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Review Article

Historical Turning Points in Medical Education

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Understanding the historical turning points in medical education worldwide is essential for predicting the future of medical training. When we listen to the past, we can hear strong voices emphasizing that medicine is a field of scientific research and practice, that medical education should be conducted by authorized institutions, that practical training is a critical component that must not be neglected, that medical education should be carried out within certain standards, and that the importance of interdisciplinary integration and active learning cannot be overlooked. In our era, where access to information has become remarkably easy, schools are on the verge of losing their identity as places primarily for acquiring theoretical knowledge. Spending class time transmitting theoretical medical knowledge and repeatedly asking an instructor to present the same topic has become both inefficient and unreasonable. Medical schools that prioritize active learning strategies—such as problem-based learning and flipped classroom approaches—at the center of their curricula, delegate the acquisition of theoretical knowledge to students' autonomous control while providing facilitation and guidance in resource access, and emphasize skills training can be regarded as institutions effectively positioning themselves for future challenges by expanding and enriching the role of their learners.

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Introduction

Understanding the historical turning points of medical education is essential to grasping how the field has evolved over time. This review highlights eight pivotal milestones that have profoundly shaped medical education on a global scale. Among these are three foundational figures of modern medicine—Hippocrates, Galen, and Avicenna; the Salerno School of Medicine, which marked a significant step toward the institutionalization of medical training; and William Osler, widely regarded as the father of clinical medicine for his groundbreaking emphasis on practical, bedside teaching. Also discussed is Abraham Flexner, who, though not a physician himself, authored a transformative report that redefined academic standards in medical education—standards that still resonate today. The review further explores the development of system- and symptom-based educational models, the growing adoption of the flipped classroom approach in the past two decades, and the sweeping impact of the COVID-19 pandemic, which brought substantial changes to medical education worldwide.

Hippocrates, Galen, and Avicenna: The Foundations of Modern Medicine

Hippocrates (460–377 BCE) is regarded as the first historical figure to transform medicine into a scientific discipline by emphasizing the role of natural factors in the development of diseases, rather than explaining them through religious or supernatural beliefs[1]. He is also credited with establishing early ethical boundaries for physicians in their relationships with patients[1]. Hippocrates adopted the theory of humoral pathology, which was based on the belief that an imbalance among the four bodily fluids—blood, yellow bile, black bile, and phlegm—was the cause of diseases[2]. Building on the teachings of Hippocrates, Galen (129–217 CE) developed a systematic and scientific approach to medicine, particularly in the fields of anatomy and surgery, grounded in observation, experimentation, and reasoning[3][4]. Known in the West as Avicenna, Ibn Sina (980–1037) synthesized the legacy of ancient Greek medicine with Islamic traditions, serving as a crucial bridge on the path to modern medicine[5][6][7].

The Salerno School of Medicine: The Institutionalization of Medical Education

The first medical school to incorporate fundamental elements of medical education such as curriculum and assessment was established in the city of Salerno, located in southern Italy[8][9]. This school experienced its golden age, particularly between the 11th and 13th centuries, and served as a model for other medical schools that would later be established in Europe[10]. The laws issued by Holy Roman Emperor Frederick II in 1231 (Costituzioni di Melfi) included provisions stating that no one could practice medicine unless they had been examined by the professors of the Salerno School of Medicine[10]. The requirement that medicine be practiced only by qualified individuals and that physicians be licensed by the state marked a turning point in the institutionalization of medical education.

William Osler: A Lasting Emphasis on Practical Training

William Osler (1849–1919) believed that theoretical knowledge must be combined with practical experience and regarded clinical training as the core of medical education[11][12]. According to him, experience and observation were crucial in learning, and medical students should acquire practical skills by directly participating in patient care[11][12]. Osler's aphorisms on the importance of experience and learning by doing continue to illuminate the field of medical education today: "*The whole art of medicine is in observation...*", "*Learn to see, learn to hear, learn to feel, learn to smell, and know that by practice alone can you become expert...*", "*...but to educate the eye to see, the ear to hear and the finger to feel takes time, and to make a beginning, to start a man on the right path is all that you can do...*", "*The art of the practice of medicine is to be learned only by experience...*".[11].

