OER faculty panel
• Elyse Yeager (Instructor, Department of Mathematics)

• Leonora Crema (Scholarly Communications and Copyright Services Librarian)
  • Erin Fields (Open Education, UBC Library)

• Agnes D’Entremont (Senior Instructor, Department of Mechanical Engineering)
• Jonathan Verrett (Instructor, Department of Chemical and Biological Engineering)

• Siobhan McElduff (Associate Professor, Department of Classical, Near Eastern, and Religious Studies)
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-- Wiley 2014
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Open UBC toolkit on open licenses

Open.ubc.ca

CC logo from the CC website
CLP Calculus

Feldman, Rechnitzer, Yeager

OER Faculty Panel
Oct 1, 2019
## Calculus Series at UBC

<table>
<thead>
<tr>
<th>Differential CLP 1</th>
<th>Integral CLP 2</th>
<th>Multivariable CLP 3</th>
<th>Vector CLP 4</th>
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<td>MATH 100, 180, 104, 184</td>
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<td>MATH 200, 217, 253</td>
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Calculus Series at UBC

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**PDF text**

**Browser-based**
Motivation

e. Textbook costs vs value

Calculus: Early Transcendentals
by James Stewart | Feb 4 2015

Hardcover
CDN$197.95
10% off promotion available

✔️prime Get it by Tomorrow, Sep 25
FREE Shipping by Amazon
More buying choices
CDN$153.00 (20 used & new offers)

Loose Leaf
More buying choices
CDN$114.97 (5 used & new offers)

Calculus
by James Stewart | May 19 2015

Hardcover
CDN$199.95

✔️prime Get it by Thursday, Sep 26
FREE Shipping by Amazon
More buying choices
CDN$153.00 (11 used & new offers)

Loose Leaf
More buying choices
CDN$178.66 (7 used & new offers)
Motivation

- Textbook costs vs value
- Personalization
Motivation

- Textbook costs vs value
- Personalization
- Unwarranted optimism about the difficulty of the undertaking
Motivation

- Textbook costs vs value
- Personalization
- Unwarranted optimism about the difficulty of the undertaking
- Warranted optimism about the joy of the undertaking
Motivation

- Textbook costs vs value
- Personalization
- Unwarranted optimism about the difficulty of the undertaking
- Warranted optimism about the joy of the undertaking
- Get rich quick
Student involvement

- Initially: very little
Student involvement

- Initially: very little

- Bug bounty: undergraduate editing, overseen by graduate TA
Student involvement

- Initially: very little
- Bug bounty: undergraduate editing, overseen by graduate TA
- Work-learn for accessibility and clarity in figures
Student involvement

- Initially: very little

- Bug bounty: undergraduate editing, overseen by graduate TA

- Work-learn for accessibility and clarity in figures

- Reaction very positive
Support that would have helped

- Student feedback from critical reading
Support that would have helped

- Student feedback from critical reading

- Teaching buy-outs for polishing a credible draft
Support that would have helped

- Student feedback from critical reading
- Teaching buy-outs for polishing a credible draft
- Easier funding for subsequent editing
Next Steps

CLP:
- Deeper development of exercise books for CLP3 and CLP4
Next Steps

CLP:
- Deeper development of exercise books for CLP3 and CLP4
- Continued polishing for clarity and accessibility
Next Steps

CLP:
- Deeper development of exercise books for CLP3 and CLP4
- Continued polishing for clarity and accessibility
- Further webonization

Related Projects:
Next Steps

CLP:
- Deeper development of exercise books for CLP3 and CLP4
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Related Projects:
- Orchard: habit tracking and study assistant
Next Steps

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Related Projects:
- Orchard: habit tracking and study assistant
- Introduction to Proofs textbook
Next Steps

CLP:
- Deeper development of exercise books for CLP3 and CLP4
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- Further webonization

Related Projects:
- Orchard: habit tracking and study assistant
- Introduction to Proofs textbook
- PLOM (ParperLess Online Marking)
The Library’s Role in Open Texbooks & OERs

REPORT ON A TLEF PILOT PROJECT
LEONORA CREMA, STEPHANIE SAVAGE
PRINCIPAL APPLICANTS

OCTOBER 2019
What did we set out to accomplish and why?

