

## STLF Report to CWSEI and Mathematics Department

STLF: Katya Yurasovskaya

Period: 10.02.2012 - 15.03.2012

Submitted: 15.03.2012

### Specific activities performed by STLF

#### 1) Professional development

- Attended **weekly STLF meetings** ( 8, 15 Feb, 7, 14 March).
- Attended **weekly Reading Group meetings** (2, 9, 16 Feb, 8, 15 March).
- Attended **NOJO** meetings (3, 10, 17 Feb, 9 March)
- Attended **Math Department Teaching Seminar** (March 15)
- Attended **CSWEI Math Lunch Series** ( March 14)
- Attended RUME (mathematics education research) conference in Portland, Oregon (Feb 23-25)

#### 2) Department meetings/activity

- **Conduct discussion Thursday**

#### 3) MATH SEI general meetings/activity

- Meeting with other Math STLFs (Feb 15, Feb 29, March 14)
- Held individual meetings with Math STLF director (Feb 21, March 6 )

#### 4) Course-specific meetings/activities

##### **Math 230/335 – Finite mathematics course (Math for future elementary school teachers)**

- A set of most important recommendations has been put together and presented to Undergraduate Committee - see the copy below. The future of the project and its direction now depend on the decision of the committee on the definition and main goal of the course.

\*\*\*\*\*

##### **FINITE MATHEMATICS/ MATH FOR ELEM SCHOOL TEACHERS**

Math 230 /Math 335 serves as a prerequisite to admission into Elementary Education Program. Both courses have historically covered the same material. Students who listed their future profession as elementary school teachers: 30 yes, 9 maybe out of 42 in the Fall 2011, 33 yes, 7 maybe out of 42 in Spring 2012.

Characteristics of students: wide range of abilities and mathematical knowledge; intense mathematical anxiety; expectations of the course to prepare them for their future work as teachers. Most students are intensely hard-working and willing to work hard to succeed, though they need careful guidance in how they need to study.

Mathematics education of perspective teachers is one of the most pressing problems in both Canada and USA. If the course content is not considered carefully, a large number of future teachers will end up with serious gaps in their knowledge, which they will subsequently take into their own classrooms – for example, be unable to divide fractions correctly; select a verbal model of “splitting in half” for division by  $\frac{1}{2}$ , be unable to reason effectively and give wrong answers to potential

questions from students ("Take a rectangle. If you increase its perimeter, then you would also increase its area. True or false").

**Two main recommendations at present:**

- The Department needs to decide on the definition of the course. At present it is defined as a general course for people who have not seen math for a long time. Each individual instructor teaching the course may not even be aware of the particular student population – and is left to reinvent the curriculum each time the course is taught.

Teaching a course for elementary teachers does not mean re-teaching elementary mathematics from scratch. Rather, all the mathematical topics that the teachers will face in the curriculum, need to be explored with rigour and intensive problem-solving component – and be put in context of larger mathematical topics as well. Since June 2011, CWSEI has assembled a package of materials to help put together such a course. Materials include a diagnostic test, interviews with students and instructors (including Andrew Adler, Mark Maclean, Malgorzata Dubiel), a survey of existing literature on the problem, and course materials from Fall 2011 and Spring 2012 courses. *These can be put together to build a course geared specifically to the future teachers.*

In addition, CWSEI can help *re-establish connection with the Faculty of Education*: they offer a course in Mathematics Teaching methods – the only other time that the future teachers see mathematical content before they face kids in schools. *The two courses – ours and theirs – can be built as to offer a unique connected experience to students.*

- Eliminate Math230 all together and replace it by Math 335: Math 230 meets 3 times a week, while Math 335 meets 4 times per week – a lab is included. Given students' weak problem-solving skills and an immense challenge that the instructor faces in teaching this audience, a lab under instructor's supervision is essential. *CWSEI can help build the workshop component with a problems database, following the present model for Math220.*

\*\*\*\*\*

- I continue to attend workshops and conduct student interviews, gathering students' opinions, attitudes, and suggestions regarding the course. The data will be put together into a report. It is also being communicated to the course instructor with the goal of improving the course and communication between instructor and students.
- End-of-term project. Last semester's Math 230 class ended in a very nice and well set-up science fair project, with students presenting a mathematics topic of their choice. Project was of great benefit to students, who were exposed to the difficulties of presenting a mathematics topic to an audience, and of answering possible questions. Format of the project has been carefully documented - and this semester all the recommendations and materials have been passed on to the present instructor.
- End-of-term projects will take place in the last two weeks of the semester, and I will make an effort to observe most of them, pass them to the instructor and save them for future reference.

