Teaching Teaming, Writing, and Speaking
ASEE Workshop, June 22, 2003
Nashville, TN

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Workshop Objectives

- Identify issues, choices, and challenges associated with emphasizing teaming, writing, and speaking (TWS) in engineering curricula
- Explore methods and models for integrating TWS into engineering courses
- Facilitate strategic choices and implementation plans
- Share materials and resources based on instructional needs and parameters
Workshop Agenda

12:30 Introduction(s), agenda, context-setting, exploration of issues
1:30 Explanation of TWS models and methods
2:30 Break
2:45 Application of models
3:45 Discussion and questions
4:00 Adjourn
Please form small groups.

Read the case and, playing the role of committee members, read and discuss the emailed response.

Formulate a response to the email’s author.

Assign a spokesperson and be prepared to share your group’s response.
Junior level

Chemical engineering unit operations lab

Course: one hour lecture plus three hour lab

TWS module:
- 4 times/semester during lab off-weeks as a class
- 4 times/semester with TWS consultant as teams
Models and Methods: Lab

- **Focus of in-class activities**
  - Teaming
  - Collaborative writing
  - Collaborative speaking

- **Focus of consultations**
  - Proper citations
  - Report organization
  - Graphics and layout
  - Rehearse oral presentation
Models and Methods: Lab

Preliminary Results

- Statistically significant difference in 3\textsuperscript{rd} and 4\textsuperscript{th} written reports: TWS outperformed non-TWS
- Statistically significant difference in final oral presentation: TWS outperformed non-TWS
Models and Methods: Lab

CHE 330 Average Written Lab Report Grades

- **Report 1**
- **Report 2**
- **Report 3**
- **Report 4**

- **Average Grade**
  - 65
  - 70
  - 75
  - 80
  - 85
  - 90

- **Written Lab Report**

- **TWS**
- **Non-TWS**
CHE 330 Average Oral Lab Report Grades

Presentation 1
Presentation 2

Oral Lab Report

Average Grade

TWS
Non-TWS
Lessons Learned: Lab

- Make an effort up front to get students invested in **writing**. Some students think that "engineers never really have to write in the workplace."
- **Punctuate discussion with real world details and anecdotes.** Students don’t appreciate the role of communication skills in the workplace.
- **Always be prepared to break from the lecture to address questions and concerns.**
- **Team consultations:** Plan a theme but be prepared to digress to respond to students' needs.
Models and Methods: Design

- Senior level
- Chemical engineering design
- Course: one hour lecture plus problem session
- TWS module: two modes
  - 4 times/semester consultation on team basis
  - Weekly, 2 hour instruction/workshop
Models and Methods: Design

- Lecture Mode: in-class activities
  - Teaming: Roles and responsibilities
  - Maximizing Team Productivity and Cohesiveness
  - Identifying Personal Strengths and Weaknesses
  - Peer evaluation
  - Presenting in Multidisciplinary Teams
  - Writing Collaboratively
  - Exploring disciplinary conventions
  - Better Managing the Question and Answer Session
  - Video Critiques
  - Troubleshoot Final Oral Presentations
Models and Methods: Design

- **Lecture advantages**
  - Importance transparent
  - Significant contact time
  - Depth and variety
  - Accountability

- **Lecture disadvantages**
  - Workload
  - Transference
  - Time intensive
  - Inflexibility
Results: Design Lecture

- 23 design teams from Spring ‘02 semester
- 3 groupings:
  - no TWS instruction, CHE students only (NTWS/SD)
  - TWS instruction, CHE students only (TWS/SD)
  - TWS instruction, multidisciplinary teams (TWS/MD)
- 3 progress reports, final report, final presentation
Results: Design Lecture

- No statistically-significant difference in performance between groups on progress reports
- Differences appear for final report - analysis ongoing
- Oral final presentation
  - TWS/SD outperformed TWS/MD and NTWS/SD
  - TWS/MD equivalent to NTWS/SD
Results: Design Lecture

