Chart the Course
Identifying the Presence of Technical and Professional Skills in Engineering Syllabi Over Time
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**Background**

- Many engineering graduates are underqualified in the workforce.
- Education must remain flexible and versatile to prepare students to meet societal needs for engineering innovation.
- Engineers require professional skills that build upon their analytical skills to allow them to adapt to new working environments.
- Presence of professional skills in Capstone 400 courses.

**Problem statement:** The goal of the study was to identify the extent of professional and technical skill development, as per ABET standards, expressed within courses syllabi over multiple semesters.

“...One study [showed that] civil engineering students' concern related to the welfare of the public decreased over the course of their engineering education. Some attribute this to the focus on technicality... ABET professional learning outcomes ask engineering programs to act with social implications in mind”.

**Methods**

**Setting and Participants**
- Instructors in two ABET accredited programs in an engineering department at a R1 university in the Midwestern U.S.

**Data Collection**
- Syllabi from core sophomore and junior level core courses collected from Spring 2019 to Spring 2023

**Data Analysis**
- Deductively coded information in syllabi based on ABET standards (Table 1 and 2; Fig. 1)
  - “What” instructors would teach in the courses (Table 1, Table 2)
  - Linear regression lines done to test for change
  - Establish ≥ 80% interrater reliability (IRR) for all codes

**Results**

- ABET1 had highest levels in syllabi
- Average R² range from 0.05 - 0.08
- Only ABET2 R² score above 0.2
- ABET1 has weak negative correlation, rest have a very weak positive correlation
- Not statistically significant changes based on R² values
- ABET4 and 5 declined during COVID
- ABET1 and ABET6 alternated peaks

**Limitations**

- Shows need to expose students to culturally relevant problem-solving and professional skills in sophomore and junior level courses
- Focus on only sophomore and junior level core courses in one department

**Conclusions and Future Discussion**

**References**


**Acknowledgements**

The work was made possible by a grant from the National Science Foundation (NSF REU 2244323, NSF RFE 2105156). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of the National Science Foundation.

Special thanks to Dr. Grace Panther and Dr. Heidi Diefes-Dux for their mentorship and team members Dorian Bobbett, Haylen Wall, Jessica Momany, and Maddie Miharci for their support through this project.

**Table 1:** Definition and categorization of ABET standards

<table>
<thead>
<tr>
<th>ABETs</th>
<th>Simplified Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABET1</td>
<td>Computation, STEM principles</td>
</tr>
<tr>
<td>ABET2</td>
<td>Experimental design</td>
</tr>
<tr>
<td>ABET3</td>
<td>Presentation skills</td>
</tr>
<tr>
<td>ABET4</td>
<td>Ethical &amp; professional responsibility</td>
</tr>
<tr>
<td>ABET5</td>
<td>Teamwork</td>
</tr>
<tr>
<td>ABET6</td>
<td>Conducting lab experiments</td>
</tr>
<tr>
<td>ABET7</td>
<td>Understanding “why” and “how”, learning big picture</td>
</tr>
</tbody>
</table>

**Table 2:** Definition of ABET levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Evidence (0)</td>
<td>Not mentioned anywhere</td>
</tr>
<tr>
<td>Declared but no evidence (1)</td>
<td>Mentioned but lacks facilitation</td>
</tr>
<tr>
<td>Low (2)</td>
<td>5-45% of content or grade</td>
</tr>
<tr>
<td>Medium (3)</td>
<td>45-75% of content or grade</td>
</tr>
<tr>
<td>High (4)</td>
<td>&gt;75% of content or grade</td>
</tr>
</tbody>
</table>

**Figure 1:** Sample of a coded syllabus

**Figure 2:** Average ABET Level From Spring 2019 to Spring 2023 (n=77 syllabi)