## Math 220 – Introduction to proof

- Bi-weekly workshops are still going on, with student interviews after workshops and after Thursday lectures in one of the sections. We are using the opportunity to try various interactive engagement techniques semester - just to see how they work in this setting. So far we have experimented with student presentations in one of the sections, with subsequent student interviews. Suggestions on format have been communicated to the instructor. We have also tried group quizzes - see below.
- Group quiz has been give in one of the sections. The format tried was: students write individual quiz for 10 minutes and turn in their work. Then they write the same quiz again in groups - again for 10 minutes, since there is quite a bit of writing to a proof. Then they turn in the quiz. No further review of problems is done by the instructor.

Preliminary recommendations: it seems that the grade of the group depends on the number of people in the group. The groups of 2 students are more likely to receive a lower grade: out of 4 groups of two students, only one group obtained full marks, while three remaining groups of two received at most 3 points. The groups that were too large - four and five students - also did not receive full marks, though did not perform badly (6 or 5 pts out of 8).

Of course, at present we only have data and observations from one run of the group quiz. Other factors are at play: this is the first time students wrote such quiz, some people were working with a new group, a particular selection of problems may not be optimal (a lot of writing).

- Two more group quizzes were given on Thu, March 15th - to gather more data and to introduce instructors to this interactive method of instruction. Quizzes will be marked by next week, and more grounded recommendations as to the use and the effect of quizzes can be given then.
- Midterm survey was given. Students' main concern: very short time that they are given to write quizzes and midterms. Concerns have been communicated to both instructors.

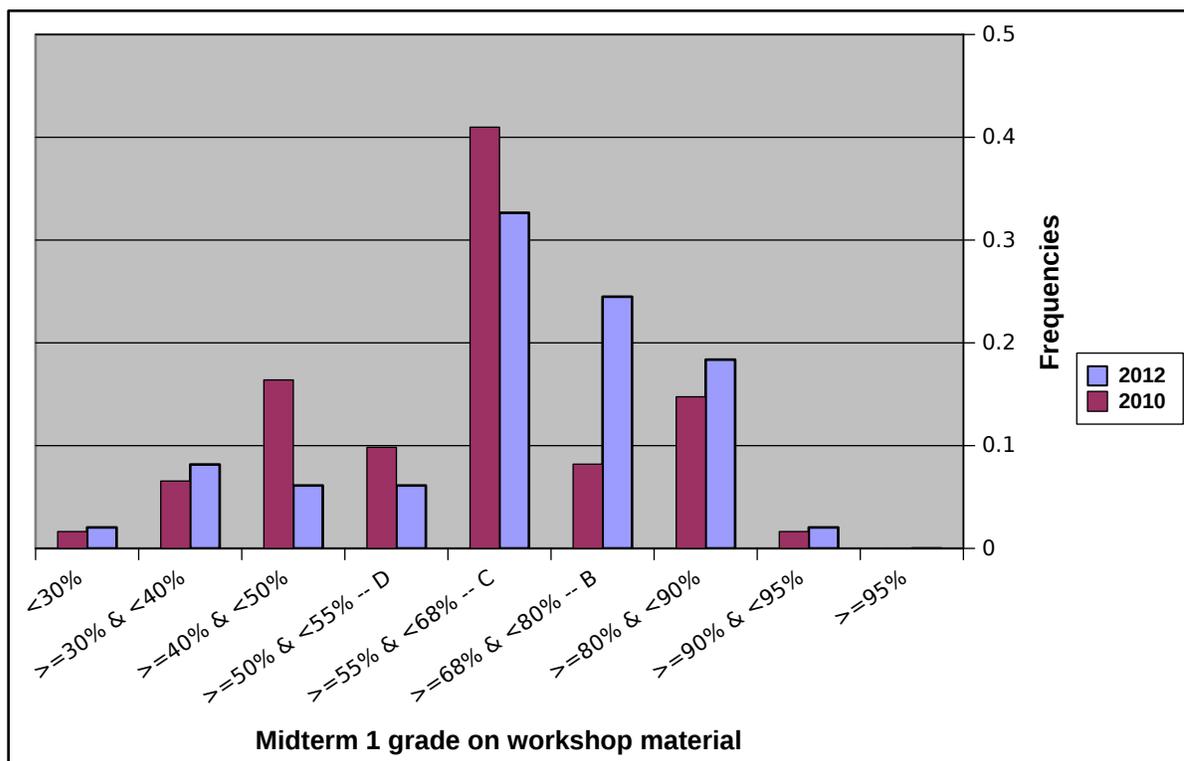
Additional items gathered were information on background: whether students were previously exposed to any proofs material before. 15 out of 42 respondents said 'yes'. I will wait until the end of the course to have the final grades - to analyze the effect on the final grades. In addition, survey touched on instructor presentations, the use of tutorial centre (many students are unaware of its existence), study habits.

