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Empowering Career Planning for Generation Z Medical Students through Artificial Intelligence: A Strategy Framework Based on Career Self-Management

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Abstract

With the expansion of artificial intelligence (AI) across education and employment services, its application in the career planning of medical students has gained growing attention. This study constructs an analytical framework based on the Career Self-Management (CSM) model and integrates data from surveys and focus groups with Generation Z medical students. Five major challenges in AI-driven career guidance are identified, spanning goal ambiguity, low trust in algorithms, functional misalignment, lack of feedback mechanisms, and ethical concerns. Accordingly, the study proposes a four-stage, five-strategy framework grounded in the CSM process—cognitive scaffolding, pathway suggestion, behavioral execution, and dynamic feedback. These strategies emphasize transparency, personalization, and developmental continuity. The findings contribute both theoretically and practically to the digital transformation of medical education, offering a path toward more sustainable and student-centered career development supported by AI.

Keywords: Artificial Intelligence, Medical Students, Career Planning, Career Self-Management, Generation Z

Introduction

In an era of increasingly specialized medical education and rapidly evolving employment landscapes, career planning has become a critical component of student development. Medical students today face unprecedented complexity in navigating their future paths, driven by technological disruptions, diversification of roles in healthcare, and shifting societal expectations. This is particularly true for Generation Z, who emphasize personal fulfillment, work-life balance, and proactive career exploration. As a result, their expectations are often more individualized, flexible, and purpose-driven than previous generations (Barhate & Dirani, 2021). Without effective career guidance, many students may struggle with indecision,

low engagement, or misaligned professional goals, which not only affects individual well-being but also hinders workforce development in the medical field. Therefore, integrating systematic and scientifically grounded career planning into medical education is not only an educational imperative but also a strategic necessity.

Recent data highlights the urgency of this integration. A large-scale 2024 survey conducted by Huapu Yifang across more than 60 universities and involving over 30,000 students found that over 82% of university students reported career-related confusion, while more than 72% of 5,000 surveyed high school students expressed having no clear direction for their future. These figures underscore the inadequacy of traditional career guidance models and point to a systemic gap in supporting young people's career development (Huapu Yifang, 2024). In response, China's State Council included the promotion of digital and intelligent transformation of employment services in its 14th Five-Year Employment Promotion Plan, emphasizing the importance of improving both reach and precision in career services (State Council, 2021). In this policy environment, Artificial Intelligence (AI) has emerged as a promising tool to meet the rising demand for effective, scalable, and personalized career support (Bankins et al., 2024).

AI technologies such as big data analytics, machine learning, and natural language processing are reshaping the delivery model of career guidance. These technologies enable tailored services like career interest matching, major selection advice, skill evaluation, and career trajectory prediction. For educators, AI can also serve as an early warning system by identifying at-risk students and predicting dropout tendencies, thus facilitating timely intervention (Pandya & Wang, 2024). Importantly, AI systems can guide students in understanding the competencies required in future labor markets, especially in fields that demand AI literacy and interdisciplinary adaptability. For medical students—many of whom are still in the exploratory stages of professional development—AI-driven career planning offers valuable support for navigating complex, uncertain futures. However, these benefits are accompanied by risks. Overreliance on AI-generated recommendations could weaken students' self-efficacy and decision-making autonomy. Algorithmic biases and data limitations may compromise the fairness and accuracy of advice, and the opacity of AI models raises ethical concerns regarding privacy, accountability, and trust (Bankins et al., 2024; Pandya & Wang, 2024). These challenges must be addressed if AI is to serve as a credible and equitable tool for career planning.

To offer a conceptual framework for understanding and addressing these issues, this study introduces the CSM framework, which defines career development as a dynamic process of goal setting, information gathering, planning, action, and feedback (Hirschi & Koen, 2021). This framework emphasizes individual agency and contextual interaction, aligning well with AI's strengths in providing adaptive, real-time, and personalized feedback. The synergy between AI and CSM provides a compelling model for reforming medical career guidance systems to enhance students' engagement, foresight, and responsiveness in complex professional landscapes.

