Engineering Leadership Education: A Review of Best Practices

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Presentation

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**Engineering Leadership Education: A Review of Best Practices**

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**ABSTRACT**

Traditional Engineer - technically competent - most University education systems

21st Century Engineer - technically competent - teamwork, leadership - most engineering careers

- GAP

**FINDINGS**

**Engineering Leadership Program Goals**

- **Effective Leadership**
  - Teach engineers to be "more effective leaders"\(^{[5]}\), while ensuring they can "better service their professions & society."\(^{[6]}\)
  - Engineers of the 21st century must be able to solve engineering systems. "Engineers are taught to think analytically & systematically"\(^{[7]}\) and this must include an "interdisciplinary integration of skills & knowledge."\(^{[8]}\)
- **Leadership development focused;**
  - Sustainable STEM education and workforce development through the Smart Cities initiative, "Invention, innovation, and implementation"\(^{[9]}\) of engineering projects & technologies.

**Engineering Leadership Student Competencies**

- **Experiential & project-based learning provides a blend of education & practice opportunities,"** and creates an environment where students "engage in public life making social contributions."\(^{[10]}\)
- Regardless of one’s role, engineers are almost always required to do teamwork. It is important for all team members to have leadership & self-leadership skills for the most effective teamwork.\(^{[11]}\)
- Engineers spend 60% of their time communicating with other people, and this figure would likely be higher for engineers in leadership positions.
- **Communication**
- **Teamwork**
- **Innovation**
- **Creativity**
- **Personal Drive**
- **Execution**

**RESULTS**

- **System Thinking**
- **Information & Technology**
- **Effective Leadership**
- **Experiential Learning**
- **Independent Learning**

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**REFERENCES**


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**DISCUSSIONS**

**Conclusion**

- Insight gained into the best practices surrounding engineering leadership program goals and competencies.
- The findings provide a starting point for engineering institutions looking to develop a leadership program.

**Engineer Context**

- Engineering leadership and the findings from this study should not be separate from other engineering skills, but should be integrated in the engineering curriculum\(^{[1]}\).

**Dynamic Engineering**

- Continuous program improvement is essential to success, particularly in the dynamic field of engineering.\(^{[2]}\)

**Programs Analyzed**


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**METHOD**

- **40 initial programs**
  - Three Criteria:
    - Leadership development focused;
    - Specific to engineering students; and
    - Clear definition of program goal & competencies

- **11 programs analyzed**

**Program Goals**

- Broken down into main concepts or ideas
- The incidence frequency of each concept was determined
- Five main themes were observed (see middle-bottom)

**Student Competencies**

- High level of diversity with 72 different competencies
- Frequency determined
- Six observed in at least 5 of the 11 programs (see middle-bottom)