a strong sense of mission drive and unambiguous value coordinates. Medical education itself is inherently rich in the pursuit of "truth, goodness and beauty." CIPE is a deep activation and methodical manifestation of the fundamental requirements inherent in the medical professional spirits, scientific virtues and national missions rather than a simple "professional training + political education" addition. Therefore, we aspire to use the exquisite knowledge of life as soil and the scientific virtues alongside ethical deliberation as sunlight and water, ultimately fostering in students the natural development of a complete personality marked by rationality and compassion, reverence and responsibility, and the capacity to recognize the beauty of life within its microscopic mechanisms.

4. Challenges with CIPE for Our Institution's Medical Cell Biology Course

Previous teaching methods have been relatively inefficient in motivating and directing students' values, personal traits, learning attitudes and emotions. This is due to several factors, including the large number of majors taught, insufficient class hours, rapidly evolving course content, as well as the substantial and abstract knowledge of the Medical Cell Biology course at our institution. Furthermore, complex student profiles, a shortage of resources for values education, and the difficulties in naturally integrating values education with professional teaching pose many challenges to the practical implementation of CIPE.

4.1. Multifaceted, Cross-Cutting Student Profile

First-year freshmen are the main target audience for our institution's Medical Cell Biology course, which is delivered during their first semester. Typical "multi-dimensional cross-cutting" traits are included in the student profile: ①cognitive growth stage: as students go from exam-oriented learning to university students' self-directed inquiry, their critical thinking and knowledge transfer abilities continue to grow; ② knowledge structure disparity: between 15% and 20% of pupils have a liberal arts background, lacking a high school biology curriculum and an intuitive grasp of micro-level terms like "cell" and "gene"; ③ professional identity differentiation: while students in clinical majors are highly motivated and have clear goals, certain non-clinical majors frequently express perplexity about the course's practical utility ("Why study this?"), which leads to a lack of intrinsic desire for learning.

4.2. Insufficient Resources and Teacher Awareness in Values Education

Professional course instructors, whose teaching lies outside the scope of ideological and political education, are influenced by the traditional medical education model that "prioritizes knowledge over ideology" and by the prevailing "grade-first" assessment mindset. Therefore, they tend to emphasize students' academic achievement much more heavily while largely ignoring values education. This has led to the long-term insufficient attention paid to CIPE instruction. Teachers usually lack experience with excavating CIPE elements, both in depth and breadth. This results in a

scarcity of relevant teaching resources for values education, as well as a lack of methodical organizing. Some teachers have limited cognition and practice with CIPE, demonstrating reluctance or inability to use it effectively. They have yet to successfully integrate theoretical information transfer with value guiding, nor have they fully recognized the imperceptible influence that their own professional ethics and values may have on students during the teaching process.

4.3. Difficulties of Organically Integrating Values Education with Professional Teaching

The Medical Cell Biology CIPE system's ineffective systematic design results in a lack of depth and breadth in the integration of CIPE elements with expert knowledge. Teachers find it challenging to properly identify the intrinsic sites of convergence between values education and professional knowledge since a thorough, in-depth excavation of the CIPE aspects inherent in the course has not been accomplished. Therefore, it is imperative that educators become more adept at incorporating components for values education into their lessons. Long-term monotonous teaching approaches can also impede beneficial teacher-student connection, while an unsatisfactory teaching assessment system is unable to completely assess the educational effects of professional course instruction. The CIPE system's design should take into account all of the aforementioned concerns, which should be handled, enhanced and optimized over time.

Therefore, we have followed a student-centred strategy and a diverse teaching philosophy in light of the new medical education reform and all-round education reform, as well as the healthcare professional spirit of the new era. Enhancing teachers' professional competence, forming collaborative teaching teams, creating a CIPE case database, integrating and sharing teaching resources, implementing blended online and offline teaching methods, encouraging research to feed back into teaching, fusing theory and practice, and implementing diverse and comprehensive teaching evaluation are just a few of the creative practical pathways that we have adopted. We have developed the "Three-Three-Three" CIPE integration model as a result of our efforts (see Figure 1). This approach successfully accomplishes the goals of new medical education reform by incorporating implicit contents for values education into the curriculum.

