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Ferments of Life: barley, saliva and the enzyme idea.

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In scientific education it is important to help our students have a better understanding of the fast-changing world we live in. This is particularly true for Biology. A Biology teacher today must integrate the classic concepts with the latest developments. Students have a natural curiosity for Modern Biology and thus teachers may open their pupils minds to the basic biological concepts. Biochemistry is quite the ideal subject for this. In fact this "borderline" discipline can be considered as an "Esperanto" of Life Sciences. It is in fact simple to start from an explanation in biochemical terms and then integrate that with mutually beneficial fields and with theoretical knowledge or vice versa. In this way the goal of scientific education- i.e. critical thinking through assimilating facts- is achieved.

I began by analyzing the natural difficulties of students in understanding the enzyme concept. In school texts all the descriptions are at a molecular level and often our students are not up to the abstract thinking necessary to understand them. In this way knowledge is substantially mnemonic and not rational, only because the concept is not accessible. Are our students experiencing the excitement of what it is like to be a scientist and developing an appreciation of the scientific progress... or are we just teaching them about facts or some new words? Since teaching results are generally successful when the hypothesized causal agent is observable an essential first approach would be to introduce the concept while working at a phenomenological level on something that the student can easily observe and experiment with; this can reflect the true nature of science as a process of inquiring. Starting with a laboratory approach is ideal for allowing students to grasp meaningful concepts; since here the students handle, observe, use instruments, learn techniques and acquire scientific concepts in a dynamic way through questions, discussions, elaboration, charts and reports.

I chose an enzyme that the student can easily study: amylase from human saliva and from barley seeds. By considering the stark difference between starch hydrolysis obtained by inorganic catalysts and enzyme, student can explore the hypothesis of a "special and powerful substance" present in living organisms. Through a series of easy, rapid and inexpensive laboratory experiments students learn what the activity of an enzyme consists of: first in a qualitative then in a semi-quantitative way. They also learn how some environmental effectors can influence amylase and realise that enzymes are also molecular sensors. All these experiments, obviously connected with the theoretical study, allows students to think in terms of metabolic flexibility and complexity. This heuristic inquiry approach is integrated with theoretical knowledge about amylase and starch, their physiological meaning and biotechnological applications.

I hope that via my simple words, some teacher would return to school with at least one new resource or idea for enhancing lessons and can think about Biochemistry not as a collection of difficult concepts, strange words or complex formulas, but as an extraordinary tool for thinking.

References

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