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Creating an Educational Ethos where Innovation and Accountability Flourish: A New Model for Transparency in Educational Organizations

Amy Dee

Ken Badley

The Skunk Works – Introduction

In 1954, Clarence "Kelly" Johnson, Chief Engineer at Lockheed, submitted to the Central Intelligence Agency a proposal for a previously unthinkable spy plane, one capable of flying higher than any Soviet air-to-air missile could reach. A short seven months later, Lockheed's secret Skunk Works division began conducting test flights of the U2 airplane. Such a delivery schedule should catch the attention of anyone interested in education. How could a corporation as large as Lockheed deliver an unthinkable aircraft so quickly? Johnson, who oversaw the project, insisted that Lockheed built the U2 with only 35 pages of specifications (Johnson and Smith, 1985). They used essentially off-the-shelf components wherever possible and they focused on just one thing – the project – concentrating their efforts for six days a week until they finished.

Two decades later, Lockheed's Skunk Works repeated their U2 performance with the F117 Nighthawk stealth fighter. Lockheed engineer, Denys Overholser, believed that a paper by a Soviet physicist, Pyotr Ufimtsev, contained the mathematics for stealth (Boyne, 1998; Crickmore, 2000; Ufimtsev, 1962). Using Ufimtsev's algorithms, the Skunk Works produced an airplane literally invisible to radar. These two stories – the best known to come from the Skunk Works – introduce and illustrate our thesis that organizations can structure themselves to unleash great creativity and innovation from their people and that the 14 rules by which the Skunk Works operated so successfully have application in education.

We focus here not on aerospace, but on education. Specifically, we propose that the Skunk Works principles apply to the work done in universities and colleges, in classrooms at all levels, in schools and school districts. We believe that the success of the Skunk Works can teach educators much about how we structure educational institutions and educational work. Why apply these principles to education? The Skunk Works unleashed immense creativity and produced previously inconceivable innovations while facing very high-stakes, summative assessments. Education needs models that support and unleash creativity without sacrificing accountability. Like Lockheed engineers, educators are asked to think the unthinkable in order to transform current practice. Since Kelly Johnson's time, the Skunk Works principles have gained followers far beyond Lockheed, and now encompass a philosophy of design, leadership and structuring for creative thinking from which educators can benefit.

Most contemporary educators attempt to do as much work as educators have done historically but now do so with decreased funding. At the same time that educators find themselves responding to funding

restrictions, they now hear a chorus of demands for assessment and heightened accountability. Until now, classrooms have typically served students of varied ability; now they increasingly serve students of varied cultural backgrounds as well. Finally, teachers face constantly shifting curriculum initiatives. We believe that these circumstances constitute a call for educators to apply a new set of leadership concepts. We believe that institutions of elementary, secondary and higher education can remain intensely innovative and creative while retaining accountability. Now, perhaps more than ever before, educators need to consider how new leadership practice might enable us to think the unthinkable in universities, colleges, classrooms, schools and school districts. We offer educators a framework by which to direct educational thinking toward the same objective as Lockheed's original Skunk Works: imaginative, reliable and quality work completed on time. Educators who use the Skunk Works rules may accomplish the unthinkable in education. Those rules, which we have adapted for education, offer educators a new view of the kinds of communication and authorization people need to work in today's educational context, and we will call on contemporary educators to employ them with a view to doing the unthinkable in our own field.

Literature Review

Empowering teachers to recover the artistry of teaching in a time of standards- and assessment-driven education requires confident leaders. According to Baines and Stanley (2006), standards-based education encourages conformity to a static and common curriculum, focuses on minimum competencies rather than individual needs, and perpetuates practice controlled by administration rather than classroom teachers. Furthermore, teachers report that they spend disproportionate class time preparing students for high stakes assessments (Moon, Brighton, & Callahan, 2002). Others recognize that standards-based education has benefits, but that a balance between linear instruction and methods that promote creative learning allows students to develop individual strengths and deep thinking (Betts, 2004; Burke-Adams, 2007). Unfortunately, school administrators in many jurisdictions also face pressure to meet annual state, provincial or national goals. Empowering teachers in an era so focused on accountability requires that school leaders break away from school reform solely focused on standardized assessments and build structures to foster creative engagement, thus enabling the renewal of teacher artisanship.

