

Mining of Ideological and Political Teaching Resources in Biochemistry—Taking the Tricarboxylic Acid Cycle as an Example

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Abstract: Under the background of the national party history study and education, it is a great practice of socialist education with Chinese characteristics in the new era to display the rich red culture nurtured by the party history in the classroom teaching of biochemistry majors. The study and education of party history can help teachers and students to deeply understand in practical work to hold fast to their beliefs, strengthen their revolutionary beliefs, and undertake the mission of the times. The key and difficult part of sugar metabolism in the biochemistry course is the tricarboxylic acid cycle. The Long March of the Red Army of Workers and Peasants is an important historical event of the victory of the Chinese revolution. Find the similarities between the two, use teaching skills skillfully, and teach the tricarboxylic acid cycle in conjunction with the history of the Long March. Not only vivid image, experience the spirit of the Long March, but also help students understand and remember, and improve students' learning effectiveness of this part of the content. In the way of teaching and leading learning by history, it helps students to learn their majors and integrates the correct guidance at the spiritual level, and implements the fundamental task of "cultivating morality and cultivating people".

Keywords: Curriculum ideology and politics; Party history; Tricarboxylic acid cycle; History of the Long March.

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The meeting on ideological and political work in colleges and universities held in December 2016 clearly put forward for the first time that ideological and political work should run through the whole process of education and teaching. Institutions of higher learning need to be clear about who educates people and who trains talents for. Professional courses in universities must be synchronized with ideological and political courses to form a positive synergy^[1]. At the same time, ideological and political education can not ignore the teaching requirements of the curriculum itself^[2]. To improve the quality of ideological and political teaching, we need to integrate value shaping, ability training and knowledge teaching, and transfer them to students in a subtle way^[3]. With the advent of the Internet era in recent years, it is more and more convenient for students to acquire knowledge. This way of sharing knowledge resources, on the contrary, has not greatly improved the humanistic quality of students, leading to widespread spiritual decadence and weak will among students, which poses a serious challenge to the ideological and political education of students^[4]. To implement the fundamental task of "establishing morality and cultivating people" and achieve the goal of "three integrity and educating people", teachers need to have strong political feelings, set an example, and fully use Marxist materialist dialectics and the view of universal connection of things in teaching activities^[5]. Through the continuous accumulation and excavation of ideological and political education resources in biochemistry, and actively carry out teaching practice in biochemistry courses. There is a very classic maxim in On the History of the CPC: "Chinese revolutionary history is the best nutrition. The revolutionary spirit is the precious wealth of the party and the country." Integrating the study and education of party history into the classroom teaching of college students is an effective way to inherit the great revolutionary spirit. In the teaching process of biochemistry, in the process of knowledge innovation and scientific research, we must inherit the spirit of the Long March, keep our ideals and beliefs firm, never let go of any doubt, never give up any

attempt. To explore and research through endless training, always fight for the truth, always fight for the ideal, and always climb the peak of science and technology. Based on the history of the Long March of the Red Army, this paper describes the process of the “tricarboxylic acid cycle” in the chapter of sugar metabolism, shares effective teaching methods and skills, and communicates with colleagues struggling in the teaching line, with a view to further improving the teaching quality of biochemistry classroom.

1. Using the similarity between the tricarboxylic acid cycle and the history of the Red Army's Long March to promote memory

The tricarboxylic acid cycle (TCA cycle) was proposed by German Nobel Laureate Adolf Hans Krebs. It is a very important cyclic metabolic pathway in the process of biochemical metabolism, providing energy molecules for life continuously, which can be said to be the driving force of life. At the same time, the entire circulating metabolic pathway is also the hub for the interconversion and connection of carbohydrates, lipids and proteins in the body. After in-depth study of the history of the Chinese Workers' and Peasants' Red Army's Long March, we can learn that the Chinese Workers' and Peasants' Red Army's Long March has preserved the revolutionary armed forces of the Chinese Communist Party and is an important guarantee for the success of the Chinese revolution. It will always be accompanied by the long-term rule of the Chinese Communist Party. In the new era, we will go back to the Long March, let us not forget our original aspirations, and still be able to obtain a steady stream of motivation to work hard. The two have similarities in this respect.

Acetyl-CoA, citric acid, cis-aconitic acid, isocitrate, oxalosuccinic acid, α -ketoglutarate, succinyl-CoA, succinic acid, fumaric acid, malic acid, oxaloacetic acid involved in the TCA cycle A total of 11 molecules. During the Long March of the Central Red Army, it has passed through 11 provinces in China. The Central Red Army's Long March passed through 11 provinces including Jiangxi, Fujian, Guangdong, Hunan, Guangxi, Guizhou, Sichuan, Yunnan, Xikang (named at the time of the Long March), Gansu, and Shaanxi. These 11 molecules correspond to 11 provinces one by one. When teaching in class, you can write on the blackboard the compounds in the loop and mark the corresponding provinces respectively, which is convenient for students to understand and remember. During the period, the second characters of Jiangxi, Guangxi and Shaanxi provinces all carry the word “West”, which correspond to acetyl CoA, oxalosuccinic acid and oxaloacetic acid in the compounds respectively. The second word in these three acyl compounds is “acyl”, the radical is “you”, and the shape is close to “xi”, which can be well remembered. In the process of this strategic shift of the Red Army, it is full of endless sadness. There are 9 different compounds in the reaction cycle with the word “acid”. In this way of memory, students get rid of the tedious rote memorization. The students increased their understanding of Chinese geography knowledge and stimulated their patriotism through the lectures. Through a simple induction of words and expressions, and by analogy to compounds with the same group, students can firmly grasp the writing method and main structure of compounds, and increase their further understanding and mastery of the enzymatic reaction process.