Based on this theoretical foundation and current technological developments, this study investigates how AI can be effectively integrated into the career planning processes of medical students. It explores AI's role in areas such as academic advising, competency

matching, and reflective support, while also critically examining its limitations in terms of equity, ethics, and practical implementation. Core research questions include: How can AI enhance the scientific and personalized nature of career guidance? How can it help students understand the relationship between AI and future careers? And how can we construct trustworthy AI-based support systems that address concerns around transparency, privacy, and fairness? Ultimately, this study aims to provide theoretical insights and practical strategies for improving career development services in medical education, contributing to broader reforms in higher education and talent cultivation.

Literature Review

Artificial Intelligence Empowering Medical Students' Career Planning

In recent years, AI has seen increasing integration into the fields of education and career development, gradually extending into highly specialized areas such as career planning for medical students. Studies indicate that AI, through algorithm-driven counseling systems, intelligent learning analytics tools, and predictive models, is assisting students in identifying personal strengths, exploring career paths, and adjusting learning trajectories. Compared to traditional counseling approaches, AI demonstrates clear advantages in personalization and data visualization (Bankins et al., 2024; Gedrimiene et al., 2024).

In medical education, AI has been widely applied to support academic progress, provide intelligent assessments, and identify at-risk students, offering more targeted guidance to students navigating diverse clinical specialization options (Abdelhadi et al., 2025; Grow et al., 2025). Members of Generation Z, in particular, are inclined toward autonomous exploration, value quality of life and career meaning, and show high levels of acceptance and engagement with digital career planning tools (Barhate and Dirani, 2021).

Despite these promising developments, AI-powered career planning still faces several practical challenges. On one hand, algorithm-generated career path recommendations may weaken students' capacity for critical reflection, leading to technological dependence or career insecurity (Pandya and Wang, 2024). On the other hand, concerns around privacy invasion, lack of data transparency, and skepticism about the fairness of AI systems continue to hinder trust and broader adoption in educational settings (Köchling et al., 2025; Cheng and Hackett, 2021). Furthermore, in medical education, students' clinical experience, mentorship, and professional networks play an essential role in shaping career decisions. This raises an urgent question of how to integrate AI systems with these human-centered influences in system design (Grow et al., 2025; Anyango et al., 2024). Thus, the role of AI in medical career planning must strike a careful balance between supportive assistance and intrusive intervention, in order to serve as a complement rather than a replacement.

The Career Self-Management Framework

The CSM framework offers a robust theoretical lens through which to understand individual career development behaviors. Rooted in action regulation theory and first proposed by Raabe et al. (2007), CSM conceptualizes career development as a goal-driven, self-regulated process. Greenhaus et al. (2008) later expanded the model into a structured system that emphasizes the dynamic cycles through which individuals define, implement, and monitor career goals and strategies. Hirschi and Koen (2021) further refined the theory, identifying four critical stages: goal setting and development, information search, behavioral

execution and planning, and feedback and monitoring. This model moves beyond the traditional "one-time decision" view of careers, instead portraying career development as an ongoing, multi-stage adjustment process. CSM integrates cognitive, emotional, and behavioral components into a self-directed system. Its widespread application in organizational development, student career guidance, and career transitions demonstrates its adaptability and operational relevance.

In medical education, which features long study durations, highly differentiated tracks, and diverse career entry points, students often face delayed career awareness, limited information access, and sudden decision-making pressures (Anyango et al., 2024; Grow et al., 2025). Many medical students do not begin considering future career options until clinical internships or graduation approaches, showing tendencies of delayed exploration, vague paths, and insufficient awareness. Therefore, introducing the CSM framework into the context of medical student career development is highly relevant. Its four-stage structure aligns closely with the medical education trajectory: establishing early career interests during preclinical studies, gathering information and accumulating skills during clinical stages, focusing and strategizing during the specialization selection phase, and finally adjusting paths based on feedback and outcomes. In this process, students' self-reflection, goal orientation, and self-regulation are systematically activated, helping them shift from passive to proactive planners.

