Redesigning CBEN402: Chem. Eng. Senior Design Intervention in Assessments

BACKGROUND

General Description
- Capstone course for CBEN seniors
- Steadily grown over the past decade
  - Class sizes of about 140-160
- Mines’ = 13th largest B.S. class in 2017 [1]
- Continued growth thru 2019 (about 160)

Problems with course
In 2017-2018:
- Most (5 of the 6) Profs unable to grade (and provide feedback) for one individual assignment in the 3rd week of class
- Course will be moved from Spring to Fall in 2019-2020, increasing workload for:
  - Students (CBEN418, Kinetics)
  - Profs (impacted adjuncts and course conflicts)

Redesign solution: Assessments
- Expansion from checklists (new in 2018!) to 3- or 5-degree rubrics (cf. sidebar) for many (major) assignments
- Students responded well to the introduction of checklists (2018), but requested they be posted sooner
- Introduction of peer-grading for the 3rd week assignment mentioned above
- Introduction of formative evaluation of peer group presentations during week 7 (1st pass conceptual process design) and week 12 (technical detailed design) in the form of a “Pro/Con Grid” [2] assignment

Course Management & Delivery
- Coordinated by one Professor
- Delivered by five to seven Profs
  - Manage separate projects
  - Several (1-6) groups of 4-5 students
  - Grade all project-specific assignments

Historical complaints
Prior years have shown (1) student complaints about grading discrepancies between Profs; and (2) Prof complaints about grading workload.

REDESIGNED COURSE

INTENDED OUTCOMES

Student Outcomes
This effort should primarily influence student performance through three principles of learning:
1. Motivation (transparency/clarity)
2. Metacognition (grading others, and insights into assessment)
3. Practice & Feedback (more feedback from peer grading and the grading experience, also from new rubrics)

Instructor Outcomes
It is further expected to significantly reduce the workload on Professors in the 3rd week, and slightly reduce it overall due to the ease of grading with rubrics.

ASSESSMENT

The feedback collected from this course will include:
- Mid-course evaluations, including question(s) focused on the rubrics
- Feedback frequency (grading speed)
- Final grades, compared to prior years
- Course evaluations
  - Examined for motivation keywords, mentions of peer grading, rubrics
  - Coded for grading & assessment
  - Comparison to prior (two) years
- Informal feedback session from Profs

References

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Barankin received his Bachelor of Science and Ph.D. from the University of CA, Los Angeles (UCLA) and received his Master of Science and performed his post-doctoral research at the Technical University of Delft (TU Delft) in the Netherlands, all in Chemical Engineering. He taught Chemical Engineering, Chemistry, and Life Sciences at the Hanze University of Applied Sciences in Groningen, the Netherlands, from 2012 through 2016, when he joined the Colorado School of Mines.

Figure 1. Number of B.S. Chemical Engineering graduates from U.S. programs in 2016-17 [1].