OERS GROWING IN IMPORTANCE
STUDENT SUPPORT
FACULTY NEEDS
ALIGNED WITH UBC TLEF PRIORITIES

MAINLY, WE WANTED TO EXPLORE THE LANDSCAPE OF OERS ON CAMPUS AND THE LIBRARY’S CAPACITY TO SUPPORT FACULTY IN THIS WORK
$38,863 from a UBC Teaching and Learning Enhancement Fund grant for a 1 year project

Process: Library gave adjudicated subgrants of ~$2K each to incentivize faculty partnerships

~1/2 funds went to faculty directly, 1/2 to support library project students

We did not decline any project, as long as it resulted in open content.
The Project

10 faculty projects funded
• mix of new works and enhancements to existing works
• across the subject spectrum
• many formats: textbooks, videos, simulations, and more

Used Pressbooks due to robust BCcampus support
• but we quickly found other approaches and platforms were needed (e.g., LaTeX - Overleaf)

Took a publishing lite approach:
• we accepted author-proofed content, with no copyediting, no indexing
• focused on layout, open licensing, and front matter

Key finding:
Formatting and production of a 200-page monograph took about 10 workdays
• using content proofed by authors
• CC-cleared images
Assessment

Enhanced Students’ Overall Learning Experience

In terms of your learning experience, which of the following would you generally prefer?

Over 80% prefer open textbooks to traditional ones. None preferred the traditional textbook.

Saved students money

When compared to another similarly demanding class, has the use of an Open Textbook reduced the overall cost of the class? About 75% agreed, some were not sure, and none disagreed.

“It’s imperative open textbooks become mainstream if we are to continue to say that university is for everyone.” -- UBC undergraduate
Takeaways

**Library can add value to the process**
- knowledge of copyright
- CC licences
- front matter, publishing standards – e.g., DOIs
- accessibility through metadata and platforms
- digital preservation

**Pressbooks is easy to use and effective**
- LaTeX conversion and H5P interactivity

**Lots of peer support:** local post-secondaries, BCcampus, Open Textbook network

**Format proliferation will continue**

Interactive elements likely to outstrip standard e-publishing software

**What is an ‘edition’ in an era of constantly updated content.**

**Pedagogy and publishing have become inter-twined:**
- student-created content hugely beneficial to their learning
- though makes a conventional ‘publishing project’ more challenging
Next steps

With the recent OER fund announcement –

The Library has boosted its direct support for faculty authors, working in collaboration with CTLT

Contact: Open.ed@ubc.ca

And expanded its digital publishing services. Info at: scholcomms.ubc.ca
DEVELOPING FOR AND DEPLOYING WEBWORK ACROSS DISCIiplines IN SECOND-YEAR ENGINEERING

AGNES G. D’ENTREMONT, MECHANICAL ENGINEERING
JONATHAN VERRETT, CHEMICAL AND BIOLOGICAL ENGINEERING
NEGAR M. HARANDI, ELECTRICAL AND COMPUTER ENGINEERING

https://tinyurl.com/WeBWorKEngineering2019
BACKGROUND

• WeBWorK is an open-source online homework system
• Typical usage: each student assigned a unique set of numerical values, allowed multiple (up to unlimited) attempts, and given instant feedback (correct/incorrect)
• ~35,000 problems in Open Problem Library (OPL), mostly math (prior to this project, only ~260 engineering problems in three topics\textsuperscript{1,2})
• UBC engineering students exposed to WeBWorK through math course homework in first year

• Goal: develop WeBWorK problems in common subjects at second-year level in engineering

1. WeBWorK OPL, 2. Evans 2017
WEBWORK IMPACTS ON STUDENTS/INSTRUCTORS BEFORE THIS PROJECT

EECE student survey*: 88% rated their experience with WeBWorK as satisfactory
86% liked immediate feedback
78% liked the lack of cost

Selected statements

<table>
<thead>
<tr>
<th>Blackboard [mean (SD)]</th>
<th>WeBWorK [mean (SD)]</th>
</tr>
</thead>
<tbody>
<tr>
<td>The feedback was EASY TO ACCESS</td>
<td>1.7 (1.0)</td>
</tr>
<tr>
<td>The feedback was CLEAR</td>
<td>1.9 (1.0)</td>
</tr>
<tr>
<td>The tool enhanced my learning</td>
<td>1.9 (1.0)</td>
</tr>
<tr>
<td>I would like to use the tool in the future</td>
<td>1.3 (0.6)</td>
</tr>
</tbody>
</table>

1 = Strongly disagree, 3 = Neutral, 5 = Strongly agree

MECH student survey**: 92% preferred WeBWorK to other systems

CHBE TA/Instructor working hours:

Pre-WW  | Post-WW
---|---
2016W  | 2017W  | 2018W

*%d'Entremont, Verrett, M. Harandi, CEEA 2019; **d'Entremont et al., CEEA 2017
WEBWORK IN UBC ENGINEERING BEFORE THIS PROJECT

Departments working in isolation.
No (or very few) questions available openly.
No sharing of questions in courses that may have content overlap.

