



STEM in Education Symposium 2019

Implementing Innovation in STEM Education

*From more technology to enhanced
learning*

Dr. Marina Milner-Bolotin

UBC Department of Curriculum and Pedagogy



Dr. Marina Milner-Bolotin

- Associate Professor in
Science Education, UBC, Canada
- Department of Curriculum & Pedagogy
- e-mail: marina.milner-bolotin@ubc.ca
- Web site: <http://blogs.ubc.ca/mmilner/>





November 5, 2019



Science Education in Canada

Science Exposure

K-12

University

Elem

Second

B. Sc. &
B.Eng.

Other fields



Teacher Education in Canada

Bachelor Subject + B.Ed.

Elem

Secondary

B.A.

B.Ed.

B.Sc.

B.Ed.



University of British Columbia



**16,188 international students
from 140+ countries!**

UBC FACTS

- Public university
- Established: 1908
- 2 campuses: Vancouver & Kelowna
- ~65,000 students
- Acceptance rate: 64%
- Ranking – 35th (U.S. News & World Report 2019)

UBC Teacher Education

FACTS



- 11 month-long
- ~ 700 teacher-candidates
- Bachelor is required
- 13 week practicum
- K-12 teacher certification

The Big Challenge

1. New knowledge about how people learn (STEM)
2. New tools to support STEM learning
3. New STEM curricula and standards
- 4. Old problems with K-12 STEM education**

My Answer to the Challenge

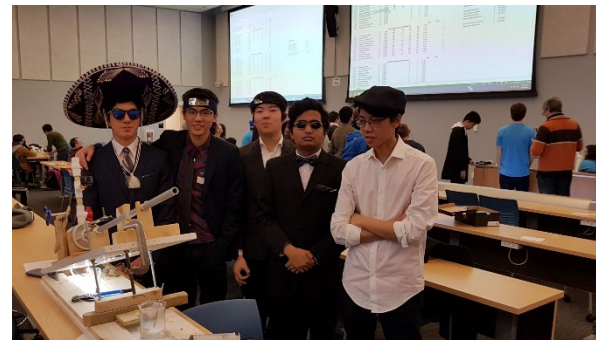
We **have to implement pedagogical innovations in STEM teacher education** to change how STEM is learned in our schools

Three Examples of Innovations

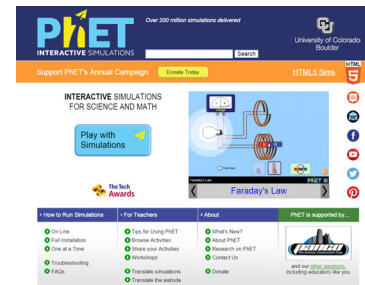
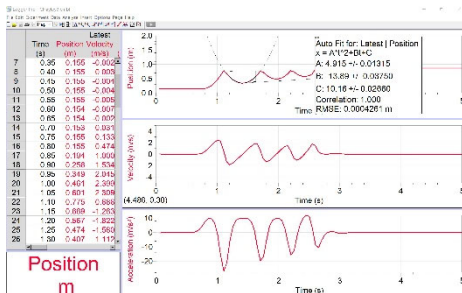
1. Family Math and Science Day



2. UBC Physics Olympics



3. Creative use of technology



VR & AR Resources 4 STEM Teachers

These resource will help STEM teacher incorporate Virtual Reality (VR) and Augmented Reality (AR) into their lessons.

