Evidence of Teaching Practices and Strategies Through the Course Complexity Typology

Dorian Bobbett[1], Morgan McArthur[2], Grace Panther[3], Heidi Diefes-Dux[2]

[1]Chemical Engineering, [2]Biological Systems Engineering, [3]Civil & Environmental Engineering

Background

Wide Array of Teaching Practices and Strategies (WATPS)

- Use improves student outcomes and persistence in engineering
- Traditionally underutilized in engineering classrooms

Course Complexity

- Extent to which WATPS are implemented and the challenge associated with implementation

Inductive Coding

- Method of categorizing text by theme
- Themes are developed as data is analyzed

Methods

Setting and Participants

- Engineering faculty at R1 university in Midwest U.S.

Data Collection

- Syllabi collected from Fall 2019 – Spring 2022 semesters
  - 7 departments represented in all data
  - Focus of this coding: 18 core courses from 1 department in Spring 2022

Data Analysis

- Inductively coded for WATPS relative to course complexity
- Two researchers established inter-rater reliability (IRR)

Research Question

The overall goal of this project is to investigate course complexity, as indicated by engineering faculty's use of a WATPS, and the effect that COVID-19 had on this. The research question that drives this study is:

- How does course complexity change after a forced change?

Attendance/Participation:

Regular attendance is essential for all classroom experiences. It is a significant factor that promotes success in coursework. According to the National Center for Education Statistics (2018), students with regular attendance achieve higher grades than those who do not regularly attend class. It is up to you, ultimately, how successful you want to be in this course. You are expected to be active in class and participate until the last day. If you cannot access canvas from home, it is your responsibility to make other arrangements.

SYL_InstJustAca = 1

Reasoning: The instructor offers a reason that they have a mandatory attendance policy. This reasoning is based in academic performance, stating that it is important for students to attend class in order to get a good grade.

Summary:

This course is aimed at preparing students to carry out complete mechanical engineering projects. Specifically, formalized strategies for design are presented, and certain elements of mechanical design and analysis are explored in depth. Through homework, case studies, and projects, students will gain an improved understanding of mechanical design and the formal design process. At the conclusion of the course, students should be able to demonstrate that they are prepared to pursue a complete mechanical design project from problem statement to final reporting.

SYL_InstJustPro = 1

Reasoning: The instructor provides an overall reason students must take the class and bases this reason in the students' increased ability to perform real world professional tasks.

Each lab report has to be typed. Here is an example of grading if the lab is worth of 40 points:

1. (1') Title + your Name. No need to have a standalone page for this.
2. (7') Introduction. State your perspective of this lab purpose. What added value will this lab give to you? What has been learnt? What has gone wrong? What can be improved? And many others. Usually this piece will be about half page long.
3. (10') Experiment description(s). Draw setup for each individual station or experiments. Include description on instrumentation. (Camera picture DOES NOT count as drawing)
4. (20') Results and discussion. Present your data, data plot, and data analysis. Draw conclusions. Questions to discuss are included in lab handouts. You are expected to answer all of them.
5. (2') Note. I have strict requirements on format and they are: Margin 1 inch on four sides; Font size: 12; Font: Times New Roman; Single space.

If you are not sure, ask course instructor about your report. For your reference, there is a PDF file included on CANVAS. While it does not follow the exact structural flows as above, it has all the elements.