The introduction of AI expands the potential of CSM in medical education. AI can be embedded in multiple stages of the CSM model. For example, natural language processing and big data analysis can support interest assessments, resource matching, and goal recommendations, improving the goal-setting and information-search phases (Shah et al., 2023; Gedrimiene et al., 2024). In the behavioral execution stage, AI can help identify behavioral deviations, recommend internships or research opportunities, and enhance engagement planning. During the feedback stage, dynamic AI-based monitoring systems can generate targeted adjustments and reduce mismatched decisions. Given that medical students often lack sufficient time and resources for career reflection, AI can serve as an external feedback mechanism to strengthen their CSM capabilities. CSM thus provides a theoretical foundation for understanding career behaviors, while also guiding the design of AI systems for precision interventions. The combination of CSM and AI has the potential to build an intelligent, student-driven medical career development ecosystem. To better illustrate the correspondence between the four stages of the CSM model and actual challenges in medical student career planning—as well as possible AI interventions—this study presents the following analytical framework (see Table 1), which outlines the core tasks, common challenges, and AI integration points for each stage.

Table 1
Stages of the Career Self-Management Model in Medical Student Career Development and Corresponding AI Interventions

CSM Stage	Career Planning Focus	Challenges Faced by Medical Students	Potential AI Interventions
Goal Setting and Development	Identify interests (clinical, research, management) and set goals	Limited awareness, vague targets, fragmented understanding of career paths	Interest assessments, AI-based profiling, goal recommendation systems
Information Search	Find relevant information on majors, internships, mentors, and projects	Scattered sources, limited access, reliance on subjective judgment	Data aggregation platforms, recommendation engines, intelligent mentor matching
Behavioral Planning and Execution	Engage in research, internships, skill development, and networking	Lack of systematic action plans, unclear participation paths	Action plan generators, time management tools, opportunity recommendation (e.g., internships, projects)
Feedback and Monitoring	Evaluate outcomes, adjust plans	Absence of feedback mechanisms, low ability to detect misalignment, slow goal revision	Academic behavior analysis, feedback dashboards, dynamic career path tracking tools

Challenges in AI-Driven Career Planning for Medical Students and Focus Group Interview Design

With the continuous advancement of AI in the education sector, its application in medical talent development has moved from theory to practice. In alignment with China's strategic goals of "digitalized education" and "innovation in medical education," the Shanghai Jiao Tong University School of Medicine established a dedicated task force for "AI + Medical Education," aimed at systematically integrating AI into undergraduate medical teaching. This initiative centers on supporting autonomous learning and personalized development, with a focus on curriculum redesign, learning behavior analysis, intelligent learning support, and career development guidance—ultimately creating an innovative model of intelligent medical education tailored to the Chinese context.

According to official sources, the task force drew upon insights from leading domestic and international universities and took into account the multi-phase nature of medical education. Several AI-driven initiatives were implemented, including career interest assessments, pathway recommendations, mentor matching, and internship allocation. These features aim to achieve more accurate talent identification, personalized guidance, and tailored instruction. The system primarily serves undergraduate medical students, especially those from Generation Z, who are technologically adept, focused on personal growth, and inclined toward independent decision-making.

The platform development team emphasized that "AI + Medical Education" is not simply a technological add-on, but rather a deep redesign of the instructional system. The goal is to activate students' initiative, reflective thinking, and career self-management capabilities, enabling them to make informed and timely decisions within the complex landscape of medical careers. Within this context, the present study selects the task force as a representative case and plans to conduct a round of focus group interviews to identify the real challenges and feedback encountered by Generation Z medical students during their use of AI for career planning.

To thoroughly investigate these challenges, the focus group interviews will target three key stakeholder groups: senior medical students who have used the AI platform, to understand their authentic experiences and feedback in career decision-making; platform developers and operators, to explore discrepancies between design intent and real-world implementation; and career counselors, to assess the complementary or substitutive role of AI in educational support systems. Interviews will be structured around five core themes: the effectiveness of goal setting, the reliability of career path suggestions, the usability of system functions, the feedback loop mechanism, and concerns regarding data privacy (see Table 2). These five key challenges are described in detail below.

