

# Analysis of improving cooperation ability of students in high school biology education

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**Abstract:** High school biology education plays a crucial role in nurturing students' interest and understanding in the field of life sciences. Biology as a subject encompasses a wide range of knowledge areas including cell structure and function, genetics, evolution, and ecology. In order to effectively teach high school biology, educators should focus on developing students' observation skills, critical thinking abilities, and practical laboratory skills to enable them to comprehensively grasp and apply biological knowledge. This paper aims to discuss several key teaching strategies that can be employed to enhance the teaching and learning experience in high school biology classes.

**Keywords:** High school biology education; Thinking expansion ability; Textbook learning; Bioinformatics applications

## 1. Introduction

For instance, In the context of global warming, it is increasingly recognized that dynamics of above-belowground communities are vital for the stability of ecosystem, and therefore, the changing tendency of soil biomes communities is getting more and more attention, which can generate long-term legacy effects on the stability and diversity of ecosystem (Fukami and Wardle, 2005; Fukami, 2015). Belowground ecosystem processes vary among aboveground plant functional groups (Diaz et al., 2003). And the change of an individual plant functional group can therefore be expected to affect soil biomes differently. However, it remains unclear and lack comprehensive understanding about the influencing ways and intensities of foundation plant species to soil biomes, such as nematode, through changes in above-belowground linkages, and whether different plant species can create knock-on effects for soil communities. Soil nematode is an important component of the soil food web, they might be differently influenced by direct and indirect effects of the aboveground plants [1-2].

## 2. Importance of Developing Students' Observation Skills

Observation is one of the fundamental skills in biology education. By honing their observational skills, students can gain insights into the structure, function, and behavior of living organisms. Teachers can design experiments and observation activities that allow students to examine the morphology and tissue characteristics of organisms, observe growth and development processes, and witness how organisms adapt to their environment. Through observation, students can develop a scientific mindset and cultivate scientific inquiry.

## 3. Strategies to Cultivate Students' Critical Thinking Abilities

High school biology education should focus on nurturing students' critical thinking abilities. Biology is not merely a subject of rote memorization; it requires students to apply their acquired knowledge to solve problems. Teachers can engage students in questioning, discussions, and research to encourage active thinking and exploration. Group discussions can be organized where students raise questions based on the course content and work together to find solutions. Additionally, teachers can design inquiry-based experiments that empower students to apply scientific methods and thinking patterns. These strategies help students develop critical thinking and innovation skills, enabling them to better comprehend and apply biological knowledge. For instance, how to use the knowledge of human immune system in books to understand the argument that "structure determines function" is very important, because understanding the structure of the human body is essential for a variety of professions and fields, such as medicine, physical therapy, and even art. The human body is complex and intricate, consisting

of numerous systems and organs that work together to maintain life, such as the Skeletal System, the Muscular System, the Nervous System, the Cardiovascular System, the ResSystem, the Urinary piratory System, the Digestive System, the Endocrine System, and the Reproductive System[3-5].

#### **4. Enhancing Practical Laboratory Skills**

Laboratory experiments are an integral part of biology education. Through hands-on experiments, students can actively observe, practice, and apply their knowledge, leading to a deeper understanding and memory retention of biological concepts. Teachers can arrange simple and practical experiments where students operate instruments, observe experimental results, and analyze and discuss data. Furthermore, teachers can guide students in designing their own experiments and assessing and summarizing the results. By actively engaging in practical activities, students can develop observation, manipulation, and analytical skills, ultimately enhancing their understanding and application of biology knowledge. For example, Nematode is an important part to many soil ecological functions, such as nutrient cycling, litter decomposition, convert mineral elements to plant-assimilable forms (Freckman, 1988; Beare et al., 1992; Rahman et al., 2009). Soil nematode includes many feeding types, including bacterial feeders, fungal feeders, plant feeders, predatory feeders and omnivores (Yeates, 1999; Pan et al., 2016), they hold different trophic levels, represent one of the most abundant groups of soil organisms (Sechi et al., 2018), and respond directly to the changes of plants and as an ideal bio-indicators for soil ecosystem (Bongers et al., 1998), it is essential to communicate difficult new concepts clearly.

