Knowing Practice:

vocational thresholds for GPs, carpenters, and engineering technicians

SUMMARY REPORT

Karen Vaughan
Linda Bonne
and Jan Eyre

AKO AOTEAROA
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How do we learn to become fully capable practitioners at work? How do teachers, advisors and mentors support learners to do so? What is the significance of practice-based learning—also known as apprenticeship, practicum or vocational immersion—in capability and career development?

We explore the role that **vocational thresholds** play in our work, whatever the field of practice. We suggest ways that people in practitioner learning support roles such as employers, workplace mentors and educators, and tertiary institution-based educators can identify and work with vocational thresholds to improve practitioner development.

Vocational thresholds and why they matter

Vocational thresholds are transformational learning experiences that show learner-practitioners the big picture of their field of practice and their role in it. Vocational thresholds help learner-practitioners connect their field's theory to its practice.

Once someone has crossed a vocational threshold, they see their work and its purpose in a new light. They are likely to move to a new level of capability and vocational identity that integrates what they know, what they can do, and *how they are* as practitioners. While vocational threshold experiences are most common to learner-practitioners, more expert practitioners can also have these experiences.

Transformational learning and authentic experience

The idea of vocational thresholds was developed through the *Knowing Practice* project: a study of practice-based learning in general practice medicine, carpentry and engineering. We observed and interviewed 41 learner-practitioners and 34 of their workplace-based mentors, advisors, and teachers.

We developed the idea of vocational thresholds to better understand the role played by, and potential of, learner-practitioners' most significant learning experiences. We built on Meyer and Land's idea of "threshold concepts"[1], which has been used by tertiary educators to identify disciplinary concepts that act as a gateway to students' understanding.

Vocational thresholds are similar to threshold concepts in that the learning involved is transformational. However, there are three important differences. Firstly vocational thresholds lead to transformation not only in what someone knows or can do, but in *the way they are* as a practitioner. This is an identity and being-ness demand, not only about the accumulation of knowledge or refinement of skills. Secondly, vocational thresholds arise out of experience of authentic practice, rather than from classroom-based activities. Thirdly, because practitioners' identities constantly evolve in relationship to practice, practitioners may potentially cross many thresholds over time.

We asked GP registrars, carpentry apprentices, and engineering technician cadets about their work, learning and role. We focused particulary on their most significant learning experiences[2] – ones that were especially meaningful and that led to them feeling and/or behaving differently in their work. Their stories were detailed and specific to their field of work. However, there were also notable characteristics shared across all three fields: the most significant learning experiences almost always revealed an integrated "big picture" of practice to the registrar, apprentice or cadet. The experiences had a memorable, "no going back" quality. They were personally and professionally challenging. Sometimes they involved painful lessons or counter-intuitive realisations about work practice or the practitioner role.

We also asked mentors, advisors and workplace teachers (some of whom were also employers) about the kinds of things that might constitute especially significant learning experiences for learner-practitioners. Their thoughts were very similar to those of registrars, apprentices and cadets. GP teachers cited experiences derived from patient relationships that were experienced as holistic understanding about the GP role. Carpentry trainers (employers and foremen) and training advisors described experiences leading to a view beyond the technical to craft for meaningful projects. The engineering mentors and team leaders emphasised experiences that uncovered the inter-relationship of engineering and community.

There are likely to be vocational thresholds for practice in any field. The next sections look at these for GP medicine, carpentry, and engineering technician work. The final section looks at how we might make the most of vocational thresholds for capability development in any field. We make some suggestions for workplace and institution-based educators, mentors, employers and careers educators.

Vocational thresholds for **GPs**

Vocational thresholds for GP registrars in *Knowing Practice*

- **Rethinking medical knowledge in a relationship-centred, community setting**
- **Deepening their expertise through uncertain work**
- **Managing their own anxieties**

GPs are doctors with a clinical speciality in primary health care. Having completed medical school and with several years' experience working in hospital, GPs are more like "novice experts" than novices on a straightforward apprenticeship to expertise. Patients typically spend only a brief time with their GP, presenting an array of unclassified symptoms, potentially spanning a wide range of conditions. Treatment plans must be negotiated according to patient circumstance, capacity and preferences, rather than imposed. The GP clinic cannot provide the same level of in-house diagnostic testing or hold patients for observation as a hospital can. Uncertainty is a constant feature of GPs' work. New GPs cross a vocational threshold when they understand that the inherent unknowables in practice are things with which they must thoughtfully engage, rather than reject. In other words, expertise does not necessarily mean an eradication of uncertainty.

The GP registrars in our study had to reposition their existing medical knowledge in a community health context. Being a GP could no longer be about knowing everything in a clinical sense. Instead, registrars found their expertise had to be derived from a different kind of knowing—and management—of their own strengths, frailties and anxieties within the context of patient relationships.