Table 2
Focus Group Interview Topics: Identifying Key Challenges in AI-Enabled Career Planning for Medical Students

Interview Theme	Sample Questions	Purpose
Career Awareness and Goal Setting	Has the AI system helped you gain clearer insight into your career direction?	Assess whether students have formed a sense of career goals
Acceptance and Trust of AI Recommendations	Do you trust the AI-generated career path suggestions? Why or why not?	Explore boundaries and criteria for Generation Z students' trust in AI
User Experience with the AI System	Which features were most helpful? What problems did you encounter?	Evaluate the system's usability and human-computer interaction quality
Feedback Mechanisms and Path Adjustment	Did the AI system provide timely feedback or revision suggestions based on your real situation?	Assess the system's support in the feedback stage of the CSM framework
Privacy and Data Use Concerns	Are you concerned about how the system uses your personal data?	Identify ethical risks and sensitive points related to data usage
Relationship Between Human and AI Guidance	Do you think AI can replace career counselors? In what aspects, and in what aspects not?	Analyze students' preferences for human-AI collaboration in career support

Lack of Clear Career Goal Setting Among Students

Although the AI system offers interest assessments and career pathway recommendations, many medical students remain in a state of uncertainty and hesitation when first interacting with such platforms. This is particularly common among students in the early stages of their academic journey, who may have limited exposure to clinical practice or

insufficient understanding of available medical career options. As a result, students without a baseline sense of direction often perceive the AI as unhelpful—what may be described as "input without meaningful output." This indicates that the system lacks robust mechanisms to guide students through value clarification, identity exploration, or the initial formation of professional aspirations. Without foundational career awareness, students may struggle to interpret or apply AI recommendations effectively. Furthermore, the absence of integrated self-reflection prompts, mentorship narratives, or experiential simulations contributes to the limited impact of the platform in shaping career intention during the crucial goal-setting phase. A more developmental approach—anchored in personal meaning, professional context, and narrative-based exploration—may be necessary to strengthen this early stage.

Limited Trust in AI-Generated Recommendations

Focus group insights reveal that while AI-generated career suggestions are often accurate in a technical sense, students tend to treat them as supplementary rather than definitive. This is due in part to a lack of confidence in the algorithm's capacity to fully account for personal nuances, lived experiences, or long-term aspirations. Many students, particularly those facing complex or high-stakes decisions such as specialty selection or international postgraduate applications, express a preference for the guidance of trusted faculty advisors, mentors, or peers who can provide human insight. Moreover, students frequently question how recommendations are generated—what variables were weighted, what assumptions were made, and whether the system accounts for changes over time. This perceived opacity in the recommendation logic fosters skepticism, and in some cases, outright rejection of system-generated advice. Bridging this trust gap requires not only improvements in algorithmic explainability, but also the integration of collaborative decision-making models in which AI augments, rather than replaces, human expertise.

Mismatch Between System Functions and Actual Career Needs

Despite the presence of multiple features such as internship databases, mentor matching, and research project listings, students report that these tools often fall short of their expectations in terms of usability, depth, and contextual guidance. In many cases, the platform provides lists or links without offering personalized filtering, scenario-specific advice, or action-oriented support. For example, a student considering pediatric residency might receive a broad set of recommendations with little relevance to their academic performance, clinical interests, or geographic constraints. Additionally, the user interface may require multiple steps or technical input that becomes a barrier rather than a facilitator of decision-making. This disconnect between system functions and students' evolving academic milestones—such as transitioning from preclinical to clinical phases, or deciding between local and international pathways—undermines the platform's potential to provide meaningful, timely guidance. To truly support users, systems must map functions to students' cognitive and developmental stages, offering context-sensitive interventions aligned with their real-world concerns.

Absence of Dynamic Feedback and Path Adjustment

One of the most critical limitations of existing AI career planning tools is their static design. While initial recommendations may be appropriate, the system often lacks the ability to adapt to students' ongoing progress, new experiences, or revised priorities. For instance, after completing a clinical rotation in internal medicine or participating in a research project,

a student may gain new interests or identify competencies not previously apparent. However, without mechanisms to log such experiences, solicit feedback, or revise career trajectories accordingly, the AI system continues to offer outdated or irrelevant advice. This undermines the dynamic, iterative nature of career development emphasized by the CSM framework. Moreover, without a feedback loop, students may disengage from the platform altogether, perceiving it as rigid and unresponsive. Introducing reflective prompts, real-time portfolio updates, and personalized adjustment suggestions based on behavioral or outcome data would significantly enhance the system's ability to serve as an adaptive career companion.