The Nanchang Uprising in Jiangxi Province, the starting point, fired the first shot of the Kuomintang reactionaries, marking the beginning of the Chinese Communist Party's independent creation of the revolutionary army and leadership of the war. This is like acetyl-CoA in the tricarboxylic acid cycle, which is the starting material and the only compound consumed in this cycle, providing a source of power for the body. Jiangxi is said to be the holy land of the revolution, because here the Red Army spread the fire of revolution to all parts of the country. Guizhou Province is one of the revolutionary holy places for the Red Army of the Workers and Peasants, and it is also an important passage through the victory of the Long March. The Zunyi Conference held here ensured the future direction of the Chinese revolution. In the TCA cycle, α -ketoglutarate also plays an important role. It is a node molecule connecting carbon and nitrogen metabolism. It can synthesize glutamic acid and use the tricarboxylic acid cycle to ferment amino acids in enterprises. In the TCA cycle, one molecule of carbon dioxide is released before and after the reaction of α -ketoglutarate, which is also one of the important characteristics of this molecule, which is convenient for students to understand and remember.

The spirit of the Long March and the scientific research spirit reflected in the improvement of the theoretical system of the tricarboxylic acid cycle have shown similar qualities in the aspects of not being afraid of difficulties and obstacles, hard work, gathering wisdom, and solidarity and cooperation, which are worthy of people's inheritance and development forever. The basic connotation of the Long March Spirit is: ① Put the fundamental interests of the people of the whole country and the Chinese nation above everything else, strengthen the ideals and beliefs of the revolution, and firmly believe in the spirit of the inevitable victory of the just cause; ② In order to save the country and the people, we will not be afraid of any difficulties and obstacles, and will not hesitate to sacrifice. The spirit of all sacrifices; ③ the spirit of adhering to independence, seeking truth from facts, and starting from reality; ④ the spirit of taking the overall situation into consideration, strictly observing discipline, and being closely united; A scientific history is actually a spiritual history of scientists. The spirits of innovation, truth-seeking, dedication, collaboration and educating people formed by them

in the process of striving for scientific research have made outstanding contributions to creating a good scientific research environment and promoting scientific and technological innovation. Dare to be the first and dare to make breakthroughs is the common inspiration given to us by the discovery process of the tricarboxylic acid cycle and the long march process.

2. Summarize the characteristics and physiological significance of the tricarboxylic acid cycle by using various methods

When summarizing the characteristics of the tricarboxylic acid cycle, “one, two, three, four” is often mentioned as a jingle. Just like we usually shout slogans when we go out of the gymnasium queue, it reflects the grand momentum. In the process of teaching, let students shout slogans together to achieve efficient classroom interaction and make students pay more attention to the class. When summarizing the characteristics of each round of the tricarboxylic acid cycle, “one, two, three and four” are: first, only one compound (acetyl CoA) is consumed in the entire cycle, and other intermediate compounds are actually unchanged. One can also be recorded as a substrate-level phosphorylation in the tricarboxylic acid cycle, that is, a one-step reaction from succinyl-CoA to succinic acid; the second is “two decarboxylation” to release 2 molecules of carbon dioxide; the third is three catalysis. The key enzymes of the TCA cycle are citrate synthase, isocitrate dehydrogenase, and α -ketoglutarate dehydrogenase. Fourth, the four oxidative dehydrogenases in the TCA cycle form three molecules of NADH, respectively. And 1 molecule of FADH₂, providing a steady stream of energy for the body. The story of “Crossing Chishui on Four Sides” is well known to every household. This battle is one of the most typical combat cases of the Red Army of Chinese Workers and Peasants. With this strategic decision, the Red Army will continue the revolutionary fire, which is the positive energy spread by the justice division. Finally, according to a five-character quatrain summed up by the Red Army’s Long March itself: “A tragic and solemn history, 25,000 miles. The three main forces gather together to cross the Chishui God on four sides.” “and “Shi Li Gathering Spirits” indicate that the Long March spirit will always inspire us Communists to lead the people to be majestic, not afraid of hardships and dangers, and to work hard, forging the great Long March spirit to be passed down from generation to generation. This generalization helps students to remember the knowledge points.