Registrars described the difference between being a good GP and a bad GP as centering on the patient relationship. Registrars put a lot of energy into establishing and maintaining good relationships so that patients felt heard and secure in their continuity of care. Registrars were clear that, while up-to-date clinical knowledge was necessary and fundamental, it was not sufficient. Being truly knowledgeable about a patient meant knowing about much more than their physical condition. Registrars needed to adopt a mindset for listening and negotiating with patients. GP registrars' experiences of caring for "the whole person" opened them up to the idea that medical knowledge was not the only knowledge worth having.

The focus on the relationship sometimes came with an uncomfortable trade-off: their clinical knowledge was not always obviously valued or in play. Sometimes patients just wanted to be listened to, which some registrars described as making them feel like they were "doing nothing". For registrars who derived a sense of purpose from technical, problem-solving challenges, this was very disturbing. For others, a new, rewarding and problem-*finding* dimension was opened up.

> In hospital I learned to address a problem and give the medicine. Here, I am trying to change lifestyle. When I get positive feedback, that it has clicked, and [the patient] wants to change, that makes me a GP. In hospital we could not change anything. We could diagnose really good stuff...But here, there's a satisfaction in looking after a *man*. (Kendrick, GP registrar)

Registrars found they needed to integrate two forms of care—one for patients and one for themselves. Providing continuity of care over time required both the maintenance of professional boundaries and facing the possibility of staying close to patients who died or had devastating changes in health. Many registrars feared identifying too much with patients on the one hand, and burning out and losing empathy on the other. One described going to a rugby match after seeing parents whose child had died. "I [was] thinking: how can I be doing this...How can anyone go out and do something fun?" Registrars also described the ever-present background fear of missing a vital diagnosis against the backdrop of everyday work which consisted mainly of busy schedules and routine diagnoses. "You can over-investigate patients to manage your own anxiety... Otherwise you cannot sleep at night."

Vocational thresholds for **carpenters**

Vocational thresholds for carpentry apprentices in *Knowing Practice*

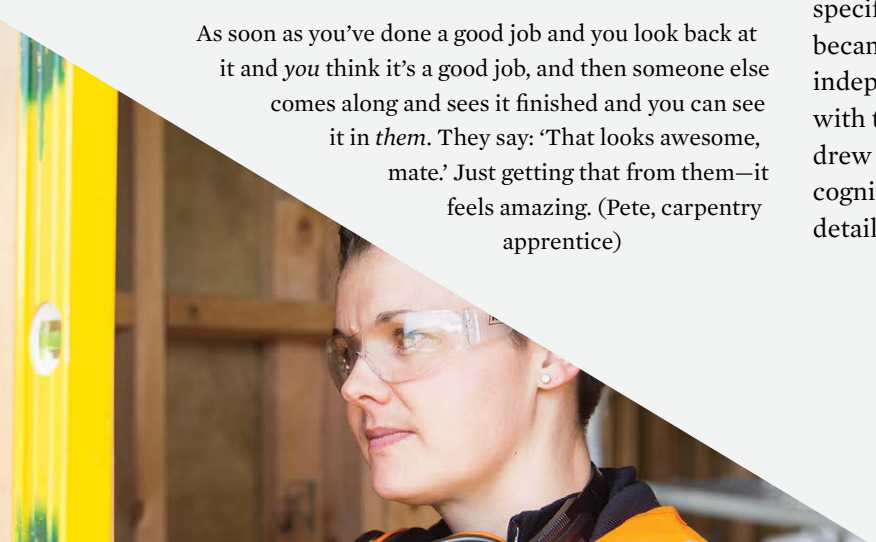
- Taking pride in their craft
- Integrating aesthetic values and judgement with technical skill
- Developing a sense of belonging in the construction industry

Carpenters work with materials such as timber, concrete and steel to construct buildings from scratch and to alter, repair and renovate them. During the apprenticeship, carpentry expertise develops in several main areas: technical skills, which are continually refined through practice and repetition on the job; knowledge of theoretical aspects underlying principles of building; practical judgement about how to use these skills and knowledge to produce work of an acceptable industry standard; and values and attitudes associated with the craft of carpentry.

Carpentry apprentices were clear that, while technical building prowess was important, practical skills were not enough to become a carpenter. They referred in particular to attitudes and values such as pride, craftsmanship, independence and willingness to continue learning as being cornerstone qualities in a good carpenter. Apprentices developed positive relationships and good communication skills within the (often very close-knit) team and with subcontractors. Building and construction require a good deal of trust, mutual respect and cooperation. Apprentices reported transformational experiences in working closely with more experienced colleagues on unusual or difficult projects, and taking photos of their work and reflecting on it at night.