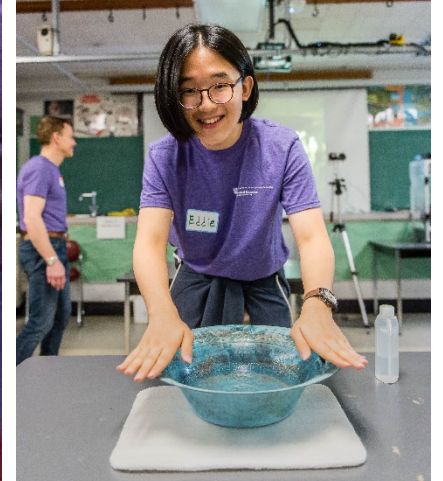
Virtual & Augmented Reality Resources 4 STEM Teachers

Real learning from unreal environments



1

UBC Family Math and Science Day



1

Engaging Future Teachers



UBC Faculty of Education Math and Science Day

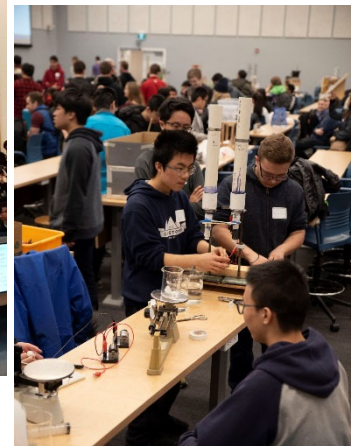
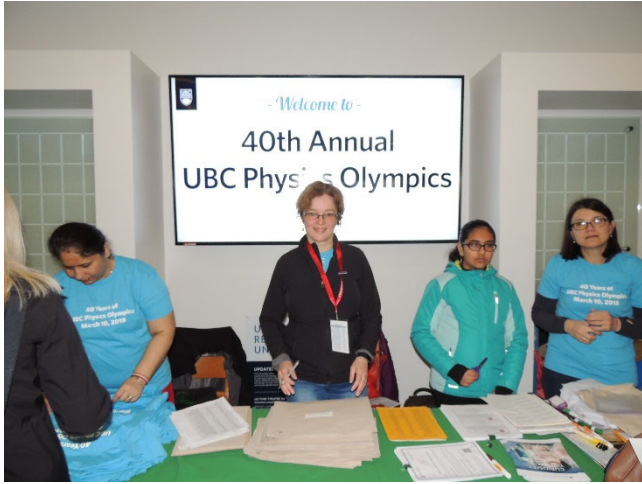
1 Engaging Parents in STEM

- UBC Faculty of Education Math and Science Day



2

UBC Physics Olympics



2

UBC Physics Olympics

During the practicum teacher-candidates mentor students who participate in UBC Physics Olympics

THE UNIVERSITY OF BRITISH COLUMBIA
Vancouver Campus

Faculty of Science
Physics Olympics at the University of British Columbia

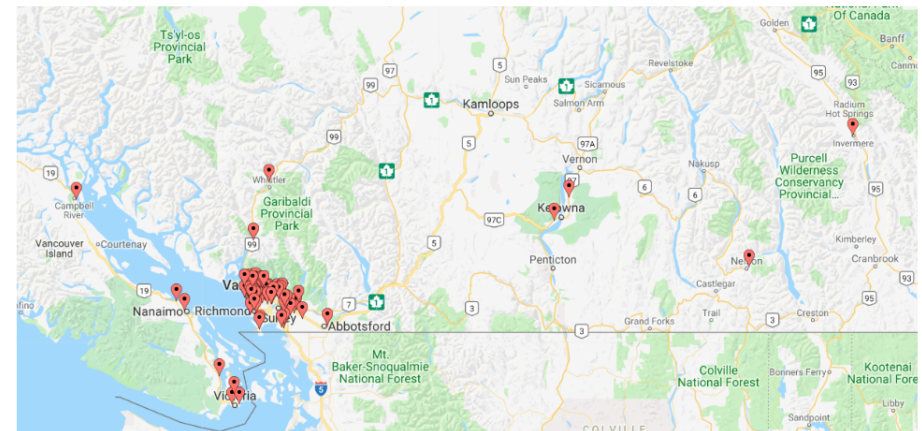
Home Registration Schedule Rulebooks Results For Teachers About Contact Us

Welcome to UBC Physics Olympics Website
Registration for the 2020 Physics Olympics is now open.
[Register now!](#)

The 2020 Physics Olympics will take place on Saturday, March 7. Every year teams from high schools across British Columbia will compete for medals in 6 science events. The team with the highest overall score will receive a trophy for their school, as well as other awards.

