

Learning Through Teaching – a Collaborative Learning Strategy

By

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Outline

- Background
- Learning Through Teaching Implementation
 - Prior experience
 - Current practices
- Assessment
- Future plan

ME Integrated Curriculum

- Initiate the curriculum change in 1997
- Consolidate relevant classes into a class sequence to emphasize connectivity between topics, design considerations, team work, etc..
- Ex: Thermodynamics + Heat Transfer + Fluid Mechanics \Rightarrow Thermal/Fluids I & II
- Add a 3-hour weekly workshop to every ME core course promoting group work, laboratory development, and **collaborative learning**
- Enhance hands-on components in all core courses

Learning Through Teaching

- LTT was originally introduced (Summer 2001) to engage students in establishing a demonstration laboratory in Dynamics (suggested to NSF as a cost-effective strategy to get instant feedback and improvements in lab development)
- Each group concentrates on one experiment and is responsible for introducing the experiment to all other groups, including TA
- Recognize this practice as a success (collaborative learning) and a disappointment (lab development)

Collaborative Learning Strategy

- Definition: an instructional methodology through which students work interactively in groups to achieve common academic goals
 - Shared knowledge: knowledge is created through interaction not by simply transferring
 - Shared responsibility and learn as a group: role-playing for all participants
 - Teacher as a facilitator: students take center stage
 - Nurture environment for collaboration: motivation, at own pace, learn from feedback, feel in control

Learning Through Teaching

- Teaching is the ultimate learning tool
 - Personal experience
 - Higher order skills: data collection, organization, analysis, integration, self-reflection..
 - Enhance communication and personal skills
 - Confidence building, better understanding of teachers' perspective
- Tell me and I may forget, show me and I may remember, involve me and I will understand
 - ⇒ **Ask me to teach and I learn**

Prior Experience

Course title, semester taught	LTT Assignments
Dynamic Systems I, Summer '01	Laboratory Demonstration
Propulsion Systems, Fall '01	Advanced beyond-textbook topics
Thermal/Fluids Lab, Spring '02	Experiment preparation, report writing, lab TA responsibilities
Analytical Tools in ME, Fall '02, Spring '03, Fall '03	Advanced topics (Finite Element Analysis, FFT and Music)
Intro. to ME, Fall '03	Mini-symposium on issues such as engineer as a profession, ethics, globalization, etc..
Thermal/Fluids Lab, Spring '04	Experiment preparation, report writing, lab TA responsibilities

Implementation

- Lecture:
 - Students in group prepare 30 minutes lecture on assigned subjects
 - Serve as TAs in weekly workshop
- Laboratory Course:
 - Conduct and learn experiments before fellow students
 - Present theory, background, experimental procedures, data presentation, and all relevant information for report writing in formal lectures
 - Serve as TAs in assigned experiment periods

Other Responsibilities

- Working with faculty, each group is responsible for preparing an assignment relevant to the topic taught
- Arrange with Graduate TA and faculty to go over teaching materials ahead of class time
- Prepare a web page for information dissemination to class
- Submit a final report to discuss experience learned in LTT practice; feedback and suggest improvement; vote for the best LTT group

Assessment

- End-of-semester, anonymous questionnaires, personal interviews, and self-assessment reports
- Quantitative:
 - Question 1 (Q1): whether it is a good idea to implement LTT throughout the curriculum
 - Question 2 (Q2): whether LTT is useful to their overall educational experience
 - Scale 1 to 5; 1 being strongly agree and 5 strongly disagree (3 or lower is considered positive)

Quantitative Assessment Results

Course title, semester taught	Q1	Q2
Dynamic Systems I, Summer '01	2.0	2.1
Intro. Propulsion Systems, Fall '01	1.7	1.6
Thermal/Fluids Lab, Spring '02	2.4	1.8
Analytical Tools in ME, Fall '02	1.8	1.4
Analytical Tools in ME, Spring '03	1.2	1.3
Analytical Tools in ME, Fall '03	1.4	1.6
Thermal/Fluids Lab, Spring '04	1.9	1.9
Average	1.9 (1.7) SA, A: 75% D, SD: 10%	1.9 SA, A: 81% D, SD: 10%

Qualitative Response

www.eng.fsu.edu/LTT

- Group and individual self-evaluation reports
- In general are quite positive:
 - Great learning experience, stronger motivation, feel active the first time in a class, understand teacher's perspective, confidence building, the importance of time management, self-reflection, etc..
- Negatives:
 - Too time-consuming, poor preparation by student instructor, lack interaction with lecturer, uneven load distribution, unfair assignment, resentment for extra work

Other observations

- Need to clearly explain the objectives of the LTT concept to students first.
- Provide timely feedback during presentation, but refrain from frequent interruptions - students making mistakes is part of the learning process.
- Make sure critical concepts be covered accurately
- Make the effort accountable to all participants to enforce the learning experience.
- Don't be too ambitious at the beginning – learn from mistakes and don't hesitate to drop unsuccessful practices.

Future Plan

- Systematic integration into the core curriculum
 - Engage students early (freshman) with the concept
 - Start with easy assignments and gradually build up capability and confidence
 - Involve students in different LTT practices: laboratory TA, lecturer, tutoring, mentoring
- Conduct longitudinal analysis for long-term assessment/improvement
 - Annual LTT forum (students), workshop (faculty)
- Expand horizontally to other disciplines

Summary

- “Learning Through Teaching” is an effective strategy to promote collaborative learning.
- Systematic implementation to the entire program is possible
 - Integration at a gradual pace
 - Coordinate throughout the curriculum at different levels
- A more rigorous evaluation process is needed for further expansion and broader dissemination