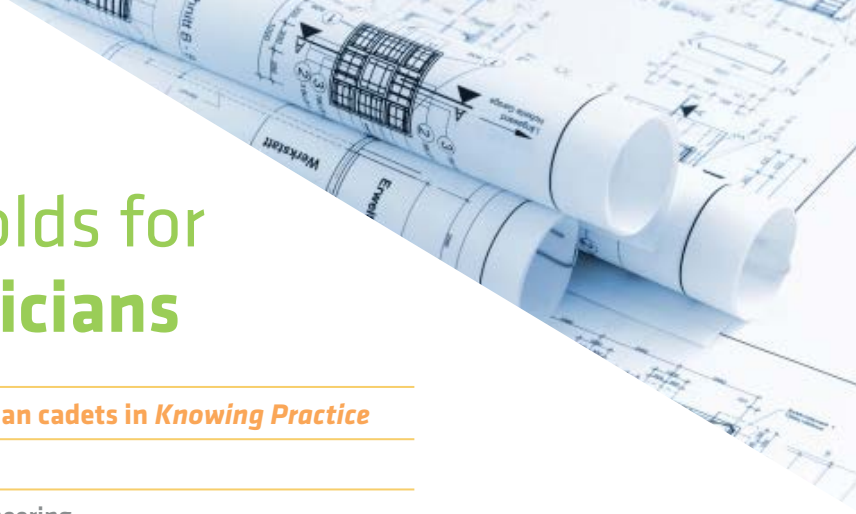
A sense of belonging was crucial to crossing these vocational thresholds. Being recognised by clients, their own team, and other construction contractors helped apprentices see themselves differently.

> As soon as you've done a good job and you look back at it and *you* think it's a good job, and then someone else comes along and sees it finished and you can see it in *them*. They say: 'That looks awesome, mate.' Just getting that from them—it feels amazing. (Pete, carpentry apprentice)



Carpentry apprentices' transformational learning experiences were based on an increasingly sophisticated interplay between their minds, their bodies, and their physical environment of tools and materials. What may at first appear to be a job involving very simple mathematics, physics, and chemistry opens up a requirement for higher-order thinking that can integrate the concrete and the abstract.[3] Building became less straightforward as the complexities involved in a building project revealed themselves. Apprentices began to steer away from following one right method to literally *sensing* the possibilities.

Apprentices were entrusted with opportunities to solve more difficult problems as they became more skilful at working with their minds, bodies and the physical environment (including tools). The capability to independently identify and correct mistakes was a key aspect of their learning. This capability incorporated technical prowess, mental imagery, and a carpenter's "eye" and "nous". Working independently and exercising independent judgement about the work quality was built up in relation to a craft identity. This identity was modelled by the apprentices' employers and site supervisors and made visible the importance of taking pride in doing a good job. That sense of pride was intimately connected to how the apprentices worked with, and were recognised and respected by, others onsite. So the idea of "standards" was no longer only a question of meeting standards or specifications contained in qualification outcomes. It became a question of internalising the standards of independent, good carpentry work and identifying with the industry. Apprentices' vocational thresholds drew attention to the way that *values* influence cognitive processing and technical skill as much as detailed plans do.[4]



Vocational thresholds for **engineering technicians**

Vocational thresholds for engineering technician cadets in *Knowing Practice*

- **Seeing their work as a vital cog in a larger wheel**
- **Appreciating the possibilities and impact of engineering**
- **Understanding the social dimensions of engineering**

Engineering technicians solve well-defined engineering problems using a combination of practical know-how and analytic techniques, complementing the work of professional engineers. The range of their work includes installing, testing, calibrating, fault-finding and monitoring equipment and systems. They also supervise tradespeople, and select equipment and components to meet given specifications and assemble them into customised systems.

Much of the work for engineering technician cadets in *Knowing Practice* was in the symbolic realm (notations, calculations, measurements, computer-aided drafting). It involved intense devotion to detail. Cadets were charged with ensuring accuracy of those details that were then fed into a larger project. However, this meant they sometimes struggled to appreciate the place of their work within a project and team. For this reason, cadets were rotated through different roles and teams at various points in their cadetship. This offered opportunity to get a broader understanding of technician work, in relation to other roles. However, this could also make it harder for some cadets to develop a good sense of belonging and contributing to one team or project.

Cadets' significant learning experiences were ones that allowed them to see what their measurements and drawings, a small aspect of a project, enabled for the rest of the team and for the project overall. Experiences interacting with other members of the team, or people in mentoring roles, helped cadets lift their gaze, reinforce diligence and understand their contribution as fundamental rather than trivial. They were not just taking soil samples or using a theodolite. They were *engineering* solutions, making things possible.

