Impact of Different Curricular Approaches to Ethics

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E³
Exploring Ethical decision
making in Engineering

Purpose

Common approaches to teaching ethics in engineering (e.g. case studies and memorizing ethical codes) may not be the most effective. This study aims to evaluate a variety of pedagogical approaches to determine their impact on students' development of ethical reasoning.

Research Questions

- *Do different curricular approaches to ethics education have differential impacts on undergraduate students' ethical reasoning ability?*

- *How does the impact of these approaches differ for students across academic class-years?*

- *Regardless of approach, what impact does the **depth** of cognitive processing of the experiences have on students' ethical reasoning ability*

Model of Students' Engineering Ethical Development
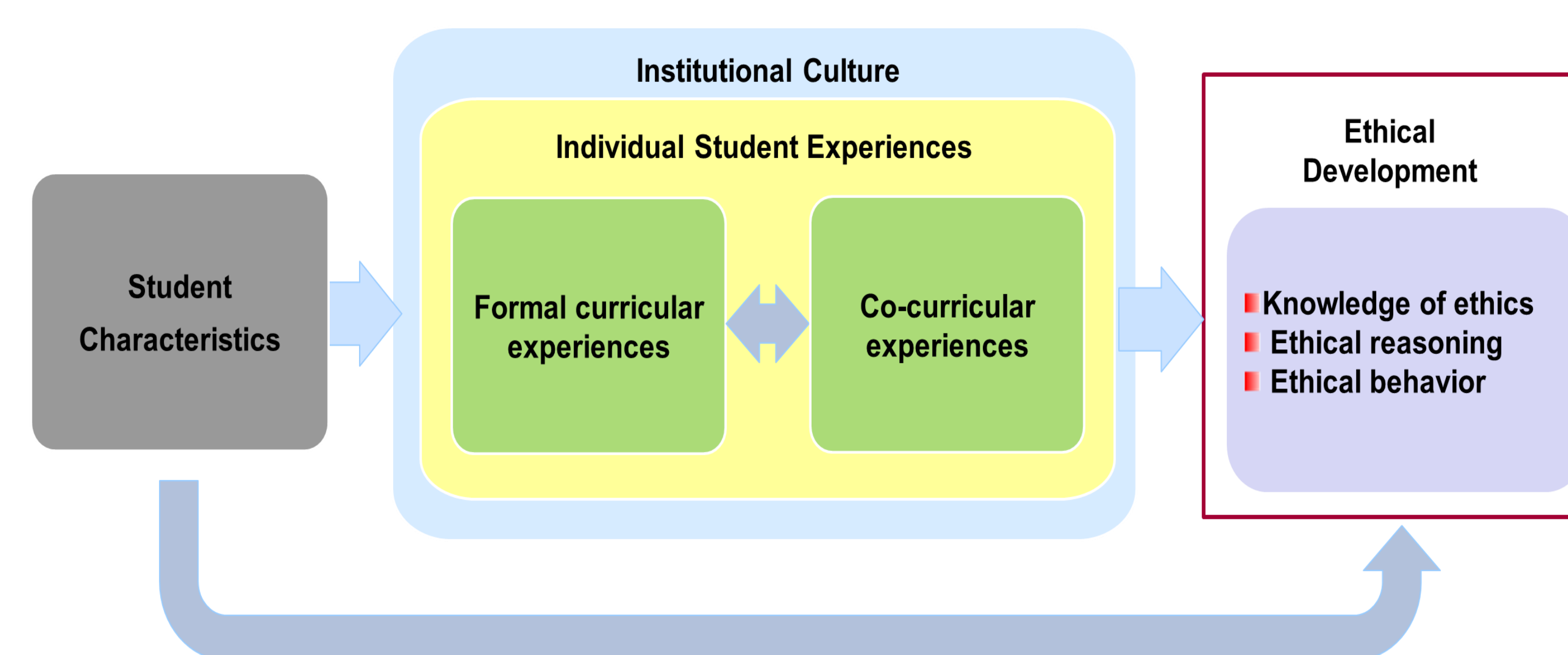
Data

- Survey of 18 U.S. engineering programs differing by:
  - Size, Geography, Carnegie Classification
- Sample: 3,914 undergraduate engineering students

Variables of Interest

Ethical Reasoning Ability

- Measured by Defining Issues Test-2 N2 Score, a measure of complexity of students' moral judgment

Curricular Experiences

- 27 specific experiences classified into 3 contexts (introductory, advanced, or capstone course) and 9 modes of presentation (e.g. presentation, class discussion, video, etc.)

- Used in models individually and also as a sum of total experiences to which a student was exposed

Cognitive Depth

- 6-point scale related to Bloom's taxonomy of intellectual objectives, ranging from 1="Remember facts presented through the activity" to 6="Justify the decision you would make if faced with the same ethical dilemma"

Findings

Independent Variable	Direction and Sig of Effect
Total number of experiences	− **
Presentation by professor, advanced course	+ **
Presentation by professor, capstone course	+ **
Presentation by experienced engineer, capstone course	+ ***
Group discussion, capstone course	+ **
Depth of cognitive processing	+ ***

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

- The total number of curricular experiences of a student is negatively related to ethical reasoning for all class levels except seniors, where there was no relationship

- Experiences found to have positive and statistically significant relationships with ethical reasoning:
  - Presentation by a professor in an advanced or capstone course
  - Presentation by an experienced engineer in a capstone course
  - Group discussion with classmates in a capstone course

- Approaches requiring a higher level of cognitive processing were found to be related to higher levels of ethical reasoning across all groups

Implications

- **Amount** of ethics curricular experiences does not appear to be the most important aspect in developing ethical reasoning ability.

- Presentations involving students in advanced and capstone courses may be the best ways to specifically target the development of ethical reasoning skills

- While **mode of presentation** plays some role, **depth of cognitive processing** required, no matter the mode or context, has a positive and significant relationship with ethical reasoning ability

- *These findings suggest instructors should seek to incorporate higher levels of cognitive processing (e.g. require students to synthesize concepts and evaluate alternatives) when possible*