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1497

Strategies of Contingent or Just-in-Time Teaching and Peer Instruction

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Strategies of Contingent or Just-in-Time Teaching and Peer Instruction

One of the chief benefits of clicker technologies is that they enable us to gather information about our students’ learning in real time. The instructional challenge, however, lies in interpreting and responding to the information we receive, particularly if we are used to employing didactic teaching methods in large lecture halls. When we develop lectures, we make assumptions about what students know and will need to know to understand new concepts or processes, and we structure our lectures based on our assumptions. Yet, if we are mistaken, we may fail in our instructional aims and learn only too late that we have failed when students struggle with tests, quizzes, and homework problems. Soliciting questions at key moments in a lecture or stopping periodically during instruction to ask students questions and check their understanding can provide some provisional information about students’ comprehension, but these strategies do not afford instructors a sense of the whole class’s experience. Clickers are able to give us more complete information, but they do not alone constitute an adequate instructional intervention.

When instructors do learn that students may not be understanding material or when they uncover students’ misconceptions, they have some strategies available to them. Consider this example. In the fall of 2010, Vanden Heuvel was teaching a large introductory biology course for majors at a midsized regional university. Students included more than 200 first-year biology majors who had satisfied the prerequisite of at least one year of high school biology. After finishing a 15-minute introduction to Mendelian genetics, Vanden Heuvel proceeded to ask a series of five multiple-choice clicker questions. After each question, he posted a histogram of the classroom responses, allowing the students to see how the entire class answered each question. This particular set of students showed an equal distribution for each answer, indicating either that students were disengaged and simply guessing or that they believed each of the answers represented a viable response to each of the questions.

When confronted with these results, Vanden Heuvel asked the students to try to convince a partner that their answers were correct. He emphasized that even if the students were guessing when they chose their answers, they were still likely making choices because of something in the question, perhaps a word or a phrase that offered an association with a concept. After one minute, students re-voted on the same set of clicker questions. Typically, when Vanden Heuvel asks students to re-vote after they have discussed their response with other students, he sees a dramatic improvement in the classroom data. He finds either that most students select a single “correct” answer or that students are very evenly split in their responses between two answers. If the students are split in their responses, he asks them to explain to the larger group why they would select one option over another, which gives him an opportunity to check for specific conceptual or procedural errors, and then he identifies the correct response.

Vanden Heuvel often finds peer instruction to be an effective strategy to address gaps in students’ learning, evidenced by students’ ability to demonstrate their understanding in subsequent questions. In fact, involving students in peer instruction following clicker responses is a recommended best practice (Stewart & Stewart, 2013). In this particular instance, however, when students re-voted, he saw once again an equal distribution of responses. With this new information, having witnessed the failure of peer instruction to address students’ problems with the material, Vanden Heuvel knew he had to do something else, but his options were limited. He could review the slides from the first 15 minutes of lecture, but he realized immediately that doing so would be an exercise in futility. If the lecture content failed to produce results the first time he delivered it, it was unlikely to do so a second time. He could step away from the PowerPoint and attempt to “chalk talk” students through the concepts, but he had not prepared additional
strategies for explaining the concepts, and he did not have enough information from students’ responses to his clicker questions to identify exactly where students were getting stuck.

Vanden Heuvel made a split-second decision to close the lecture and pull up the students’ homework problems. For the remainder of class, students worked in groups on their homework while he circulated among them. Students were able to practice applying their knowledge and could receive immediate feedback from their partners and from him about their answers. Working through problems helped students to develop a deeper understanding of the concepts and to identify significant conceptual and procedural errors. At the beginning of the next lecture, Vanden Heuvel asked students to respond to another set of clicker questions related to the previous lesson, and students’ responses indicated that they understood the topic.