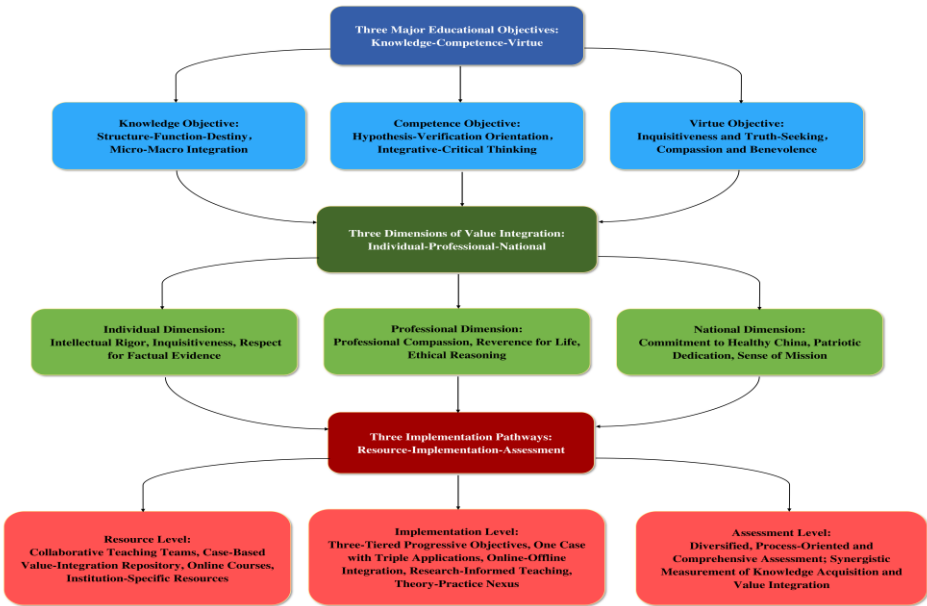


Figure 1: Architecture of the "Three-Three-Three" CIPE Education System: the three objectives determine the overall direction of cultivation, the three dimensions form the content framework, and the three pathways act as implementation safeguards.

5. Implementation Pathways to CIPE in Medical Cell Biology

5.1. Establishing Collaborative Teaching Teams and Developing a CIPE Case Database

Continuously improving teachers' professional competence and moral development is inextricably linked to ensuring overall educational excellence. Higher education institutions should place a special emphasis on developing instructors' emotional intelligence, ethical values, and moral judgment [6]. In order to tackle pragmatic concerns like "insufficient teacher capacity for CIPE integration" and "scarcity of elements for values education," we implemented a two-pronged strategy: on the one hand, we increased teachers' awareness of values education and their capacity to excavate pertinent elements through collective lesson preparation, educational thought seminars and casual meetings; on the other hand, we concentrated on forming collaborative teaching teams, which successfully shorten teachers' independent exploration cycles through regular frequent and experience sharing. Practice showed that rigorous teacher training and team building could effectively improve teachers' professional knowledge and teaching skills, resulting in better teaching quality and significantly higher student engagement and learning outcomes.

Furthermore, the Medical Cell Biology textbook utilized at our institution has 14 chapters that may be divided into three key knowledge modules: introduction to cell biology, basic cell structure and function, and basic cell life activities. Numerous CIPE components can be found in the cell biology research methodologies and accomplishments mentioned in these modules. Based on the educational objectives of Medical Cell Biology and the features of specific professional knowledge points, we organized a collaborative effort to thoroughly uncover CIPE elements. We organically linked social life, current political hotspots, classic cases, scientific stories, and research breakthroughs with professional knowledge to create a "Medical Cell Biology CIPE Teaching Case Compendium" (see Figure 2). This ensures that CIPE elements are present throughout each teaching chapter. By clearly annotating the precise material, applicable chapters, specific CIPE elements embedded, and approaches for incorporating them into classroom teaching, all instructors have access to comprehensive cases as reference materials for values education. This effectively leverages the synergy of explicit and implicit education, enabling the concurrent advancement of professional courses and values education while achieving synergistic educational outcomes.