Survey also asked for students' impression of workshops - which was overwhelmingly positive, for all the right reasons: exposure to other people's line of thinking, feedback from instructor and peers, extra practice.

- Midterm 1 data was gathered. Summary of results is below. *Please note that the results are as yet preliminary - we may not be able to replicate the results again for the second midterm and the final.*

Midterm 1 grade for workshop-covered material		
	<b>2010 Andrew</b>	<b>2012 Andrew</b>
<b>Average</b>	60.19%	66.21%
<b>SD</b>	15.46%	16.81%
<b>error</b>	1.98%	2.40%
<b>number of students writing</b>	61	49

Comparison on workshop-covered material: Mid 1 2010 vs 2012		
Grade Frequencies	2010	2012
>=95%	0%	0%
>=90% & <95%	2%	2%
>=80% & <90%	15%	18%
>= 80% -- A	16%	20%
>=68% & <80% -- B	8%	24%
>=55% & <68% -- C	41%	33%
>=50% & <55% -- D	10%	6%
<50% -- F	25%	16%
>=40% & <50%	16%	6%
>=30% & <40%	7%	8%
<30%	2%	2%
Points worth	15	18



- Similar results are seen in the other section, with respect to overall average grade on the workshop-covered materials - similar shift in F's and A's, and some shift in Bs and Cs, but we have no last year's data to compare the section of the other instructor to his own class.
- Midterm 2 will take place next Tuesday, March 22. Similar data comparison will be conducted. I am at present looking for additional interactive activity techniques that can be suggested to instructors. Perhaps a "group" solution of the hardest question?
- Some interactive engagement comments have been given to instructor following lecture observation.
- For the lack of time, the last workshop may be shortened to 30 minutes, with a short quiz. This way active problem-solving component will still be retained even for the last topics, at least in some measure.
- Work on the second draft of the learning goals is continuing.

### **Current Project Status (material prepared STLF and/or other members of MATH SEI group)**

#### **Math 220 – Introduction to proof**

**Learning Goals:** Work is continuing. The updated version of learning goals with topics up to Midterm 2 will be made available to students after next Monday - in time for Thursday's midterm.

#### **Assessments:**

- Instructors put together post-workshop quizzes for each workshop. These can be saved for next iteration of workshops.

#### **New Methods/Materials:**

- Problems from Midterm 1 that caused most trouble for students will be added to the pool of workshop problems, so that they can be re-used next year.
- Group quizzes/student presentations have been tried.

#### **Math 230/335 – Finite Mathematics**

**Learning Goals:** none.

#### **Assessments:**

- Per conversations with other professors at the RUME conference, add some questions to the diagnostic test. The questions are to test understanding of basic concepts: if a student understands a given concept, then the answer is straightforward, otherwise the answer is difficult to compute - with or without calculator.

#### **New Methods/Materials:**

- I am continuing selection of problems to be recommended to the instructor for workshops.

## **Plan for immediate future work**

### **Math 220 – Introduction to Proof**

- 1 Give end-of-term survey, gathering similar data to last year's control class - for comparison. Additional topics will include polling extra mathematics background that students bring with them to this class.
- 2 Diagnostic test will be given in class again - perhaps as one more homework. This question will be discussed with instructors.
- 3 Continue work on the second draft of the learning goals and finish it by the end of term.

### **Math 230 / Math 335 – Finite Mathematics**

- 1 The work on the project has been scaled back, pending department's decision as to course goal, as well as need to continue course improvement.
- 2 Observe end-of-term projects.
- 3 Give diagnostic post-test, analyze the results, compare to start of term 2012, as well as post-test results 2011.