

Encouraging Students in Large Classes

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Abstract

Our experiences and results of encouraging our students in a large CS1 course to keep up with the pace of the course at a reasonable cost for us are presented. We have successfully managed to pinpoint students who are about to fall into the anonymity and passivity trap and give them the extra attention they need to avoid the trap *when* they need it. Since we managed to pinpoint the most needing students we can give them the extra personal recognition and encouragement they need at a very reasonable cost in the perspective of the whole course. For the two years we have tried our concept we can see a significant increase in the pass rate of the final exam.

1 Introduction

Since the meaning of “a large class” is something that differs between different universities and lecturers we need to clarify our definition. In our world a large class is 100-200 students, and the course we present in this paper is a CS1 course taking about 180 students.

Problems with large classes are many and massive. “For students the dominant problems are anonymity and passivity. For staff the dominant problems are not being able to relate to students as individuals and being overwhelmed by the number of demands placed upon them.” [6]. Linked to these problems are others such as negative effects on students’ understanding of the subject [2], and a most likely higher drop out rate followed by the first year students’ experiences of their anonymous situation in a large class [6]. Even though these problems are severe and present for all students, some of them seem to be experienced in a higher degree by the women than by the men [4], an important concern in a situation where more women are encouraged to study computer science. The

problem shows itself when it comes to drop out and to the learning outcome of those who remain in the system.

This text describes how it is possible to deal with the core problem in large classes - the lack of interaction between students and their teacher - and how this can improve the pass rate at the end of the course. By focusing on the students at risk all along the course, the course leader can direct his attention, his teaching, where it is needed the most, and where it gives the highest payoff. The information needed to do this is gathered in different ways and the time to do this is bought by hiring an extra teaching assistant (TA), a fairly low cost compared to the positive effects on the pass rate of the course.

In detail the lecturer, who is the head of the course, spends an average of two hours a week visiting the group exercises of the course. During these visits he simply walks around and talks to the students and TAs. The students feel recognized even if the lecturer, in average, spends less than one minute per student. The TAs are provided with weekly performance sheets where they write down their students’ performance. These sheets are handed in to the lecturer after each exercise and they give an overview of who is on pace or not. This information is then used by the lecturer during his visits to spend some extra time with the students who are not on pace and encourage them.

2 Course Format

The course is a typical CS1 course, for the moment offered in Pascal. We are giving the course as a service course to the School of Mechanical Engineering at Lund Institute of Technology, Lund, Sweden. They have about 150-200 freshmen every year and this course is compulsory for all of them. The course is given as a one-semester course with a 20 percent workload and it is given during their very first semester at the School of Mechanical Engineering. Similar CS1 courses are given as service courses to almost all non-computer science programs at the Lund Institute of Technology. There are only some minor differences between the courses offered to the different programs. In all, 600-700 students take these courses every year.

The course format is:

- 13 lectures (2 hours, 180 students).
The lectures have the form of traditional lectures.

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- 3 seminars for beginners (2 hours, 100 students).
The seminars are given in parallel with the three first lectures as support for those who never have been in touch with programming before.
- 10 classroom exercises (2 hours, 16 students and 2 TAs).
A small pen and paper problem set has to be fulfilled at each exercise. These exercises are compulsory and the students have to fulfill all the ten problem sets to be eligible for the final exam.
- 5 computer lab exercises (2 hours, 24 students and 3 TAs).
A small programming exercise has to be fulfilled individually at each lab. These labs are compulsory and the students have to fulfill all the five labs to be eligible for the final exam.
- 2 individual programming projects.
These projects are compulsory and the students have to fulfill them to be eligible for the final exam.
- 1 final exam (no mid terms).
A five hour exam on paper.

The effort we put in with the seminars during the first three weeks of the course has two purposes. The most obvious purpose is to help those who never have been in touch with computers or programming to keep up with the lecture pace. As a bonus we can keep a “normal” pace at the lectures and avoid to completely bore those students who already know a little about programming. When we added the seminars to the course it clearly declined the early drop out rates (see Results).

We also provide some catch up exercises at the end of the course for those who still are not eligible for the final exam.