The Flexner Report: Establishing Academic Standards in Medical Education

Abraham Flexner (1866–1959), an educator deeply concerned with practical issues, published a book titled The American College: A Criticism in 1908[13][14]. In this book, Flexner's general criticisms of the education system caught the attention of Henry Pritchett, the first president of the Carnegie Foundation—established in 1905 by Andrew Carnegie to support education[13][15]. As a result, Flexner was tasked by the Carnegie Foundation with investigating the problems in medical education across the United States and Canada and proposing improvements[13][15]. Although not a physician himself, Flexner is considered one of the most influential figures in the history of medical education[16][14]. His extensive 364-page report published in 1910, heavily influenced by the German medical education system and the example of Johns Hopkins Medical School, marked a turning point for medical education both in the United States and worldwide[15][14]. Flexner noted that some of the 155 medical schools he examined were inadequate in terms of student admissions, laboratory facilities, and clinical services, and he argued that medical education should be conducted within academic institutions that meet certain standards and offer research opportunities[13][16]. Flexner's report revealed that many medical schools were inadequate and demonstrated the need for establishing quality standards in medical education[13][16]. Following the report, some for-profit private medical schools were criticized for producing a large number of poorly trained doctors, and approximately one-third of medical schools in the United States were closed during that period[13][15]. Since its publication, the Flexner Report has been subject to various criticisms. At the heart of Flexner's proposed system was medical knowledge generated by physician-scientists conducting research in university hospital laboratories and clinics[15]. It has been argued that this perspective laid the groundwork for viewing patients as mere instruments serving the academic goals of physicians[15]. The Flexner Report has also been criticized for relocating medical education entirely within university hospitals, which some argue led to failures in recognizing and addressing community health issues. Consequently, beginning especially in the 1960s, community-based medical education approaches started to be advocated as an alternative to hospital-centered training[17]. Flexner proposed a four-year medical education program consisting of two initial years focused on basic medical sciences followed by two years dedicated to clinical sciences[13]. In the following years, it was argued that this approach created a gap between basic sciences and clinical sciences. As a result, greater emphasis was placed on the need to integrate these two areas[17]. It has also been suggested that, contrary to the traditional approach, students should gain early clinical experience[17]. It is especially noted that if the content taught in basic sciences does not reflect what physicians actually need to know or apply in practice, or if students do not fully grasp its significance, this can result in decreased motivation[17].

System-Based Model: Efforts Toward Integration in Medical Education

Until the mid-20th century, medical education was conducted entirely on a discipline-based structure. In this traditional/classical model, each discipline attempted to teach its subject matter independently, without any integration with other disciplines[18]. In this setup, for instance, students might study the structures of the respiratory system in anatomy class and then immediately have to learn about the functions of intestinal cells in physiology class. In the 1950s, Case Western Reserve University School of Medicine developed an organ/system-based integrated approach[18]. This model is based on the idea that students learn better when related topics from different disciplines are taught simultaneously. Therefore, the curriculum is organized around integrated topics or organ systems[18]. Integration can occur within basic sciences or within clinical sciences themselves; this is referred to as horizontal integration[17]. Integration between basic sciences and clinical sciences is called vertical integration[17]. The wedge approach has been proposed for vertical integration. According to this approach, both basic sciences and clinical sciences are taught throughout the education program, with basic sciences being more prominent in the early years and the emphasis gradually shifting toward clinical sciences as the program progresses[17].

Problem-Based Learning: A Shift Toward Student-Centered Educational Approaches

The system-based model has been criticized in certain aspects. For example, there are diseases like diabetes that involve multiple systems, or the effects of some medications may be related to more than one system[18]. Moreover, patients do not present with a specific disease but rather with a complaint or a problem; what is expected from physicians is to solve the problem in question[18]. The idea of training students through problems similar to those they will encounter in their medical careers led to the emergence of the Problem-Based Learning (PBL) model in the late 1960s, pioneered by Howard Barrows, a professor of neurology at McMaster University Faculty of Medicine in Canada[18][19]. PBL is conducted in small groups (typically 10–12 students) with the assistance of a facilitator (guide)[18]. Interest in the approach that emphasizes active learning and the development of problem-solving skills among students continues to grow today[20][19]. For the PBL model to be implemented effectively, students need to have a certain level of foundational knowledge and understanding of basic concepts. Therefore, it is stated that PBL has some limitations in the early stages of education[20]. When applied to first-year students, no significant difference has been found between PBL and traditional methods in terms of critical thinking and problem-solving skills[20]. Therefore, it is considered that gradually increasing the use of active learning methods within the curriculum may be more appropriate. It is also argued that PBL, which was born and developed within Western culture, cannot be easily transferred to other regions[20].