Educators take advantage of in-service days or classes related to leadership hoping to learn new practices that will lead to improved student achievement. Leithwood (2007) calls for transformational leadership in which the principal makes decisions based on best evidence, supporting practices that serve students and the community. Fullan (2007) notes that schools undergoing improvement usually have strong leaders who authorize classroom educators to take needed action; such leaders empower teachers to do good work, a conclusion borne out by Kouzes and Posner (Kouzes & Posner, 2007). Even more compelling, Barth argues that "the possibility that schools can and will reform from within rests squarely on whether and how much teachers and principals are willing to risk in the name of good education for youngsters" (Barth, 2007, p. 215). These qualities – risk, strong leadership and empowerment – reflect the underlying principles of the Skunk Works (Johnson and Smith 1985).

Skunk Works (and variants such as skunkworks) have established their place in common English usage, but with a range of meanings. Many fit a general, undifferentiated category, by which we mean that they simply refer to secrecy, rapid prototyping, speedy and lean production, simplicity, co-operation and

networking, think tanks, effective working groups, high levels of expertise, creativity and innovation (examples include Abram, 2007; Diamond, 2005; Ellisman, 2005; Goodsell, 2006; Greenstein & Thorin, 2002; Hansen, 2005; Nicolai, 1997; Peters & Waterman, 1982). Here, one also finds praise for operating against normal organizational policies and for the absence of accountability, the first of which arguably did not and the second of which definitely did not characterize Lockheed's original Skunk Works.

Among those who refer to Lockheed's Skunk Works in a differentiated way, one finds authors addressing the conditions that typically accompany brilliant innovation and rapid prototyping in engineering (Dodgson, Gann, & Salter, 2008; Sawyer, 2001). Reports of applications of Skunk Works principles range from automotive design (Single & Spurgeon, 1996), digital technology (Gwynne, 1997) and equipment manufacturing (Bommer, DeLaPorte, & Higgins, 2002) to philanthropy (Orosz, 2002). Two well-known business authors, in their attempt to identify the secrets of high-functioning collaborative groups, give a whole chapter to the Skunk Works (Bennis & Biederman, 1997).

In contrast to business writers and engineers, educators have paid scant attention to the Skunk Works. One writer makes reference to it in a lament that educators cannot combine innovative products and services from multiple vendors in the way that Lockheed used off-the-shelf parts to build airplanes (Hill, 2005). The author calls for "systems integrators, like the Lockheed Skunk Works, that combine new components into designs for whole schools" (21).

A number of educational writers make undifferentiated references to skunk works, to recall our distinction above. One charter school's annual report expresses its hope "to be for public education what teaching hospitals are for the medical field and 'skunk works' are for business," revealing by its mention of business in general instead of aerospace in particular an undifferentiated understanding of the Skunk Works (Spence, 2002). In the most detailed (although undifferentiated) reference to a skunk works in any educational publication we have found, another writer calls for skunks works schools and innovative work groups to carry out research and development into improving education (Wagner, 1996). One utopian blogger clearly misunderstood the Skunk Works when calling for an interdisciplinary think tank without "classrooms, tests or formal requirements" (Grammatis, 2009). A higher educator claims that the "academic side of a university is like a giant skunk works" (Foster, 2006, p. 49) but calls for "the creative faculty, staff, and students" to build a wall of separation between the academic and administrative functions of the university and thus protect their creativity from the "standard ways of thinking" that characterize the uncreative people who run the university (p. 49).

In summary, skunk works has entered our contemporary lexicon, with most users employing an undifferentiated sense of the phrase, some of whom are actually mistaken about the character of the original Skunk Works. Beyond the few items mentioned, exhaustive searching has yielded no further connections between education and Lockheed's Skunk Works. Other than those noted in the foregoing, not one author that we know of has suggested applying Skunk Works principles in higher or K-12 education until now.

