Flipped Teaching Methods in High School Biology

Erik Johnson
River Valley High School
Montana State University MSSE
Outline

• School background
• How I came up with project
• Research Questions
• Methods
• Results
• Moving Forward
Classroom/school background

- Spring Green, WI
- 13 Townships, 4 Villages, 300 square miles
- Declining enrollment, 1,244 students K-12
- 1 High School, 1 Middle School, 2 Elementary Schools
Classroom/school background

• Biology, Conservation Science, AP Biology, AP Environmental Science
• Four science teachers
• Biology sections are split with a colleague
Coming up with the project

• MSSE Capstone Project
• Biology
• NGSS
• One-to-one
• Google
• YouTube

How to get them engaged?
Research Questions

• What are the effects of implementing flipped units on:
  • student performance?
  • assignment completion?
  • student attitude?
  • on me as a teacher?
<table>
<thead>
<tr>
<th>Unit</th>
<th>Treatment Type</th>
<th>Methods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cells</td>
<td>Traditional</td>
<td>• In-class lectures</td>
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<tr>
<td>Microbiology</td>
<td>Mixed</td>
<td>• Fewer in-class lectures</td>
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<tr>
<td>Protists &amp; Fungi</td>
<td>Flipped</td>
<td>• A few video lectures</td>
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<tr>
<td>Plants</td>
<td>Flipped</td>
<td>• A few homework assignments</td>
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<tr>
<td></td>
<td></td>
<td>• Lectures assigned on video</td>
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<td></td>
<td></td>
<td>• More labs and other in-class activities</td>
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</table>
Flipping Method

• Screencastify Extension
  • Free
  • No editing
  • Time Limit: 10 min

• Recorded the presentation, assigned as homework
  • Hand notes
  • Google Doc notes
  • Questions in Google Classroom
  • EdPuzzle
In-Class Activities

- Microscopes
- Bacteria lab
- POGIL
- Podcast
- Germination
- Plant structures
- Wisconsin Fast Plants
Methods - Data Collection

- Surveys and questionnaires
- One or two questions per unit
- Unit exams
- Student assessment of unit difficulty
- Missing/Late Assignments
- Student interviews
Research Questions

• What are the effects of implementing flipped units on:
  • student performance?
  • assignment completion?
  • student attitude?
  • on me as a teacher?
What are the effects of implementing flipped units on student attitudes?

- 25 out of 28 - preference for in-class lecture
- “yes, because i learn more from the teacher”
- “I think we should watch videos and take notes instead of a lecture. That way students can work at their own pace and there is more time for labs and hands-on activities in class.”
- “No. I get really distracted in class taking notes. I feel like I pay attention better with videos.”
Research Questions

• What are the effects of implementing flipped units on:
  • student performance?
  • assignment completion?
  • student attitude?
  • on me as a teacher?
Research Questions

• What are the effects of implementing flipped units on:
  • on me as a teacher?
What are the effects of implementing flipped units on me as a teacher?

• More enjoyment in class
• More interactions and conversations with students
• More feedback from students
During labs students might not all learn something with the group they are in, but in a lecture, every student is learning what you want them to learn."

With labs and POGIL sheets etc., it's hard to focus or do the work, understand what we're supposed to do or learn, and pay attention to what's supposed to be happening in the experiment. Lectures are cut to the point and easier to understand."
What are the effects of implementing flipped units on me as a teacher?

• Video lecture challenges – timing and editing - Screencastify

• Developing and implementing valuable activities was difficult
Moving Forward

• Determine which lessons should be flipped

• Determine which other teaching strategies from MSSE I should implement

• Determine which other MSSE classes I should take
MSSE Program

In-person and online
Fossilized stromatolites in
Geology of Glacier National Park

Fossil in Dinosaur Paleontology
Streamside Science – Lab based class, taught online
Online Courses

Tentative course list, subject to modification

Most online courses run June 10 - Aug 2. Schedules may vary, check individual course listings.

Biology
- BIOE 513 Terrestrial Ecology of Plains and Prairies (1 cr) CRN# 10907
- BIOE 519 Biology of Riparian Zones and Wetlands (2 cr) CRN# 10908
- BIOH 595 Anatomy & Physiology (3 cr) CRN# TBD

Chemistry
- CHMY 595 Chemistry of the Environment - Water, Air, Earth (3 cr) CRN# 11248
- CHMY 587 Exploring Chemistry for Teachers (3 cr) CRN# 11247
- CHMY 597 Exploring Biochemistry (3 cr) CRN# 11381

Earth Sciences
- ERTH 525 Landforms for Elementary Teachers (1 cr) CRN# TBD June 24 to Aug 2
- ERTH 528 Understanding Climate Change for Teachers (3 cr) CRN# 11199 June 10 to Aug 2
- ERTH 520 Fundamentals of Oceanography (3 cr) CRN# 11271 June 10 to Aug 2
Electrical Engineering
- ELE 591 Introduction to Logic Circuits for Teachers (3 cr) CRN# TBD

