

First year calculus courses are required by a large number of science, engineering and business students. Nevertheless, because of the various background of students and the “3+3+4” curriculum reform, it was found that students usually do not equip with sufficient pre-calculus knowledge to study first year calculus courses. This project serves as bridging self-learning material and it aims at conducting and consolidating the pre-calculus knowledge of students via the e-learning environment.

In this project, six micro modules were developed as a collection of web-based materials, namely Sets and Logic, Functions, Trigonometry, Mathematical Induction, Binomial Theorem, Polynomial and Rational Functions, where each of them is a pre-calculus topic.

We design the modules by adopting the diagnostic assessment approach. Each of them starts with an entry test, then relevant contents will be recommended to students according to their results so that they can catch up the missing parts in a short time.

Thanks to the technology, we are able to provide a more interactive learning environment. Geogebra (Mathematics teaching software) materials enable students to perform “mathematical experiments” in a more dynamical way; intermediate knowledge checking questions and YouTube video clips provide a step-by-step guidance which enables students to study according to their individual progress and needs.

Furthermore, students may check their knowledge after finishing the whole module by a revision exercise. Borrowing the idea of flipping classroom, when relevant contents in a micro module will be covered along the progress of the course, announcement is made by the lecturer in advance. Students will have to study by themselves. Problem sets will be given as an assessment and their questions will be followed up in tutorials.

As a prior scheme, the micro modules were implemented in two classes of the project supervisor in the first semester 2015/16. From the primary statistics and comments from students, the micro modules were able to enhance their pre-calculus knowledge. Students also reflected that the micro modules help them to pick up the concepts of trigonometric identities, partial fractions, binomial theorem.

As a matter of fact, contents developed in this project are common foundations for several services courses on calculus which intake a large number of students. Further improvement and enrichment of the contents will be carried out according to the experience of actual implementation and students’ feedback. In a long run, well-established materials can be shared among those courses to lower the teaching burden of colleagues in the department. If this model of self-learning is successful, it can be further extended to other service courses as well.