Electrical and Computer Engineering (EECE)
Mechanical Engineering (MECH)
Chemical and Biological Engineering (CHBE)
ENGINEERING WEBWORK PROJECT OVERVIEW

Fluid Mech (150 Qs)
- CHBE
- CIVL
- MECH

Dynamics (120 Qs)
- BMEG
- MECH

Solid Mech (160 Qs)

Materials (60 Qs)

Circuits 1 (100 Qs)
- EECE
- MECH
- BMEG

Circuits 2 (40 Qs)
- EECE

Signals & Systems (100 Qs)
- EECE

Electromag. (60 Qs)
- EECE
- BMEG

Mining (5 Qs)
- MINE

UBC TLEF $50,000
BCcampus OER $7,500

Year 1 subject
Year 2 subject
Collab. dept
Service dept
PROBLEM DEVELOPMENT PROCESS – STUDENT DEVELOPERS

Subject: Fluids
Focus: General
Chapter: Pressure distribution in fluids
Section: Hydrostatic pressure distribution
Keywords: Hydrostatic pressure

Variables:
$FluidSpGrav = 0.82, \text{[g]}
$PressureReadingTmp = 5.10, \text{[psi]}

Solution formula(s):
$PressureReading = \frac{\text{PressureReadingTmp} + 689.45 \cdot \text{FluidDensity}}{689.45} [1]$
$\text{Ans}_a = (\text{PressureReading} + \text{FluidDensity}) \cdot 1.2 [1000 \text{ psi}]$
$\text{Ans}_b = 4.714 \text{ [m]}

Problem text:
The tank shown in the figure contains a fluid with a specific gravity of $\text{FluidSpGrav}$. The region above the fluid is filled with vapor. The pressure gauge located at the top of the tank indicates a reading of $\text{PressureReading}$. (a) Determine the gauge pressure at the bottom of the tank. (b) Determine the height of the liquid column in the vertical tube.

Answer text:
Answer: $\text{Ans}_a = 108.188 \text{ [kPa]}$
$\text{Ans}_b = 4.714 \text{ [m]}$

Does the image need to be created/recreated?: Yes

Numerical check:
$\text{PressureReading} = 10, \text{[psi]}
\text{PressureReadingTmp} = 5, \text{[psi]}
\text{Ans}_a = 108.188, \text{[kPa]}
\text{Ans}_b = 4.714, \text{[m]}$
ENGINEERING QUESTIONS IN THE OPEN PROBLEM LIBRARY (OPL)

Subject

Dynamics
Electric Circuits
Electromagnetism
Fluid Dynamics
Heat Transfer
Material and Energy Balances
Materials Science
Mechanics of Materials
Signals and Systems
Statics
Thermodynamics
Vibrations

Number of Questions

Totals:
OPL (others): 327
OPL (UBC): 324
In testing/Contrib (UBC): 1048
• 13 partner course sections adopted questions from this project (over both terms)

• Student pre-survey:
  • Past experience with online homework systems (WeBWorK and others)
  • Important aspects/features of online homework

• Student post-survey:
  • Quality of problems, staff/instructor/TA support
  • Motivation and learning
  • Interactions during course around WeBWorK questions

• Instructor feedback
## PRE-SURVEY RESULTS – WEBWORK AND OTHER OHW SYSTEMS

1 = Strongly disagree, 3 = Neutral, 5 = Strongly agree

<table>
<thead>
<tr>
<th></th>
<th>WeBWorK (n = 320)</th>
<th>Other Systems (n = 295)</th>
</tr>
</thead>
<tbody>
<tr>
<td>The system was easy to use</td>
<td>4.3*</td>
<td>3.7</td>
</tr>
<tr>
<td>The site was easy to navigate</td>
<td>4.2*</td>
<td>3.7</td>
</tr>
<tr>
<td>The question presentation was clear</td>
<td>4.0</td>
<td>3.9</td>
</tr>
<tr>
<td>The required answer formats were straightforward</td>
<td>3.5</td>
<td>3.7</td>
</tr>
<tr>
<td>The feedback was clear and easy to access</td>
<td>3.3</td>
<td>3.8*</td>
</tr>
<tr>
<td>The system enhanced my learning</td>
<td>4.0*</td>
<td>3.7</td>
</tr>
<tr>
<td>The system motivated me to persist in finding the correct answer</td>
<td>3.8*</td>
<td>3.6</td>
</tr>
<tr>
<td>I would like to use the system in the future</td>
<td>4.0*</td>
<td>3.2</td>
</tr>
</tbody>
</table>

