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Work in Progress: Exploring Leadership Orientations in the Classroom

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Over the past twenty years, many engineering programs have introduced leadership development programs [1] and an emerging body of literature has explored how engineers develop as leaders. In 2015, an engineering leadership research team at the University of Toronto set out to examine how engineers lead through professional practice [2]. This work used grounded theory to develop a professionally contextualized description of three engineering leadership orientations that was professionally relevant. The research team mobilized their findings by integrating a sub-set of survey questions into an undergraduate engineering leadership course through the Engineering Leadership Orientations (ELO) inventory [3].

While the ELO inventory has helped students identify their own orientation to leadership, it depends on archetypal embodiments of leadership. How can educators make these archetypes feel more immediate to students or young professionals? More important, how can decontextualized archetypes help students develop as leaders? Our work in progress (WIP) paper begins to answer these questions by examining a recent pedagogical innovation merging the three orientations with the concepts of Leadership and Followership as articulated by Hurwitz and Hurwitz [4].

Theoretical Foundations of the Learning Activity

The classroom initiative described in this paper draws on two theories—Rottmann et al.'s grounded theory of engineering leadership [2], and Hurwitz and Hurwitz's theory of followership [4]. From the first theory, we help students connect leadership theory with the engineering profession by introducing them to the three engineering leadership orientations—technical mastery, collaborative optimization, and organizational innovation. We do this, in part, to help them integrate conceptions of leadership rooted in engineering practice into their emerging professional identities. Table 1 summarizes the key characteristics of the three orientations.

To help students imagine the three orientations as a dynamic developmental process rather than a set of static typologies, we supplement the ELO lesson with Hurwitz and Hurwitz's theory of followership [4]. In particular, we draw on the guiding principle that leadership is "setting the frame" and followership is "creating within it". Hurwitz and Hurwitz propose a framework for leadership and followership as a generative partnership. They argue:

> "…followership is not an imitation of leadership, a sort of mini-leadership, or a leadership-in-training. Followership is a different role requiring different, but complementary, skills to those of leadership.[4]"

Hurwitz and Hurwitz also stress that followership is an active role that helps the team accomplish the mission, takes initiative to scout new information, insights, and options, and contributes ideas and advice. Hurwitz and Hurwitz emphasize that as individuals develop they will play the role of both leader and follower at all points in their careers. By this set of definitions, graduating students will be expected to primarily play the follower role earlier in

their careers but there will be opportunities and even requirements to step forward to set the frame. Similarly, their managers or team leaders may occupy the formal leadership role but may also step back from time to time to play the follower.

Table 1: The Engineering Leadership Orientations (adapted from Rottmann et al. [2]). The final row was added based on observations from the student activity described in the current paper.

	Technical Mastery	Collaborative Optimization	Organizational Innovation
Brief Description	Technical expertise passed on through informal advice and mentorship	Skilled facilitation of group process with an eye to quality, efficiency and engagement	Visionary realization of practical, entrepreneurial and intrapreneurial ideas
Who?	The engineer you most often go to with your technical questions	The engineer who builds high performing teams by bringing out the best in everyone	The engineer whose creative ideas drive the company
Key feature – technical	Technical expertise	Process optimization	Innovation
Key feature - influence	Mentorship	Team catalyst	Realization
Added feature: Key requirements of followers	Technical skills Growth mindset Independence	Technical skills Good team players Constant communication	Technical skills Willing to "get on board" Willing to do what it takes to achieve the vision

Classroom activity

The lesson covering the engineering leadership orientations (ELO) is part of a thirteen week for-credit course on engineering leadership. During the course, students explore their own leadership identities through a variety of lectures, discussions, case studies and experiential exercises. Students write weekly reflections on their learning using a Describe-Analyze-Evaluate format [5]. At the end of the term, they submit a summative reflection on the course in which they are asked how their understanding of leadership has evolved, and which concepts, frameworks or exercises have had a strong impact.