5.2. "Tiered-Differentiated" CIPE Integration Design Using Multi-Dimensional Student Profiles

In our classroom teaching, we have divided the objectives for values education into three progressive stages depending on the student profile traits (see Figure 3). This ensures that all students may reach the objectives while simultaneously allowing high-achieving students to be fully engaged, thereby overcoming the frequent CIPE difficulties such as "one-size-fits-all" or "forced integration" approach.

In addition, to address different sorts of student profiles, we devised differentiated CIPE integration approaches. For liberal arts students who may lack micro-level imagination but are strong in abstract reasoning, we used "analogical teaching" and "visualization teaching" methodologies. These approaches helped them build fundamental knowledge, lower the threshold of understanding and reduce their learning anxiety. To reduce confusion and enhance enthusiasm among non-clinical major students, we adopted a "professional relevance" entry-point method. For clinical medicine students, we utilized "problem-based learning (PBL)," "frontier literature review" and other strategies to extend CIPE from the classroom to extracurricular settings, as well as from teacher-led teaching to student-initiated exploration, thereby raising expectations and expanding horizons.

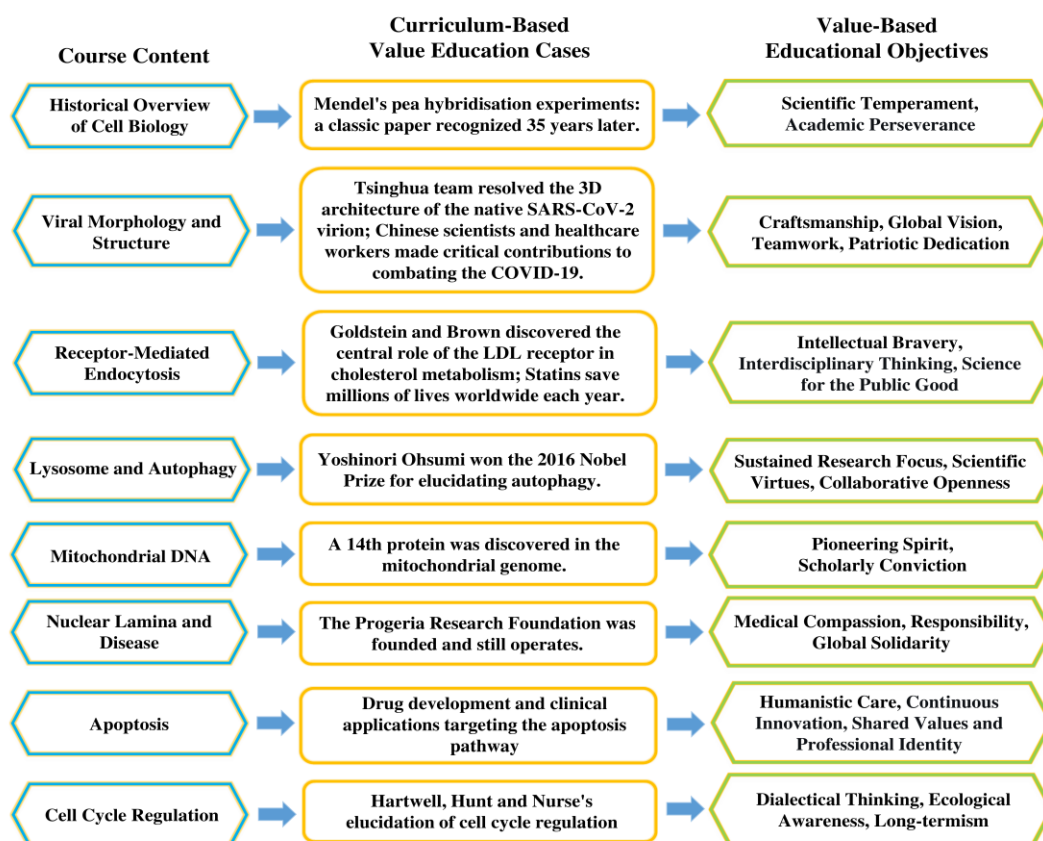


Figure 2: Medical Cell Biology CIPE exemplary teaching case compendium (excerpt).