Vanden Heuvel’s experience illustrates the benefits and challenges of using clickers in formative assessment. As other research has suggested, clickers provide instructors with real-time feedback that enables them to address students’ needs through contingent or just-in-time teaching (Sun, Martinez, & Seli, 2014). Contingent teaching uses student feedback to structure lessons and respond to students’ authentic needs for instruction rather than using a pre-determined lesson (Draper & Brown, 2004). The idea of contingent teaching is supported by social constructivist theories, which hold that learning takes place in a student’s zone of proximal development, that is, in the space between what students know and can do on their own, and what they need guidance to learn or accomplish (Vygotsky, 1978). Understanding the foundational knowledge that students possess helps instructors operate effectively within students’ zones of proximal development and identify misconceptions before students internalize them. Contingent teaching enhances instruction because it helps instructors make good use of class time by prioritizing topics in discussions, illuminating students’ misconceptions, and, when paired with peer instruction, fostering students’ classroom interactions (Kay & LeSage, 2009).

Research also supports the efficacy of peer instruction in teaching and learning (Topping, 1996). Peer instruction leverages the power of students in the group to provide reciprocal feedback on each other’s learning (Boud, Cohen, & Sampson, 2001). It represents a departure from the typical lecture format characteristic of most postsecondary instruction and results in a more active, collaborative, and problem-based method of instruction. Peer feedback works best when students are asked to apply a concept or solve problems alone or in small groups and then explain their reasoning to others (Crouch & Mazur, 2001). As an intervention, peer learning has both cognitive and emotional effects, increasing students’ critical thinking and capacity for applying their knowledge, as well as their motivation (Baud, Cohen, & Sampson, 2001). Clicker questions provide an opportunity for faculty to incorporate peer instruction into their lectures and can be effective in offering just-in-time instruction in large classroom settings, where it is impossible for an instructor to address every student during the course of a class.

As Vanden Heuvel’s experience also demonstrates, however, contingent teaching and peer instruction present instructors with some challenges. These teaching strategies demand a certain kind of flexibility from instructors. Rather than imagining a lecture as a linear progression through a series of related concepts, instructors might need to structure their lectures as “branching” plans, where students’ responses to material determine the course of the lecture (Draper & Brown, 2004). Structuring a class this way is complicated and potentially messy. Rather than designing only one lesson for each class, an instructor may need to prepare several lessons designed to address the common issues students might experience when they learn a topic – and to be ready to shuttle among these lessons based on students’ responses.

An additional issue might be the use of PowerPoint and other presentation software as a standard for lectures. Such programs make shuttling back and forth even more difficult, because they are linear in their organization. Although these programs have enabled more sophisticated visual and
multimedia components to be incorporated into lectures, they have also made the lecture structure more rigid and made it more difficult for instructors to go off script, backtrack, or supplement instruction based on students’ needs. As Vanden Heuvel discovered, if students fail to grasp material after working through every planned contingency, instructors may be at a loss. Although he was able to recover and, with some quick thinking, engage students in an activity that was also instrumental in their learning, he also lost most of a lecture and had to reduce the amount of material he would cover in the class.

Similarly, peer instruction, although a recommended best practice, is not always effective. As many critics of peer-centered pedagogies have noted, it can at times seem like “the blind leading the blind.” If students leave a peer-mediated discussion with their misconceptions reinforced, they may have a difficult time revising their understanding.

To use clickers effectively in formative assessment, we need to do more than simply stop periodically throughout a lecture to ask students a few questions. We need to have an instructional goal in mind that clickers help us to realize. We need to know what kinds of student information we should acquire and what this information might communicate about our students’ learning, and we need techniques to help us respond in real time to what our students tell us. To implement strategies in support of contingent teaching and peer learning, instructors need to reconceptualize the way they build their lectures; learn to identify common sticking points for students; come to class with flexible plans and extra activities and problems; and be willing to forgo coverage for deeper kinds of learning. We need to shift from thinking about teaching as an act of communicating content to recognizing that teaching requires that we understand who is in the room.

References


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