News
October 18, 2019
NEW Registration for the 2020 Physics Olympics is now open! [Register now.](#)
March 14, 2019
[List of top teams for 2019 Physics Olympics has been posted!](#) [Click to view more.](#)

2019 participating teams



<https://physoly.phas.ubc.ca/> More than 720 students – 72 teams from all over BC

3

Creative Use of Technology

PhET Interactive Simulations website interface showing navigation options and a simulation titled "Faraday's Law".

Navigation menu items:

- How to Run Simulations
 - On Line
 - Full Installation
 - One at a Time
 - Troubleshooting
 - FAQs
- For Teachers
 - Tips for Using PhET
 - Browse Activities
 - Share your Activities
 - Workshops
 - Translate simulations
 - Translate the website
- About
 - What's New?
 - About PhET
 - Research on PhET
 - Contact Us
 - Donate

Sponsor section: PhET is supported by... United Construction Corp. and our other sponsors, including educators like you.

FREE
RESOURCES

PhET Computer simulations from the University of Colorado, Boulder


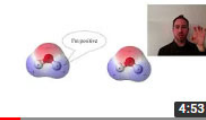

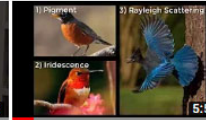






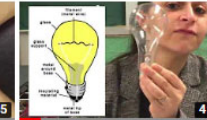



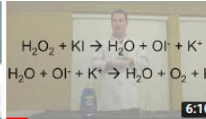

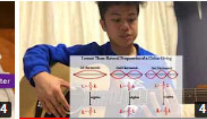







*You can download the simulations.
You can also use Chinese!*

3

STEM Educational Videos for All

HOME VIDEOS PLAYLISTS CHANNELS ABOUT Q

Uploads ▾ PLAY ALL SORT BY

 <p>Intro to Google Tour for Educators 1 views · 6 days ago</p>	 <p>The Mystery of Sodium Polyacrylate 603 views · 1 year ago</p>	 <p>Atlas 21 views · 1 year ago</p>	 <p>Exploring the Colours of Birds' Feathers 316 views · 1 year ago</p>	 <p>Lichtenberg Figures - French Version 18 views · 1 year ago</p>	 <p>Lichtenberg Figures - English Version 16 views · 1 year ago</p>
 <p>Exploring Water Movement in Plants 3 views · 1 year ago</p>	 <p>Exploring Wimshurst Generator 188 views · 1 year ago</p>	 <p>Ice Cube Fishing Experiment 66 views · 1 year ago</p>	 <p>Exploring Surface Tension with Soap-Powered Boats 202 views · 1 year ago</p>	 <p>Lightbulbs and Circuits 46 views · 1 year ago</p>	 <p>Exploring Hidden Colours of the Fall Leaves with Paper... 111 views · 1 year ago</p>
 <p>The Magic (Cartesian) Diver 7 views · 1 year ago</p>	 <p>The Decomposition of Hydrogen Peroxide 44 views · 1 year ago</p>	 <p>Elephant Toothpaste 13 views · 1 year ago</p>	 <p>Exploring the Science behind Ocean Currents 18 views · 1 year ago</p>	 <p>Natural Frequency and Harmonics 102 views · 1 year ago</p>	 <p>Exploring Density With Oranges, Lemons and Limes 48 views · 1 year ago</p>
 <p>Exploring Surface Tension with Colours 3 views · 1 year ago</p>	 <p>Magical Candle 18 views · 1 year ago</p>	 <p>Aluminum Boats 30 views · 1 year ago</p>	 <p>Jar of Clouds 28 views · 1 year ago</p>	 <p>Strawberry DNA Extraction 128 views · 1 year ago</p>	 <p>Exploring buoyancy of Limes, Lemons and Oranges 154 views · 1 year ago</p>