The 14 Skunk Works principles and their applications

On most accounts, including his own, Kelly Johnson outlined the Skunk Works philosophy of productivity in 14 succinct rules in the early 1950s (Boyne, 1998; Johnson & Smith, 1985; Lockheed-Martin, 1992; Rich & Janos, 1994). In our list below, we present the 14 rules as they appear on Lockheed's web site

(Lockheed-Martin, 2009). In its own 1992 report, The Skunk Works Approach to Aircraft Development, Production and Support, Lockheed added commentary to all 14 rules, and we include that commentary below (in italics, following each of Johnson's respective original rules and retaining any of Johnson's original italics). For historical accuracy, we do not correct for nor flag gender-exclusive language.

1. The Skunk Works manager must be delegated practically complete control of his program in all aspects. He should report to a division president or higher. *It is essential that the program manager have authority to make decisions quickly regarding technical, finance, schedule, or operational matters.*

2. Strong but small project offices must be provided both by the military and industry. *The customer program manager must have similar authority to that of the contractor.*

3. The number of people having any connection with the project must be restricted in an almost vicious manner. Use a small number of good people (10% to 25% compared to the so-called normal systems). *Bureaucracy makes unnecessary work and must be controlled brutally.*

4. A very simple drawing and drawing release system with great flexibility for making changes must be provided. *This permits early work by manufacturing organizations and schedule recovery if technical risks involve full failures.*

5. There must be a minimum number of reports required, but important work must be recorded thoroughly. *Responsible management does not require massive technical and information systems.*

6. There must be a monthly cost review covering not only what has been spent and committed but also projected costs to the conclusion of the program. Don't have the books ninety days late and don't surprise the customer with sudden overruns. *Responsible management does require operation within the resources available.*

7. The contractor must be delegated and must assume more than normal responsibility to get good vendor bids for subcontract work on the project. Commercial bid procedures are very often better than military ones. *Essential freedom to use the best talent available and operate within the resources available.*

8. The inspection system as currently used by the Skunk Works ["Advanced Development Projects" in Kelly: More than My Share of it All], which has been approved by both the Air Force and Navy, meets the intent of existing military requirements and should be used on new projects. Push more basic inspection responsibility back to subcontractors and vendors. Don't duplicate so much inspection. *Even the commercial world recognizes that quality is in design and responsible operations – not inspections.*

9. The contractor must be delegated the authority to test his final product in flight. He can and must test it in the initial stages. If he doesn't, he rapidly loses his competency to design other vehicles. *Critical, if new technology and the attendant risks are to be rationally accommodated.*

10. The specifications applying to the hardware must be agreed to well in advance of contracting. The [ADP, in Kelly's book ...] Skunk Works practice of having a specification section stating clearly which important military specification items will not knowingly be complied with and reasons therefore is highly recommended. *Standard specifications inhibit new technology and innovation and are frequently obsolete.*

11. Funding a program must be timely so that the contractor doesn't have to keep running to the bank to support government projects. *Rational management requires knowledge of, and freedom to use, the resources originally committed.*

12. There must be a mutual trust between the military project organization and the contractor, with very close cooperation and liaison on a day-to-day basis. This cuts down misunderstanding and correspondence to an absolute minimum. *The goals of the customer and producer should be the same – get the job done well.*

13. Access by outsiders to the project and its personnel must be strictly controlled by appropriate security measures. *This is a program manager's responsibility even if no program security demands are made – a cost avoidance measure.*

14. Because only a few people will be used in engineering and most other areas, ways must be provided to reward good performance by pay not based on the number of personnel supervised. *Responsible management must be rewarded and responsible management does not permit the growth of bureaucracies.*

The Skunk Works remains as an organizational unit within Lockheed, but because of acquisitions and restructurings, it now operates at three sites, Burbank and Palmdale in California and Fort Worth, Texas. According to an interview with Gary Ervin, then Vice-President of Lockheed's Advanced Development Projects, the Skunk Works still operates by Kelly's 14 rules (Sawyer, 2001) a claim confirmed by the materials currently available on Lockheed's web site.

Given the role of the 14 rules in the Skunk Works' success, and the notable applications in areas other than education, we began to search in earnest for ways to replicate Johnson's approach to leadership for creativity and innovation, with our focus on education. Over several months of preparation for a Skunk Works-style graduate course on fostering innovation in a culture of assessment, we made several unsatisfactory attempts to write commentary or specific educational applications for the 14 rules. We found that some rules lent themselves to obvious application in education while others defied adaptation. These difficulties in developing fitting parallels for educational settings eventually led to our abandoning that enterprise in favor of rewriting our own principles rather than forcing educational applications from the Skunk Works' 14 rules.