Here, using "apoptosis" as an example, we will quickly describe the differentiated teaching strategy of "one case, three applications" used in classroom practice. For all students, we begin with a brief animated movie of Sydney Brenner, the "father of the nematode," disclosing the genetic regulatory mechanism of programmed cell death, to impart the scientific virtues of patient dedication to long-term research. For liberal arts students, we employ the metaphor that "apoptosis is not the failure of life, but an elegant exit" to assist them in overcoming cognitive obstacles by displaying pictures of tadpole tail disappearance and the loss of interdigital webbing in human embryos. For clinical medicine students, we present the most recent research findings on apoptosis and tumour-targeted drugs, encouraging them to investigate the double-edged sword effect of "excessive apoptosis or insufficient apoptosis," and we pose the question: "If you were an oncologist, how would you formulate an individualized treatment strategy while balancing the efficacy and safety of pro-apoptotic drugs?" This allows the same knowledge point to cover a variety of topics for values education, from "scientific attitude" and "ecological philosophy" to "clinical reasoning."

5.3. Reforming Teaching Methods and Implementing Diversified Instruction

To successfully implement CIPE's innovative education model, we adhered to the principle of "student-centred approach," fully utilized contemporary information-based teaching platforms and resources, and consistently strengthened the organic integration of in-class and out-of-class, online and offline teaching.

