

Just-in-Time: Better Teaching in Hong Kong

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ABSTRACT

I report on my experiences with Just-in-Time Teaching (JiTT) in the course COMP272 (Theory of Computing) at the Hong Kong University of Science and Technology. The course was given in spring 2002, 2003, and 2004 as a reading course within the JiTT framework. My experience is very positive. Students were always very happy with the course, and they seemed to learn more than in a traditional course. The only negative aspect of JiTT is the unusually high workload for the instructor.

Keywords

Just-in-time teaching, self-study, team work, PRS

INTRODUCTION

Some twenty years ago, I was a student in an undergraduate course that was organized as a reading course [8]. The professor expected the students to read a few pages of the textbook before each class, and then in his lecture he would focus only on the important issues. Since he did not introduce mechanisms to enforce the reading, very few students did it and the course was something of a fiasco.

Nowadays, with computers, email and WWW generally available to students, teaching a reading course has become much easier. In spring 2002, I taught COMP272 (Theory of Computing), a second-year undergraduate course at The Hong Kong University of Science and Technology (HKUST), as a reading course [1]. To enforce the homework reading, students had to send me email questions on the content the day before class, which I answered individually. Each class started with a short quiz on the new material. Then, I mainly discussed some of the problems from the student emails. Most questions and answers were anonymously made public on the course web page in the form of an FAQ list for each lecture. No other course notes were provided, except for links on the course web page to the course notes of a previous traditional course. I repeated the course in spring 2003 with a better web-based course administration system (provided by CELT), and I am currently repeating this in spring 2004.

The course organization falls into the framework of Just-in-Time Teaching (JiTT)

[2,6], see Section 2. JiTT is a student-centered teaching method where students are 'forced' to be more active and thus to learn more, and more easily. Most notably, students prepare the material before coming to class and communicate their difficulties to the instructor who then adapts his or her teaching to the individual problems encountered.

In all three courses, the students' questions showed that a true effort had been made (and success achieved) in understanding the material and seeking a deeper understanding of the concepts and their relationships. The extraordinarily good results of the final exam in 2002 even surprised me. I will give details of the course concept in Section 3. I will end with some concluding remarks in Section 4.

JUST-IN-TIME TEACHING

Student-instructor interaction is the single most important part of the teaching process. Eric Mazur concluded in [4] that the traditional teacher monologue in front of a passive classroom would better be replaced by some other forms of teaching where students are more actively involved in the teaching process, for example by discussing problems first before presenting solutions (*Peer Instruction*). To get the class time necessary for discussion the traditional lecture has to be replaced by student-self-learning.

This leads naturally to the concept of *Just-in-Time Teaching (JiTT)* which is based on a simple feedback mechanism: students prepare the class material at home *before* coming to class, and instructors closely monitoring their learning progress use that information to adjust their teaching to those parts of the material which were most difficult for the students (this has given the technique its name).

JITT FOR COMP272

Students learn best when they can learn at their own speed and according to their own time schedule. This means that traditional classroom lectures are not well suited to delivering information. It is not surprising that many courses have an attendance rate below 50%. Many students do not learn the material in the classroom, they learn the material two days before the exam reading the course notes, forgetting most of it again two days later. A reading course should therefore provide a much better learning experience for the students. To implement the ideas of the JiTT framework, one has to be careful.

- **Choice of Reading Material:**

The reading material must be on a sufficiently low level. Many textbooks are unsuitable for self-study. I used a new textbook by Kinber and Smith [3] which is based on well-written course notes by the authors. Students had to read about five pages of the book for each class, three times a week.

- **Enforcing Self-Studying:**
I used two methods to enforce the homework reading. Firstly, before every class the students had to submit a question on what they had read. Most questions and answers were anonymously made public in FAQ lists for each lecture. Secondly, each class started with a five-question multiple-choice quiz, using PRS [7].
- **Team Work:**
Learning in a group can be beneficial not only for weaker students. I had the students organized in teams of three to four. In the class quizzes, teams could earn an extra point for good team performance.
- **Tutorials:**
In the tutorials (one hour per week), the students solved problems (again as a team) and presented their solutions.
- **Grading:**
I used a reasonable absolute grading scheme, based on my long teaching experience in Europe, North America, and Asia. In 2002, the students performed surprisingly well, achieving an exam average of 91% in a normally difficult final exam. In 2003, probably due to the SARS interruption, the students did not so well in the final exam, which had a 'normal' grade distribution.

Although the workload for the instructor is usually quite high, in particular on the evenings before class, I found teaching this course very rewarding. Due to the individual questions there was much closer contact with the students than in a traditional course, with immediate feedback on their learning progress. Also, in contrast to most other courses, I had a class attendance of 95% until the very last week of the term (except during the SARS period).

The students always liked the course. In mid-term teaching evaluations in 2002 and 2003, about 80% of the students in each year preferred this course to a traditional lecture-based course.

CONCLUSIONS

I have used JiTT in two successful courses. The advantages of JiTT are

- Students learn regularly, enforced by reading questions and class questions;
- Answering the reading questions comes closer to individual tutoring;
- High class attendance;
- Students seem to learn better;
- Lectures are more improvised (and more fun for the instructor).

Unfortunately, there are also disadvantages:

- A high workload for the instructor;
- Finding suitable reading materials is difficult;
- Lectures are more improvised (no pre-prepared slides).

I will continue using JiTT in my classes, hopefully extending it to other subjects than COMP272. In the future, I may also introduce some of the Peer Learning [4] and ConceptTest [5] ideas by Eric Mazur to my courses. They seem to fit well into the JiTT framework.

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