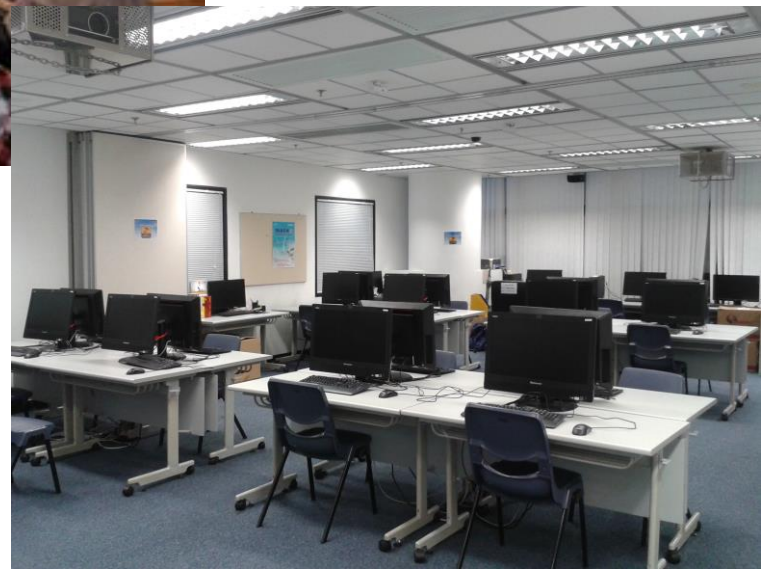
WeBWorK and the Math Support Center at HKUST

Workshop@UST Jun 10-11



WeBWorK and the Math Support Center at HKUST

About This Talk

To provide some brief background information for the Workshop participants on:

- The WeBWorK system
- A brief history of WeBWorK at HKUST
- The development and current status of the Math Support Center at HKUST
- A few things that triggered these actions for change

and perhaps also a brief tour of the workshop program between the lines.

WeBWorK and the Math Support Center at HKUST

What is WeBWorK?

Suffice it to say briefly here that WeBWorK is an open-source and freely available online homework system for math and science courses, originally developed by Professors Michael Gage and Arnold Pizer at the University of Rochester.

Obviously you will find out more about the system from the next talk *"The WeBWorK Online Homework System And Its Academic Community"* by Prof. Gage, one of the two keynote speakers of this workshop.

WeBWorK is supported by the Mathematical Association of America (MAA) and the National Science Foundation (NSF, USA).

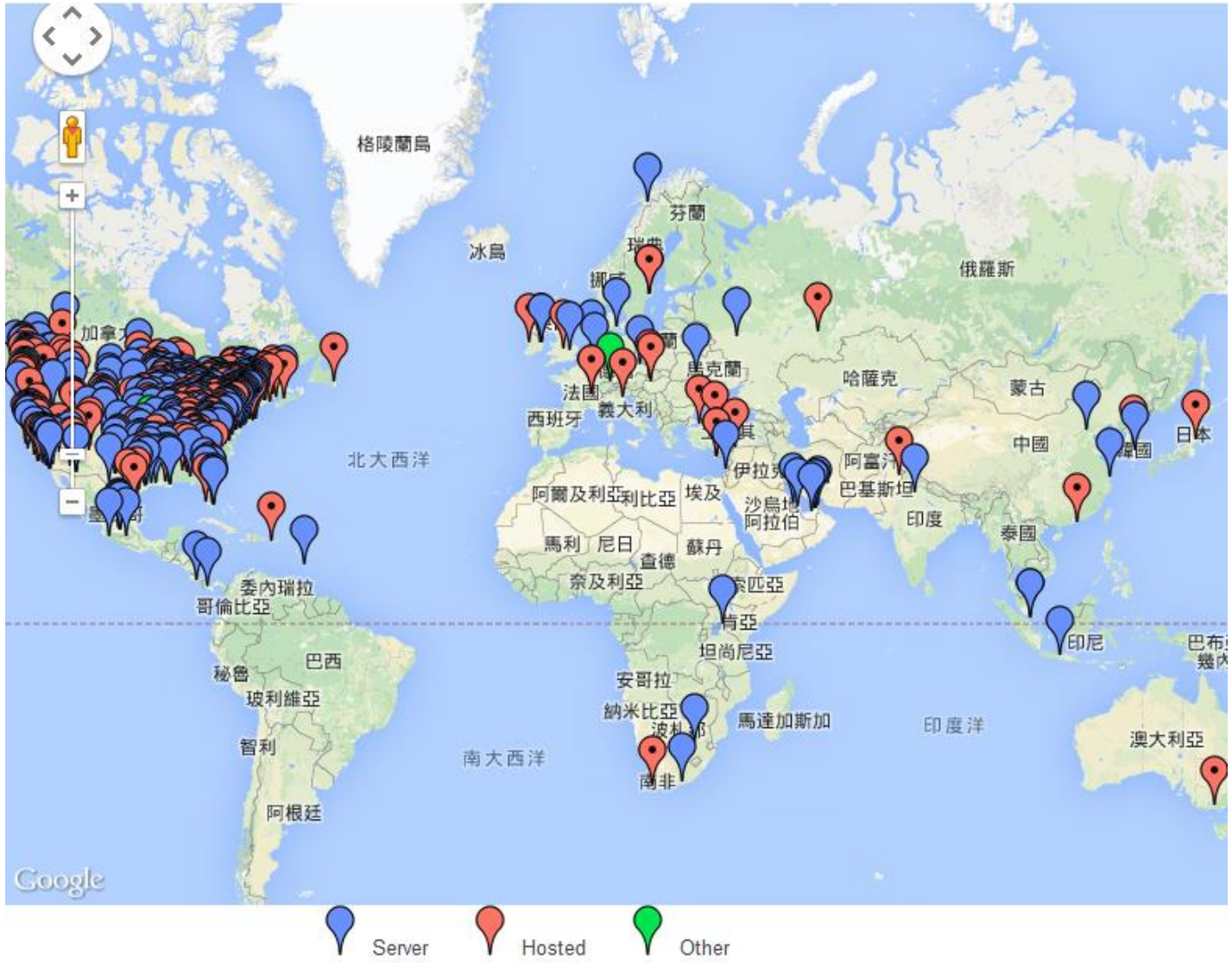
A lot about WeBWorK can also be found at:

WeBWorK at MAA

WeBWorK and the Math Support Center at HKUST

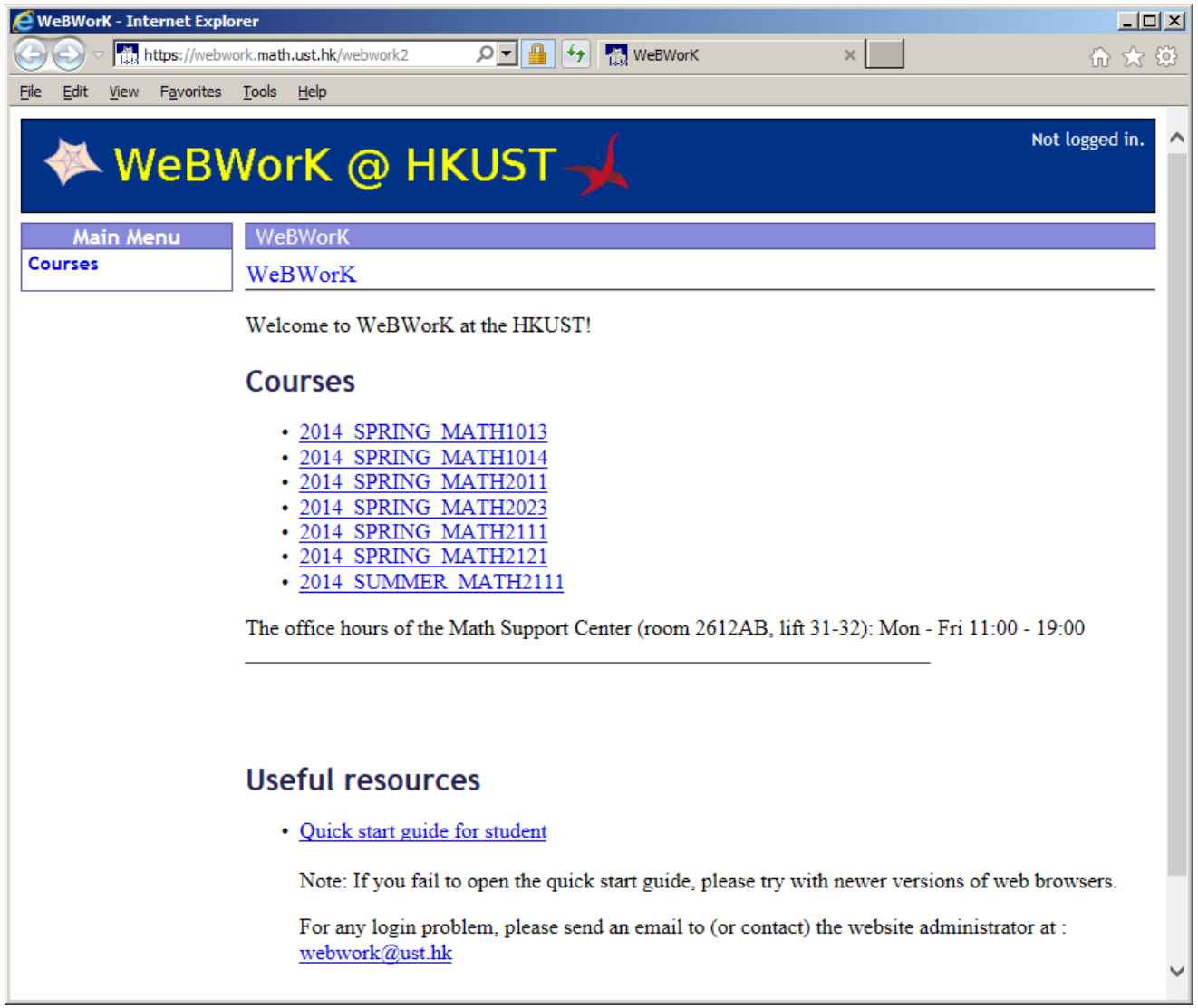
Who are using WeBWorK?