- Intellectual background of group members is a potential confounding variable
  - Average GPA of TWS/MD groups = 3.5; TWS/SD groups = 3.5; NTWS/SD group = 3.3
- Student reflections indicate 4 challenges
  - Integrating multidisciplinary information
  - Managing diverse feedback and audiences
  - Aligning content material with communication task
  - Addressing interpersonal team issues
- Multidisciplinary groups face a larger challenge than single discipline groups
Lessons Learned: Design Lecture

- Treat as practical lab
  - scheduling of joint instructional time generated conflict specific to multidisciplinary teams.

- Combine with individual team consultations
  - Teach the MD teams to address multiple audiences in written and oral communication.
  - Teach teams how to assimilate members with varying degrees of expertise in both technical content and writing and speaking.
Models and Methods: Design

Consultation Mode

- Teamwork
- Collaborative writing
- Written feedback
- Appropriate acknowledgements
- Report structure/organization
- Rehearse oral presentation
- Feedback from oral presentation
Models and Methods: Design

Consultation advantages
- "Teachable moments"
- Student centered
- Deliverables

Consultation disadvantages:
- Time flies
- Perception versus reality
- Norming?
- "Tracking"
Results: Design Consultation

- 23 design teams from Spring ‘03 semester
- 3 groupings:
  - No TWS instruction, (NTWS)
  - TWS instruction, (TWS)
  - Multidisciplinary teams (MD)
  - Single-discipline teams (SD)
- 3 progress reports, final report, mid-semester and final presentations
- GPA equivalence between TWS and NTWS
Results: Design Consultation

- TWS (42) vs NTWS (35)
  - TWS superior on final oral report
- MD (35) vs SD (62)
  - MD superior on final oral and final written reports
- TWS/MD (16) vs NTWS/SD (36)
  - TWS/MD superior on final oral and final written reports
- NTWS/MD (19) vs NTWS/SD (36)
  - NTWS/MD superior on final oral report
Lessons Learned: Design Consultation

- Shape expectations early
- Provide clear and concrete motivation
- Clearly define feedback
- Coordination with consultant critical
- Outcomes/process dynamic heavily favors outcomes
Preliminary Conclusions

- Vertical integration of TWS instruction superior to single-shot instruction (instructional content)
- TWS integration superior to external instruction (anecdotal)
- TWS instruction improves performance at all levels, particularly oral presentations
Break

2:30-2:45
Your turn…

- Form small groups according to institutional types.
- Identify which, if any, of the models presented are most useful or appropriate to implement on your campus, based on your general objectives.
- With your group members, work through the implementation issues identified on the handout.
- Now collectively identify and try to solve both general challenges and those unique to your own situation.
- Selected participants will report on their discussions.
Resources

- **www.che.ncsu.edu/action agenda**
  - Contains all of the information from this workshop, and complete set of project information from this 3 yr effort

- **www.ncsu.edu/labwrite/**
  - Contains extensive instructional materials that help students understand the genre of the lab report and guide them in the process of writing effective reports.

- **www2.chass.ncsu.edu/CWSP/fac_seminar/sem_archives.html**
  - Archives of how faculty have incorporated writing and speaking in various courses, including engineering.
Resources

- **www.engl.iastate.edu/ISUComm/s2proceedings/ISUComm2.html**
  - A communication across the curriculum program at Iowa State; started in Agriculture and is spreading out to the entire university

- **www.udel.edu/pbl/**
  - Extensive problem-based learning site (not directly TWS but problem-based learning always implies TWS skills)

- **www.engrng.pitt.edu/~ec2000/ec2000_project_description.html**
  - Assessment methods for a variety of learning outcomes associated with EC 2000.

- **www.chemistrycoach.com/linkstoa.htm#Links%20to%20a%20Better%20Education**
  - A collection of links to handouts for students on writing in general and scientific writing, writing lab reports, time management, speaking, and working in groups.
Good luck!