Heightened Student Concerns About Privacy and System Transparency

Medical students from Generation Z—who have grown up in a digital ecosystem—exhibit a heightened awareness of data rights, surveillance risks, and algorithmic accountability. When engaging with AI systems for career planning, these students frequently express concern about how their academic records, behavioral data, and psychological profiles are being collected, stored, and used. Many report uncertainty about the data lifecycle: who has access, whether their data are anonymized, and whether it might influence future assessments or decisions in unintended ways. This leads to reluctance in sharing detailed or sensitive information, which in turn limits the accuracy and personalization of AI recommendations. Ethical system design must therefore include clear and accessible consent protocols, customizable data-sharing settings, and options for users to revise or delete inputs. Transparency regarding algorithm operations—such as data sources, decision rules, and adjustment procedures—should be presented in understandable language. Only by addressing these concerns can trust be fostered, enabling sustainable and ethically sound integration of AI in career guidance.

Strategy Recommendations for Optimizing AI-Enabled Career Planning for Medical Students

Building on the five core challenges identified previously and guided by the four-stage CSM framework, this chapter proposes five strategic solutions to enhance the effectiveness of AI-enabled career planning systems tailored to Generation Z medical students. These strategies not only address limitations in current platform design and functionality, but also propose sustainable and student-centered pathways for future development. The goal is to reimagine AI not merely as a recommendation engine, but as an intelligent, adaptive partner in students' career journeys.

Introducing Career Awareness Modules to Support Early Goal Formation

To mitigate the problem of unclear career goals, particularly among preclinical students, AI systems should integrate a robust "career awareness" module aimed at fostering self-understanding before any career recommendations are generated. This module should offer interactive tools such as personal values clarification tests, life design interviews, immersive virtual career simulations, and alumni narrative archives. These features are designed to activate introspection by prompting students to answer foundational questions like "Who am I?", "What environments do I thrive in?", and "What kind of doctor do I aspire to become?"

Beyond passive information delivery, AI should take an active role in initiating exploratory thinking. For example, machine learning algorithms can be used to cluster students by behavior patterns, academic history, and career values, then recommend comparable cases or professional trajectories undertaken by similar users. This peer-

referenced approach not only lowers the emotional barrier to exploration but also helps students visualize realistic and achievable options. Reframing the system from a "content dispenser" into a "cognitive scaffolding tool" enables the early stages of career planning to become a guided process, rather than a trial-and-error experience.

Enhancing Algorithm Transparency and Human-AI Collaboration to Build Trust in Recommendations

Given that trust is a prerequisite for the adoption of AI in high-stakes educational contexts, system designers must prioritize transparency, explainability, and collaborative validation. Each AI-generated recommendation should be accompanied by a rationale box explaining why it was generated, highlighting relevant data points such as GPA trends, elective choices, assessment results, or research interests. The system should also disclose the confidence level of each recommendation, allowing students to better understand the weight and limitations of the suggestion.

In addition, a dual-validation model should be implemented, wherein AI-generated advice is reviewed or commented on by human career counselors. This allows students to compare both perspectives, weigh different reasoning processes, and make more informed decisions. It also reinforces the role of AI as a co-pilot, not a replacement for professional judgment. To avoid promoting rigid or overly deterministic paths, a "pathway flexibility index" could be introduced to visually represent which nodes in the career map are fixed and which are adaptable—thus encouraging personalized, agile planning. Together, these features contribute to a more dialogic, trustworthy career planning process.

Aligning System Functions with Key Development Milestones

Rather than offering a generic set of tools for all users, AI career systems should be calibrated to reflect the developmental milestones that define medical training. Functional design should be centered around high-stakes decision points such as selecting a research focus, applying for internships, or preparing for residency. For example, a "research project planning kit" could be introduced for third-year students, which includes mentor recommendation algorithms, project-matching databases, publication case studies, and time management guides.