More than 700 educational institutions world wide!



WeBWorK and the Math Support Center at HKUST

WeBWorK@UST for students



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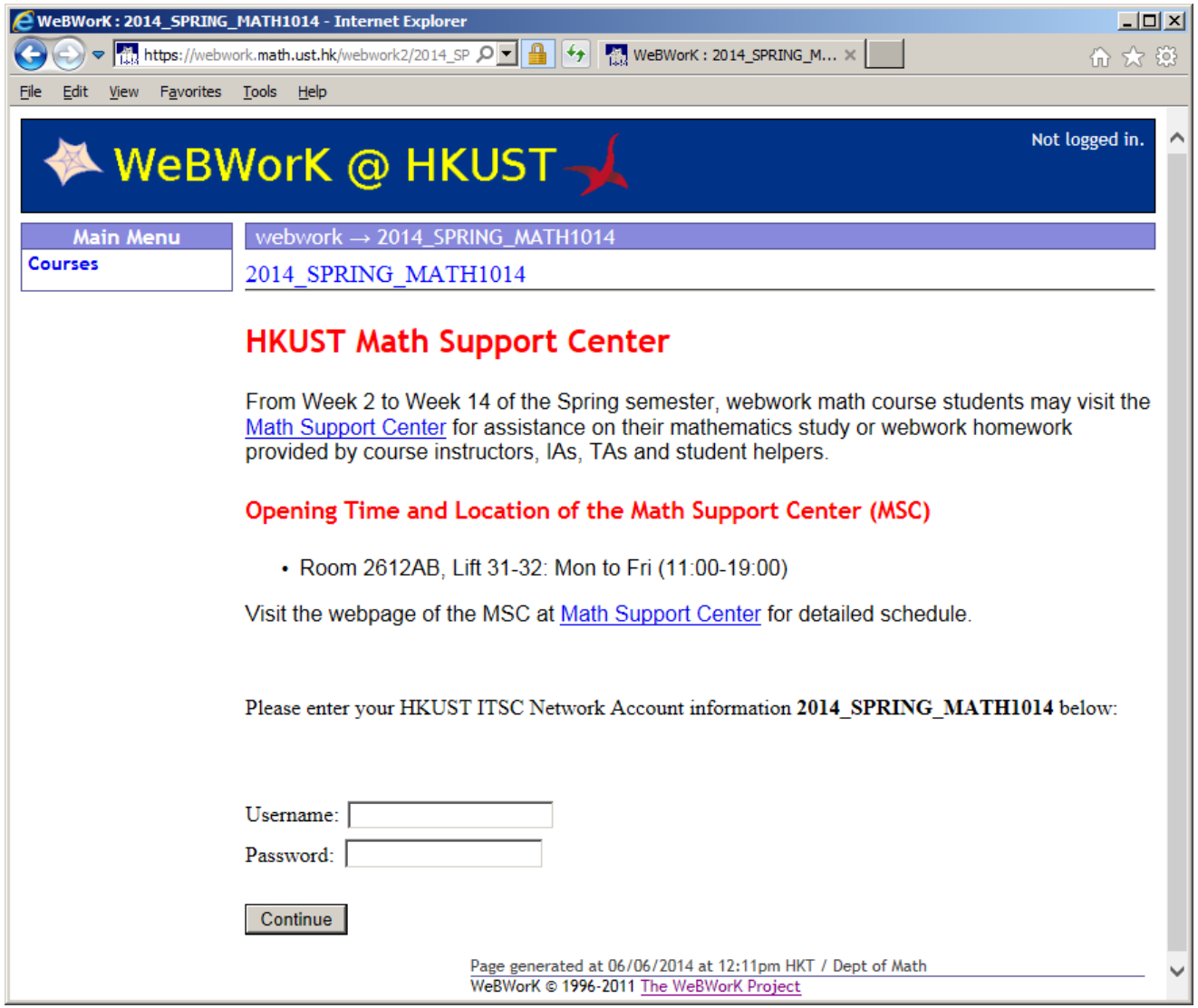
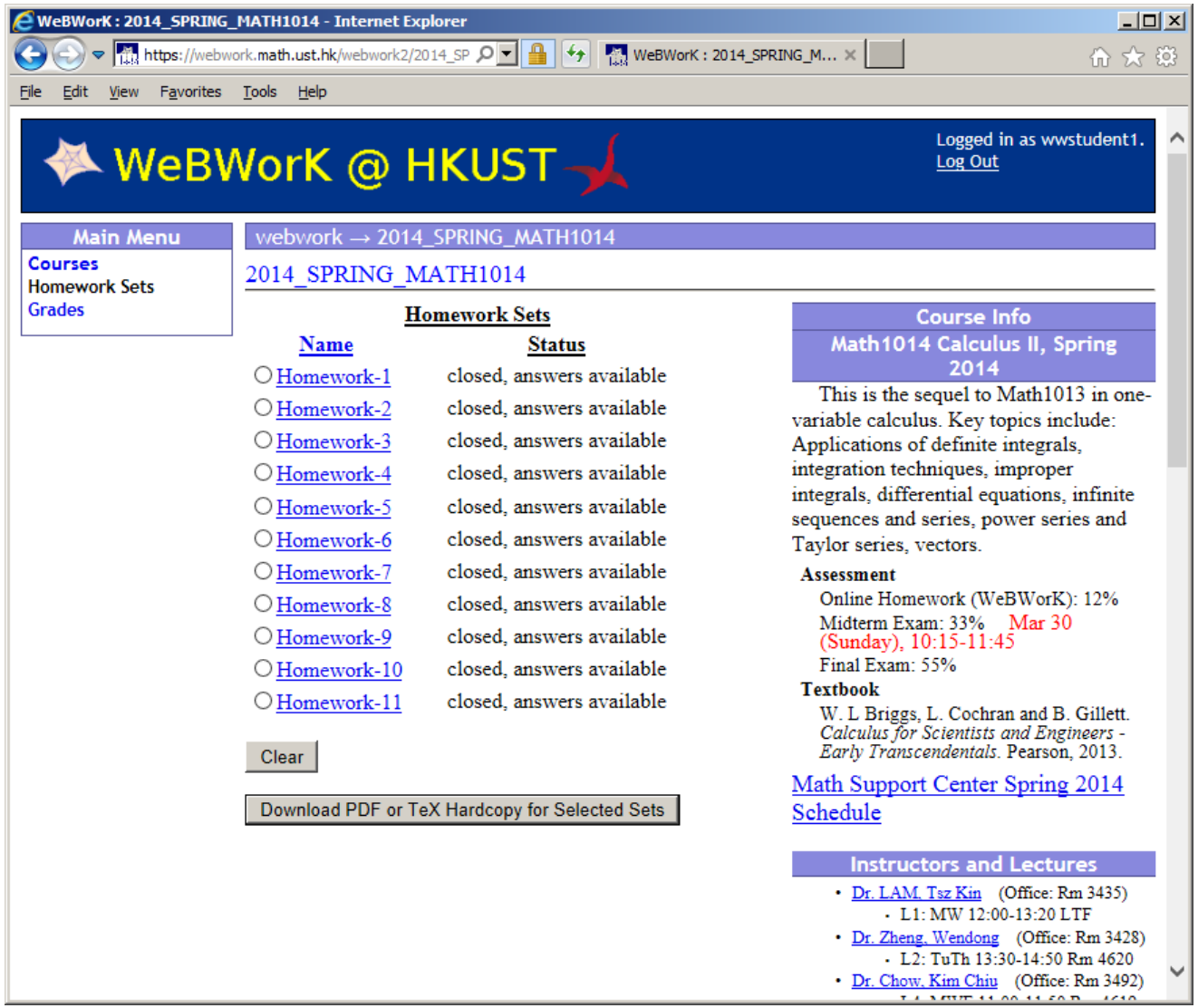


WeBWorK and the Math Support Center at HKUST

WeBWorK@UST for students

- Homework delivered on line
- Homework graded automatically
- Multiple trials allowed
- Answers available after due day