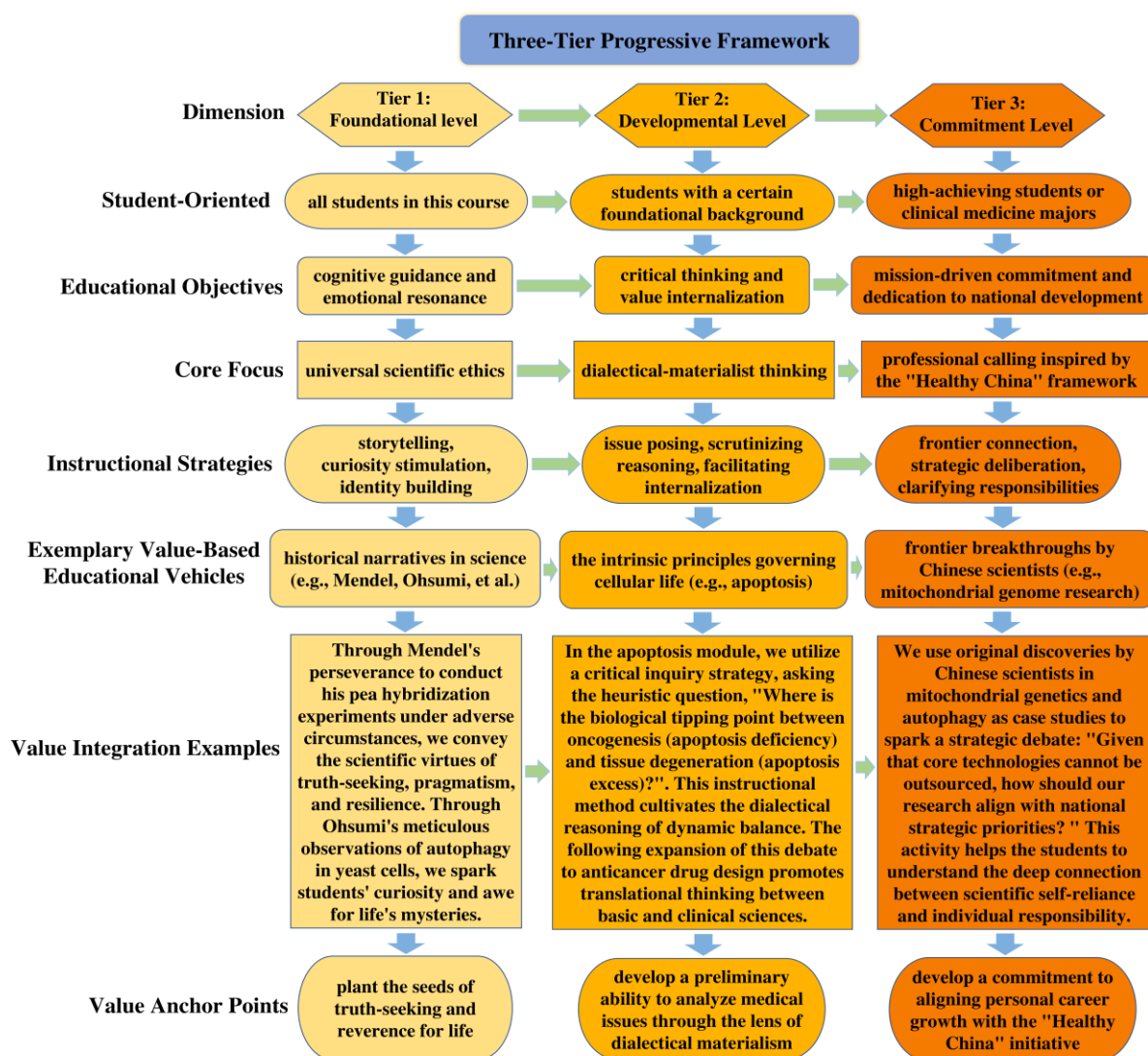


Figure 3: "Three-Tiered" progressive CIPE education system for Medical Cell Biology.

Heuristic teaching, case-based teaching, small-group cooperative learning, discussion-based and debate-based teaching, problem-oriented teaching, and flipped classrooms were just a few of the strategies that were widely used throughout the three-stage teaching structure of pre-class, in-class and post-class to combine theoretical and practical teaching. These approaches guided students toward intuitive understanding and personal experience by incorporating elements for values education such as humanistic care, patriotic dedication, medical benevolence, respect for life, health and environmental sustainability.

Simultaneously, we expanded the temporal and geographical aspects of course instruction by constantly improving the building of curricular resources on the institution's integrated platform. Multiple forms were adopted, such as graphics and texts, animations, videos, discussions and original micro-lecture videos for self-directed learning, with current political affairs, hot news, and real-life examples integrated into these forms to strengthen teacher-student interaction. As a result, it can boost students' capacity for independent learning, increase learning effectiveness, broaden frontier horizons, and stimulate their interest in learning or research.

In addition, we have upheld the idea that research innovation should be incorporated into instruction. We integrated contents for values education such as "national strength hinges on

scientific and technological strength" and "concentrate resources on major tasks," by sharing frontier disciplinary developments, scientists' stories, teachers' personal research and visitation experiences. This stimulated students' patriotic enthusiasm and national pride, as well as fostered their sense of responsibility, innovative thinking ability and scientific research thinking ability.

Furthermore, in offline laboratory instruction, we promoted students' awareness of unity and cooperation, revere and safeguard life, boundless love and selfless devotion, unity of knowledge and action, along with their capacity of integrating theory with practice and solving real-world problems through students' hands-on experimental practice and teachers sharing experimental insights.

The thorough use of these different teaching methods created a large operating space and successful implementation paths for the deep integration of CIPE aspects into professional teaching. Figure 4 selectively displays several CIPE cases and the design rationales used by the author in teaching, with the goal of providing some references for instructional practice in this field.

