INSIGHT: Thinking Issues

Tony Clear

Meeting Employers Expectations of DevOps Roles: Can Dispositions be Taught?

In the education and teacher education fields there has been much debate about where the balance of good teaching should lie, and how much the focus should be on imparting 'content knowledge' as opposed to fostering particular 'dispositions' toward learning. [10, 11] In science teaching, 'essential' dispositions have been noted as, "professionalism, a passion for science and teaching, and a dedication to student learning" [9]. In mathematics education Gresalfi and Cobb [7] argued that cultivating dispositions in discipline specific contexts can be a key strategy towards more equitable forms of pedagogy. In nursing education Profetto-McGrath [14] has applied a set of instruments to measure the vital role of not only 'critical thinking skills' for practicing nurses but 'critical thinking dispositions', which means those acquired skills are then likely to be used in practice. This column reflects upon the critical dispositions that employers are seeking from computing practitioners in emerging DevOps roles and how we might educate towards those outcomes.

Working with my colleague Dr Waqar Hussain of our Software Engineering Research Lab, we recently conducted a study of Employers' expectations for DevOps roles [8]. The rise of the DevOps movement is an emerging phenomenon within Global Software Engineering, driven by the quest for 'continuous value delivery' [6]. The underlying driving forces suggest that it is more than just a passing enthusiasm, and, in a cloud based software and services paradigm, probably here to stay. While the term 'DevOps' has been described as ambiguous, difficult to define and multifaceted, Smeds and colleagues [16] contend that there are two camps in the blogosphere with opposing views. The one camp argues for DevOps as "a specific job position that requires both software development and IT operations skills" and the other that "DevOps cannot be summarized into a job description and is more than a specific role". Some of the 'hand waving' about DevOps in the cult-like fashion of the IT industry when pursuing a new agenda, makes it hard to determine the reality of the concept. Arguing that the focus on DevOps as merely a culturally defined phenomenon is not particularly helpful, and that a focus on engineering practices is more productive, Smeds and colleagues derive the following definition:

> "a set of *engineering process capabilities* supported by certain cultural and technological *enablers"*[16].

They then maintain that adopting DevOps in an organization requires integration of the three core aspects of DevOps listed in table 1.

Capabilities	Continuous planning Collaborative and continuous development Continuous integration and testing Continuous release and deployment Continuous infrastructure monitoring and optimization Continuous user behavior monitoring and feedback Service failure recovery without delay
Cultural Enablers	Shared goals, definition of success, incentives Shared ways of working, responsibility, collective ownership Shared values, respect and trust Constant, effortless communication Continuous experimentation and learning
Technological Enablers	Build automation Test automation Deployment automation Monitoring automation Recovery automation Infrastructure automation Configuration management for code and infrastructure

Table 1. DevOps Capabilities and Enablers [Ex. 16]

In our study of job advertisements for DevOps related roles in New Zealand [8], we identified several technically focused dimensions - knowledge areas, technologies, languages and frameworks – in addition to the tasks, responsibilities and roles demanded of DevOps personnel. These were all reasonably self-evident aspects of any technical position description. Yet in addition to this set of knowledge and skills, we saw that employers were seeking a set of additional qualities from their candidates. While our study grouped them broadly under the category of "Capabilities", they probably transcended the normal classification of a 'capability' [1] or a 'professional competency' [3], with many having a strongly value laden dimension. We grouped this set of qualities thematically as "dispositions" [15], as depicted in Table 2.

Capabilities	Sub Themes	Freq	%Ads
Attributes	Communication Skills (39), Leadership (16), Customer Engagement (14), Mentorship (14), Adaptability and Learnability (11), Collaboration (8), Interpersonal Skills (8), Problem Solving (7), Analytical Ability (6), Self-Management (6), Handle Pressure (5), Planning (3), Task Management (2), Independence (2), Relationship Building (2), Knowledge Sharing (4)	147	98%
Dispositions	Passionate (8), Team Player (6), Motivated (3), Enthusiastic (3), Visionary (3), Curious (3), Innovative (3), Proactive (2), Energetic (2), Confident (2), Technical Orientation (2), Business Acumen (2), Committed (2), Self-Starter (1), Responsible (1), Talented (1), Respectful (1), Pragmatic (1), Favor Free (1), Flexible (1), Hardworking (1), Change Tolerant (1), Quality Conscious (1), Resilient (1), Critical Thinker (1)	53	80%
Attitude	can do attitude (2), try anything once (2), won't mind getting hands dirty (1),	5	10%
Philosophy	Healthy disregard for functional silos (2)	2	4%

Table 2. DevOps Job Advertisements Capabilities and Dispositions [Ex. 8]

But is the notion of a 'disposition' particularly obvious, and how should it be defined? In her exploration of the meaning of the term 'disposition', Schussler has distinguished a disposition from knowledge and skills arguing that a disposition "*concerns not what abilities people have, **but how people are disposed to use those abilities***" [15]. So here we are talking about a mindset and attitudinal dimensions, which raises the question can a disposition be taught or is it some innate part of a person's character? Clearly from our data in table 1, where eight advertisements sought candidates "passionate" about some aspect of DevOps, employers see dispositions as critical to their candidate selection. Although personally I find the corporate abuse of the lovely word "passion" cringe making! [Yes, I'm really ***passionate*** about helping administer tax returns, because that's what you want me to say to get your far from thrilling job!]. But if we reinterpret the meaning here, can we teach our students to <u>care</u> about what they do and take a pride in their work?? Furthermore do educators see that as their role?