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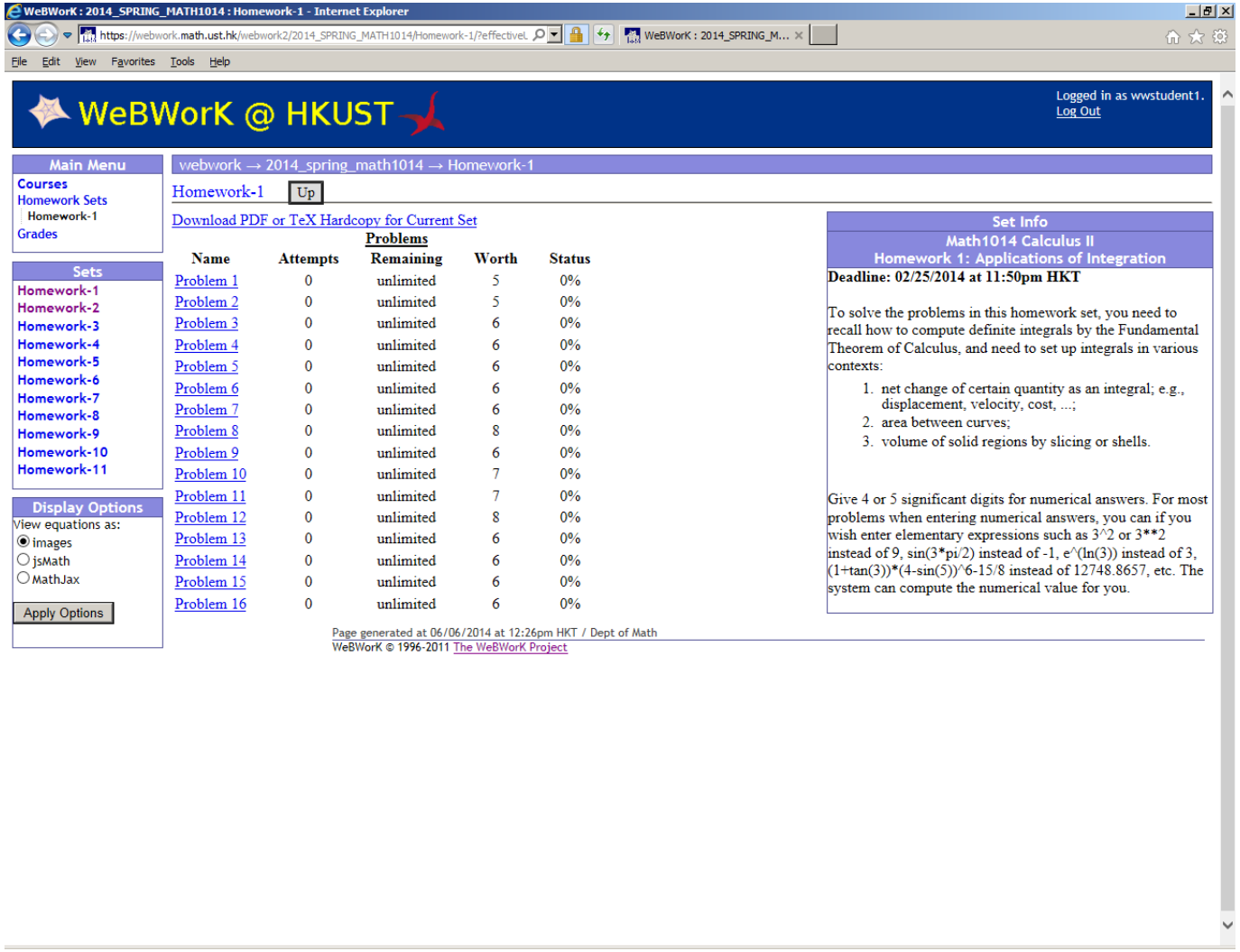

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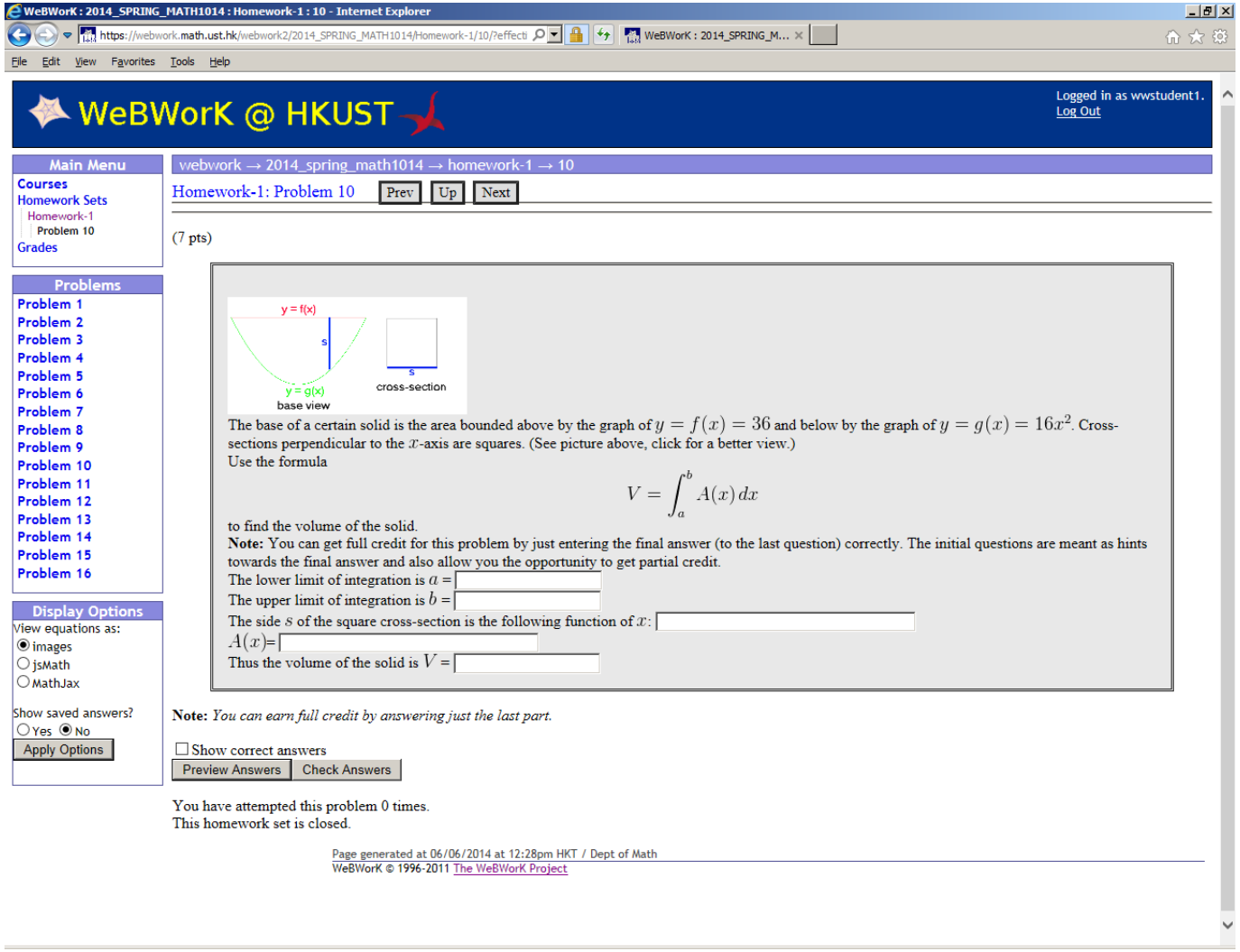

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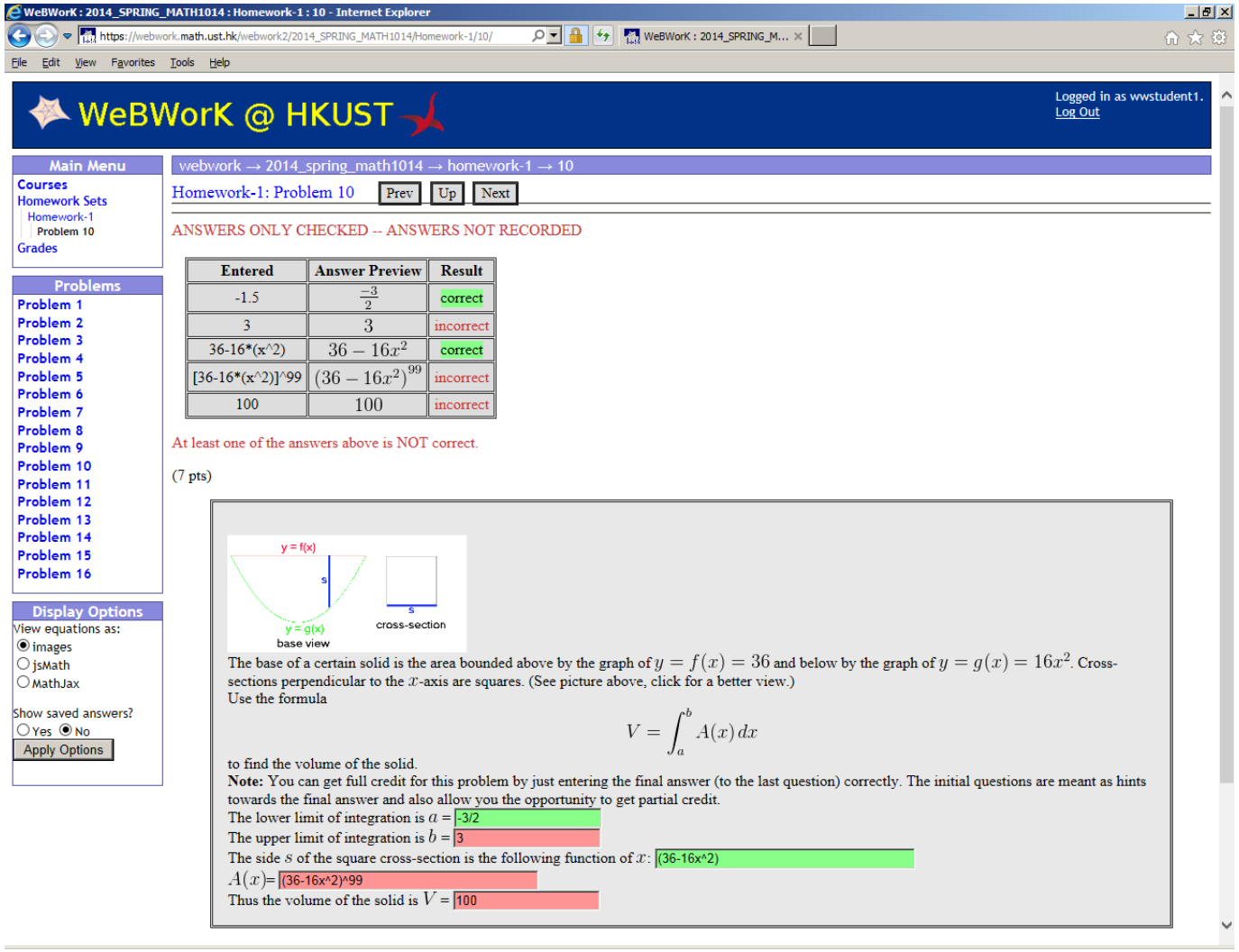

