

Delft University of Technology, The Netherlands

Submitted by: Pieter Kruit, Department of Applied Physics

CASE SUMMARY

The lecturer found that his students were underestimating the amount of studying they needed to do in order to pass the course so the **fail rate for the final exam was high**. By introducing MasteringPhysics in a **group problem solving class** students were more engaged in their learning before taking new individual credit-bearing MasteringPhysics assessments. The result is a significantly **higher pass rate** on the course.

Courses

Mechanics, Waves and Optics

Textbooks

Essential University Physics 2nd edition, Wolfson

Type of data collected

Anecdotal & Statistical

Data collection period

2013-14

The current practice

The course used to be taught in 7 weeks, 2 x 2 hour lectures per week with different types of student participation in the lecture room (peer instruction, voting system). For each chapter, sets of problems were suggested to the students for practice. In the ninth week there was a written exam consisting of ten problems.

Not all students attended the lectures, and many students failed the exam. When I analysed the reasons for this, it became clear that most students simply did not put the required time (3 credits = 84 hours) into preparation. It had been their experience in high school that they could get high grades in physics in less than half the time of their fellow students; that's why they chose to study physics at university!

with a short explanation of the material (sometimes in a separate lecture hall), then I open the "group assignments" in MasteringPhysics. Students are stimulated to discuss the solutions of the exercises and if a group cannot figure it out, they can ask for support from the teaching assistants. If I notice that many students are struggling with a specific problem, I ask for their full attention again and explain the physics once more. Sometimes we add small table experiments (e.g. collision physics of coins, a pendulum, imaging with lenses and mirrors) and ask the students to write their answers in a MasteringPhysics format.

At least once a week I set "individual assignments" where students no longer work in groups. These are invigilated by the teaching assistants to ensure students are working alone.

The challenge

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The solution

I converted a large room into a "studio classroom". Students sit around tables in groups of 6 with their laptops open. There are also several screens that project what I do on my computer. I start each teaching session

Implementation of the technology

To do the assignments, the students have to be present. For the group assignments they slowly gather credits; 10-20% of the final grade. The credit they get is proportional to their grade in MasteringPhysics. The individual assignments replace the final exam, although it is possible for students to choose for a traditional 3 hour final exam instead, although very few do.

The results

ANECDOTAL EVIDENCE

I was surprised how natural it felt to be teaching in this fashion. The students get to work as soon as they understand what to do. The whole room is buzzing with discussions about physics: they feel the immediate need to understand, in order to solve the assignments. Within a week, the students know if they need to work harder to keep up because they get feedback on their performance. In the old system, the grade for the final exam was the first time they found out how well they were doing.

STATISTICAL EVIDENCE

The fail rate has decreased dramatically, from around 40-50% to 10-15%. Of the students who fail, I can now identify those who, despite putting a lot of time and effort in to studying, still did not pass. It's likely that I would recommend they reconsider whether physics is really what they should be doing.

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In brief

- Solving problems in MasteringPhysics is a great activity in a studio classroom set-up. To work on assignments in small groups is a very natural way of learning.
- Students feel that finishing a set of assignments, getting the grade directly and earning some credit towards the final exam is a very satisfactory result for a morning of hard work.
- Almost from the start, the students know how they are doing in the course and can adapt their efforts. The level of the “exam” is never a surprise because they have practised solving similar problems.
- I can adapt what I teach to the level of understanding of the students, which I monitor both through my discussions with the students and through analysing the scores in MasteringPhysics.

The learning

We need to help first year students put enough time into their studies. When they start, they do not realise that studying physics at university level is much more demanding than anything they have done before and often find out too late. We need to give them feedback on how they are doing as soon as possible, and we need to make problem solving a social event.

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