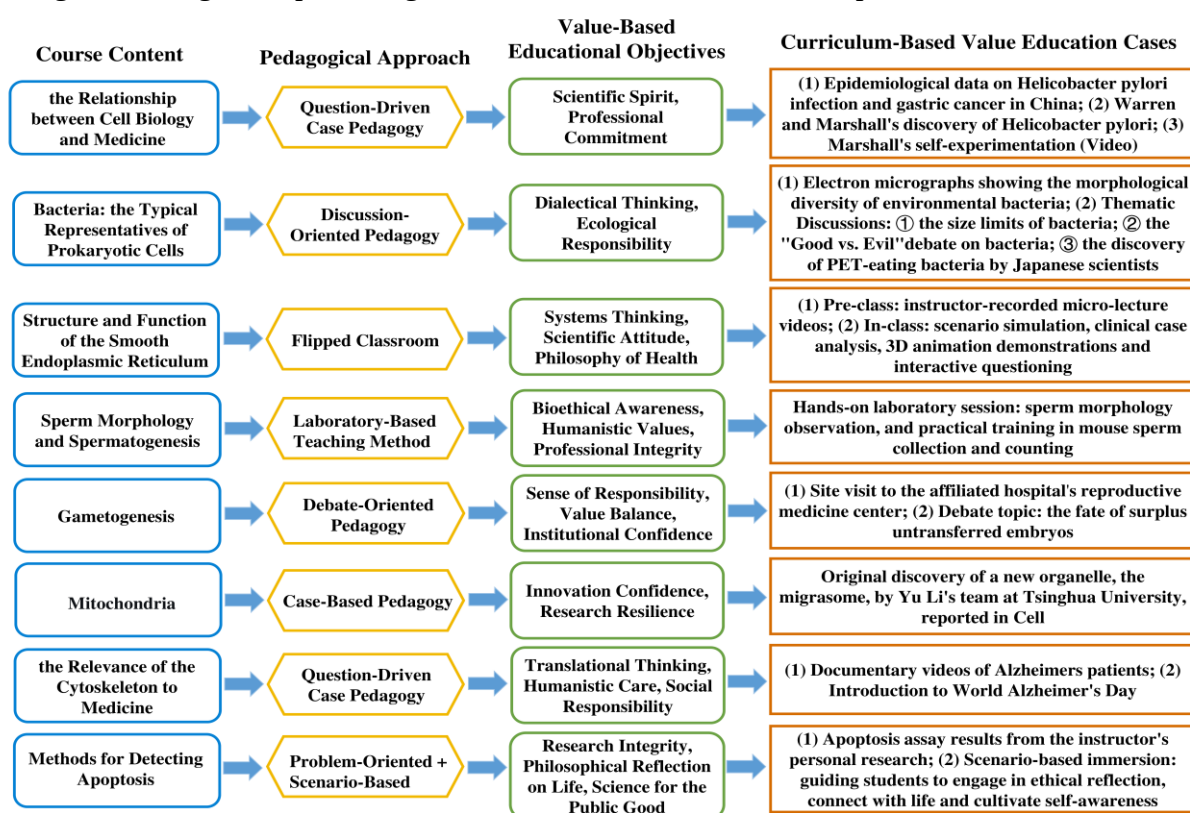


Figure 4: Design and integration strategies for selected CIPE teaching cases.

6. Establishing a Diversified and Comprehensive Evaluation System

We have reformed the traditional assessment model, establishing a diverse and comprehensive evaluation system that equal emphasis is placed on knowledge and skill assessment & values education evaluation, on theoretical assessment & practical evaluation, and on final examinations & process-based evaluation. We aim to achieve an educational impact in which "Moral education follows a proper path, like spring breeze and rain nurturing life silently."

In order to thoroughly and multidimensionally assess the efficacy of CIPE in Medical Cell Biology, instructors can employ a variety of methods in their teaching practice, including classroom performance, group discussions, practice reports, case analyses, research reports and questionnaires

(Table 1 excerpts some students' reflective course statements). Professional teachers can also add CIPE to the assessment scope as part of the usual performance in order to represent students' comprehension and mastery of professional knowledge while emphasizing CIPE. However, individual subjective characteristics can have a significant impact on the efficacy of moral education assessments. As a result, future CIPE teaching reform practices will still require more exploration and improvement of moral education assessment styles.

Table 1: Excerpts from students' reflective texts on the Medical Cell Biology course.