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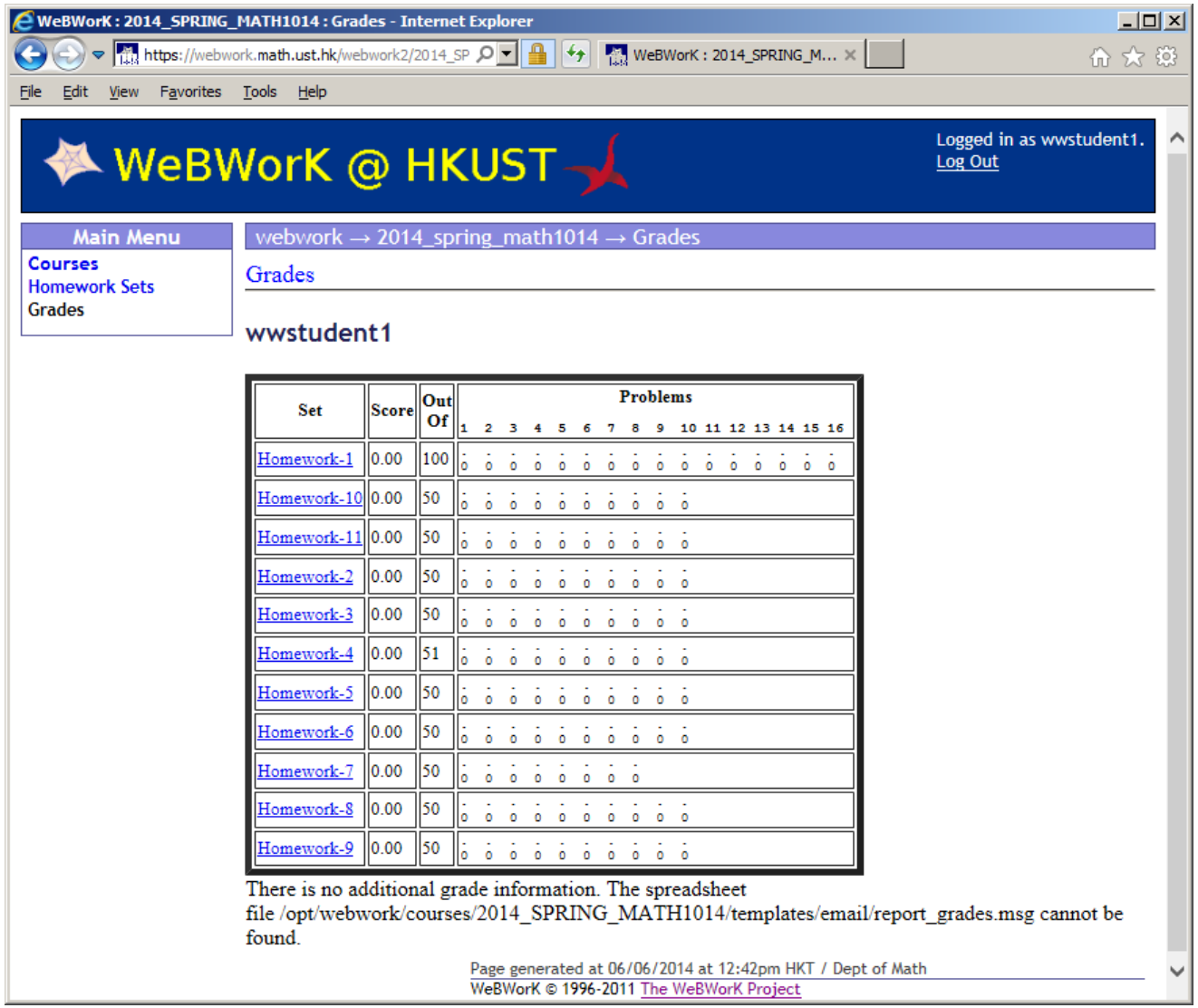
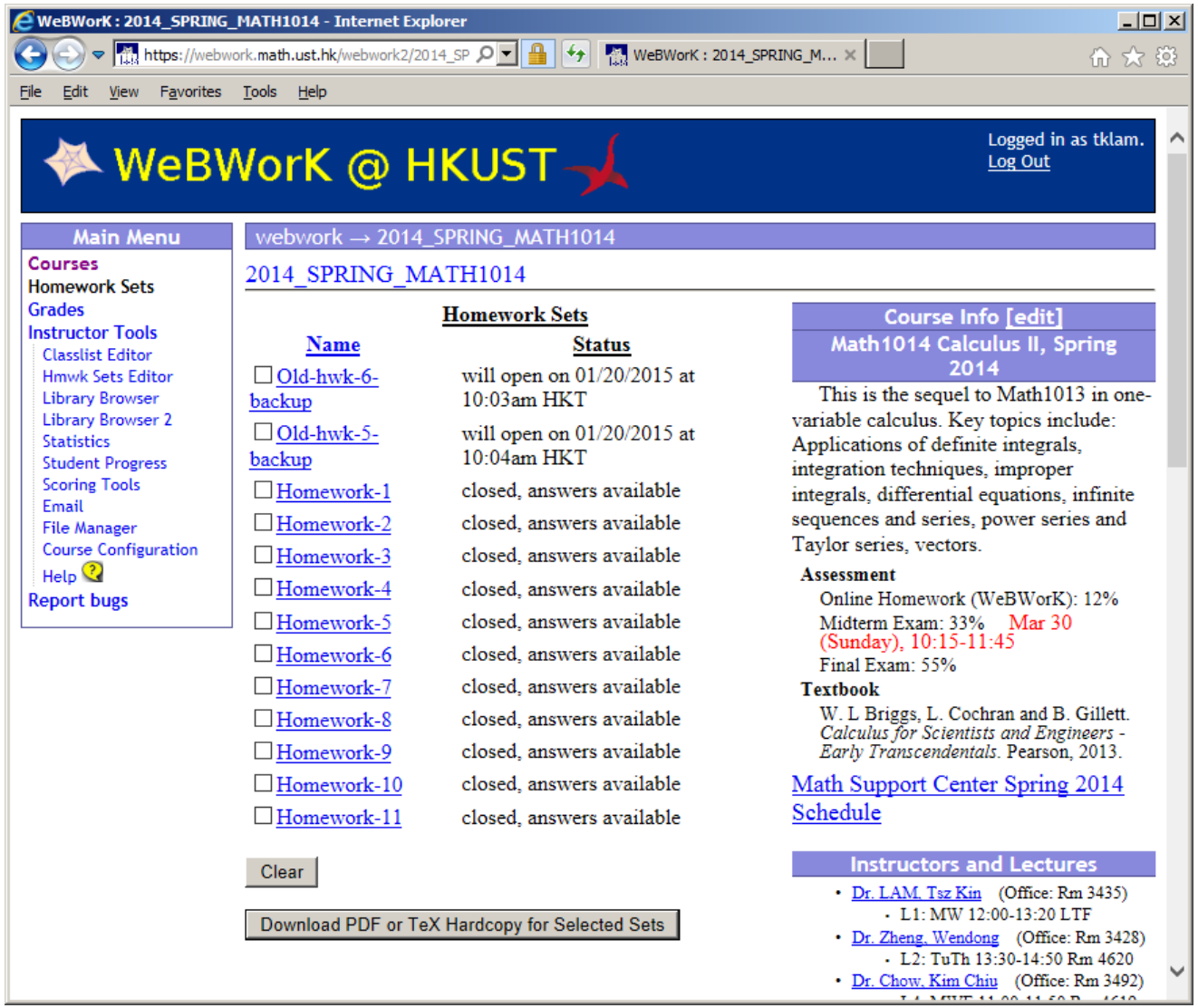


WeBWorK and the Math Support Center at HKUST

WeBWorK for instructors

A online platform to

- create and assign online homework
- select homework problems from a large problem bank
- monitor students' progress
- respond to students' email enquires
- create quizzes