SYL_ExpectationsGrading = 1

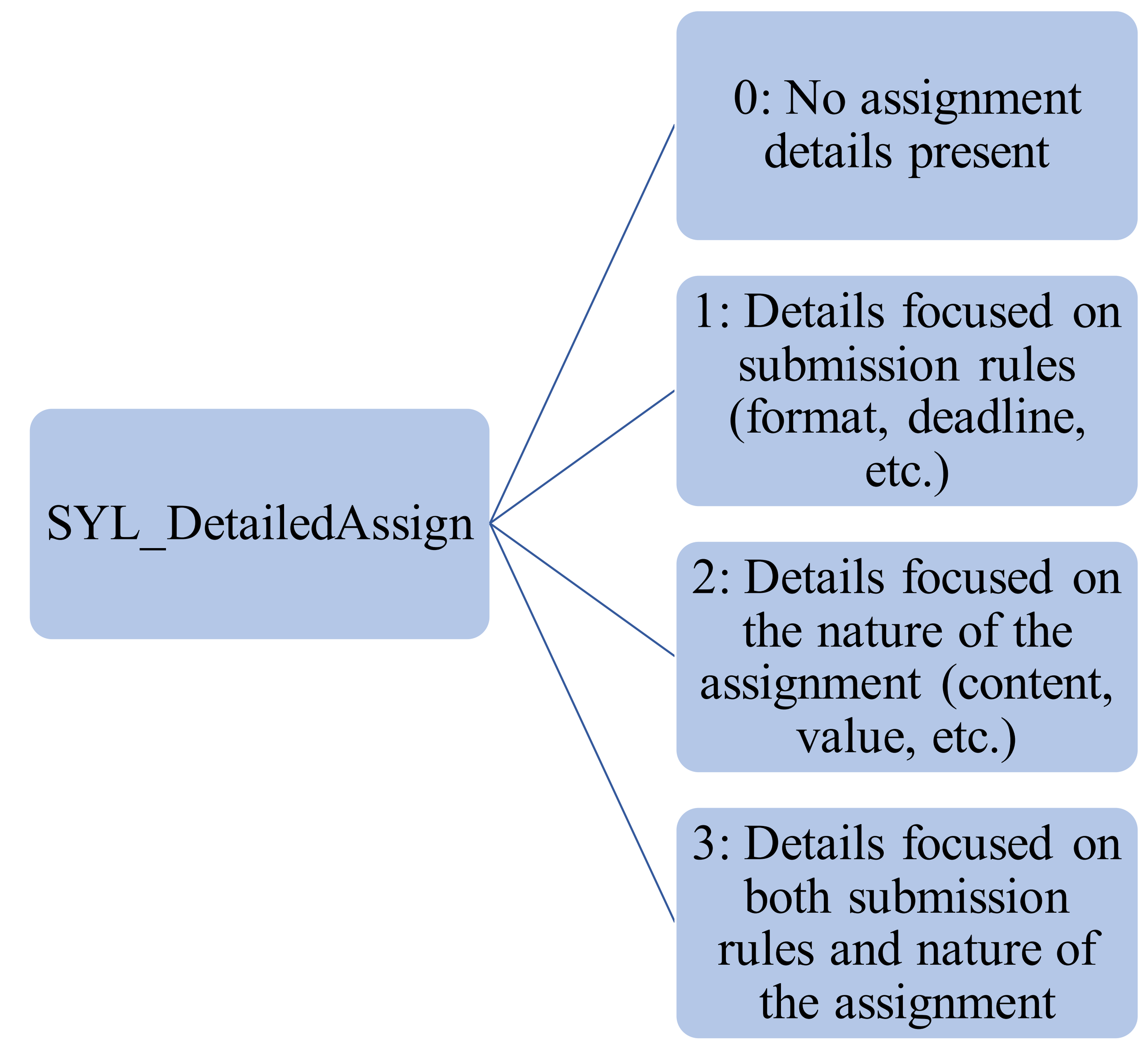
Reasoning: The instructor provides a breakdown of how assignments will be graded. In this case, they make it explicitly clear how points will be distributed and provide an example for students to follow.

SYL_DetailedAssign = 3

Reasoning: The details of the assignment are included explicitly. Students are provided with what content must be included in the lab report (2) as well as guidelines for formatting the report that must be followed (5). This makes this code a 3.

Coding Scheme

Code	Definition	Level
SYL_InstJustAca	Instructor offers academic justification for actions/policies	Count
SYL_InstJustPro	Instructor offers professional justification for actions/policies	Count
SYL_ExpectationsGrading	Inclusion of how assignments are graded	0-1
SYL_DetailedAssign	Nature of the details of the assignments in the syllabus	0-3



Acknowledgements

This work was made possible by a grant from the National Science Foundation (NSF #2105156). Any opinions, findings, conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the National Science Foundation.