Flipped Classrooms: A New Phase in Active Learning

The idea, which emerged in the 1980s, is to replace the traditional approach where theoretical knowledge is delivered to students by instructors during classes with a method in which students acquire theoretical knowledge from various sources on their own, followed by activities in class that reinforce the knowledge they have previously learned[21][22]. Militsa Nechkina, a member of the USSR Academy of Pedagogical Sciences, wrote the following to teachers in Russia in 1984: "*...let pupils extract new things from autonomous reading of a textbook, which has been created accordingly. Allow them to consider it, then discuss it with their teacher at school and come to a united conclusion.*"[23]. In 1993, Alison King advocated the idea that classroom time should be used for active learning rather than the transmission of information in her work titled "From Sage on the Stage to Guide on the Side."[24]. The year 2000 marked the conceptualization of flipped learning[25]. In that year, two independent publications introduced the terms "classroom flip"[26] and "inverted classroom"[27] into the literature. The flipped classroom approach is primarily recommended for several key reasons: it shifts the theoretical learning phase outside the classroom, thereby creating opportunities to implement active learning strategies during class time; it increases students' control over their own learning; and it offers more opportunities for peer learning[25]. The rise in popularity and widespread implementation of flipped learning began in 2007[28]. Jonathan Bergmann and Aaron Sams began sharing lecture presentations and videos online for students who were unable to attend class[29]. They discovered that this approach enhanced learning by allowing students to pause the videos to take notes and replay them as needed[29]. One of the main problems with the traditional approach, in which information is directly transmitted to students during lessons, is the mismatch between the student's

learning style and the teacher's teaching style[22]. Flipped learning involves reviewing theoretical content before class through physical resources like textbooks or digital tools such as pre-recorded lectures, thereby allowing students to learn in their own style and at their own pace[22]. Class time, on the other hand, is dedicated to the use, application, and discussion of the knowledge acquired, thereby reinforcing learning through active engagement[30][22] (Figure 1). In flipped classrooms, the role of the instructor is not to transmit information but to provide guidance[25].

