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Institution Name(s): Fort Valley State University

Team Members: There are 4 team members:

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2. Dr. Samuel Cartwright, Associate Professor of Mathematics, Department of Mathematics and Computer Science, cartwris@fvsu.edu
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Project Lead: Dr. Samuel Cartwright

Course Name(s) and Course Numbers:

Calculus I (MATH 1154)

Calculus II (MATH 2164)

Calculus for Business and Economics (MATH 1150)

Differential Equations (MATH 3223)

Semester Project Began: Spring 2017

Semester(s) of Implementation: Fall 2017

Average Number of Students Per Course Section:

Calculus I (MATH 1154) – 35 Students

Calculus II (MATH 2164) — 13 Students

Calculus for Business and Economics (MATH 1150) – 32 Students

Differential Equations (MATH 3223) – 6 Students

Number of Course Sections Affected by Implementation: 4 Courses

Total Number of Students Affected by Implementation: 86 Students

1. Narrative

A. Describe the key outcomes, whether positive, negative, or interesting, of your project. Include:

Transformation Summary

The learning experience was a positive one in that we were able to find and create materials for Calculus I, Calculus II, Calculus for Business and Economics, and Differential Equations so that students in these courses did not have to pay for any course materials needed.

Uploading quizzes using the software Respondus was a challenge. This is because images seem to be scattered on a couple of quizzes that were uploaded.

Finding videos online that were aligned with course content was sometimes challenging because we had to be sure examples followed the content covered. For example, for the Calculus for Business and Economics course, examples of derivatives for trigonometry in the openstax textbook were not needed because there was no trigonometry in the course content and many videos had many examples with the trigonometry content.

- Transformative impacts on your instruction

The location and creation of materials was in Brightspace which allowed all students to easily access the resources. The materials were readily available at the beginning of the semester. This increased the number of students having access to the materials from day-one to 100%. Faculty gained experience of putting together materials with the help of an Online Instructional Professional.

Transformative Impacts

Students were able to save a total of \$23,320.00 (see Table 1A).

Table 1A

Course	Number of Students Enrolled	Cost of Textbook	Students' Savings
MATH 1154	35	\$306.25	\$10,718.75
MATH 2164	13	\$306.25	\$3,981.25
MATH 1150	32	\$225.50	\$7,216.00
DMATH 3223	6	\$234.00	\$1,404.00
Total Savings			\$23,320.00

Table 1B gives the breakdown of the students served by the project. It also gives a breakdown on students with experience using Brightspace before entering the project courses. At least 48% or more of the student who participated in this project used Brightspace. Passing grades consists of A, B, and C. Non-passing grades consist of D, F, WF, and F. For Calculus I 21 of the 25 students expected to pass the course. For Calculus II 7 of the 8 students expected to pass. For

Differential Equations students did not answer that question. For Calculus for Business and Economics 24 of the 25 students expected to pass the course.

Table 1B

Data Questions	Calculus I	Calculus II	Differential Eq.	Business Calculus
Gender	16 Male 9 Female	4 Male 4 Female	4 Male 2 Female	8 Male 16 Female
Age	23 Ages 18- 22 1 Ages 23 - 27	6 Ages 18- 22 2 Ages 23 - 27	6 Ages 18- 22	12 Ages 18- 22 9 Ages 23 – 27 4 Over 27 years
Students enrolled in the course	25	8	6	25
Expected Grade out of the course	8 – A; 2 – B; 11 – C; 3 – D; 1 – F.	1-A; 2-B; 4-C; 1-D.		9-A; 9-B; 6-C; 0-D; 1-F.
Students who have taken a Math course in D2L before.	56%	63%	67%	48%

Lessons Learned

When creating questions using Brightspace, all instructors used only multiple choice questions because of time constrains. In future, after having gained experience using Brightspace and knowledge to create the course content, post open ended questions will be used to edit and update the course materials.

For Calculus for Business and Economics the search for more reasonable textbook will have to continue. The textbook selected was for a general calculus course and many examples using trigonometry dominated the textbook. Updating the course with an applied calculus textbook or one that caters to business will be in the works.

2. Quotes

Below are three quotes from students on the videos and its content.

Student 1

The course lecture videos are somewhat assisting and I do refer to them often, however I try to refrain from the videos that have actual instructor view. I am most comfortable watching the videos that have the black background along with using colored text for highlighting, these videos to more are most demonstrative, easy to view, and appealing to hear.

Student 2

No the video did not help understand the topic being discussed. I may need extra help trying to understand the problems being discussed.

Yes. I would watch the video again to try to get a better understanding of the lesson.

The quality of the video in terms of the sound, visual, and content was very clear to my understanding.

Student 3

Yes. I am a visual learner and being that close and going step by step with the tutor helped me understand a bit easier. Also being able to pause and rewind made things a lot easier.

Yes. [I would watch the video again]

Everything [the video] was clear on my end, in all aspects.

3. Quantitative and Qualitative Measures

3a. Overall Measurements

Student Opinion of Materials

Was the overall student opinion about the materials used in the course positive, neutral, or negative?

The overall student opinion was mixed. Table 1C gives a breakdown of student's opinions about the materials.

There were positive opinions on: students downloading and printing a hard copy. For example, 50% or more of the students downloaded their respective textbook: that is 60% of Calculus I students, 50% of Calculus II students, 67% of Calculus for Business and Economics students and 68% of Differential Equations students.

