

The efficacy of case studies for teaching policy in engineering and technology courses

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Overview

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The purpose of this study was to extend the work of Chong, Depew, Ngambeki, and Dark “Teaching social topics in engineering: The case of energy policy and social goals,” that discussed a process to develop and introduce public policy topics in an engineering and technology curriculum. The study used a case study approach to introduce public policy to undergraduate engineering technology students in an engineering economics course in the College of Technology.

Research Questions

1. Did the students understand and identify the policy context?
2. How effective was the use of case studies to introduce the students to policy?
3. Areas of improvement to enhance efficacy of the case studies to introduce students to policy

Framework and Methodology

Research Participants

- There were a total of 66 undergraduate engineering technology students who participated.
- 56 were males and 10 were females.
- Participants were mainly juniors and seniors.
- 48 students were from the department of mechanical engineering technology.
- 60 of 66 participants did not take a formal policy course.

Study Instrument

- Online survey

Case Study 1

- This case study was about the phasing-out of Germany's nuclear power plants.
- Case study 1 can be found in Dark, Ngambeki, Depew, and Chong Chapter 3 “Social engagement by the engineer” In Coyle and Simmons (2014).

Case Study 2

- This case study was about the increase of biomaterial cost and its effects upon Eco-Energy Systems LLC.
- Case study 2 can be found in Dark, Ngambeki, Depew, and Chong Chapter 3 “Social engagement by the engineer” In Coyle and Simmons (2014).

Procedure

- This study was introduced 2/3 into the semester as part of the engineering economics final project of the course.
- Participants were randomly placed into teams of four or five, totaling to 15 teams.
- 7 teams were assigned to case study 1
- 8 teams were assigned to case study 2
- Students were given four weeks to write their report.
- After the submission of the report (i.e., the first part of the final project) the students were asked to respond to an online survey.

Data and Analysis Survey

The analysis was based on a qualitative study. The first two survey questions concentrated on the participants understanding and identification of the policy context. Survey questions 3, 4, and 5 addressed the efficacy and areas of improvement of the case studies to introduce engineering technology students to public policy.

Question 1: What is policy?

Table 1 Question 1 Major Themes

| Major Themes | Frequency of Participants |
|---|---------------------------|
| Rules and regulations | 54 |
| Actors | 26 |
| Control | 20 |
| Components of the policy process | 18 |
| An authoritative entity that sets forth the rules and regulations | 16 |

Question 2: Can you list anything you believe you wrote in your report that was related to policy?

Table 2 Question 2 Major Themes

| Major Themes | Frequency of Participants |
|-----------------------|---------------------------|
| General policies | 21 |
| Economics | 15 |
| Rules and regulations | 13 |
| Actors | 11 |
| Concerns | 11 |

Question 3: Do you feel engineers should learn about policy?

Table 3 Question 3 Major Themes

| Category | Major Themes | Frequency of Participants |
|----------|--|---------------------------|
| Need | A need to learn, understand, and know the rules and regulations | 19 |
| | A need to obey, follow, and comply with the rules, regulations, and general policies | 16 |
| Impact | Impact product development, implementation, and outcomes | 19 |
| | Impact engineers | 17 |
| Inherit | Inherit by the institution | 12 |
| | Inherit everywhere | 4 |

Note: 64 participants responded that engineers should learn about policy.

Question 4: What are your thoughts about this group project?

Positive feedback

Table 4.A Question 4.A Major Themes

| Category | Major Themes | Frequency of Participants |
|-----------------------------|-----------------|---------------------------|
| Practicality | Realism | 18 |
| | Benefits | 25 |
| Positive project attributes | Career | 5 |
| | Favored | 9 |
| | Quality aspects | 8 |

Negative feedback

Table 4.B Question 4.B Major Themes

| Category | Major Themes | Frequency of Participants |
|-----------------------------|----------------------|---------------------------|
| Lack of relevance | Relevance | 10 |
| | Not beneficial | 4 |
| Negative project attributes | Academic | 3 |
| | Poor quality aspects | 9 |
| | Disfavored | 6 |

Question 5: Are you interested in learning more about policy?

Part 1: Participants who were not interested

Table 5.A Question 5.A Major Themes

| Category | Major Themes | Frequency of Participants |
|------------------------------|-------------------------------|---------------------------|
| Absolutely not interested | Generalization of no interest | 8 |
| | Boundary oriented | 2 |
| May or may not be interested | Pressure of time | 5 |
| Some interest | Learn on the job | 9 |
| | Enough understanding | 3 |

Part 2: Participants who were interested

Table 5.B Question 5.B Major Themes

| Categories | Major Themes | Frequency of Participants |
|---------------------|-------------------------|---------------------------|
| Importance | Important | 9 |
| | Global impact | 4 |
| | Need to experience | 3 |
| Self-improvement | Improve knowledge | 8 |
| | Improve decision making | 2 |
| Instrumental effect | Career investment | 13 |
| | Social contribution | 3 |

Note: 39 participants were interested in learning more about policy and 24 participants were not interested more about policy

Results and Discussion

Revisiting research question 1

According to this study, the participants did understand and identify the policy context. The students identified two dominant themes that they associated to policy, *Rules and Regulations* and *Actors*.

Revisiting research question 2

The case studies that introduced policy were effective to the degree of positive feeling and enhanced interest. The students felt that the case studies simulated the real world, relevant to their interest, and had academic and career benefits. In addition, the students were interested in learning more about policy as they viewed policy as something that was deemed important, could provide self-improvement, and have an instrumental effect upon them.

Revisiting research question 3

Although the case study final project had moderately more positive responses than negative, potential improvements, such as case study customization may be necessary that includes the following: a) student relevancy, b) topic interest, c) and academic and career orientation.

Reference List

Published work credit

All the research questions, framework and methodology, data and analysis, tables, results, and discussion are credited to the published work of:

- Chong, R., Dark, M., Ngambeki, I., & Depew, D. The efficacy of case studies for teaching policy in engineering and technology courses. in 1–19 (American Society for Engineering Education, 2014).

References

- Chong, R., Depew, D., Ngambeki, I. & Dark, M. Teaching social topics in engineering: The case of energy policy and social goals. in 1–16 (American Society for Engineering Education, 2013).
- Dark, M., Ngambeki, I., Depew, D. & Chong, R. in *Understanding the global energy crisis* (Coyle, E. & Simmons, R. A.) (Purdue University Press, 2014).