Land Resources and Environmental Science
- LRES 582 Streamside Science for Teachers (3 cr) CRN# 11167 June 10 to Aug 2

Microbiology
- MB 540 Environmental Microbiology (3 cr) CRN# 10858 June 10 to Aug 2
- MB 541 Microbial Genetics (3 cr) CRN# TBD

Physics
- PHSX 491 Conceptual Physics (3 cr) CRN# TBD June 10 - Aug 2
- PHSX 511 Astronomy for Teachers (3 cr) CRN# 10770 May 28 - Aug 2
- PHSX 513 Quantum Mechanics (3 cr) CRN# 10238 May 13 - July 26
- PHSX 591 Electric Circuits and Magnetism (2 cr) CRN# TBD June 10 - July 26
- PHSX 591 Physics of Renewable Energy for Teachers (3 cr) CRN# TBD June 10 - Aug 2
- PHSX 591 The World of Motion (1 cr) CRN# TBD May 13 - June 21
- PHSX 591 World of Force (1 cr) CRN# TBD June 24 - Aug 2
Education, Curriculum & Instruction

- **MSSE 501 Inquiry through Science & Engineering Practices** (2 cr) CRN# TBD
- **MSSE 502 Emerging Technology & the Science Classroom** (3 cr) CRN# TBD *(formerly MSSE 591 Web Tools for Teachers)*
- **MSSE 507 Capstone Data Analysis & Classroom Statistics** (2 cr) CRN# TBD
- **MSSE 536 Construction of Curriculum** (2 cr) CRN# TBD *(formerly EDCI 536)*

http://www.montana.edu/msse/students/summer-2019.html
Campus Courses

Tentative course list, subject to modification

June 17-21, 2019
- BIOE 520 Understanding and Managing Animal Biodiversity in the Greater Yellowstone Ecosystem (2 cr) CRN# 10896
- PSPP 549 Plants, People, Health (2 cr) CRN# 11163

June 24-28, 2019
- BIOE 523 Wildlife Ecology of the Northern Rocky Mountains (2 cr) CRN# 10897
- PHSX 596 Teaching Electricity & Magnetism Using Research-based Curriculum (2 cr) CRN# 11315
- PSPP 548 Flowering Plants of the Northern Rocky Mtns (2 cr) CRN# 10906

June 24-29, 2019
- GEO 521 Dinosaur Paleontology I (2 cr) CRN# 10902

June 29, 2019
- MSSE 591 Statistics Bootcamp for Capstone Projects (2 cr) CRN# TBD
July 1-5, 2019
No classes on July 4th

- BIOE 596 Land Use Issues in the Greater Yellowstone Ecosystem (2 cr) CRN# 11193
- CHMY 594 Chemistry Seminar: Science Lab Safety and Risk Management (1 cr) CRN# 10898
- MSSE 575 MSSE Professional Capstone Paper and Symposium in Science Education (3 cr) (SUMMER 2019 GRADUATE CANDIDATES ONLY!) CRN # 11380

July 8-12, 2019

- BIOE 522 Birds of Prey of the Greater Yellowstone Ecosystem (2 cr) CRN# 11314
- ELEE 508 Solar Cell Basics for Science Teachers (2 cr) CRN# 11259
- LRES 557 Thermal Biology in Yellowstone National Park (2 cr) CRN# 10903
- LRES 569 Ecology of Invasive Plants (2 cr) CRN# 10904
- PHSX 401 Physics by Inquiry I (1st wk of 2 wks) (3 cr) CRN# 10905
- PHSX 402 Physics by Inquiry II (1st wk of 2 wks) (3 cr) CRN# 11316

http://www.montana.edu/msse/students/summer-2019.html
July 15-19, 2019
- BIOE 593 Alpine Ecology (2 cr) CRN# 11164
- ERTH 516 Northern Rocky Mountain Geology (2 cr) CRN# 10901
- GEO 522 Dinosaur Paleontology II (2 cr) CRN# 11317 *(Prerequisite GEO 521 Dinosaur Paleontology I)*
- MB 538 Cell and Molecular Biology (2 cr) CRN# 11170
- PHSX 401 Physics by Inquiry I (2nd week) (3 cr) CRN# 10905
- PHSX 402 Physics by Inquiry II (2nd week) (3 cr) CRN# 11316

July 20, 2019
- ERTH 594 Geology Seminar: Geology of Earthquakes (1 cr) CRN# 10900

July 21, 2019
- GEO 585 Mineralogy for Teachers (1 cr) CRN# 11369

July 21-26, 2019
- ERTH 596 Geology of Glacier National Park (2 cr) CRN# 11166

July 22-26, 2019
- CSCI 582 Computer Science: The Joy and Beauty of Data (2 cr) CRN# TBD
- LRES 586 Lake Ecology (2 cr) CRN# 11195

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