# Leading Change in the Innovative Virtualization of the Classroom Experience: (Lessons learned from the design and evaluation of online and face-to-face versions of Calculus I)

### INTRODUCTION

Math 150: Calculus I with Review, was created in 2008 by Veselin Jungic and Jamie Mulholland with the support of the SFU Centre for Online and Distance Education which was coordinated by Kanthi Jayasundera. In creating this course every effort was made to make incorporating recorded lectures, similar homework problems and exams. The course was offered for the first time in Spring 2009.

In Spring 2011, both the online and the face-to-face (FTF) versions of the course were offered. In addition, one of the cosupervisors of the online offering was also the instructor of the face-to-face version of the course. This created an opportunity to compare the two versions of the course from students' and instructor's perspectives. Gregory Hum was brought in for the evaluation.

### **RESEARCH QUESTIONS**

In two versions of a Math 150 course (face-to-face and online):

**Question 1** what are the differences between the two versions in terms of student perspectives regarding teacherstudent interaction; student-student interaction; impact of course design on learning; time spent on course content; satisfaction with course design and course management?

**Question 2** what are the differences in student performance on course assignments, quizzes, and exams between the online and ftf versions of the course?

**Question 3** what are the differences in the experiences of the instructor regarding the teacher-student interaction; impact of course design on the delivery

of the course and course management; instructor's role as a course designer in two versions of a Math 150 course (faceto-face and online)

#### Context

Total of 151 students in the face-to-face class and 25 in the online class.



#### Demographic



### **Enrolment in F2F and Online:**



- campus students

#### **Reasons for taking the online course** rather than F2F course:

• Few F2F students taking online courses • Most students in online course are on-

• Scheduling: students take the course due to course requirements, course conflicts, work, or other time demands

- Travel: student want to avoid the commute to campus
- Prefer structure of online courses: students can work on course at own pace and convenience

#### Methodology and Results

- Three online surveys for students (results generally focus on survey three)
- Questions in F2F and online versions of surveys mirror each other with some differences (e.g. focusing on tutor marker in online instead of instructor)
- The instrument was comprised of rating items, validated scale items (studentstudent interaction), fill-in-the-blanks
- Two interviews, pre- and post-course, with the instructors, program director and tutor marker

#### **Grade Results:**

B+ 8

**P** 7

C+ 5

C+ 4

C- 3





- Grade expectations drop over semester
- Expectations between F2F and Online across time are similar

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- Online had slightly lower grades
- Participants in the survey had higher grades
- Overall, actual grades are lower than expected grades

#### **Student-Student Interaction Results:**



#### **Correlations with grades:**

 In F2F Spearman correlations for cohesive (0.51) and cooperation (0.38) with final grades, but not in online



### **Teacher-Student Interaction Results:**

#### **Correlations with grades:**

In F2F Spearman correlations for teacherstudent interaction items (~0.3) with final grades, but not in online.

#### What students would like changed in the course (short answer):

- Online students sometimes felt isolated and perceived a lack of community
- Both F2F and Online students expressed desire to meet and interact with other students

• F2F and Online students want study groups

### **Time Spent on Course Content:**

In the average week, how many hours did you spend				
Activity	f2f 2	f2f 3	online 2	online 3
Watching online lectures	1.57	2.12	2.89	3.58
Reading the textbook	1.88	1.45	3.18	3.54
Working on assignments individually	4.21	3.19	7.89	6.54
Working on assignments in groups	0.71	0.78	0.00	0.38
Attending the math workshops	1.40	1.14	0.29	0.00
Studying alone	3.88	3.33	4.57	6.85
Studying with others	0.88	0.80	0.43	0.15
total (+3.33 hours for f2f)	17.86	16.14	19.25	21.04

- Both Online and F2F watched online lectures
- Online spent more time reading, working on assignments, & studying alone
- F2F spent more time working (on assignments) with others
- Online spent more time total
- Online lectures Spearman correlated with final grades in survey 2 for both F2F (0.2) and Online (0.51)
- Working alone, especially in Online (0.59) and in F2F as well (0.24) Spearman correlated with final grades
- In Online, time spent working on assignments and total time spent Spearman correlated with final grades in survey 2 (0.63) and survey 3 (0.39)

## CONCLUSION

#### Lessons Learned:

Online Courses: Valued for convenience, structure/pacing and flexible scheduling

#### **Teacher-Student Interaction**

- Difficult to replicate due to asynchronous interaction constraints
- Incorporate synchronous online discussions/ virtual workshops?

#### **Student-Student Interaction**

- Students want interaction
- Can be valuable, but challenging in online

 Need well-structured and meaningful discussions?

#### **Time Spent on Course Content**

- Time spent on course, especially on assignments associated with higher grades
- Much time was spent on this course overall,
- is the key to student time commitment many smaller graded assignments?

#### Impact of Course design on Learning:

Online lectures are a valuable resource for both F2F and Online.

#### **Overall Outcomes:**

This project provided instructors with valuable feedback that helped them improve their own teaching in both online and face to face settings, as well as produced recommendations for the design of online mathematics coursework at SFU and elsewhere. It also is informing potential changes in the SFU Department of Mathematics' existing policy, which currently does not have many distance education course offerings.

More generally, information about students', instructor's, and designer's perspectives collected through this project also fitted in the Centre for Online and Distance Education's program goal to monitor and measure effects of newly introduced courses.

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