Many educational institutions do aim for a well-rounded graduate in their officially promulgated 'graduate profiles', where we see the desired qualities of graduates framed in statements such as "*the ability to critically evaluate information; independent critical and reflective judgement; the ability to work effectively as a member of a team*" [13]. These are statements we see echoed in our dispositions for DevOps roles in table 1: "critical thinker"; "team player". But while we can educate for the ability to perform a task, can we inspire the ongoing desire to act in that way? Perhaps this conundrum poses the limits of what an educational institution can realistically achieve? An ability can be taught, but can we inculcate a disposition which is really more of a state of mind? Yet if we look at figure 1 and the 'cultural enablers' for DevOps, we see close analogues to our notion of dispositions, such as: "shared values, respect and trust"; "continuous experimentation and learning". I have some misgivings about corporate manipulation through management by values, which can generate cult-like behaviour, but the values expressed in this set of cultural enablers seem to me to be pretty positive ones, and values I would be very happy to see embodied in my own graduates. Consistent with the "continuous experimentation and learning mindset", it is fairly typical in an educational setting to see an explicitly stated goal of teaching the students "to learn how to learn" [5], which is in the nature of a disposition by preparing students for a future orientation, and towards a future in which they are innately disposed towards further learning. So, while in the computing disciplines we may teach our students a range of conceptual materials and technical and professional capabilities, I argue that we also have the traditional educational role of "building character" within our students so that they leave ready to take their place as responsible, and committed professionals and citizens in their chosen roles. As one approach, Mats Daniels and colleagues have been applying an Open Ended Group Project Pedagogy focused on developing professional capabilities [3, 4, 12]. This work does address dispositions as a related aspect, but we have not been wholly explicit about the distinctions between professional capabilities and dispositions, and perhaps we need to address that volitional gap more consciously. So, I do not think we have all the answers on how to inculcate dispositions, but I have observed that it has been internalised within their practice by the many excellent educators I have had the privilege to work with. As Biesta has observed we need to "keep in view education as a thoroughly moral and political practice requires continuous democratic contestation and deliberation" [2].

1. Acuna, S. and Juristo, N. “Assigning People to Roles in Software Projects”. *Software - Practice and Experience*, 34 (2004): 675-696.
2. Biesta, G. "Why “what works” won’t work: Evidence-based practice and the democratic deficit in educational research." *Educational Theory*, 57 (2007): 1-22.
3. Daniels, M. *Developing and Assessing Professional Competencies: a Pipe Dream? Experiences from an Open-Ended Group Project Learning Environment* (PhD). (Uppsala University, Uppsala, 2011). Retrieved from http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-145983
4. Daniels, M., Cajander, Å., Pears, A. and Clear, T. "Engineering Education Research in Practice: Evolving Use of Open Ended Group Projects as a Pedagogical Strategy for Developing Skills in Global Collaboration.” *International Journal of Engineering Education*, 26, (2010): 795-806.
5. Dawson, R. & Newman, I. “Empowerment in IT Education.” *Journal of Information Technology Education*, 1, 2 (2002): 125 - 141.
6. Dingsøyr T. and Lassenius, C. "Emerging themes in agile software development: Introduction to the special section on continuous value delivery." *Information and Software Technology*, 77, (2016): 56-60.
7. Gresalfi, M.S. and Cobb, P. “Cultivating students' discipline-specific dispositions as a critical goal for pedagogy and equity”. *Pedagogies 1*, 1, (2006): 49-57.
8. Hussain, W. Clear, T. and MacDonell, S. “Emerging Trends for Global DevOps: A New Zealand Perspective”. In *Proceedings IEEE 12th International Conference on Global Software Engineering*. (Buenos Aires, Argentina: IEEE, 2017). [accepted for publication].
9. Miranda, R. 2012. “Urban high school teachers' beliefs concerning essential science teaching dispositions.” *Science Educator 21*, 1, (2012): 44 -50.
10. Misco, T. “Did I forget about the dispositions?: Preparing high school graduates for moral life”. *The Clearing House: A Journal of Educational Strategies, Issues and Ideas 80*, 6, (2007): 267-270.
11. Murray, F.B. “Disposition: A superfluous construct in teacher education”. *Journal of teacher education 58*, 5, (2007): 381-387.
12. Peters, A-K., Hussain, W., Cajander, A., Clear, T. and Daniels, M. "Preparing the Global Software Engineer." in *Proceedings of the IEEE 10th International Conference on Global Software Engineering*. Castilla La Mancha, Spain, IEEE, 2015: 61-70.
13. Petrova, K. Philpott, A. Kaskenpalo, P. and Buchan, J. “Embedding information security curricula in existing programmes”. In *Proceedings of the 1st Annual Conference on Information Security Curriculum Development (*Kennesaw, USA: ACM, 2004): 20-29.
14. Profetto-McGrath, J. “The relationship of critical thinking skills and critical thinking dispositions of baccalaureate nursing students”. *Journal of advanced nursing 43*, 6, (2003): 569-577.
15. Schussler, D.L. “Defining dispositions: Wading through murky waters”. *The Teacher Educator 41*, 4, (2006): 251-268.
16. Smeds, J. Nybom, K. and Porres, I. “DevOps: a definition and perceived adoption impediments”. In *International Conference on Agile Software Development.* (Helsinki, Finland: Springer, 2015):166-177.

Tony Clear
School of Engineering, Computer and
Mathematical Sciences
Auckland University of Technology
Private Bag 92006
Auckland, 1010 New Zealand
Tony.Clear@aut.ac.nz

Note: Image Options

1) **for DevOps at: https://www.bigstockphoto.com/image-154744250/stock-photo-devops-in-the-form-of-scoreboard-3d-illustration**
2) **Suggested Caption: A disposition to act?**