At Swedish universities we do not require a student’s grading point average to be at a certain level. On the other hand, our minimum requirements in the single courses are normally quite high. The pass limit for this particular course is set somewhere in between a (US) C grade and a C+ grade. The course is compulsory, but computer science is not a core subject for the mechanical engineering students. As a consequence, a lot of the students are happy to just pass the course

3 Implementation

We want to be able to pinpoint the students who need extra help when they need it, and we think we have come close at a low extra cost (for the department).

It is important the students are given the possibility to keep up to the pace of the course *during* the course [5]. Our experience tells us if a student does not manage to keep the pace his problem will most probably increase along the rest of the course. To postpone too much work to later on is normally never a good solution. So, instead of having some big catch up exercises at the end of the course, we now

have introduced a small catch up exercise every week instead. Here is a small extra cost involved, but since we only allow students who have been encouraged to attend this week’s catch up exercise to participate we know exactly how many TAs we need each week (see below). It is finally the student’s own responsibility if he is going to attend the catch up exercise or not. We do not force anyone, but we encourage. The exercises are always placed late Friday afternoon.

We provide all the TAs with weekly performance sheets with the students names preprinted. For all students in their groups the TAs mark one of the three possibilities; Done, Catch Up, or Missing. This is done at every exercise.

- Done means a student is done with this week’s problem set or lab. He is on pace!
- Catch Up means a student is not done, but has worked with the material, and is eligible to attend this week’s catch up exercise.
- Missing means simply a student was not attending the lecture or lab. To be eligible for this week’s catch up exercise he must ask the course leader.

The sheets are handed in to the lecturer at the end of the same day as the exercise or lab has taken place. They give him a clear picture of who are on pace and who are not. This information is used to “confront” the students who need extra help *when* they need it.

The weekly classroom exercises are normally given in four adjacent classrooms on three different occasions. Normally, the lecturer spends a little more than an hour visiting the four classrooms during each occasion every, or every second, week. In average he spends about two hours per week visiting the students and TAs. During these visits he simply walks around in the classroom and talks to the students. He asks them how they are doing, if the stuff is difficult, if they think he needs to repeat a special topic in the next lecture, etc. Almost always there are questions related to the last lecture, questions the students did not dare to ask at the lecture because there were too many students then. Since the lecturer talks to most of the students, individually or in groups, the students who gets the lecturer’s attention because they are not on pace does not feel pointed out. Normally, it is enough to just encourage these students to make them study a little harder and get back on pace again. When the lecturer realizes a student is too far off the pace, he can set up a meeting at his office with the student. Then they can make up a catch up plan for the student in privacy. These visiting hours in the classrooms are really stimulating and rewarding!

4 Results

Figure 1 shows the pass rates of the final exam for the last nine years. During these years there have of course been minor upgrades of the course continual, but only two major changes have taken place. The seminars were added to the

course in 1994/95, and then the visits were added in 1997/98. The course leading lecturer has been the same since 1994/95.

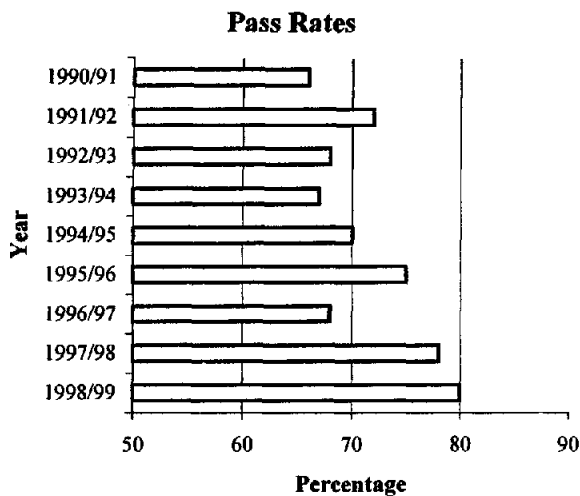


Figure 1. Pass rates of the final exam

When the seminars were added in 1994/95 we could see a decline in the early drop out rates, and the students were very positive to the initiative. In the course reviews from 1994/95, 98% of the students were in favor of keeping the seminars.