We have used the ELO inventory for a number of years in our classroom as a self-assessment activity. Students are introduced to the ELO framework through a lecture and course reading. After completing the inventory in class, they gather in groups by orientation with large poster boards that characterize each of the orientations. Students discuss what resonates with them and how they have observed themselves engaging in this form of leadership. Then, they share new insights through a full class discussion.

With the move to virtual learning in September 2020, we made some changes to the way the ELO content was delivered and took the opportunity to introduce the followership content. Students now come to class having completed an asynchronous module that introduces both the ELO and Followership frameworks. Students also read a chapter from Hurwitz and Hurwitz [4]. In class, students assess their own leadership orientations by completing the ELO Inventory as described previously, and then break into small groups by leadership orientation for discussion. A change in the current lesson plan is that students are now asked to describe not only how they have experienced the leadership behaviours for their orientations, but also what they think these types of leaders would look for in followers. Students capture their content on charts and then debrief in a whole class sharing activity.

As instructors we have run this activity in eight classrooms (both virtually and in person) between September 2020 and April 2022. We are in the process of completing an institutional ethics review protocol to formally evaluate this initiative and our undergraduate engineering leadership courses as a whole. For now, we use this WIP paper to share key themes emerging from our own classroom observation and student reflections.

Instructor Observations

Our first observation is that the majority of students identified with the technical mastery orientation – consistent with earlier results from Reeve et al. [3] which found that early career engineers tended to foreground technical aspects of their work, with many of them shifting orientations over the course of their careers. In the debrief, students identified demonstrating technical competency as a necessary first step to establishing credibility and thus exerting influence. It is also notable that technical skills were specified by students in all three groups when describing what they would be looking for in followers (final row, Table 1). The concept of technical mastery is thus celebrated as a powerful and valued form of influence and an orientation that students can embrace as they begin to navigate their careers. Beyond helping them embrace their technical training, the technical mastery orientation helps them think of themselves as informal mentors to peers and managers across organizational locations.

While all students emphasized the need for strong technical skills in followers, slight differences were observed for follower requirements for different orientations (final row, Table 1), with more of an emphasis on making the choice to follow the vision of Organizational Innovators, on following team processes for Collaborative Optimizers, and on being able to work independently for Technical Masters.

Students frequently mentioned followership and/or engineering orientations in their final summative reflection as a particularly helpful set of concepts supporting inquiry into in their emerging leadership identities. Many students seem to embrace the concept of followership as liberating – perhaps because it aligns with their sense of self and early career organizational location to a greater extent than traditional depictions of top down, managerial leadership. By exploring the leader/follower perspectives for each orientation, students report an increased understanding of how they might use their particular strengths in the workplace depending on both their own and their supervisor's orientations.

As instructors, we believe the overlay of two complementary leadership theories—one grounded in engineers' professional practice, and the other grounded in many engineers' conceptions of themselves as service professionals—helps them reflect on issues that are relevant to both students and professionals, thereby scaffolding their school to work transition. We have also received feedback from the students that this way of approaching leadership and followership, within the engineering context, has been refreshingly supportive to their understanding of self and their formation of a shared engineering leadership identity.

Plans for Assessment

We are currently in the process of completing an ethics review protocol with our institutional review board (IRB) for a pre-post survey of this and other engineering leadership courses offered by our institute. The key objective of this program evaluation process is to examine students' development of leadership identity and confidence over the course of a semester. We expect that the results of this survey will provide us with important insights into how students develop their understanding of leadership from the beginning to the end of the semester but will not help us assess the impact of the intervention described here. Therefore, we will supplement our pre-post survey with more targeted content analyses of students' reflections—one set after the ELO/followership lesson, and another following the final reflection. We are currently integrating this request into our IRB protocol. Student comments will be anonymized and analyzed for insights gained from their application of the ELO/Followership framework to their own leadership development process.

Implications for Engineering Leadership Educators

Our curricular integration of these two complementary leadership theories supports the development of a dynamic and accessible framework that has helped us as engineering leadership educators supporting professional identity development in our students. We believe it holds promise for Engineering Leadership educators and program evaluators in other institutional contexts committed to fostering and assessing leadership development of undergraduate engineering students.

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