Similarly, fourth-year students undergoing clinical rotations could benefit from a "specialty selection navigator" that integrates their rotation evaluations, self-assessment data, lifestyle preferences, and postgraduate goals into a ranked list of specialties with pros and cons. The system should also be able to detect a student's current academic phase through logins, academic calendar syncing, or curriculum tracking, and proactively adjust its offerings accordingly. This kind of adaptive interface, informed by the student's situational context, ensures that the platform remains relevant, timely, and behaviorally aligned.

Building a Dynamic Feedback System for Continuous Path Adjustment

Reflecting the CSM framework's emphasis on adaptability, AI systems should be equipped with dynamic feedback loops that allow continuous recalibration of career trajectories. A "career trajectory dashboard" could be created to visualize how each new behavior (e.g., joining a surgical interest group, failing a course, completing a cardiology rotation) impacts the suitability of current recommendations. This dashboard would serve

both diagnostic and motivational functions, helping students to recognize when their actions are diverging from or reinforcing their long-term goals.

In addition to visualization, the system should push short micro-reflection prompts after each milestone experience—such as completing an internship or a major assessment—allowing the platform to collect updated self-perceptions and goals. These micro-reflections can then feed into a recommendation engine that updates the student's personalized pathway in real time. Such mechanisms support a move away from static, one-size-fits-all career planning toward an evolving, experience-integrated guidance process—making the system feel more like a developmental coach than a bureaucratic tool.

Improving Data Transparency and Authorization Mechanisms to Address Privacy and Trust Concerns

For Generation Z students, who are highly literate in digital ecosystems and acutely aware of surveillance risks, data control and ethical algorithm design are not peripheral—they are central. To ensure continued engagement, AI platforms must offer granular data control interfaces through a "data authorization center," where students can view, toggle, and adjust data types (e.g., academic performance, behavioral logs, psychological tests) used for career recommendations. Data retention timelines, sharing permissions, and revocation options should also be clearly presented and user-manageable.

Furthermore, every recommendation should transparently state what data informed it—using intuitive icons or short labels like "based on clinical performance" or "derived from peer cluster behavior." A "reverse feedback mechanism" should empower users to contest, flag, or delete results they find inaccurate or misrepresentative. For instance, if a student feels that a particular suggestion does not align with their goals or identity, they should be able to remove the associated data point from future training cycles or request explanation on its influence. These features collectively foster a sense of user agency, algorithmic accountability, and psychological safety, which are essential for sustainable adoption of AI in education.

Conclusions and Future Directions

This study explored the enabling role of AI in the career planning process of medical students by employing the CSM framework as a theoretical foundation. It identified five core challenges currently limiting the effectiveness of AI in real-world educational contexts: unclear initial career goals, limited credibility of algorithmic suggestions, misalignment between system functions and developmental stages, lack of dynamic feedback mechanisms, and concerns over data privacy and trust.

In response to these issues and based on the developmental characteristics and cognitive preferences of Generation Z students, the study proposed five system-level strategies to guide the optimization of AI-enabled career planning tools. These include the integration of cognitive scaffolding modules, the reinforcement of system credibility through transparency and human-AI collaboration, the realignment of platform functions with key academic transitions, the establishment of continuous feedback mechanisms, and the implementation of ethical data governance practices.

The main conclusions of this research are as follows: First, AI holds significant potential in medical career education but must be integrated in a way that closely reflects the authentic developmental trajectory and psychological characteristics of medical students. Second, the CSM framework provides a useful structure for dissecting the career development process into phases, allowing for the targeted design of AI interventions. Third, students' trust in AI is pivotal. Systems must be designed to offer explainable, flexible, and collaboratively validated suggestions to ensure engagement and adoption. Fourth, AI platforms should evolve beyond mere data-matching utilities. They should function as reflective facilitators and developmental companions that support students in navigating increasingly complex medical career landscapes.

Looking ahead, future research should consider expanding data sources to include students from diverse academic disciplines, year levels, and demographic backgrounds. Longitudinal studies could also be designed to track how students interact with AI tools over time and how their trust, goals, and outcomes evolve. Moreover, experimental development of prototype platforms and small-scale pilots are encouraged to test the practicality and effectiveness of the proposed strategies in real educational settings. Through iterative refinement, AI systems may ultimately become integral to the personalized and sustainable career development ecosystems of medical education.

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