WeBWorK and the Math Support Center at HKUST

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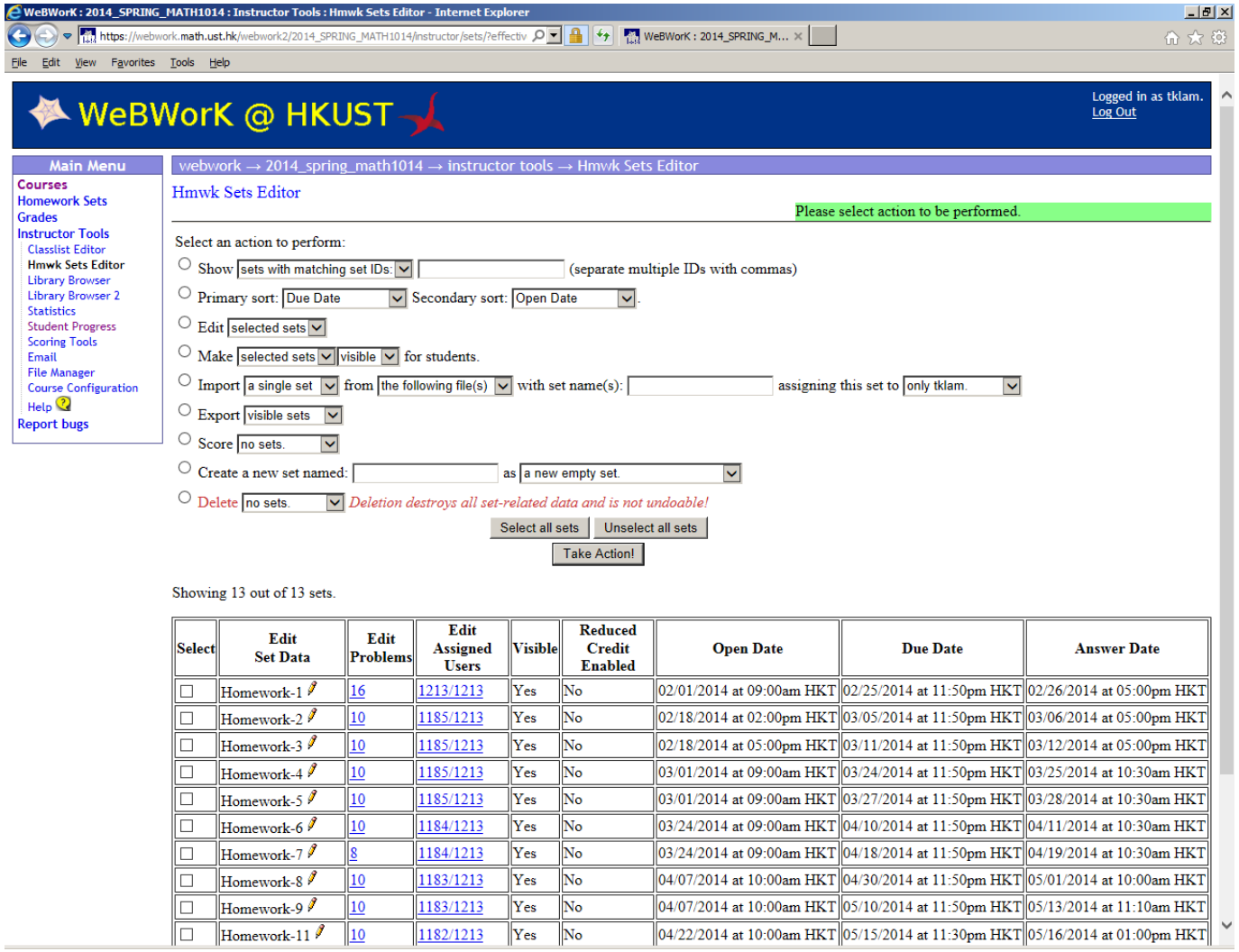

Select	Edit Set Data	Edit Problems	Edit Assigned Users	Visible	Reduced Credit Enabled	Open Date	Due Date	Answer Date
☐	Homework-1	16	1213/1213	Yes	No	02/01/2014 at 09:00am HKT	02/25/2014 at 11:50pm HKT	02/26/2014 at 05:00pm HKT
☐	Homework-2	10	1185/1213	Yes	No	02/18/2014 at 02:00pm HKT	03/05/2014 at 11:50pm HKT	03/06/2014 at 05:00pm HKT
☐	Homework-3	10	1185/1213	Yes	No	02/18/2014 at 05:00pm HKT	03/11/2014 at 11:50pm HKT	03/12/2014 at 05:00pm HKT
☐	Homework-4	10	1185/1213	Yes	No	03/01/2014 at 09:00am HKT	03/24/2014 at 11:50pm HKT	03/25/2014 at 10:30am HKT
☐	Homework-5	10	1185/1213	Yes	No	03/01/2014 at 09:00am HKT	03/27/2014 at 11:50pm HKT	03/28/2014 at 10:30am HKT
☐	Homework-6	10	1184/1213	Yes	No	03/24/2014 at 09:00am HKT	04/10/2014 at 11:50pm HKT	04/11/2014 at 10:30am HKT
☐	Homework-7	8	1184/1213	Yes	No	03/24/2014 at 09:00am HKT	04/18/2014 at 11:50pm HKT	04/19/2014 at 10:30am HKT
☐	Homework-8	10	1183/1213	Yes	No	04/07/2014 at 10:00am HKT	04/30/2014 at 11:50pm HKT	05/01/2014 at 10:00am HKT
☐	Homework-9	10	1183/1213	Yes	No	04/07/2014 at 10:00am HKT	05/10/2014 at 11:50pm HKT	05/13/2014 at 11:10am HKT
☐	Homework-11	10	1182/1213	Yes	No	04/22/2014 at 10:00am HKT	05/15/2014 at 11:30pm HKT	05/16/2014 at 01:00pm HKT

WeBWorK and the Math Support Center at HKUST

WeBWorK for instructors

A online platform to

- create and assign online homework
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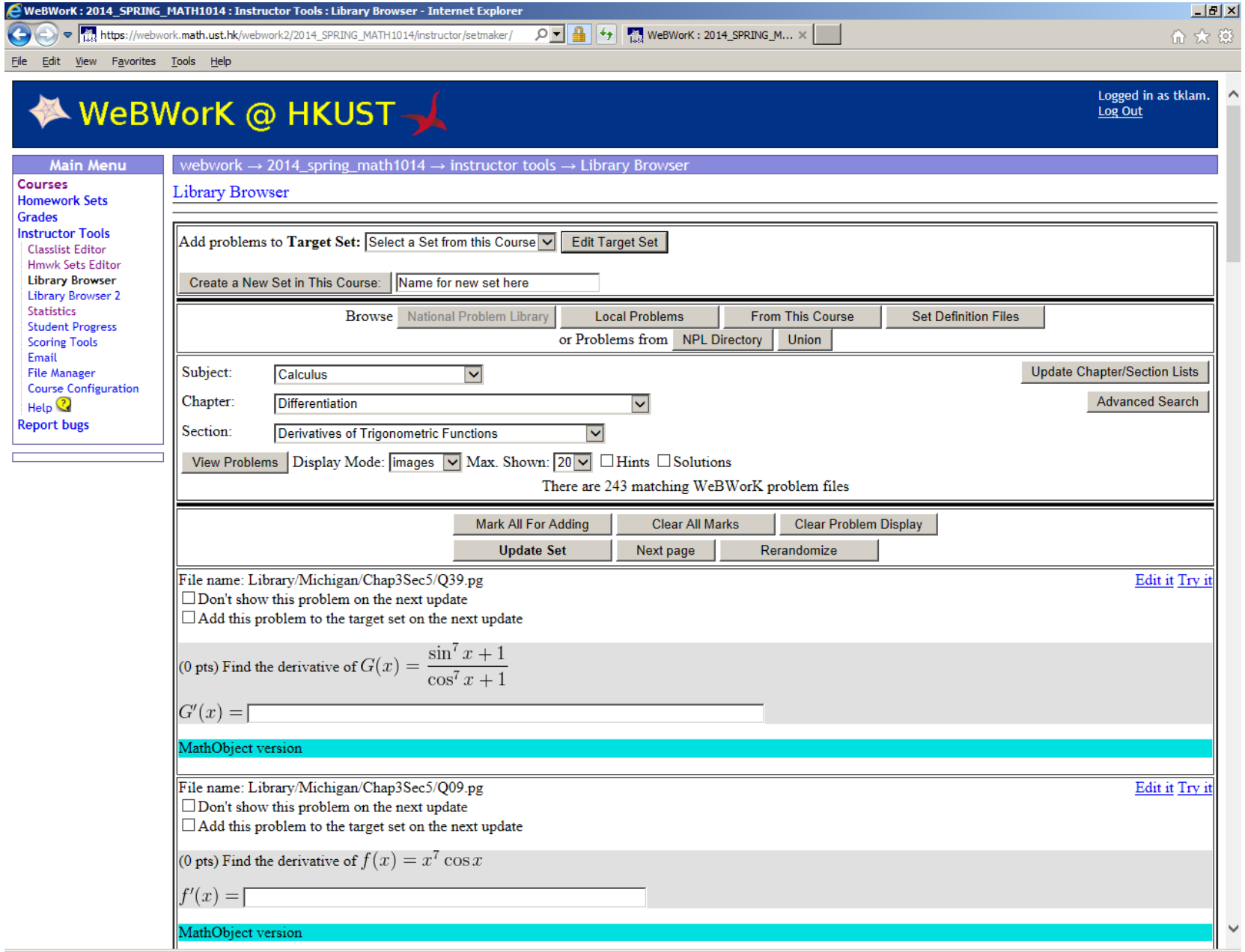

