Pathways to engineering leadership education

D.O. Northwood

University of Windsor
Windsor, Ontario, Canada

Opening Address

ABSTRACT: This review first examines the attributes/capabilities of an engineering leader. The author then looks at the means of effectively developing these attributes, recognising that there will not be a *one solution fits all* approach given the variety of teachers, students, programmes of study, careers and industry sectors. In the past, management theory has been used as the basis for the design of engineering leadership education programmes. This has led to the development of management education rather than leadership education programmes. Such programmes do not develop *tomorrow's leaders* since, as pointed out by Jean-Pierre Bal, *Management is about today-showing people how to do. Leadership is about tomorrow-showing people where to go* [24]. In the present world of complexity and rapid, discontinuous change, it is not sufficient to simply *manage*, which is all about the *status quo*. Engineering leaders can effectively be developed on the job where they work on solving problems in complex social and political environments. This must be supported by learning by doing, learning about themselves as they do, and learning about relationships as they happen.

INTRODUCTION

The kernel for this paper, published in 2010, was an earlier paper on *Training tomorrow's leaders,* which examined how tomorrow's leaders are *developed* [1]. In Reference [1], it was recognised that there will not be one solution that fits all, and certainly the answer was not what Margot Cairnes calls *the sausage factory school of leadership with their seven habits, rules or answers which sell books and fuel the multibillion dollar global online training and management school markets, not to mention the huge industry of in-house training* [2]. This is not to say that there is nothing to be learned from such sets of rules. Table 1 lists the *Seven Golden Rules of Leadership* as created by Betsy Bernard, President of AT&T [3].

Table 1: The Seven Golden Rules of Leadership [3].

Rule 1. Everyone's time is valuable.
Rule 2. No temper tantrums.
Rule 3. Get to the point!
Rule 4. Be candid.
Rule 5. Just say thank you (and mean it).
Rule 6. Integrity is everything.
Rule 7. If you don't know, who does?

Bernard, herself, has commented [4]:

> *I hope you'll notice as we go through these rules that all of them are about communication, because leadership is, in fact, a special case of the larger discipline of human communications. The content of what we communicate, whether in writing or on our feet, should get across what's on our minds in a way our audience can grasp. What a concept*!

Bernard emphasises that *Leadership communication is not elevator music. You've got to know what your purpose is. Don't leave people guessing at it* [4]. She also points out that the whole object of communication lies in some *delta*. *Some change in the way your audience understand the situation*.

As well as sets of *rules* for leadership, there are those who define different *levels* of leadership. One of the more highly cited is John C. Maxwell with the five levels of leadership [5]. Maxwell describes leadership as a step-by-step process with discernible and definable stages/levels. The five levels are variously described as:

Level 5   Pinnacle (Personhood)
Level 4   People Development
Level 3   Production (Results)
Level 2   Permission (Building Relationships)
Level 1   Position

Leadership progression through the levels depends on influence rather than rank or title. At Level 1, it is a question of *Rights* where people follow because they have to. This progresses to Level 5 where there is *Respect* and people follow because of who you are and what your represent.

ATTRIBUTES OF AN ENGINEERING LEADER

In discussing these attributes, there are two key issues to be addressed, namely:

1.   How are the desired attributes of an engineering leader different, if at all, from those of leaders in business, industry or other professions?
2.   What are the essential differences between a leader and a manager?

It is only after recognising these differences can we begin to chart the pathways to engineering leadership education. A.E. Focke in his seminal short book on *Engineering Leadership* identified eight intrinsic qualities or characteristics of successful engineering leaders [6]. These are summarised in Table 2: as emphasised by Focke, these are not in order of relative importance [6].

Table 2: Qualities of successful engineering leaders [6].

Quality	Description
Vision	Strong desire to contribute to an outstanding accomplishment.
Enthusiasm	Takes an active interest in things, life and people.
Courage	Willing to take responsibility for actions needed.
Self-control	High self-confidence - able to withstand criticism. This is an essential requirement for inspiring the confidence of others.
Sense of Justice	Free from bias - a deep concern for the well-being of other. Gives the credit to others when such credit is due; makes others feel important.
Integrity	Morally sound, honest, dependable.
Technical Competence	Sufficient to understand the problem.
Decisiveness	Able to make the right decision promptly.
Persistence	Steadfast, consistent.

When examining these *qualities*, readers should keep in mind that Focke's book was first published in 1983. Many, of what are often described - at least for engineers - as *soft skills*, are now included under such attributes as *emotional intelligence* [7], social intelligence [8] or *character* [9]. With respect to *Engineering Leader* versus *Leader*, there is only one quality; namely, technical competence, that could be considered as engineering-specific and this required quality is qualified in that it should be at a level *sufficient to understand the problem*. Leaders in fields other than engineering would also require specific competencies but, again, at a level sufficient for them to understand the problem. This is a key to avoiding Type III errors, where we get *the right answer to the wrong question* [10].

