Successfully Using Clickers in the Classroom

Use Appropriate Pedagogy

- Use class time to build a solid understanding of course concepts; let pre-class reading and post-class homework provide the rest
- Use exams and other performance metrics that support, not contradict, the concept- and reasoning-centered focus of the class
- Design for "multi-pass learning," in which an idea or technique is developed through multiple visitations in varying contexts spread over time
- Appreciate and convince students that confusion is an inevitable part of learning and that they will not fully understand what is taught at first encounter
- Focus on the reasoning behind answers and not on their correctness; a full spectrum of answers should be drawn out and discussed before indicating which (if any) is correct
- Convince students that questions are for learning and not for evaluation

Avoid the "Instructor-Centric" Classroom

- Resist the temptation to read the question out loud or clarify it; if it contains ambiguities, it's better to allow class discussion and student questions to bring them out
- Tolerate silences while students ponder and make up their minds to speak out
- Whenever possible, allow other students to find error or flaws in an argument, even it this appears inefficient
- Ask two to four questions per 50-minute class; if that doesn't fill a class, it probably means there isn't sufficient discussion or sufficiently divisive questions
- Use sound as a clue to decide how long to allow for small-group discussion; the noise level rises as students finish reading and assimilating the question and begin discussing it, the noise level drops as they reach resolution and enter their answers; if too much more time passes, the noise level rises again as small talk ensues

Use Question Wrap-Up

- Summarize key points or arguments students have put forth, possibly adding ones they missed
- Make connections to related questions and topics, pose "what if" alternative questions to be pondered but not answered, or segue into the next question
- Before revealing a "right" answer, ask for a show of hands indicating how many students changed their minds as a result of the discussion; if the count is significant, resend the question
- Deliver a mini-lecture of some piece of subject matter if the students answers and discussions have revealed a fundamental gap in knowledge or understanding
- Keep this phase short and directly tied to the students' recent and upcoming learning activities and do not slip into extended lecturing

Engineer Questions Deliberately

- Ensure that each question has a clearly identifiable pedagogic goal, not just a topic to address; the goal should indicate the action you hope to induce in the students' minds, such as drawing out their background knowledge and beliefs, making them aware of their own and others' perceptions of a situation, discovering points of confusion or misconception, distinguishing two related concepts, realizing parallels or connections between different ideas, elaborating the understanding of a concept, exploring the implications of an idea in a new or extended context
- Avoid computational or simple factual questions or those that probe memory rather than understanding
- Strive for questions that get students to reason qualitatively and to draw conclusions from a conceptual model
- Design questions to "catch" students in likely misunderstandings and points of confusion
- Design ambiguous questions to help students learn to reason and think defensively and to answer future questions, especially the vague, fuzzy kind often encountered outside the classroom
- A broadly spread histogram of students answers, indicating several popular choices, is a signature of an effective question; it provides good material for discussion and argument among students
- Use sequences of related questions to build on each other to develop a complex idea or set of related issues; present a concept in different contexts or use slight variations of the same question to explore the limitations of a concept or to relate different concepts.
- Use familiar situations for new concepts to develop understanding; use new situations for familiar concepts to check for understanding (as on an exam)
- Consider when and how a question is presented; if a question is posed before presentation of subject material, students will draw on preexisting knowledge, apply intuition, and extrapolate from prior course material; if it is presented after, they will draw on whatever was just covered regardless of its relevance

Meta-communicate

- Explain to students the learning objectives of the course and its components, the virtues of instructional techniques and styles employed and the reasons why particular assignments are given
- Accept the role of a learning coach and advisor and help students find strategies that increase their benefit from the course and form education in general; help them learn how to learn