WeBWorK and the Math Support Center at HKUST

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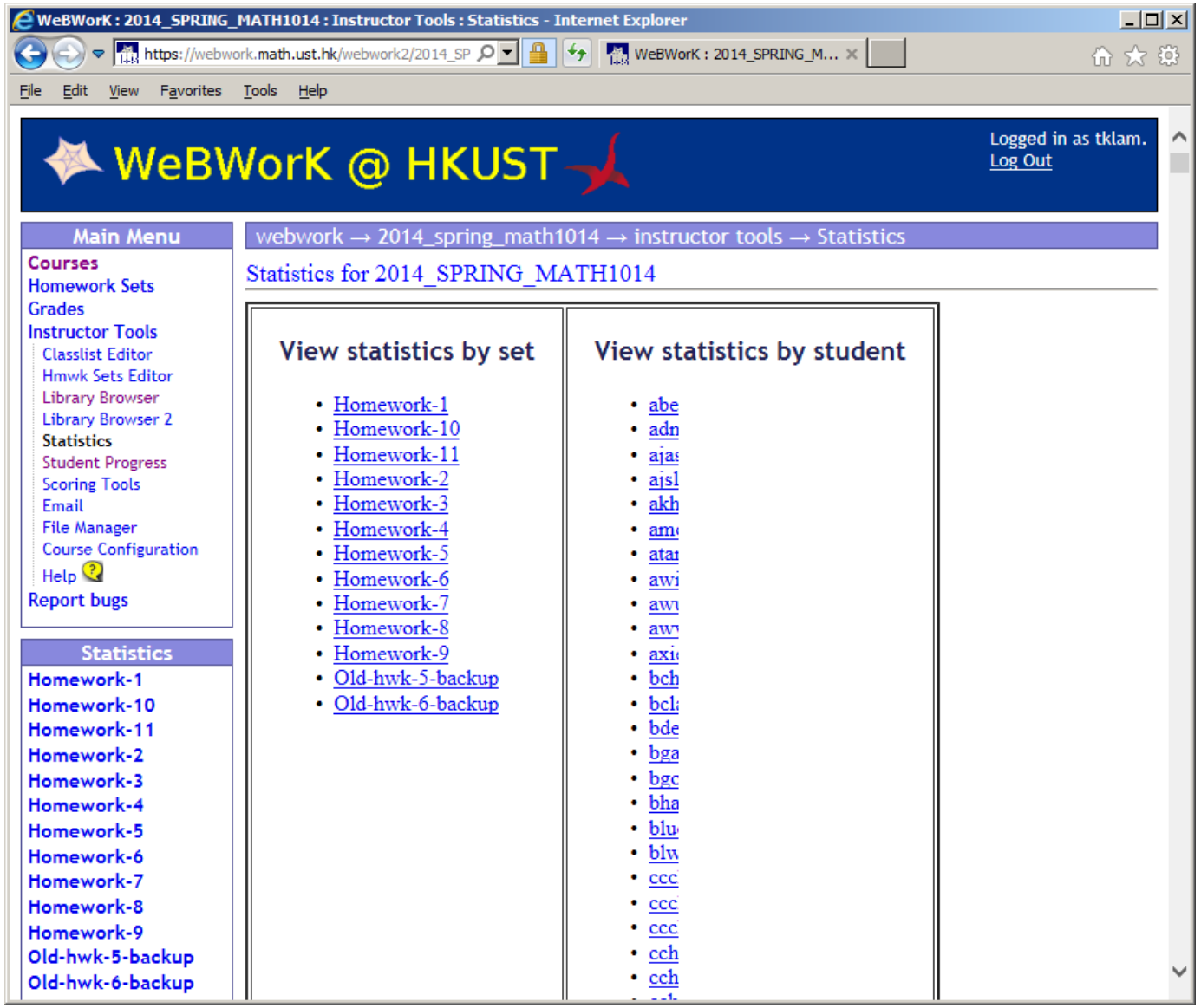

WeBWorK and the Math Support Center at HKUST

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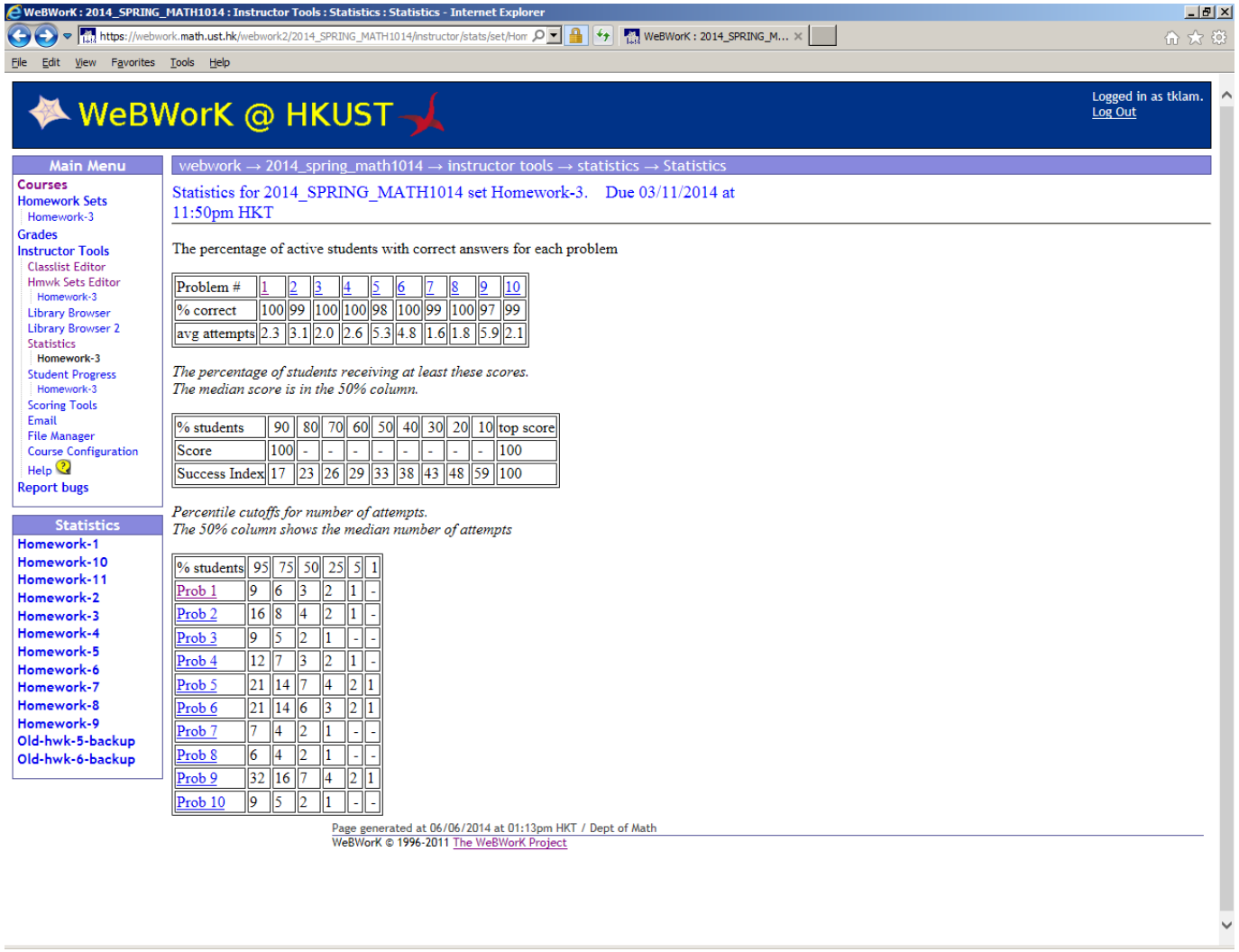

WeBWorK : 2014_SPRING_MATH1014 : Instructor Tools : Statistics : Statistics - Internet Explorer

https://webwork.math.ust.hk/webwork2/2014_SPRING_MATH1014/instructor/stats/set/Hom

File Edit View Favorites Tools Help

WeBWorK @ HKUST

Logged in as tklam.
Log Out

Main Menu

Courses
Homework Sets
Homework-3
Grades
Instructor Tools
Classlist Editor
Hmwk Sets Editor
Homework-3
Library Browser
Library Browser 2
Statistics
Homework-3
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Homework-3
Scoring Tools
Email
File Manager
Course Configuration
Help
Report bugs

Statistics

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Homework-10
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Homework-4
Homework-5
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Homework-7
Homework-8
Homework-9
Old-hwk-5-backup
Old-hwk-6-backup

webwork → 2014_spring_math1014 → instructor tools → statistics → Statistics

Statistics for 2014_SPRING_MATH1014 set Homework-3. Due 03/11/2014 at 11:50pm HKT

The percentage of active students with correct answers for each problem

Problem #	1	2	3	4	5	6	7	8	9	10
% correct	100	99	100	100	98	100	99	100	97	99
avg attempts	2.3	3.1	2.0	2.6	5.3	4.8	1.6	1.8	5.9	2.1

The percentage of students receiving at least these scores.
The median score is in the 50% column.

