Part V
E-learning and Innovative Instruction

Hsin-Kai Wu

Recent advances in technologies have transformed ways of learning and teaching in chemistry. The four chapters in this section on the theme of E-learning and Innovative Instruction demonstrate new possibilities and learning opportunities provided by innovative use of technologies.

In the first chapter of the section, Lu, Zou, and Zhang show how the application of mind maps improved high school students' problem-solving competences. The findings indicate that the use of mind maps encouraged students' divergent thinking, guided students to approach a problem from different directions, helped students generate sub-questions, and enhanced the organization of the problem-solving process. These instructional functions cannot be easily fulfilled by traditional instruction, and the findings of this study suggest the effectiveness of e-learning.

Rather than using a single technological tool, Su presents an experimental chemistry course that integrated an effective computer-based platform to support college students' chemistry learning. The platform included animations, static charts, verbal descriptions, and multimedia presentations. By using a quasi-experimental approach, the study shows that students in the e-learning group performed significantly better in learning achievement and learning attitudes than the traditional teaching group. Similarly, the third chapter compares the differences between a computer-aided group and a traditional teaching group in high school students' chemistry performance and attitudes. The statistical results also indicate that the computer-aided instruction was significantly more beneficial to students' chemistry learning.

The fourth chapter demonstrates the potential of technologies in assessment. Chen and her colleagues integrated an instant response system (IRS) as an in-class

H.-K. Wu (✉)
Graduate Institute of Science Education,
National Taiwan Normal University, Taipei, Taiwan
e-mail: hkwu@ntnu.edu.tw

assessment tool in their undergraduate chemistry course and examined students' perceptions about the learning effects of the system. The findings show students' positive perceptions toward the system and a positive correlation between students' perceptions on IRS use and their performance in learning chemistry.

Together, the four chapters present a spectrum of research on using technologies in chemistry education and provide more evidence on the effectiveness of e-learning.