Formation of an online Community of Practice and its Application

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How can we design courses that promote learning?
Course design

Learning goals

High school students

What they want to learn
Student:

I am looking forward to learning E&M to deepen my knowledge with this course. I would like to be able to use the knowledge that I have gained in the course that I have taken to begin teaching calculus based physics in my school district. I am looking forward to learning with you.
Course design

Learning goals
High school students
What they want to learn

MPTE Program
Advanced physics
Current events
History
Education theory
Collaborative learning
New MS program

Emphasis on teaching physics

High school teachers
New MS program

Emphasis on teaching physics

High school teachers

Different background preparation

50% physics degree

50% from Texas
Scratch

New MS program

Emphasis on teaching physics

High school teachers

Different background preparation

50% physics degree

50% from Texas
Online Course design

Technical aspect

Pedagogical aspect
Technical design aspects

- PowerPoint slides
- Write with tablet
- Talk
- YouTube
- Closed captioning
- Learning management system
- Link
How can we make engaging videos?
MPTE Core Courses Video Design
Recorded Videos
Recorded Videos

Mini-lectures

Simulations

Interactive 3D diagrams
Recorded Videos

- Mini-lectures
- Simulations
- Interactive 3D diagrams
YouTube video  
Practice Problems  
Instructor Prompts  

Video Activity  
HW

Recorded Videos  
Mini-lectures  
Tutorial  
Quizzes  
Simulations

Interactive 3D diagrams  

Designed and developed by Robynne Lock and William Newton
Recorded Videos

- YouTube video
- Practice Problems
- Instructor Prompts

- Video Activity
  - HW

Discussion boards

- Mini-lectures
  - Tutorial
  - Quizzes

- Simulations

Interactive 3D diagrams

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Recorded Videos

- Mini-lectures
- Simulations
- Interactive 3D diagrams

Instructor Prompts
- HW

Discussion boards
- Reply
- Response

Practice Problems
- YouTube video
- Practice Problems
- Instructor Prompts

Video Activity

Designed and developed by Robynne Lock and William Newton
Core courses structure

Video Activity

Discussion boards

- Reply
- Response
- Problem solving

Introduce forum

Designed and developed by Robynne Lock and William Newton
Student: I had never played around with Wolfram (since chemistry and IPC don't really need this type of tool), and I'm already amazed at what it can do. I'll be using this tech tool when I DO get to teach physics!
Problem solving discussion board participation

Percentage of students

Number of posts

0 & 1
2
3+
What structural features promote collaboration?
Context

- Computational Waves for Educators
- Summer 2020
- 9-week course
- Qualitative study of posts

Nadeau et al., 2020, Under review
Computational waves for Educators

- Computational Methods
- Wave content
- Computational wave
- Instructor Prompts
- HW

Problem solving discussion board

Designed and developed by Bahar Modir
Structural features

- Animations
- Errors and debugging
- Instructor prompts
- Video code documents
- Homework

- Video structure
- Off-topic factors
- “Introduce yourself!” forum

Nadeau et al., 2020, Under review
Preliminary study
What practices students engage in?

Nadeau et al., 2020, Under review
Structure

Video structure
- Video debugging
- Video Animations
- Instructor prompts
- Video code documents
- Homework assignments

Off-topic factors
- Introductory forum

Practices

Teaching talk
- Coding talks
- Metacognition talk
- Sharing resources
- Social talk
- Past coding experience

Preliminary study
Preliminary study

Practices
Teaching talk
Coding talks
Metacognition talk
Sharing resources
Social talk
Past coding experience

Plans for application to classroom
Practices
- Teaching talk
- Coding talks
- Metacognition talk
- Sharing resources
- Social talk
- Past coding experience

Plans for application to classroom

Trouble shooting/ Discuss coding techniques

Preliminary study
Teaching talk
Coding talks
Metacognition talk
Sharing resources
Social talk
Past coding experience

Plans for application to classroom
Trouble shooting/Discuss coding techniques
How can teaching content with code promotes learning

Preliminary study
Practices
- Teaching talk
- Coding talks
- Metacognition talk
- Sharing resources
- Social talk
- Past coding experience

Plans for application to classroom

Trouble shooting/
Discuss coding techniques

Sharing part of solutions or code workouts

How can teaching content with code promotes learning

Preliminary study
Teaching talk
Coding talks
Metacognition talk
Sharing resources
Social talk
Past coding experience

Plans for application to classroom
Trouble shooting/Discuss coding techniques
Sharing part of solutions or code workouts

How can teaching content with code promotes learning
Acknowledgement

Preliminary study
Preliminary study

- Practices
  - Teaching talk
  - Coding talks
  - Metacognition talk
  - Sharing resources
  - Social talk
  - Past coding experience

- Plans for application to classroom
- Trouble shooting/ Discuss coding techniques
- Sharing part of solutions or code workouts
- Experience with python other languages or Excel
- How can teaching content with code promotes learning
- Acknowledgement
Course structure

Individual learning → Collaborative learning
Community of Practice

- Course structure
- Individual learning
- Collaborative learning
- Become better teachers
- Develop knowledge

Lave & Wenger, 1991
Acknowledgments

Thanks for your attention!

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