With the exception of Differential Equations, most students were positive or excited about using the online materials. That is, 76% of Calculus I students, 100% of Calculus II students, 76% of Calculus for Business and Economics students and 40% of Differential Equations students.

With the exception of Differential Equations students were able to complete their homework before it was due. That is, 92% of Calculus I students, 100% of Calculus II students, 92% of Calculus for Business and Economics students and 40% of Differential Equations students.

The response on the need for needing more resources for course success was somewhat neutral. Even though more than 56% of students did not need any additional resources for their class. With the exception of Differential Equations who had no need: the other courses showed that 40 to 44% needed more resources. That is, 60% of Calculus I students, 63% of Calculus II students, 56% of Calculus for Business and Economics students and 100% of Differential Equations students.

Table 1C

Survey Questions	Calculus I	Calculus II	Differential Eq.	Business Calculus
Download and View eTextbook	60%	50%	67%	68%
Referenced the textbook 7 or more times per week	15%	25%	67%	20%
Referenced the textbook for new materials	36%	88%	50%	32%
Logged 9 or more times per week into D2L	12%	40%	50%	20%
Spent 3 or more hours on homework in D2L	64%	88%	50%	40%
Current online Homework accessed in D2L	80%	100%	83%	64%
Students completed homework before it was due	92%	100%	40%	92%
Students were certain correct answers were entered in the first try in D2L.	32%	35%	50%	48%
Students looked for any mistakes in their work when D2L told them their answer was incorrect	40%	50%	13%	40%
Students worked alone on their homework in D2L	40%	100%	75%	80%
Students excited about using free resources	76%	100%	40%	76%
Students who did not need any additional resources for their classes	60%	63%	100%	56%

Student Learning Outcomes and Grades

Was the overall comparative impact on student performance in terms of learning outcomes and grades in the semester(s) of implementation over previous semesters positive, neutral, or negative?

Table 2 shows student performance in Calculus I for Spring 2017 and Fall 2017. The initial impact on student performance is positive. There was an increase of 14% passing.

Table 2.

Calculus I (MATH 1154)			
Semester	Number of A, B, Cs	Number of D, F, W, WF	% passing
Spring 2017	9	30	23
Fall 2017	13	22	37

Table 3 shows student performance in Calculus II for Fall 2016 and Fall 2017. The initial impact on student performance is positive. There was an increase of 11% passing.

Table 3.

Calculus II (MATH 2164)			
Semester	Number of A, B, Cs	Number of D, F, W, WF	% passing
Fall 2016	3	8	27
Fall 2017	5	8	38

Table 4 shows student performance in Calculus for Business and Economics for Fall 2016 and Fall 2017. The initial impact on student performance is negative. There was an decrease of 18% passing.

Table 4.

Calculus for Business and Economics (MATH 1150)			
Semester	Number of A, B, Cs	Number of D, F, W, WF	% passing
Fall 2016	23	11	68
Fall 2017	16	16	50

Table 5 shows student performance in Calculus I for Fall 2016 and Fall 2017. The initial impact on student performance is neutral. Student performance remained unchanged.

Table 5.

Differential Equations (MATH 3223)			
Semester	Number of A, B, Cs	Number of D, F, W, WF	% passing
Fall 2016	6	0	100
Fall 2017	6	0	100

3b. Narrative

For both Calculus I and Calculus II performance showed an improvement from using the traditional adopted textbook to using the free resources. That is a 14% and 11% respectively from Spring 2017 to Fall 2017. The impact of the materials on student performance for Differential Equations went unchanged. This is good news in that all students had success in passing the course during the Fall 2016 and Fall 2017 semester. Unfortunately, student in the Calculus for Business and Economics performance showed a negative impact. Comparing Fall 2016 with Fall 2017, we found a drop of 18% in passing.

For Calculus I, Calculus II and Differential Equations, the textbook and materials were all from traditional type textbooks. For Calculus for Business and Economics the textbook was a traditional textbook for calculus. Students enrolled in the Calculus for Business and Economics course had only the College Algebra as prerequisite. The additional content involving trigonometry could have created a negative factor in that students say mathematics they did not have the foundation for as they worked through problems. This may have caused a negative impact on student performance.

4. Sustainability Plan

The department's full adoption of these transformed courses has ensured that they will be reviewed annually for improvement and sustainability for students and faculty. Furthermore, with the exception of Differential Equations all of these courses are offered every semesters with the same instructors teaching the courses. Our teams' commitment to that end enhances the assurance.

5. Future Plans

This project had positive influence on our thinking in terms of teaching and learning. The process of using D2L to create materials and organize materials for students to learn has provided a foundation to build on. That is, for creating more similar materials and well as taking what works and building upon for future use in the improvement of the course design.

This project experience, its impact on student performance, and the importance of these programs are things that we will share with other with vested interest. Paper, presentations and

publications are all in the works. The MAA Southeastern Regional Meeting at Clemson University is a target event for our first presentation on this project.

6. Description of Photograph



(left-right) Dr. Samuel Cartwright, Project Lead and Instructor of Calculus for Business and Economics as well as instructional designer, Dr. Patcharin Marion, Calculus Coordinator and Instructor of Calculus I and Calculus II as well as instructional designer, Professor Burell, Calculus I instructional designer and Calculus for Business Consultant, Dr. Jianmin Zhu, Instructor of Differential Equations as well as instructional designer.