

## CHAPTER 6

### Conclusions

In this research, our approach of incorporating *adaptivity* and *interactive 3D media* to realize specific instructional design for SGT learning has been presented. By taking the notion of intelligent media, an interdisciplinary theoretical background based on educational media, pedagogy, psychometry etc. is used to design CooTutor. We suggest that “Media and Method” (M&M) is a noticeable concern on developing computer-based educational systems. That is, to develop a system by considering the characteristics of media (e.g., computer-generated 3D), the available methods to support learning needs (e.g., adaptive material selection), and the most important one, using media and method properly to realize effective pedagogical strategies.

This research also touched the critical criterion of developing adaptive educational systems—empirical evaluation. Two experiments have been conducted respectively to address the “Media” and “Method” aspects of the proposed M&M concern. In the first experiment, the effectiveness of different media representations on enhancing learners’ spatial ability is compared. The result shows a medium effect size of the difference between 3D-based and 2D-based media representations. The use of interactive 3D visualization to facilitate learners to acquire spatial skills is optimistic. Another experiment evaluated the effectiveness of different material selection mechanisms. The result shows that current adaptive material selection of CooTutor did not outperform other strategies. But the styles if are mismatched, the result could be severe and harmful. This implies that learning styles is worth to be concerned in

educational systems and used as a source for adaptivity. And it is essential to consider how to facilitate learners with extreme learning styles to learn more effectively. Since the sample size for the two experiments is rather small. It is suggested to replicate similar experiments with more samples to probe unclear underlying factors of the result.

There are still amount of points of this research could be extended in the future. From the technical aspect, it is proposed to incorporate the notion of open adaptive hypermedia into the system to use the resources from the open Web as learning materials. This is challenging, but deemed tenable by the separation of concept sequencing and material selection. It is believed that this extension would largely scale up the value of AH systems. From the educational aspect, the concern of learning styles is extensible. As we have mentioned in Chapter 5, it is recognized essential to develop and evaluate the use of adaptive facilitation regarding extreme learning styles.