*Statistically significant difference (Mann-Whitney rank sum test)

*d'Entremont, Verrett, M. Harandi, CEEA 2019*
## POST-SURVEY RESULTS – ABOUT NEW WW PROBLEMS

1 = Strongly disagree, 3 = Neutral, 5 = Strongly agree

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>The problems had few errors (missing values, incorrect answers, etc.)</td>
<td>2.8</td>
</tr>
<tr>
<td>The problems had few issues with answer tolerances</td>
<td>3.1</td>
</tr>
<tr>
<td>Problem text was almost always clear and understandable</td>
<td>3.6</td>
</tr>
<tr>
<td>Errors or other issues with the problems were corrected quickly</td>
<td>3.2</td>
</tr>
<tr>
<td>The problems were at the same level of difficulty as tests/exams</td>
<td>2.9</td>
</tr>
<tr>
<td>The problems were more challenging than tests/exams</td>
<td>3.2</td>
</tr>
<tr>
<td>Images were almost always clear and understandable</td>
<td>4.1</td>
</tr>
<tr>
<td>The instructor(s) and/or TA(s) knew how to use the system</td>
<td>3.6</td>
</tr>
</tbody>
</table>
### POST-SURVEY RESULTS – MOTIVATION AND LEARNING

1 = Strongly disagree, 3 = Neutral, 5 = Strongly agree

<table>
<thead>
<tr>
<th>How did WeBWorK impact your studies this term in your engineering courses?</th>
<th>n = 237</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was motivated to attempt to solve all problems that counted for marks</td>
<td>4.3</td>
</tr>
<tr>
<td>I was motivated to attempt to solve all problems that did not count for marks</td>
<td>2.9</td>
</tr>
<tr>
<td>I was motivated to successfully complete all problems that counted for marks</td>
<td>4.2</td>
</tr>
<tr>
<td>I was motivated to successfully complete all problems that did not count for marks</td>
<td>2.7</td>
</tr>
<tr>
<td>I was motivated to correct my errors in understanding</td>
<td>3.8</td>
</tr>
<tr>
<td>I expect using WeBWorK will help me to be well prepared for the final exam in this course</td>
<td>3.8</td>
</tr>
<tr>
<td>I enjoyed using WeBWorK</td>
<td>3.4</td>
</tr>
<tr>
<td>I believe WeBWorK enhanced my learning</td>
<td>4.0</td>
</tr>
</tbody>
</table>
BENEFITS/STRENGTHS

- Positive instructor response to system/problems overall
- Reduced marking time, more formative feedback for students
- Shared problems, with the ability to adapt them
- On-call support for new problems helpful (quick corrections)
- Scripts for automated conversion from other problem systems

CHALLENGES/SUPPORT THAT WOULD HAVE HELPED

- Time to create/implement/test 1 problem: ~1.5-2 hours
- Making shareable graphics (copyright and licensing)
- Errors in code, correct tolerances for final answer
- More funds (testing, error identification for students)
- Support for instructor time to create
- Co-creation opportunities with students
- Better documentation for WeBWorK /expertise on coding within UBC
ACKNOWLEDGEMENTS
This work was completed on the traditional, ancestral, and unceded territory of the Musqueam people.

Funding
• UBC Vancouver students via the Teaching and Learning Enhancement Fund
• BCcampus
• UBC Applied Science Dean’s Office

Thanks
• UBC APSC Centre for Instructional Support
• Instructors, academic assistants, and staff involved
• Gianni Co, coder and graphics-maker
• The UBC engineering students who used our new problems (2018-2019)

WANT TO USE THE PROBLEMS?
Some of our problems are in the OPL, but many more are posted on GitHub and can be downloaded for use.

All posted UBC problems:
https://tinyurl.com/UBCWW

Statics problems converted:
https://tinyurl.com/WhatcomStatics

Fluid mechanics problems converted:
https://tinyurl.com/QueensFluids

OpenStax Physics (Brock):
https://tinyurl.com/BrockOpenStaxPhysics
Siobhan McElduff
UnRoman Romans Project
https://blogs.ubc.ca/unromanromans/