The pass rates for the last two years shows a 10 percent increase in the pass rates compared with the three years before. We are convinced that this is a consequence of our visits. The written course reviews and interviews with some of the students from 1998/99 supports this conclusion. Especially among the female students' answers the support for the visits is very clear.

5 Discussion

When we started this experiment two years ago, we saw it mostly as a way to help the students to keep the pace of the course. But the outcome was better than expected. Here are a few benefits from the lecturer's point of view:

- He meets those not on pace. He can confront them with facts on their course status, and encouraging them verbally. For the first exercises about 15 percent of the students are sent to the catch up exercise, declining to about 5 percent for the last exercises. Since they are not more, he normally can remember them when he sees them the next time and follow up their performance. If he does not exactly remember he always has the weekly performance sheets to fall back on.
- The students feel he is caring. This is especially important for many female students [4]. Hopefully

most lecturers care about their students' performance, but it is not always the students notice.

- Problems in the course/lectures are easier to find out about when he meets the students in smaller groups. They then dare to tell him things, which they would not dare to tell in a large lecture.
- He meets his TAs on a regular basis. They can pass on information they have got from the students. Normally, the students are more open to tell a TA about things they think should be done differently in a course than telling the lecturer. We have informed our TAs about the main reason why he is visiting their exercises, and so far we have not got the impression the TAs feel he is there to evaluate them. Though, the TAs can always ask him for help if they feel insecure about a special topic.
- Stimulating! This is something not to be neglected. It is stimulating when the students open up and let you closer to them.

Some of this can be achieved by having one of the exercise groups by yourself, but you will not get a good grip on the whole then. If you normally have a group of your own, then the time spent by you will be the same with the visits and the only extra cost will be the cost of the extra TA.

If you want to succeed with the visits we think it is important to keep them as informal as possible, otherwise the students might feel you are forcing them, and not encouraging them. And force is normally not a good concept. We do not see it as we force them to keep the pace, even if sometimes it is hard for the students to see the difference. In the students course reviews you can read encouraging things like; "you got the feeling the lecturer really wanted you to learn the stuff", "the lecturer really cares about my performance", "you don't want to fail the course when the lecturer and TAs has given you all this attention".

Encourage students to work is probably done, by teachers world wide, out of a natural concern for the students. If they do not work hard enough they will most probably get into problem and maybe either fail in the exam or produce learning of a lower quality. On the other hand, giving them more assignments or more teaching hours will probably effect their study approach and effect the learning outcome in a negative way quite dramatically. There is an overwhelming amount of research showing that too much workload is one factor leading the learner to a surface approach and memorization instead of a deep approach where the new information is integrated in the mind of the learner [3,5]. To increase teaching hours can therefore, in the case described here, not be a preferable solution.

Students, especially in their first year at the university, have problems when it comes to planning and carrying out their unsupervised work [7]. Results have shown that they are not satisfied themselves with the way they manage to structure their homework, this dissatisfaction actually

increases during the first year. Cook and Leckey interviewed students in the beginning and in the end of their first year. They point out the "significant change in the confidence with which students felt they could work with minimal supervision, at the same time as there was a significant decrease in the frequency with which student discussed their academic problem with staff." [1].

In this paper we have described a teaching practice designed to overcome some of the problems that go together with large class teaching. They show themselves in the fact that some students have problems with keeping up with the course pace. There are arguments that the core problem is in fact the lack of relationships between students and the teacher [6], resulting in a feeling of anonymity faced by the students, and a problem for the teacher to pinpoint the students who are in need of support.

The solution we propose is a process where the teacher identifies the students at risk and gives them special attention, in order to support them in *their* job. Students at risk were identified continuously during course. The course leader used information provided by different sources and established a relation with those students and discussed their learning effort and their experience of the current assignments.

Finally it could be in place to point out that we do know a good deal of what constitutes good teaching. It comes to life in a lot of skills about how to make things happen in the teaching situation. But, as it is pointed out by the Australian researcher Paul Ramsden, "skills can be acquired fairly easily; a commitment to teaching and improving it is very hard to instil if it is not already present. The three most important attributes needed are:

- A positive attitude towards students
- An ability to communicate well
- A sharp interest, and ideally some experience, in continuously improving teaching through professional reflection" [3]

6 Acknowledgements

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