A Virtual Community of Practice to Support Faculty Efforts to Adopt Research-based Instructional Approaches

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Motivation for VCP project

• Major transformation in engineering education needed to meet demands of global workforce

• Better fundamentals; real world thinking, problem solving skills; communications; ethics, environmental social issues; coverage of emerging areas...

• Do not increase credits or time to complete degree

• ABET, NAE, NSF, IChemE, Engineers Australia...
Motivation for VCP Project

• Change the way we teach - bridge the gap between teaching and research
• Resistance to adopting research-based pedagogy – why?
  – Need for positive climate for good teaching
  – Lack of time
  – Fear of student resistance
  – Lack of mentoring or support
• Motivation must guide faculty development efforts
  – Must overcome resistance
Overview

• Background
  – VCP
  – Faculty Development
  – Instructional Approaches

• VCP Model
  – Structure
  – Technology
  – Implementation

• Results
• Impact
VCP

Community
- Social structure assists creation and sharing of knowledge

Virtual
- Online
- Synchronous (real time) collaboration
- Asynchronous repository/archive

Practice
- Aggregation of relevance
- Tips, pointers, insights, opinions
- Support to achieve goals
Faculty Development Effort

Facilitators

– Expertise in engineering and pedagogy
– Identify and target need and interests of the participants
– Provide choices of methods of implementation
– Model the recommended pedagogy

Participants

– Have opportunities to practice the new content in a supported environment
– Are actively engaged throughout process

Tier 1: Leadership VCP

- 2 Meta-Trainers
- 2 VCP Leaders (Civil E)
- 2 VCP Leaders (ECE)
- 2 VCP Leaders (Mech E)
- 2 VCP Leaders (ChE/Mat)
- 2 VCP Leaders (Computer E)

Tier 2: Faculty VCP

- Pair of Discipline Leaders
- Faculty Participants (20)
LVCP

- 6 weekly sessions, 1.5 hours
- Training/modeling of research-based approaches
- Reflection, planning and practice
- Plan of action and materials for leading FVCP
FVCP in ChE and Materials Eng

- 18 participants from all over USA
- Fall semester - 8 sessions, weekly, 1.5 hours
  - Focus on pedagogy and instructional strategies
  - Faculty developed a plan to implement new approaches in a course in the spring
- Spring semester - 8 sessions, every two weeks, 1.5 hours
  - Support for faculty as they implement new approaches
  - Faculty-driven, open discussion on successes and challenges
Technology

Synchronous
  • Adobe Connect web conferencing tool
    – Real time collaboration
    – Group discussion
    – “Breakout rooms”
    – Collaboration capabilities – file/screen share, notes, whiteboard, polling...

Asynchronous
  • Open-source web portal archive tool
    – Communications
    – Materials
    – Resources
Research-based Instruction

**Pedagogy**
- Bloom’s Taxonomy
- Flipped classroom
- Process Oriented Guided Inquiry Learning (POGIL)
- Small group discussion
- Online textbook annotation
- Peer instruction
- Group-based medical case studies
- Game-based pedagogy

**Courses**
- Physics Materials I and II
- Error Analysis and Design Optimization
- Materials Science and Engineering
- Materials for Energy Storage
- Heat and Mass Transfer, Fluid Mechanics
- Systems Physiology
Participant Results

- Better attendance
- Better student engagement
- Increased student motivation
- Better exam performance
- Better teacher ratings
- Faculty teaching award
- Community of Practice at home institution
VCP Results

In all classes

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Never
Results

• Faculty perception of motivation
• Ratings of 11 behaviors associated with student motivation
  – On time, interested, use critical thinking, want to perform well, seek help outside class, non-disruptive, participation, apply material, attendance, reading outside class
• 37-70%, normalized gain for each response for 10 out of 11 behaviours
  – Exam performance could not be compared because exams increased in difficulty
Results

• Sustainable community
  – Participants continue to revise courses
  – Asynchronous portal
  – Email
  – Panel session at ASEE National conference in June
  – Participant established a CP at her institution
Conclusions

- Cost-effective, time efficient model for faculty participants
- Use of research-based pedagogy increased
- Faculty perceived greater student motivation
- Keys to success
  - Two-tiered structure
  - Asynchronous and synchronous environments
  - Time-efficiency
  - Community support
  - Peer support during implementation
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