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Web-based Homework and Quiz Systems

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Mastering Physics is a Socratic tutor designed to help students learn introductory physics. The tutor poses problems and then comments specifically on about 1/2 of all wrong answers, even though most responses demanded are analytic expressions. Students can request hints (some of which are sub-problems), and work through the list of hint titles at random. In a typical problem there are 10 round trip interactions between tutor and student, raising the percentage of students who get the answer from $\sim 60\%$ on the first try to over 90% after tutoring. This is Mastery Learning where student time and effort are increased to achieve learning rather than the grade decreased to indicate that the learning is incomplete. Mastering Physics is also a homework administration system that aids the instructor in preparing an assignment by indicating (in the problem library) the difficulty and duration of each problem and of the overall assignment. At MIT doing Mastering Physics has been shown to correlate much better than written homework or going to recitation with scoring better on the final exam in May than that student did on the final in December (which is why the student was repeating the course in the spring). At Arizona State, Mastering Physics increased the class normalized gain on the Force Concept Inventory from 21% to 40% the year it was introduced.