Skunk Works rules for education

To develop our own rules for education styled after the Skunk Works, we independently read and re-read Kelly's 14 rules to identify the underlying principles. Through our re-readings and analysis, we extracted the following major values and principles from Johnson's 14 original rules:

- authority moved downward (rules 1, 7, 9, 10 and 11)
- accountability (rules 1, 5, 6, 7, 8, 9 and 10)
- simplicity (rules 2, 4, 5, 8 and 13)
- competence and quality (rules 2, 3 and 14)
- efficiency (rules 2, 3, 11 and 14).

Principles to which Johnson gave less attention but which also shaped the ethos of the Skunk Works include these:

- flexibility (rule 4)
- transparency and clear communication (rules 10 and 12)
- co-operation (rules 10 and 12).

The Skunk Works necessarily and ruthlessly protected its secrecy (rule 13), a value whose application to schools we have failed to identify, although some may see a link to privacy regulations in their respective jurisdictions. We developed our adapted rules for education with Johnson's original 14 rules literally in view. We also kept in view the five major and three minor values which we believe the 14 rules express. We made every effort to stay grounded in the original rules and in the Skunk Works story of which they are a central part.

We have focused our adaptation of Kelly's principles exclusively for educational settings, whose purposes differ markedly from aerospace manufacture. Having pointed to that coarse difference, we additionally recognize that higher education and K12 education, while possessing similarities, also differ in important ways. Without wanting to gloss over those differences, but in recognition of the similarities, we set out to articulate principles general enough to suit both K12 and higher educational settings.

An obvious similarity between K12 and higher education warrants mention before we present our list of rules. In both higher and K12 education, one can differentiate several kinds of relationships. In general terms, students report to teachers, teachers supervise the work of students and report to administrators; administrators at one level have charge over teachers and report to administrators at another level, administrators at several levels report to other administrators or to a governing board. We recognize that our generalized description glosses over some finer differences between K-12 and higher education. Still, it catches typical reporting and authority structures sufficiently well to provide a context for the adapted rules which follow.

Like Lockheed's Skunk Works, whose designers, engineers and machinists worked together organizationally and in close physical proximity to reduce the number of literal and procedural steps entailed in making changes; we call for similar organizational flatness and open communication in educational settings. We know that educators organize communication, responsibility and authority within classrooms, schools, school districts, colleges and universities in myriad ways, but we believe the adapted rules are sufficiently nuanced to apply at all levels in both K12 and higher education. Those ten rules, which we call Responsibility and Vision in Education and Leadership (RAVEL), are presented below with our own commentary in italics:

1. Educational and institutional objectives must be collaboratively established, simple and transparent. *Everyone in the organization has a voice in the establishment of objectives – from students to parents to teachers to administrators to legislators.*
2. Educators, both teachers and administrators, must have the authority to negotiate changes and improvements to educational and organizational objectives. *Innovation can come from every part of the organization and nothing can be considered unchangeable.*

3. All work is assessed against the learning objectives of the school, district or university. *Continued improvement becomes the culture, and learning the ultimate goal.*
4. The educator closest to the student must have significant authority to make decisions about how best to do his/her work. *Beyond the concept of academic freedom, the teacher is recognized as an expert authority.*
5. Flexibility must characterize all levels of the organization – from the classroom to the boardroom – so that people can innovate and change how they do their work. *So that organizations can move from reactive to proactive, policies and procedures must not hinder innovation and change.*
6. Assessment and reporting systems at all levels – from classroom to boardroom – must be collaboratively established, simple, formative, and transparent. *Agreed-upon assessments align directly with organizational and educational goals and objectives and drive improvement.*
7. Individual educators must assume responsibility for the initial evaluation of their work. *Responsibility within one's own sphere of practice takes priority in a culture of continuous improvement.*
8. Assessment structures must be flexible to allow students, educators and administrators to initiate change. Procedures for initiating such changes must be clear. *Allow for multiple voices when deciding on how learning is demonstrated, and when data show a need for change, focus on rigor and achievement on assessments.*
9. Educational organizations must have simple systems of communication that are collaboratively established and collectively maintained. *Everyone works by the rules of communication, and information is readily shared with all in the organization.*
10. Educators and educational administrators create an ethos characterized by creativity and productivity and gain the room to carry out their daily tasks by offering clear and consistent support to those they supervise. *Leaders pave the way for success in a culture of continuous improvement, and they allow for trial and error.*