Make full use of body language to effectively express classroom content and increase students’ impression of knowledge. The 10 molecules that do not change in the tricarboxylic acid cycle mentioned, use the crossed hands to indicate that the TCA cycle makes the three nutrients closely related, and this cycle is the hub of their mutual connection; use the palms of both hands to push forward relative to each other, It represents that the Sansuo acid cycle is the final metabolic pathway of the three major substances. Through body movements, help students better understand the significance of the carboxylic acid cycle to the body.

3. The effect of teaching practice

The author has many years of working experience as a class teacher. Through the communication with students in class and after class, the author can grasp the students’ ideological dynamics, mainstream values, etc., so as to test the effect of teaching work and make timely feedback adjustments. The organic combination of the history of the Long March in the teaching process of the tricarboxylic acid cycle can well promote the memory of knowledge points. Students reported that they enjoyed the teaching process combining brains, mouths and limbs. More than 85% of the classmates were excited in class, which could greatly mobilize their enthusiasm. This kind of effective classroom interaction will make more tacit understanding between teachers and students, and enhance the friendship between teachers and students. In the teaching process, the connection between party history and patriotism education has greatly improved the students’ further understanding of the aerobic oxidation process of sugar, and the important position and role of the tricarboxylic acid cycle in the metabolism of the three major substances has been clarified, which is more vivid. When assessing the knowledge of the tricarboxylic acid cycle after the teaching, 95% of the students can accurately draw the flow chart of the entire cycle by themselves, and the accuracy rate is about 20% higher than that of the students who did not use this teaching method in previous sessions. Contacting the teaching of the history of the Long March stimulated students’ enthusiasm for patriotism and love for their hometown, especially when the Chinese map was used in the lecture to describe the 11 provinces that the Red Army of the Workers and Peasants had traveled through, which allowed the students from the old revolutionary base to further increase their affection for their hometown and their sense of pride. Can indirectly promote “red tourism”. Through this teaching method, students can improve their understanding of learning history, increasing trust in learning, honoring morality, and practicing history. This teaching practice not only achieved the expected teaching goals, but also improved the understanding of the party history, and the overall memory effect is very good. Through the students’ heart-to-heart conversations, I also learned that the students understood the bitter process of discovering a metabolic process, and scientific research requires perseverance and hard work. The Long March of the Red Army has given us a good proof that “there is nothing difficult in the world, as long as you are willing to climb it”. For their own ideals, perseverance to struggle, fully reflects the purpose of the ideological and political curriculum. It plays a certain role in promoting the

development of students' good quality.

4. Teaching Outlook

With the rapid development of the intelligent information age, the channels for students to acquire knowledge are greatly enriched, and their thirst for knowledge can not only be satisfied by short classroom teaching. How can traditional classroom teaching knowledge increase the attractiveness to students, and at the same time, it can be well combined with ideological and political teaching to convey correct ideas? Some scholars have pointed out that the university classroom is more about spreading correct thinking to students, and a good classroom is a sincere communication with students. The teaching of professional courses reflects the ideological and political elements, which requires teachers to seriously study the theory of the party and other ideological and political knowledge. Only by deepening the understanding of knowledge, divergent thinking, pioneering and innovative, and fully excavating in combination with teaching content can ideological and political education be better applied to lesson preparation. Introducing historical stories, spreading the revolutionary spirit, combining Chinese geography, promoting the spirit of patriotism, and making good use of red resources to teach professional courses, can not only adjust the atmosphere of the classroom, but also improve the morality of students, play an important role in value leadership, and achieve teaching and educating people. of unity. In the integration of party history into biochemistry classroom teaching, it is necessary to flexibly adopt different teaching methods and skills according to different teaching contents. Reasonable introduction of historical materials such as the growth process of many people with lofty ideals in modern Chinese history, touching historical stories and revolutionary deeds of heroes and other historical materials will greatly expand students' ideas of learning ideological and political theories and provide high-quality talents. political security. Appropriately developing and connecting professional knowledge is particularly important, and it requires peer teachers to study carefully, actively condense and put them into practice, and continuously improve, in order to obtain ideal teaching effects, and strive to achieve "the unity of politics and knowledge" as soon as possible.

References:

- [1] Gao Han, Zhang Chunjing, Li Shuyan, et al. Practice and thinking of "course ideology and politics" in the teaching of biochemistry and molecular biology [J]. China Higher Medical Education, 2020, 3: 77-78.
- [2] Tang Fangyun. Give full play to the combined effect of "curriculum ideology and politics" to cultivate new talents in the era [N]. Guangxi Daily, 2019-05-09 (8).
- [3] Zhang Xiaoyun, Song Guiqin, Hao Min, et al. Research on the integration of "course ideology and politics" into biochemistry teaching reform [J]. Journal of Hebei North University (Social Science Edition), 2020, 36(4): 83-85.
- [4] Feng Junrong, Lu Yonghong. The confusion and solution path of ideological and political courses in biochemistry [J]. University Education, 2021, 5: 118-121.
- [5] Yu Guanghua, He Yan. On the premise, foundation and path of colleges and universities to build the "three comprehensive education" system [J]. Teaching and Educating People (Higher Education Forum), 2022, (12): 57-60.

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