https://www.youtube.com/channel/UCHKp2Hd2k_dLjODXydn2-OA

3

Math & Science Teaching & Learning through Technology

The screenshot shows the UBC Faculty of Education website. The top navigation bar includes the UBC logo, the motto "a place of mind", and the text "FACULTY OF EDUCATION" and "DEPARTMENT OF CURRICULUM AND PEDAGOGY". The main header area features "Math & Science Teaching & Learning through Technology". A secondary navigation bar contains links for "HOME", "ABOUT", "RESEARCH", "ELEMENTARY", "SECONDARY", "ADD YOUR PRESENTATION", and "NEWS". A dropdown menu is open under "SECONDARY", listing "MATHEMATICS", "PHYSICS", "CHEMISTRY", and "BIOLOGY". The "PHYSICS" dropdown is further expanded to show a list of topics: "VECTORS", "KINEMATICS", "DYNAMICS", "MOMENTUM", "WORK,ENERGY,POWER", "THERMODYNAMICS", "CIRCULAR MOTION", "GRAVITATION", "WAVE MOTION AND OPTICS", "PARTICLE AND NUCLEAR PHYSICS", "EQUILIBRIUM", and "ELECTROSTATISTICS". The main content area features a "Teacher Education" banner and a "CREATE" section with the tagline "Community to Reimagine Educational Alternatives for Teacher Education". A "Presentation about MSTLTT Project" is highlighted, mentioning Dr. Marina Milner-Bolotin. A sidebar on the right contains links for "Mission", "Contact", and "Our sponsors".

<http://scienceres-edcp-educ.sites.olt.ubc.ca/>



EDCP357 (Winter 1, 2013)

[Home](#) | [Main menu](#) > Comments written by you

Comments written by you

Comments written by you, about questions you have answered, are shown below.

Select an order:

[New replies](#) [Most recent first](#) [Show agreements only](#) [Show disagreements only](#)

Showing new replies only

No comments to view

[Return to main menu](#)



What is PeerWise?

Students use PeerWise to create and to explain their understanding of course related assessment questions, and to answer and discuss questions created by their peers.

<http://peerwise.cs.auckland.ac.nz/>

My Answer to the Challenge

We **have to implement pedagogical innovations in STEM teacher education** to change how STEM is learned in our schools

Innovation in STEM Teacher Education

The screenshot shows a Canvas LMS interface for the course EDCP 559 96A. The left sidebar contains navigation links: Account, Dashboard, Courses, Calendar, Inbox, Commons, Help, Files, My Media, Media Gallery, Course Evaluation, Evaluation Reports, Threadz, Outcomes, and Quizzes. The main content area displays the course title "EDCP 559 96A Research in the Teaching and Learning of the Sciences" and a video player for "UBC_FamMathScienceDay_2018". Below the video is a link to "Family Mathematics and Science Day 2018 at UBC Faculty of Education" and a photo of students working at a table. The right sidebar shows course status (Unpublish, Published), various management options (Import from Commons, Choose Home Page, View Course Stream, Course Setup Checklist, New Announcement, Student View, View Course Analytics), and a calendar for June 2019. A note at the bottom right states "Course assignments are not weighted."

UBC

2019S2

Home

Announcements

Syllabus

Assignments

Modules

Discussions

Library Online Course Reserves

Collaborate Ultra

Grades

People

Pages

Files

My Media

Media Gallery

Course Evaluation

Evaluation Reports

Threadz

Outcomes

Quizzes

EDCP 559 96A > Syllabus

EDCP 559 96A Research in the Teaching and Learning of the Sciences

Jump to Today Edit

UBC_FamMathScienceDay_2018

00:00:03:01

Family Mathematics and Science Day 2018 at UBC Faculty of Education

Course Status

Unpublish Published

Import from Commons

Choose Home Page

View Course Stream

Course Setup Checklist

New Announcement

Student View

View Course Analytics

June 2019

26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6

Course assignments are not weighted.

Call For Action!

STEM teachers should experience innovative pedagogies before they will be ready and open to implement them into practice.

