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Engineering Leadership Education: A Review of Best Practices

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Engineering Leadership Education: A Review of Best Practices

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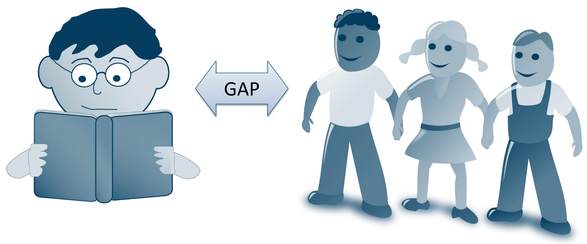
RESEARCH QUESTION

Based on a review of engineering leadership programs' goals and competencies, what is the main focus of these programs?

ABSTRACT

Traditional Engineer
- technically competent
- most University education systems

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



Filling the Gap: Engineering Leadership Education

- Literature summaries outline existing programs[3],[5]
- These summaries provide an overview, but do not give comprehensive detail.
- Case programs were analyzed, including seminar courses, certificates, minors and bachelor programs.
- Specifically, the goal and competencies from each program were compared to determine consistencies and variations in the programs.
- Provides insight on the focus & design of engineering leadership programs, and the progress in the field.

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[3] R. Graham, E. Crawley, B. R. Mendelsohn, W. Paper, B. M. Gordon, M. I. T. Engineering, and L. Program, "A snapshot review of international good practice," 2009.
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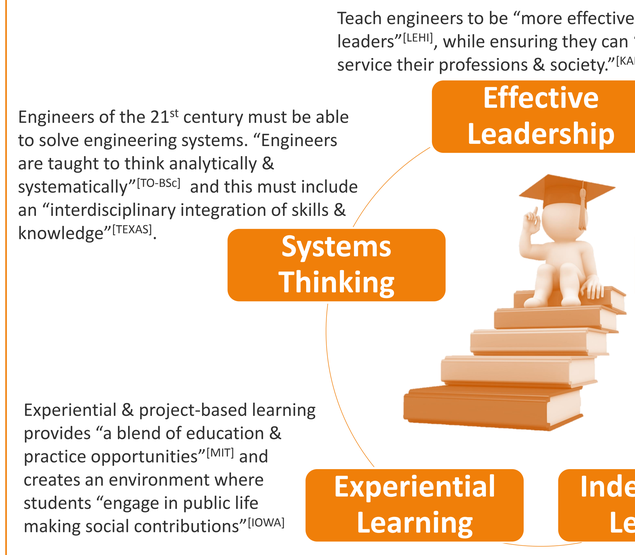
FINDINGS

Engineering Leadership Program Goals



Teach engineers to be "more effective leaders"[LEHI], while ensuring they can "better service their professions & society."[KANS]

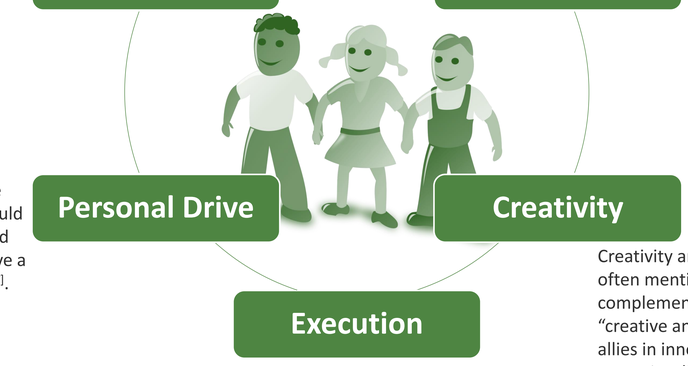
Engineers of the 21st century must be able to solve engineering systems. "Engineers are taught to think analytically & systematically"[TO-BSc] and this must include an "interdisciplinary integration of skills & knowledge"[TEXAS].

Leadership is essential to "manage innovation"[TO-MSc], as there must be someone who will champion and lead the "invention, innovation, and implementation" [NE] of engineering projects & technologies.

Experiential & project-based learning provides "a blend of education & practice opportunities"[MIT] and creates an environment where students "engage in public life making social contributions"[IOWA]

Help students learn how to be an independent learner to "further engage students in their education"[PENN], "offer students the opportunity to discover"[MONA] and develop "the student into an action-driven leader"[TEXAS].

Engineering Leadership Student Competencies



Engineers spend 60% of their time communicating with other people[5], and this figure would likely be higher for engineers in leadership positions.

Regardless of one's role, engineers are almost always required to work in a team setting. It is important for all team members to have leadership & self-leadership skills for the most effective teamwork[5].

Innovation has been discussed at great length recently in literature, and specifically the importance for engineering leaders to also be innovative leaders[4].

Engineering leaders should not only take action, but they should have the "energy and drive"[IOWA] to achieve a "personal vision"[MIT].

Creativity and innovation were often mentioned hand in hand, complementing the notion that "creative and spatial abilities are allies in innovation: an innovator must visualize what does not yet exist." [1]

Statements included "getting the job done"[MIT], "strongly goal orientated"[KANS], "excellence in execution"[TO-BSc], "results oriented"[PENN], and "resourcefulness – get it done"[NE].

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METHOD

40 initial programs → Three Criteria: → 11 programs analyzed

1. *Leadership development focused;*
2. *Specific to engineering students; and*
3. *Clear definition of program goal & competencies*

Program Goals	Student Competencies
- Broken down into main concepts or ideas - The incidence frequency of each concept was determined - Five main themes were observed (see middle-top)	- High level of diversity with 72 different competencies - Frequency determined - Six observed in at least 5 of the 11 programs (see middle-bottom)

DISCUSSIONS

Conclusions

- 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.

Engineering 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[2].

Dynamic Engineering

- Continuous program improvement is essential to success, particularly in the dynamic field of engineering[2]

Programs Analyzed

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