Chemistry Education at Tertiary Levels

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Abstract

Chemical education has to keep abreast of on going research and development in chemistry in light of the omnipresence of electronic data, information, knowledge and knowhow. Curriculum or instruction, pedagogy and assessment need to be constantly modified. Frequent instructor - student interaction is necessary. Research and development by instructors are essential.

Keywords : Frequent instructor

Introduction

One prominent aspect that distinguishes this present century from the past 20th century in the omnipresence of the Internet . The Internet facilitates ever faster and wider same-time accessibility to electronic information and communication worldwide. Now people everywhere could be equal in learning about things past, present and the near future given the opportunity, the will and necessary resources. They can receive and distribute information almost instantly. The likes of Google, Wikipedia, on-line publications, electronic databases, posted lectures and animations, social media, etc. make it possible for people to intelligently learn about their world and beyond.

Thus we are no longer confined to textbooks, monographs, paper-based publications, etc. Learners and instructors can dig into the world' s treasures of good data, information, knowledge and wisdom as much as they want. Now the challenge is how to benefit the most from what is available in terms and

electronic and human resources.

In the last few decades leading chemistry research works and their applications have undergone some significant transformations. However, textbooks and materials used to teach undergraduates lack behind realities in the field more than before. The mode of instruction in the lectures and student laboratories also lacks behind. We therefore have to concentrate more on present works in chemistry that will lead to usage in the near future.

Changes in Chemistry

For good reasons research in chemistry has recently emphasized more on biologically important problems of big molecules, biological mimic structures, applications at the sub-micron and nano levels. Synthesis of unusual and large structures has also been more and more ambitious. Novel sensors, energy converters, catalysts are intensely researched and commercial applications are made not too long after R&D. Analytical tools have also been more powerful as well as sensitive.

Gigantic biological structures and functions have become solved routinely by nuclear magnetic resonance, x-ray diffraction, mass spectrometry, Raman spectroscopy, spectrofluorometry, etc. Single molecule studies are more possible. Also atomic force microscopy is becoming more far reaching. These techniques must be taught at lower levels now.

Elements beyond the third period that used to be ignored or relegated to a few mentions in introductory courses have now become more prominent commercially and in research &development, these heavier elements used in the semiconductor and superconductor industries should be emphasized more,

Changes in Pedagogy

The above calls for big changes in pedagogy toward student-centered learning which is now more justified than before.

Since students can learn about things any time and anywhere which come with instant and ubiquitous accessibility to the internet, the emphasis now must be on their profound learning at levels not quite emphasized before, e.g., ability to compare and contrast, to analyze and synthesize, to evaluate what is being presented. Students also have to be able to work together collaboratively because the world now demand creativity and innovation. Instructors have then to be value-added agents by being interactive with students so that the latter own their knowledge by actively learn and reflect on what they acquire in class and outside class. Instructions have to be challenging and authentic so that students will carry out laboratory work more actively. Assessments of success and achievement have also be authentic as well as futuristic.

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Thus curriculum has to be constantly changing to respond to the real world that our graduates have to face upon graduation and beyond in their employment. They will have to be knowledge workers, life-long learners with creativity and ability to communicate well.

New Roles for Instructors

Instructors have to move away from their conventional teaching approaches to lecture, laboratory and assessment of students' performance. They have to interact with students more so that they can assess them formatively to ensure better learning for higher numbers of students.

Instructors have to actively do research, attend seminars and conferences on chemistry. They have to work together with other instructors to find better ways to instruct, e.g., being good coaches, guides, facilitators, mentors, etc.

In addition instructors should read published work on chemical education. Better still they should carry out chemical education research and use their own works as well as others' to help in their instruction. Instructors should invent apparatuses for demonstration and electronic simulations and games to attract interest of students. The author will provide several of his published works to show that these works are possible while one pursues conventional research, publication and other duties.

Conclusion

In this fast changing world of instant accessibility to chemical information and new trends of rapid application of chemical research, instructors and learners have to interact more frequently for more profound life-long learning. Curriculum/instruction, pedagogy and assessment have to take advantage of the changes above. Instructors have keep abreast of the field by carrying out conventional research and following published chemical education research works.

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