We offer these principles as faithful adaptations of Kelly's 14 rules. We believe they apply in higher, secondary and elementary education, and in both instructional and administrative contexts. In Kelly, *More than My Share of it All*, Johnson follows his listing of the rules with this statement:

The Skunk Works is a concentration of a few good people solving problems far in advance – and at a fraction of the cost – of other groups in the aircraft industry by applying the simplest, most straightforward methods possible to develop and produce new projects. All it is really is the application of common sense to some pretty tough problems (1985, p. 171).

Our own adapted principles are meant to authorize educators to apply Johnson's common-sense practices in order for creativity and innovation to blossom within a culture of assessment and accountability. The principles allow educators a reframed view of educational accountability in which they may take the responsibility to answer decisions and changes they make within their own classrooms to enhance student learning. These principles bring the ethos of the Skunk Works into the educational arena, promoting risk and innovative ways to approach our work.

Conclusion

We conclude by offering three challenges to educators and a call for further research. First, we challenge educators to implement our ten adapted principles in their current educational settings, whether they work in teaching or administration, and whether in K12 or higher education. Educators should limit these attempts or experiments both in time and in scope. For example, a K12 teacher might implement these principles by presenting a specific section of content to a class of students allowing them to co-determine with the teacher how to demonstrate competency. An administrator might apply the principles in one dimension of her work, such as implementation of and communication about a policy change. Professors might revise the way they structure or communicate one or two major assignments in a course. These three examples do not exhaust the possibilities and we mean them simply to point toward the forms that implementation of the principles might take.

Second, we challenge educators to create new, experimental settings in which to test some or all the principles. Obviously, not all our readers have the freedom in their work contexts to create such settings. Still, K12 educators might develop leaning labs where student choice drives the achievement of the educational objectives. They might establish professional teams who rethink curriculum in a specific content area. Higher educators might create small, quick-response administrative units and new, atypical courses such as interdisciplinary capstone seminars or field-based courses.

Third, we challenge both K12 and higher educators and administrators to implement our adapted principles. Specifically, we see the communication systems and structures in educational organizations as obvious venues for such implementation. Our view and structuring of authority, responsibility and inspection in both higher and K12 education offer other prime sites for implementing RAVEL principles. Our readers will identify other sites and we offer communication and authority as examples. But even as we offer these two, we wish to underline the necessity of recognizing that adopting our principles in settings where such principles are not already in place implies a change in ethos. The Skunk Works rules were not a part of a technique; they were the principles that drove a culture in one unit at Lockheed Aerospace. Likewise, we do not offer our ten principles as a technique. Rather, we offer these as signs that point toward an organizational culture where individuals at all levels realize their authority and responsibility to produce their best work and, initially, to inspect it themselves.

The following call for further research relates to what we believe would bring benefits to K12 and higher educators. The first benefit ties to a question raised in our literature review. Historians of education could contribute to this discussion by suggesting reasons that educators in primary, secondary and tertiary education have failed to realize the Skunk Works' potential contribution to educational practice. Perhaps this failure roots itself in simple ignorance; no one until now brought the Skunk Works to the attention of educators. Perhaps, we have uncovered a case of active resistance. Whether the failure derives from one of these two sources, from both, or from some other source, it warrants further study.

Some may bristle at the comparison of teaching students to building jet aircraft, but the facts remain: the principles of the Skunk Works allowed for flexibility and local decision-making that unleashed great creativity, resulting in unthinkable innovation along with high productivity and reliability. We live and educate in a time when classrooms, schools and colleges need such flexibility, productivity, innovation and reliability. RAVEL principles offer a framework within which administrators and classroom educators gain permission and support to unleash creativity at all levels. These principles can enable educators to

work effectively so that classrooms, schools, colleges and universities become places where innovation and productivity, creativity and accountability flourish side by side.

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