The other key point that Focke makes with respect to the qualities listed in Table 2 is:

...impact of these qualities is interrelated. If, for example, you assign a scale from 1 to 10 for each, the overall rating is the product, rather than the sum, of the totals. So a weak rating for any one quality can lower the overall rating profoundly [6].

It may not be evident from a cursory examination of Tables 1 and 2 but, although they were developed 20 years apart and Table 1 is *action-based* rules and Table 2 lists qualities, there are some common key themes that come through on a more detailed examination. Two key qualities are integrity and sense of justice. Bernard's Rule 6 is very clear: *Integrity is everything* [3]. Bernard has quoted the remarks of an un-named chairman of a company with respect to a leader's reputation for integrity:

In whatever organization you find yourself, remember that people talk. And it's not all idle gossip. Our cultures learn to protect themselves by getting the word around about people whose honour is doubtful. You'll

never be any more valuable than your word. I don't mean this as a warning he continued, *but as an opportunity - because, by the same token, healthy organizations also spread the word about people of incorruptible honesty. So tell the truth, deliver what you promise, let your caring show, and you'll be noticed. In fact, they're searching for you right now* [4].

Sense of justice would include Bernard's Rule 5, *Just say thank you (and mean it)* and Rule 2, *No temper tantrums*. Bernard has said with respect to Rule 5: *We in leadership have to remember: We are not the whole show. In the real world, the show is you and a whole lot of other people* [4]. Bernard's Rule 2, *No temper tantrums* is essentially about respect for the individual. In her words:

> *If you've mastered courtesy - made it part of who and what you are - you're more than half way to being an effective leader* [4].

Bernard's Rule 7, *If you don't know, who does?*, is essentially vision. Bernard considers vision to be *the leader's quintessential role*: nobody else can do it since *the facts do not speak for themselves: and the role of setting direction cannot be delegated*. Vision is communication and citing Roger Ailes, she states:

> *If you are the leader then you are the message* [11].

The message should be clear, consistent (which is the quality of persistence in Table 2) and candid (Rule 4 in Table 1) so that there is a sharing of both the plans and the problems.

As noted in Reference [1], *...the terms* manager *and* leader *are sometime used interchangeably, and* management theory *has been used as the basis for the design of engineering leadership education programs*. This had lead to the development of management education rather than leadership education programmes. Such management education programmes do not create *tomorrow's leaders* since there are fundamental differences between leadership and management. This differences have been succinctly characterised by Richard A. Barker:

> *The fundamental difference between leadership and management lies in their respective functions for organizations and for society. The function of leadership is to create change while the function of management is to create stability. Stability is created by managing routine, incremental, and continuous change by planning, organizing, directing, controlling, and effective staffing. The purpose of management is to stabilize the orientation of the organization by maintaining successful patterns of action through the development and control of standard operating procedures. Strategic or social change can be chaotic. Strategic change is often nonroutine, nonincremental and discontinuous change which alters the structure and overall orientation of the organization or its components (Tichy, 1983). Leadership creates new patterns of action and new belief systems. Management protects stabilized patterns and beliefs. The function of management regarding change is to anticipate change and to adapt to it, but not to create it* [12].

This concept of *Management Isn't Enough*, and what has been an overemphasis on management education, has also been examined by Bisoux [13]. Contained within this paper on page 31 is the following quote from Jean-Pierre Bal:

> *Management is about today - showing people how to do. Leadership is about tomorrow - showing people where to go* [13].

The connection between *change* and leadership has also been emphasised by Neumeister:

Change is the essence of leadership. To exercise authentic leadership, groups must purposely attempt or effect some beneficial transformation; otherwise, they are simply maintaining (i.e. managing) the status quo [14].

PATHWAYS TO ENGINEERING LEADERSHIP EDUCATION

> *No person, especially an engineering leader, can be educated once for life* [6].

Before examining potential pathways, it is worthwhile reinforcing the points made in the Introduction with respect to what is not *the way to go*, namely, *the sausage factory school of leadership* as described by Cairnes [2]. Richard Barker has addressed this issue in a number of his papers, e.g. [12] and [15]. To quote Barker:

> *At a recent leadership conference, faculty members of internationally known leadership education programs involved themselves in a discussion about what to call leadership: is it an art, a study, a discipline, a theoretical construct, or what? The discussion was interrupted by the dinner speaker who inadvertently answered the question by declaring that leadership is an industry* [15].