% students	90	80	70	60	50	40	30	20	10	top score
Score	100	-	-	-	-	-	-	-	-	100
Success Index	17	23	26	29	33	38	43	48	59	100

Percentile cutoffs for number of attempts.
The 50% column shows the median number of attempts

% students	95	75	50	25	5	1
Prob 1	9	6	3	2	1	-
Prob 2	16	8	4	2	1	-
Prob 3	9	5	2	1	-	-
Prob 4	12	7	3	2	1	-
Prob 5	21	14	7	4	2	1
Prob 6	21	14	6	3	2	1
Prob 7	7	4	2	1	-	-
Prob 8	6	4	2	1	-	-
Prob 9	32	16	7	4	2	1
Prob 10	9	5	2	1	-	-

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WeBWorK © 1996-2011 The WeBWorK Project

WeBWorK and the Math Support Center at HKUST

Hands on WeBWorK

Three short *"Hands-On Usage of WeBWorK"* sessions at the Math Support Center (MSC) for interested workshop participants have been scheduled as follows:

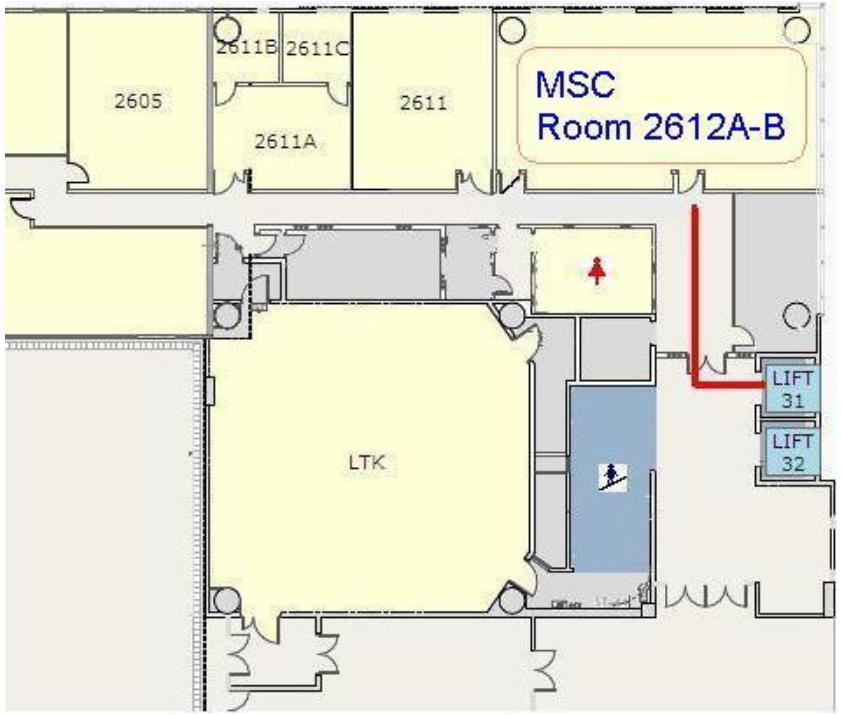
Room 2612AB

Tue

- 12:00-12:45,
- 16:15-17:45

Wed

- 16:00-17:30



Participants can login the computers there with the guest account (*information printed on the back side of your name tag*), or use WiFi through sMobileNet.

http://pathadvisor.ust.hk/

WeBWorK and the Math Support Center at HKUST

When did WEBWorK start here at HKUST?

In a critical period 2011-2012!

Latest Education Reform in Hong Kong

1997-2000	A comprehensive review of the education system in Hong Kong was carried out.	
2000	*Learning for Life, Learning Through Life: Reform Proposals for the Education System in Hong Kong* – Education Commission.	
Structural Change	**Old Academic Structure**	**New Academic Structure**
Secondary Education (Years)	3 (Form 1 – From 3) 2 (Form 4 – From 5) 2 (Form 6 – Form 7)	3 (S1 – S3) 3 (S4 – S6)
Higher Education	3 (University)	4 (University)
Fall 2012	1st cohort of graduates of the 334-system entering universities, at the same time with the last cohort of graduates of the old 3223-system.	
Some daunting consequences for universities: had to double the admissions in academic year 2012-13 and reform the university curriculum structure accordingly. A lot of other administrative work of course.		

WeBWorK and the Math Support Center at HKUST

What the reform meant to the Math Dept at HKSUT

- Developing a new curriculum, in coordination with the other departments and schools
- Allocating sufficient resources to deal with larger enrolments, especially for the increase in teaching load

Calculus Courses in the Old Days

One variable calculus courses were here then mainly for:

- Business students without A-Level math background – about 4 lecture sections with around 80 to 100 students per section.
- Other students without A-Level math background – ranging from 3 to 5 lecture sections with around 80 to 100 students per section.

(However, the number of students without A-Level math background increased over the years.)

Format of these courses

- Lectures + Tutorials

Calculus Courses in the New Curriculum

Most students would have to take a sequence of basic calculus courses, with enrolment number around 1200 to 1700.

WeBWorK and the Math Support Center at HKUST

A 2011-2012 Pilot Project

WeBWorK solution to release some grading workload

To prepare for the teaching of the common core level math courses in the new curriculum, in 2011-12, the Math Dept implemented WeBWorK through a pilot project initiated by Prof. A. Moy, Head of the Math Dept.

The project was supported by a *Teaching Development Grant* from the Center for Enhanced Learning and Teaching, HKUST (CELT).

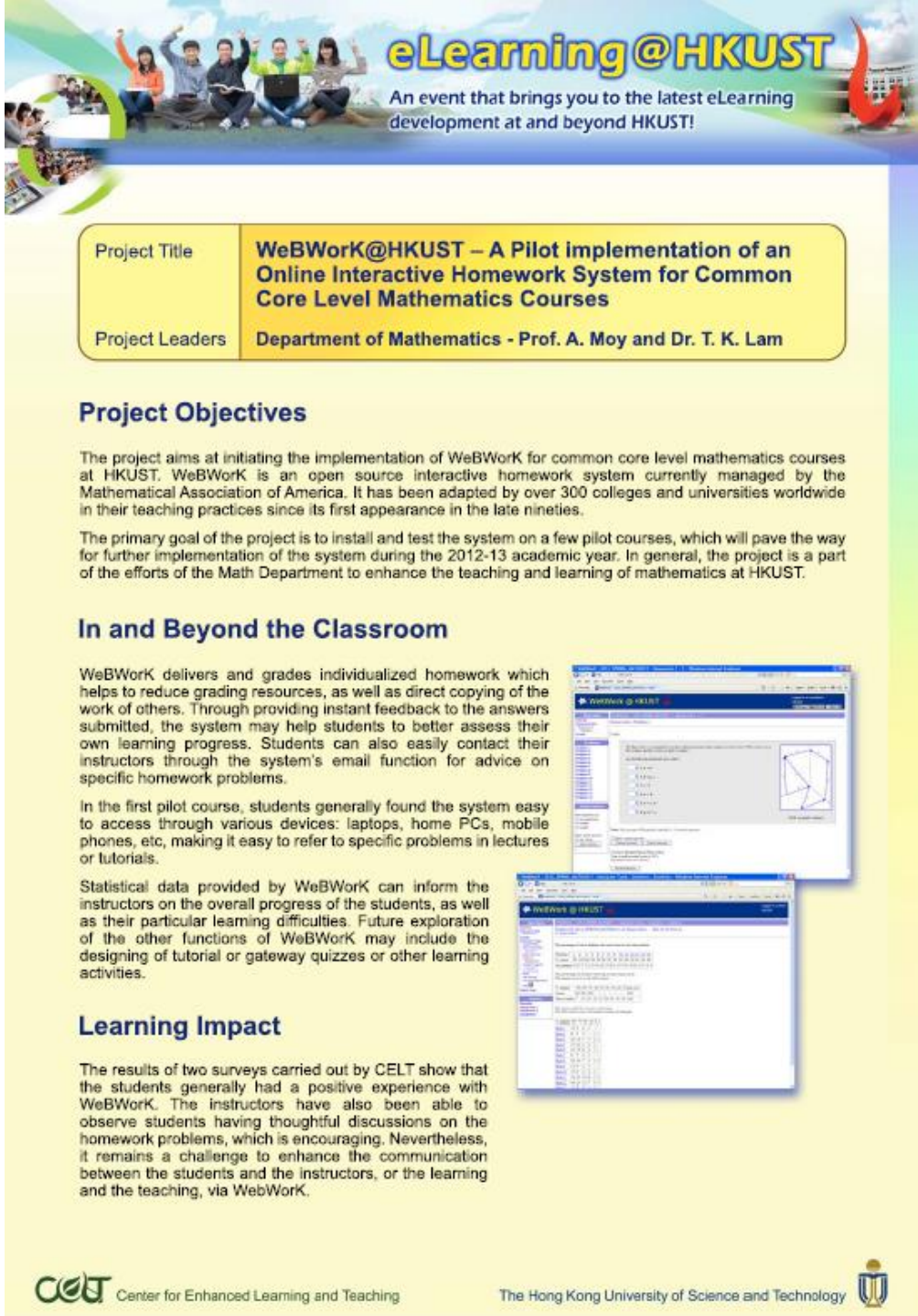
Other project team members:

Prof. S. Y. Cheng

Prof. C. H. Fung

Mr. Simon Hu

Mr. Cook Wong



eLearning@HKUST

An event that brings you to the latest eLearning development at and beyond HKUST!

Project Title	**WeBWorK@HKUST – A Pilot implementation of an Online Interactive Homework System for Common Core Level Mathematics Courses**
Project Leaders	**Department of Mathematics - Prof. A. Moy and Dr. T. K. Lam**

Project Objectives

The project aims at initiating the implementation of WeBWorK for common core level mathematics courses at HKUST. WeBWorK is an open source interactive homework system currently managed by the Mathematical Association of America. It has been adapted by over 300 colleges and universities worldwide in their teaching practices since its first appearance in the late nineties.

The primary goal of the project is to install and test the system on a few pilot courses, which will pave the way for further implementation of the system during the 2012-13 academic year. In general, the project is a part of the efforts of the Math Department to enhance the teaching and learning of mathematics at HKUST.

In and Beyond the Classroom

WeBWorK delivers and grades individualized homework which helps to reduce grading resources, as well as direct copying of the work of others. Through providing instant feedback to the answers submitted, the system may help students to better assess their own learning progress. Students can also easily contact their instructors through the system's email function for advice on specific homework problems.

In the first pilot course, students generally found the system easy to access through various devices: laptops, home PCs, mobile phones, etc, making it easy to refer to specific problems in lectures or tutorials.

Statistical data provided by WeBWorK can inform the instructors on the overall progress of the students, as well as their particular learning difficulties. Future exploration of the other functions of WeBWorK may include the designing of tutorial or gateway quizzes or other learning activities.