If you are starting to teach yourself lab biological information, reading is the most important. Articles in the field of bioinformatics are generally published in a range of journals such as Nature, Science, Nuclear Acids Research, Genome biology, and Bioinformatics. Another great platform tool is bioRxiv, a free online platform where you can view and comment on other people's work. Reading these papers will allow you to immerse yourself in the work and projects that other bioinformaticians are doing and how they get their results and how they communicate their results to the audience. As you read these papers, you should focus on finding the questions you want answered and the methods used in these studies. If you have enough data, try to reproduce these results yourself, which is good exercise for yourself. After you've delved into some of the research that other bioinformaticians are doing, it's time to start learning a programming language. The Python programming language is highly recommended for beginners. If you're new to python, it's a great tool because of python's legibility. Python is free and specializes in helping users prototype software, store data, and learn how to program like a beginner. At present, some people are using R language, and R language is also used in the development of Bioinformatic package, which has a wealth of Bioinformatic analysis tools. In addition, the statistics of R language are also very powerful, beautiful graphics, I like to use R ggplot2 to do graphs. With Python, you can also use Colab, an online Google extension where you can store your notes and research, as well as share it with others. Colab can also help you strengthen the programming language, as well as your programming experience. It's similar to Google Docs, you can share it, and if you're working on a shared project with other people, you can let other people adjust your data. With Python, you can also use Jupyter Notebooks. Jupyter Notebook Interactive computing interface has its advantages, you can test the code effect in real time, get immediate feedback, is very helpful for basic data analysis[6-9].

#### **5. Improving Teacher Professionalism**

Teachers play a vital role in high school biology education. Only with a solid foundation of subject knowledge and teaching experience can they effectively impart biological knowledge to their students. Therefore, teachers should prioritize the improvement of their professional skills. They can attend relevant professional training and academic conferences to stay updated with the latest advancements in biology research and teaching methods. Additionally, teachers should actively participate in scientific research to enhance their research capabilities and teaching proficiency. By continuously learning and improving, teachers can better guide students in learning biology and inspire their interest in life sciences:

1) A lively and interesting biology class is the first element of high school students to swim in the hall of biology, teachers can adjust the order of textbook content according to the cognitive characteristics of students and the actual situation of teaching, change the inherent content to enlightening content. For example, in the teaching of compulsory Course 2, mitosis can be reviewed before the laws of genetics, and meiosis learning can be completed, which increases students' knowledge and is closer to students' actual learning, so that it is more in line with students' learning interests and ability requirements. Of course, teachers need to use teaching materials creatively to surpass teaching materials, which requires

teachers to constantly dig teaching materials and create valuable and living biology classroom teaching. For example, 'Shrub' is a woody form of a plant, they usually distributed in Qinghai-Tibet Plateau, are exposed to extreme abiotic stress, such as drought and cold (Yao et al., 2016), therefore, they have evolved multifaceted biological properties to adapt to environmental disturbance, such as deep-root, thick-blade.

2) High school biology teaching needs teachers with personality, because only teachers with personality can create teaching with personality, and only teaching with personality can cultivate outstanding students. First of all, personalized biology teachers should be able to deal with biology textbooks uniquely, examine teaching with a skeptical eye, boldly add, delete, revise and supplement the teaching content reasonably, break through the inherent conventional constraints, and add a unique biological perspective to the teaching. Secondly, personalized teaching should not only have the form of artistic presentation, but also be able to arrange the teaching content, including clever handling of doubts, reasonable arrangement of content depth and density, flexible teaching methods, clever suspense to enhance students' thirst for knowledge and so on. Moreover, teachers need to have their own distinct personality, teachers should be good at giving full play to their own personality charm, with their own personal charm to infect students, at the same time, they can give full play to their own teaching advantages and personal strengths, and use their own unique ways of expression to create a teaching classroom with personal characteristics[10-11].

## 6. Conclusion

Teaching high school biology requires employing effective strategies that foster students' interest and understanding in life sciences. By developing students' observation skills, critical thinking abilities, and practical laboratory skills, teachers can help students comprehensively grasp and apply biological knowledge. Moreover, teachers' own professionalism significantly impacts high school biology education. Only with a solid foundation of subject knowledge and teaching experience can teachers effectively impart biological knowledge and inspire students' interest in life sciences. Therefore, teachers should continually strive to enhance their professional skills to make a greater contribution to high school biology education.

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