

Engagement when teaching computation online: Challenges and Opportunities

The sudden transition to online and remote delivery of coursework in 2020 has created significant challenges and opportunities. As part of the teaching team of a first year course on the Musculoskeletal system at the Carle Illinois College of Medicine, the world's first engineering-based college of medicine, a significant challenge was to continue engaging first year medical students as they learned about computational tools critical for health care applications aimed at treating or diagnosing musculoskeletal disorders.

In contrast to a typical engineering laboratory session, that would allow for hands-on work, one-on-one discussion with students as issues arise, and the ability to use visual and body cues to evaluate engagement in an activity, online course delivery raises several challenges. As hands-on work has to move to a digital domain, there are increased barriers to the communication of challenges that arise and potential engagement with the material. In addition, it is more challenging to gauge the response from the entire class, as attention focuses on one individual at a time.

However, through the integration of video conferencing tools such as Zoom, remote access to computers with MATLAB, together with online collaboration tools such as google docs, there is an opportunity for small teams of students to work independently on signal processing, analysis, and visualization, and together on discussion and interpretation of findings. While the opportunity for direct engagement with each student is minimized, through small group discussions, the intimate feel of a small discussion group can be recreated online. Providing guidance and support online is more challenging than in-person, but through screen sharing and remote control of a computer, some issues related to running and installing the software can be addressed to minimize the risk of students disengaging from learning activities.

Beyond a simple translation of in-person activities to their online equivalent, the sudden change to remote delivery has also allowed for the opportunity to pursue interactive simulations with domain experts that would not be otherwise be feasible in person. As an example, students can engage with more abstract processes of software development, such as the specification of data output, visualization, and user interface directly with professional software engineers, or brainstorm potential diagnostic or health management applications after virtual panels with patients. These role-playing opportunities allow students to wear alternate "hats", maintain engagement with complex material, and think about systems-level approaches necessary for solving health care challenges in the 21st century.

In conclusion, the integration of technology along with creative role-playing activities will hopefully provide an opportunity for students to maintain engagement with novel course content in computation, such as signal processing, data analysis, and visualization.