Learning Impact

The results of two surveys carried out by CELT show that the students generally had a positive experience with WeBWorK. The instructors have also been able to observe students having thoughtful discussions on the homework problems, which is encouraging. Nevertheless, it remains a challenge to enhance the communication between the students and the instructors, or the learning and the teaching, via WebWorK.

CELT Center for Enhanced Learning and Teaching

The Hong Kong University of Science and Technology

WeBWorK and the Math Support Center at HKUST

Piloting WeBWorK@UST, and thereafter

WeBWorK@UST was first used in Math1003 in Fall 2011, an algebra and calculus course for about 200 business students.

In Spring 2012, we tried it on Math2111, a linear algebra course with about 300 students, and also Math2011, a multivariable calculus course with about 400 students.

With the help of colleagues teaching these courses, the implementation went through rather smoothly. Students responses sounded positive enough to us.

And then, WeBWorK@UST survived the year 2012-2013!

- Math1003: about 600 students in Fall
- Math1013/Math1014: about 1770 students in Fall/1120 in Spring (The “new” calculus courses)
- Math2011: about 530 students in Fall/360 in Spring
- Math2111: about 460 students/320 in Spring

WeBWorK@UST continued to work well in 2013-2014, and more colleagues in the Math Dept have been gaining experience running a WeBWorK course.

WeBWorK and the Math Support Center at HKUST

WeBWorK@UST

Assessment and Administration

In a short talk of this workshop tomorrow morning, colleagues from CELT will share with you *"Some Assessments of WeBWorK and the MSC*. (Wed 11:00-11:30 LTF)

For those who are interested in the administrative matters of the WeBWorK system, please join the brief presentation *"System Administration of WeBWorK and the MSC"* by our colleague Mr. Cook Wong tomorrow afternoon. (Wed 15:10-15:40 LTF)

WeBWorK and the Math Support Center at HKUST

Other usages of online interactive homework systems in the past

Other than WeBWorK, colleagues in the Math Dept had used other systems in their teaching:

- *Webquizzer.* An online quiz system developed by Prof. Moy back in his days in the University of Michigan. The system was used in the early years of the 2000's to generate weekly quizzes for a business calculus course.
- Prof. S. Y. Cheng developed an interactive online homework system for a linear algebra course for math majors under a CELT grant.
- Prof. C. H. Fung used MyMathLab made available by Pearson in his multivariable calculus course for math majors.

In general, WeBWorK is more flexible, and with more capabilities that we are yet to explore further.

WeBWorK and the Math Support Center at HKUST

Online assessment by WeBWorK?

Assessment is a key concern that any online interactive learning system must address.

So far, our usage of WeBWorK at HKUST has been mainly on assigning and grading homework. A bit of adventuring into online quizzes in the MSC through WeBWorK was just taken place in Spring 2014, in Math2111.

In the afternoon today, Prof. Robert Megginson of University of Michigan, the other keynote speaker of this workshop, will tell us more about gateway testing in his talk *"Gateway Testing in Mathematics, Past and Present"*. (Tue 14:15-15:15 LTF)

After Prof. Megginson's talk, Dr. Jun Luo and Dr. Wing-Lung Lee will recall their first experience in arranging WeBWorK quizzes in the MSC in a short session talk *"WeBWorK Quizzes at HKUST"*.

WeBWorK and the Math Support Center at HKUST

Writing WeBWorK questions:

The hard work we've been avoiding

The problem library in WeBWorK has a large amount of math questions contributed by the system developers and many other users.

We have not been trying to write a lot of new questions, but from time to time we would modify existing questions whenever necessary.

At some point in the future, we may need to start writing some WeBWorK questions to deal with the diverse background of our students and necessary adjustments in the curriculum.

Prof. Gage's second talk tomorrow will let us know more about: *"The Old And The New In Authoring WeBWorK Questions"*. (Wed 14:00-15:00 LTF)

WeBWorK and the Math Support Center at HKUST

A blending of classroom teaching, online homework system and Math learning support

"The math skills of (university/school) students are declining."

On departmental level:

Other than introducing more bridging courses, or "reforming" the curriculum, a common practice in many universities around the world is the introduction of a drop-in Math Support Center.

Depending on resources available, a Math Support Center could be

- a small/medium size room with tables and chairs
- or a large room with tables and chairs, and/or equipped with some computers (status quo of our MSC)
- or a whole floor of space with all sorts of facilities

stationed with undergraduate/graduate tutors/helpers, and/or faculty members regularly/occasionally.

WeBWorK and the Math Support Center at HKUST

Math Learning Support

MSC at HKUST is still in its stage of development, since a trial start about 3 years ago.

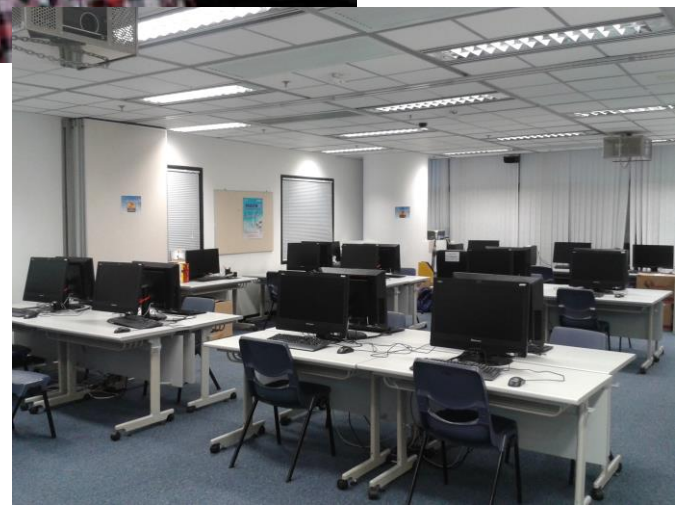
In his talk *"Drop-In Mathematics Help Centers: The University of Michigan Math Lab"* tomorrow (Wed 9:45 – 10:45 LTF), Prof. Megginson is going to share the successful experience of the math learning support services at Michigan with us.

WeBWorK and the Math Support Center at HKUST

A look at the brief history of MSC at HKUST

The pre-history

MSC in borrowed space/time - Classroom A, LC



MSC
in transition

WeBWorK and the Math Support Center at HKUST

WeBWorK@UST ⊗ MSC:

A blending of WeWorK with math learning support to enhance student learning

During the pilot run of WeBWorK in Spring 2012, the Math Dept started in parallel a trial run of a Math Support Center in the HKUST Library.

Briefly, we were able to reserve Classroom A in the newly established Library Learning Commons for Mon/Wed/Thu each week, 3:00pm – 6:00pm.

It was primarily for the Math2111 students, but Math2011 students were also welcome. The MSC staff were mainly the graduate teaching assistants, some undergraduate tutors, and course instructors.

After gaining some experience of running an MSC, and some initial satisfactory results, with the help and support of CELT, a 3 year plan to upgrade the MSC was submitted to the University.

Funding was then granted to the Math Dept to carry out the plan.

WeBWorK and the Math Support Center at HKUST

Math Support Center at HKUST

In the Library and Math Computer Lab

The official MSC project started finally in Fall 2012, again in Classroom A, Library Learning Commons, and also in our Math Computer Lab, in extended periods.

Fall 2012

- Math Computer Lab: Mon-Fri 12:00pm-2:00pm
- Library: Mon-Thu 3:00pm-6:00pm, Fri 9:00am-12:00pm

Spring 2013

- Math Computer Lab: Mon-Fri 12:00pm-2:00pm
- Library: Mon-Thu 3:00pm-6:00pm, Tue-Wed 7:00pm-9:00pm

Fall 2013

- Library: Tue-Thu 3:00pm – 7:00pm
- Tutorial Spaces (Library): Mon-Fri 12:00pm-2:00pm

http://www.youtube.com/watch?v=I3IWSwzO0Uc&list=PLkBFsfearOmHcpsY_q0O7FkI2K5hYmHOb

WeBWorK and the Math Support Center at HKUST

Math Support Center at HKUST

The current MSC

In late Fall 2013, after the completion of the LSK building and IAS-HKUST, we were able to get hold of Room 2612AB for about 1 year, with the support and help of Dr. David Mole, our Associative Vice-President for Academic Affairs.

Since then MSC has moved to the current location, equipped with about 20 computers.

Spring 2014

- MSC at Room 2612AB: Mon-Fri 11:00pm – 6:00pm

People working in MSC: Instructional assistants, course instructors.

And we now have a MSC manager, Dr. Jun Luo, to overlook the daily running of the MSC.

WeBWorK and the Math Support Center at HKUST

Math Support Center at HKUST

Just a brief retrospect of Spring 2014

In Spring 2014, we had approximately 2600 visits to the current MSC by around 560 students.

As expected, peak periods remained as usual, i.e., before homework due days and exams.

Non-WeBWorK course math students also came to study, or to seek help.

Just to mention one main problem that continues:

Some students would come completely unprepared, and asked our MSC staff to go through everything again. (Sometimes, it caused some tension.)

We are stilling trying to optimize the usage of MSC, and improving on the services to students. CELT is currently helping to design and run a training session for the MSC staff for better working relationship with the students.

WeBWorK and the Math Support Center at HKUST

Math Support Center at HKUST

Not yet the end!

We are still somewhere in the middle to secure a permanent site for the MSC, and continuous support and funding from the University after the 3 year trial.

Finally, just to recall that there will be a *"Discussion Session"* tomorrow, Wed 11:40-12:25. You are all welcome to join and share with us your comments, questions, and ideas.

WeBWorK and the Math Support Center at HKUST

Thank you!