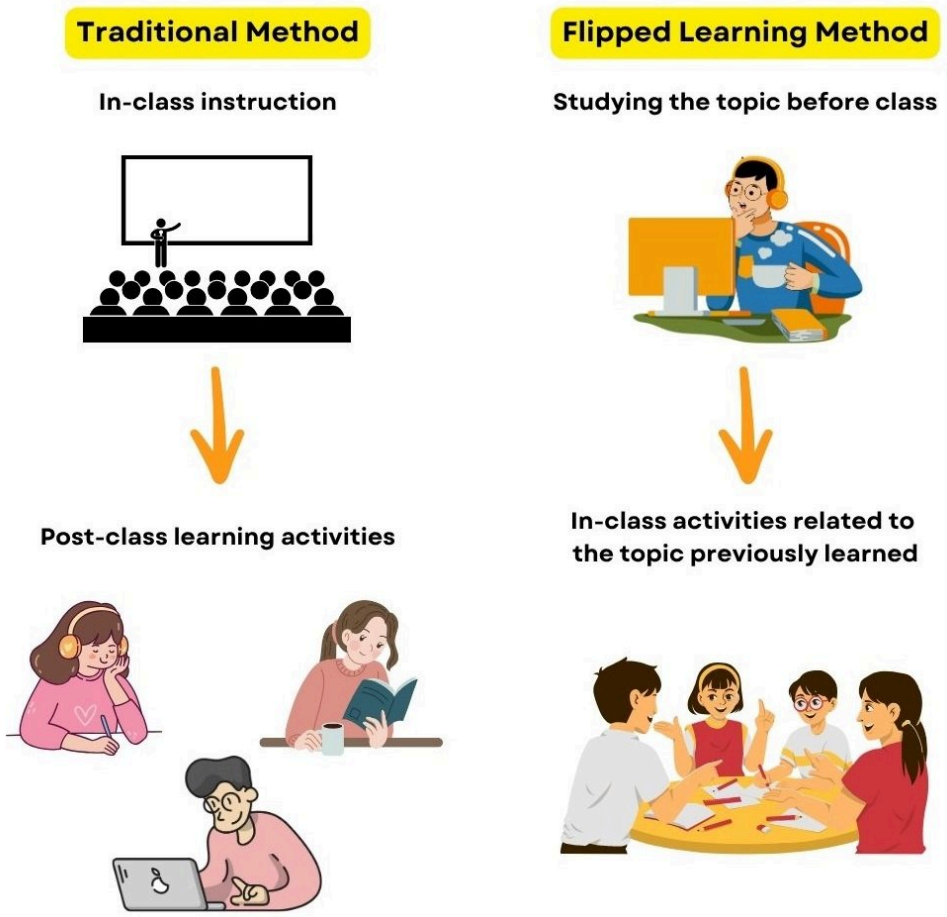

Figure 1. Comparison between the traditional method and the flipped learning method.

COVID-19: The Rise of Digital Medical Education

The COVID-19 infection, which emerged in China at the end of 2019 and quickly spread worldwide, becoming a pandemic in 2020, represents a critical turning point in many fields, including medical education[31][30]. Institutions that followed the traditional model were forced to make radical changes in their educational practices during the pandemic, which made face-to-face education impossible. In contrast, those using flipped learning were able to continue employing this strategy with minor adjustments[32][30]. The pandemic clearly demonstrated that the face-to-face transmission of theoretical knowledge by instructors in the classroom is not an obligatory method and that online education can provide a student-centered and flexible alternative learning opportunity[33]. Students realized that they could watch recorded lectures anytime, anywhere, and as many times as they wished[34]. By slowing down, pausing, or speeding up the recordings according to their own learning pace, they could learn more effectively and efficiently without needing to be simultaneously present with the instructor in the same environment to acquire theoretical knowledge[34]. COVID-19 has made virtual learning a norm[35].

Conclusion and Recommendations

In the early and mid-20th century, behaviorist and cognitivist learning theories sought to answer what learning is and how it can best occur. Circuses that demonstrated even the wildest animals could be trained through “reward and punishment,” and Darwin, who explained the origins of species and thus humans as an animal species through natural selection—thereby challenging the idea of human exceptionalism—were likely two major sources of inspiration for behaviorists trying to explain human learning processes through animal experiments. During the era when audio and video recording technologies advanced and data storage on computers became widespread, learning processes were increasingly understood through the lens of how the human brain processes and encodes information. Toward the end of the 20th century, constructivist views became more widespread, and the dominant understanding shifted from knowledge being formed through stimulus-response relationships or stored in memory to the idea that knowledge is uniquely created within the human brain. In parallel with this theoretical transformation, educator-centered approaches based on passive learning gradually gave way to student-centered approaches based on active learning.

The easy accessibility of information in digital formats necessitates a redefinition of the role of instructors in medical education. Persisting with traditional lectures that merely transmit theoretical knowledge will mostly reduce many medical educators to “lecture note narrators” or “slide readers.” Repeating the same lecture—delivered well but not recorded—every semester ignores the technological opportunities offered by the digital age. At the same time, this insistence prevents the use of active learning methods during class hours.

We must now acknowledge that students’ brains are not “audio-visual recording devices” and that they cannot absorb all the information we present during class hours. Empowering students to take ownership of learning theoretical knowledge—by providing them with lecture videos, notes, and recommended textbooks—and transforming class time into a more engaging, enjoyable, and educational experience through student-centered active learning methods is an essential approach that must not be delayed if we want to keep pace with global advancements.

Statements and Declarations

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Data Availability

No new data were created or analyzed in this study. All information is sourced from publicly available literature as cited in the references.

Author Contributions

FK: Conceptualization, Writing – Original Draft, Editing. HPY: Supervision – Review. MK: Conceptualization, Supervision. All authors contributed to the article and approved the final version.

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