Text	Key Themes	Excerpts from Students' Value-Based Reflections
Text 1	cases discussion on Alzheimer's disease	In addition to making sure patients with Alzheimer's disease are physically safe and comfortable, it is our duty to protect their human dignity and respect the life stories etched in their fading memories. The genuine warmth of medicine is found not just in extending life but also in the willingness to enter their increasingly fuzzy worlds and still address them with kindness and respect.
Text 2	the discovery of lysosomes: a scientific journey of curiosity and perseverance	One thing is made extremely evident by the discovery of the lysosome: scientific success depends not only on the capacity to recognize subtle occurrences but also on an unwavering, persistent spirit of inquiry that won't give up until the truth is discovered.
Text 3	putting autophagy on the right track: Yoshinori Ohsumi	Let Professor Ohsumi serve as our mentor: pursue greatness, be open and respectful of the world, and dedicate your talents to your country. Only then will Chinese academics be able to escape the trap of isolation and, by cooperation, develop into the capable leaders that our country's scientific future requires.
Text 4	Katalin Karikó and Drew Weissman: mRNA vaccine pioneers	As medical students, we should take inspiration from these two scientists: Karikó's genuine heart that stayed hopeful and loyal to her initial goal; Weissman's compassionate heart to heal and save lives; and their attitude of enduring solitude in research. We must do our best to fulfil our responsibilities and remain devoted to our original objective.
Text 5	David Julius and Ardem Patapoutian: discoverers of temperature and touch receptors	For innumerable Nobel laureates, science is a lifetime calling rather than just a vocation. The real gems of the scientific spirit are their curiosity, bravery and tenacity. The character of scientists is to embrace the world while keeping one's nation in mind, to aspire for the stars while remaining firmly grounded—a virtue that we as the future generation must foster.
Text 6	Harvey J. Alter: the hunter of Hepatitis C virus	We should follow Alter's lead on our own journey to become doctors by exploring a question whose answer may be obscure for years, and believing that thorough investigation will eventually yield clarity. Only by consistently learning from these predecessors can we understand our own life's value, and contribute to the growth of medicine and pharmacy.

7. The Reform's Results

We have used a variety of pedagogical strategies in recent years, based on the Medical Cell Biology course material, to naturally incorporate value guidance into the teaching of disciplinary knowledge. This has allowed us to completely abandon rigorous political didacticism and achieve the simultaneous advancement of knowledge transmission and value guidance. With attendance rates maintained at almost 98% throughout the semester and a significant increase in the average amount of classroom interaction, students' learning interest and engagement have significantly increased after the reform. Additionally, students have shown a significant increase in the number and quality of honours they have won in various kinds of discipline-specific competitions.

Three dimensions—"scientific virtues and attitudes," "professional identity and medical ethics," and "sense of mission and commitment to the nation"—were surveyed by the author among students in three taught classes (N=90). The corresponding recognition rates were 84.15%, 82.65%, and 82.80%. Moreover, 83.00% of students expressed satisfaction with the CIPE incorporated into the course, indicating their growing acceptance of this integrative pedagogical model. This change

was further supported by students' reflective essays about the course: which their attention switched from the "knowledge points" themselves to deeper observations on "scientific virtues," "humanistic care" and "selfless dedication."

8. Teaching Summary and Reflection

In higher education institutions, CIPE is an important tool for values education. In future teaching practice, we should base our efforts on the features of student learning, the structure of professional knowledge and the defined instructional objectives. On the one hand, we should continue to broaden the depth, breadth and humanistic resonance of the Medical Cell Biology course, as well as encourage the spontaneous integration of elements for values education with academic knowledge. On the other hand, we should proactively widen the pedagogical horizon of CIPE, as well as improve the ability to implicitly incorporate elements for values education.

Additionally, we will look into how contemporary information technologies, like artificial intelligence and smart teaching, may be used to optimize the content of instruction and diversify its design. For instance, AI teaching assistants may be used to present students with personalized case studies for values education. Students with a background in the liberal arts can be encouraged to read more stories about the history of science, while students who want to work in medicine might be encouraged to read more doctor-patient empathy cases. As an alternative, a more scientific basis for formative evaluation of values education can be provided by using natural language processing techniques to intelligently analyse the emotional, attitudinal and value-based expressions in students' laboratory reports or case analyses.

Through employing these strategies, we can improve students' natural acceptance and active participation, stimulate their enthusiasm and intrinsic motivation, sincerely implement the educational philosophies of whole-process education, all-round education and all-curriculum education, and ultimately create a synergistic educational effect whereby "1+1>2" is achieved.

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