## FLIPPING THE CLASSROOM: AN INVESTIGATION INTO THE USE OF PRE-RECORDED VIDEO LECTURES AND THE IMPACT ON STUDENT AND INSTRUCTOR EXPERIENCE IN TWO FIRST-YEAR CALCULUS COURSES

#### Inquiry questions

1. To what extent do students use the recorded lectures? 2. What are students' perceptions of the usability of the video lectures and their value for learning? 3. What is the impact of the video lectures on the pedagogical practice of the instructors?

#### Video Lectures



A video lecture with an interactive applet.

### Context

What is a flipped classroom?

For a flipped classroom, students are required to watch prerecorded lectures and learn the materials before coming to class. In class, they review and assimilate the materials through clicker questions, peer-instruction and just-in-time teaching.

#### **Courses investigated**

Two first-year service calculus courses offered in fall 2012: Math 150 – Calculus I with

- Review (enrollment = 220) Math 152 – Calculus I
- (enrollment = 246)

In total 16 flipped classes were conducted in the two courses (eight classes each).

#### Instructors

Both instructors were senior lecturers and SFU Teaching Excellence Award recipients. They both had taught the courses many times before. They produced all the video lectures used in the flipped classrooms.

#### **Student demographics**

Based on the data collected from the mid-term survey, a typical respondent from Math 150 is a 1st-year full-time science major male who takes 4 courses in the same semester. A typical respondent from Math 152 is a 2nd-year full-time science or applied sciences major male who takes four courses in the same semester.

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A video lecture shows instructor's handwriting.

## Methodology

The study collected both quantitative and qualitative data using the following methods:

- Survey 1 (mid-term survey)
- Math 150: 91 respondents with a response rate of 41%
- Math 152: 83 respondent with a response rate of 37%
- Survey 2 (end-of-semester) survey)
- Math 150: 68 respondent with a response rate of 31%
- Math 152: 71 respondent with a response rate of 29%
- Classroom observations, and
- Student and instructor interviews

References Crouch, C.H., & Mazur, E. (2001). Peer instruction: Ten years of experience and results. American Journal of Physics, 69(9), 970–977.

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#### **Results and conclusions**

**Q 1.** To what extent do students use the recorded lectures?

#### Weekly viewing time based on Survey 1 and Survey 2



Math 150 respondents appear to have spent less time watching the video over the semester.



Math 152 respondents' time spent on watching the videos stayed consistent over the semester.

#### Viewing behaviours before, during and after class

	Math 150			Math 152		
Lecture viewing behaviour	Almost always or often	Sometimes	Almost never or seldom	Almost always or often	Sometimes	Almost never or seldom
a) I watch assigned videos before coming to the class.	52.7%	28.6%	18.7%	90.4%	7.2%	2.4%
b) I watch the videos during class time.	1.1%	2.2%	96.7%	2.4%	2.4%	95.2%
e) I review the video after class.	13.2%	19.8%	67.0%	8.4%	28.9%	62.7%

A summary of the lecture viewing behaviours before, during, and after class based on Survey one.

Mazur, E. (2009). Farewell, lecture? *Science*, 323. Simkins, S., & Maier, M. (2010). Just-in-time teaching: Across the disciplines, across the academy. Sterling, VA: Stylus. May 2008.

#### **VESELIN JUNGIC**

DEPARTMENT OF MATHEMATICS VJUNGIC@SFU.CA

#### JAMIE MULHOLLAND

DEPARTMENT OF MATHEMATICS J\_MULHOLLAND@SFU.CA

#### **Q 2.** What are the students' perceptions of the usability of for learning?

#### Usability

Most of the respondents from both courses considered the videos easy to navigate and their instructions clear. They also thought the videos' length was about right (each video was approximately 40 minutes long, consisting of a number of 5–10 minute segments). However, a number of respondents from both courses also complained that the videos were too long.

#### Values for learning

When asked to "List the top three things you liked about the video lectures," respondents from both courses listed a wide range of features and affordances about convenience, learning and instruction values, content, style, and organization.

Respondents from both courses considered the following to be the top features of the video lectures:

Being able to learn at one's own pace

the video lectures and their value

- Being able to review the materials they missed or didn't understand in class; and
- Being able to access at anytime

#### **Q** 3. What is the impact of the video lectures on instructors' pedagogical practice?

 Producing the video lectures took a significant amount of time. It needs training and support. Instead of preparing content for lectures, instructors prepared problems for students to solve in class.

 In class, instead of instructor asking questions and students answering, students asked questions and the instructor answered.

 Instructors and students interacted in the classroom much more.

 Instructors' relationship with the classroom space changed: instead of standing in front of the classroom, they went up and down the stairs, walked in between the rows and talked to students at their desks.

 "This makes teaching fun again!" • "Will I flip the classroom again? Absolutely."

#### **CINDY XIN**

TEACHING AND LEARNING CENTRE CXIN@SFU.CA

#### HARPREET KAUR

FACULTY OF EDUCATION HKA56@SFU.CA