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ABSTRACT

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ACM Classification Keywords

H.5.m. Information Interfaces and Presentation (e.g. HCI): Miscellaneous

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INTRODUCTION

Large classes, whether they are MOOCs or traditional lectures, face many problems in providing high quality education to students. The sheer size of the class means that instructors have little ability to focus on any particular student's development. Students can easily become "out of synch" with the main flow of the class either understanding the material too quickly and becoming bored or simply being unable to keep up with the pace. Additionally students can become socially isolated, unable to form a connection with anyone related to the class who might work with them.

These problems manifest in a variety of ways. For example the inability to select problems that are appropriate for the student. For practical reasons many classes are forced to adopt a one size fits all philosophy for homeworks and reviews, since doing anything else would be too difficult. This means students might miss out both in terms of more difficult problems that pushing their knowledge forward as well as questions that ensure they don't have gaps in their knowledge.

Additionally this single homework/review setup means students can easily become isolated and disengaged with the learning pace of the class. And once they aren't in synch

it becomes difficult to get back on track. Since If the class is moving too fast or too slow the the student they will need access to tailored resources that can either keep them occupied or help them catch up with the bulk of the students. But the course can only provide a fixed set of material that won't adapt to the student's needs.

??? Need more about the Social aspect ???

Providing timely feedback can also be an issue. Students may have questions about answers or concepts and if they are not provided at the correct time the student may forget or simply lose interest. Answering questions as they arise, and giving students a tight feedback learning loop, can greatly enhance the quality of a class.

We propose a general framework "Computer Directed Peer Tutoring", exemplified by a tool we are building the "Calculus Co-Tutor", whose goal is to alleviate or reverse several of these traditional disadvantages of large classes. We propose to do this by taking advantage of several theories in learning, most notably the Teacher's Dilemma and Space Repetition, to create a framework where we will utilize computer support and peer tutoring techniques to correct these problems.

The main goal of the framework is to leverage the traditional disadvantage of a large number of students and instead turn it into an advantage. In particular we use a software environment to ensure that students are communicating in a reasonable way, in particular asking each other valid questions with correct answers. And the Teachers Dilemma provides a theory for ensuring that students not only ask each other valid question but also valuable questions in terms of ensuring the students knowledge. Then Space Repetition provides a method for ensuring the students are retaining the information beyond the initial interaction or when they need to review material.

Finally since students are being paired up and asking each other questions we can work on developing a social interaction between them. Making sure that students who can help each other are consistently paired up and a reoccurring dialog is developed.

With all these elements in place we can turn the issues associated with having a large number of students around. Each student is now a teacher in training who can assist the professor in teaching other students. The software environment ensures that they are asking each other pertinent questions. And spaced repetition ensures that the students retain the knowledge over time.

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ACKNOWLEDGMENTS

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