Barker has further expanded on this observation:

Leadership training has become an industry, pandering to the egos of corporate executives by equipping them with the secret formulas for achieving saviorhood. Not to mention that it is relatively easy to develop the seven steps of this or the ten ways of that, and to present these ways and steps very effectively. But as every trainer who has done so, and is candid, will attest, the value of these ways and steps rarely finds its way beyond the classroom. What sounds good in the training seminar may not translate well into practice. The problem of translation is based in the gap between the simplistic ways and steps, and the complexities of social and organizational processes [12].

In the introduction to a special issue of the Journal of Leadership Education examining current issues and challenges in the field of leadership education, Middlebrooks and Allen summarised the wide variety of formats used for leadership education: see Table 3 [16].

Table 3: Formats used for leadership education [16].

Format	Response Count (N = 383)	Percentage
Interactive Discussion	112	29
Workshop/Activities	96	25
Experiential/In-the-field	66	17
Lecture	51	13
On-line	23	6
Apprentice/Internship	16	4
Other (including student research, case study analysis, coaching, mentoring others, self-assessment, multi-media, virtual group projects and videos)	19	5

Middlebrooks and Allen also examined the main objectives of those engaged in leadership education and found that the objectives could be divided into *five, often overlapping main themes* [16]. These were:

- Building skills and the capacity to exercise those skills;
- Ability to work collaboratively and in groups;
- Understanding concepts/theory;
- Building self-awareness and a reflective capacity in individuals;
- Develop a social awareness/citizenship disposition.

A comparison of these objectives with the formats used for education well illustrates the importance of action learning, learning on the job and why leadership needs to be taught differently than content-based courses [17], i.e. it is not restricted to the classroom [2]. Lecture only accounts for 13% of the formats used for leadership education.

Posner makes the important point that leadership is learnable [17]. He emphasises that leadership is not *hierarchical and exercised by a select group of* exceptional *individuals* and *1% improvement in 100 people is better than 100% improvement for one*. Thus, we ask ourselves the question *How can we help all of our students improve and develop the leadership potential they already have?* [17]. In order to answer this question, Posner emphasises that learning about leadership is not the same as learning to be a leader [17]. Students *learn to lead by leading, beginning with leading themselves* [17]. Owen et al have defined leadership as a *social process* and, as such, *it follows that teaching leadership is a complex enterprise with few hard and fast laws to serve as anchors along the way* [18]. That much said, Owen et al emphasise the importance of both creating meaningful learning communities *to help students integrate the theories and practices of leadership* and developing the students' critical reflection skills [18].

As discussed in the section on leaders versus management, change is the essence of leadership:

Rost (1991) noted that modern leadership is characterised by the pursuit of real changes - transformations that involve active people...intending real changes to happen and insisting that those chances reflect their mutual purposes [14].

The operating environment for these leaders is complex and rapidly changing [2][19-21]. As noted by N.N. Taleb in 2008, cited in Reference [19], this poses significant challenges to our leaders since:

Never in the history of the world have we faced so much complexity with so much incompetence in understanding its properties [19].

Margot Cairnes has described the art of leadership in times of rapid change as *Peaceful Chaos* [21].

The other key element of any engineering leadership education programme is communication [22]:

Communication is at the heart of the leadership process.

CONCLUDING REMARKS

Although this paper has possibly spent more time on discussing what are not the pathways to engineering leadership education, it is hoped that it has helped identify the objectives of leadership education and potential pathways to achieve these objectives. If there is a *definition* of leadership it is more likely to along the lines of:

A relational and ethical process of people together attempting to accomplish positive change [23],

not *What leaders do to followers in order to get them to do what they want* [23].

As emphasised by Posner:

Developing leaders is not the result of wishful thinking, reading a book, or taking a class. Developing leaders is the result of determined doing, from the inside out [17].

The phrase *from the inside out* highlights a point that has long been made by Margot Cairnes; namely, the need to learn about ourselves and relationships. As Cairnes details in her book, *Peaceful Chaos*:

So being a leader isn't about telling others what to do, organising others, controlling the present or the future or trying to create things to be the way we think they should be. Leadership is about living our life in fullness, peace and good health and by doing so setting others an example that they may wish to follow [21].

Cairnes has also provided some useful directions on possible pathways to engineering leadership education [2]:

The way to develop today's and tomorrow's leaders is on the job where they can work on solving problems in complex social and political environments supported by high level programs aimed at learning by doing. Not just learning about doing but learning about themselves as they do. Learning about relationships as they happen. Learning about strategy in real time.

Kouzes and Posner [24] have also provided some important advice that re-emphasises that leaders are above all learners:

Life is the leader's laboratory, and exemplary leaders use it to conduct as many experiments as possible. Try, fail, learn. Try, fail, learn. Try, fail, learn. That's the leader's mantra. Leaders are learners. They learn from their failures as well as their successes, and they make it possible for others to do the same.

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