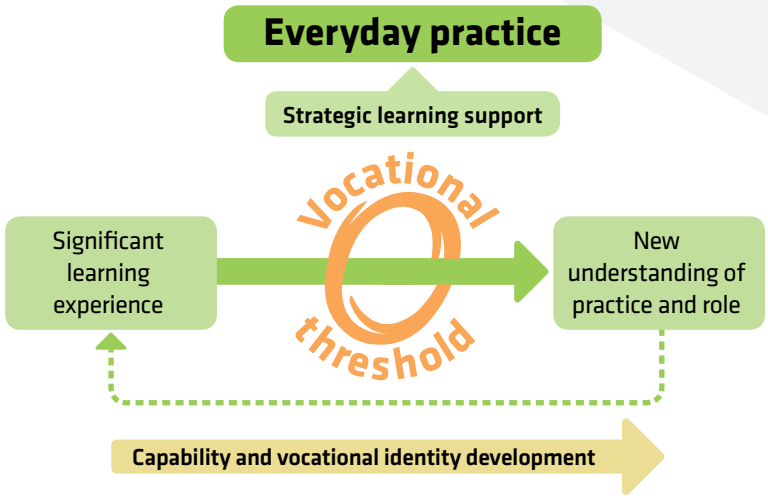
> [We] had to move 3000 litres but the pumps had to stay where they were. The fire engineer said, 'You can't do it.' The [other] guy said, 'Just engineer it out'... And they show you the examples and how you *can* do it. That's the first time I realised the power of engineering. You can go from 'no, you can't' to 'yes, you can.' (Dylan, engineering technician cadet)

Infrastructure work provided a particularly powerful means for this shift to occur because it necessarily involved a different kind of encounter with everyday objects. Cadets working on traffic safety, roading design and other public works —objects and services they use themselves in ordinary life—were confronted now with a different perspective on those objects and services, with their new skills and budding identity as engineering technicians. As part of the design process they were faced with considering how people would engage with the results of their (and their team's) labour, including that the work could be contested by different groups or had differential impacts in the world. This awareness seemed to be part of a growing realisation that engineering is bounded by sets of rules and standards, of which non-engineers are largely unaware. They began to develop a "communicative imagination"— an ability to appreciate communication as a key component of socially, ecologically and economically responsive engineering practice, rather than simply a soft skill additional to technical.[5]

These experiences not only proved useful to finding meaning in ostensibly small roles, but opened up a much deeper understanding of an engineering disposition. Engineering was now visible as an integration of the social, and the technical-physical. Cadets cited a growing awareness of engineering as inextricably intertwined with social and cultural issues. Often the vocational thresholds they encountered were ones that required judgement to be developed beyond the technical realm into an understanding that science and technology knowledge must be social knowledge-in-practice.

Using vocational thresholds to build deeper capability

Vocational threshold process



Vocational thresholds:

- Transform not only in what someone knows or can do, *but the way they are*
- Reveal the big picture and previously hidden theory-practice integration
- Are memorable and unshakeable
- Can be troubling or counter-intuitive
- Arise from authentic practice
- Are multiple and can be crossed throughout a career

Registrars, apprentices and cadets identified the most meaningful experiences leading to a crossing of vocational thresholds in their practice. However, experience alone is not enough. Nor is it always educative. And the experiences themselves are authentic and personal to each individual, which makes them difficult to anticipate or manufacture for learning purposes. However, the systemic learning arrangements themselves – such as vocational immersion programmes, apprenticeships, and cadetships – offer an important means for shifting especially meaningful experiences into a vocational threshold zone in three ways.

1. Recognition and cultivation of a practice landscape

Vocational thresholds are more likely to be crossed when practitioners recognise and cultivate a broad view of the workplace as a "landscape of practice".[6] The landscape includes the working conditions and shared meanings of work practice. It includes a range of relationships, from those with immediate co-workers and clients, to those in adjoining areas of practice: for example, other medical specialists (GPs); other subcontracting tradespeople (carpenters); and architects (engineering technicians). A landscape perspective underlines the importance of authentic and diverse relationships for crossing vocational thresholds. Practice-based learning is not so much the master-to-novice education of a traditional apprenticeship. It's more like an induction into a community.

2. Opportunities to practise and reflect

All learner-practitioners were engaged in authentic practice on a daily basis: GP registrars saw patients; carpentry apprentices engaged in building projects; engineering technician cadets engaged in civil engineering projects. So their activities had real meaning, real consequences and real challenges and rewards. All learner-practitioners also had support that focused on their dispositional development and included space for critical reflection. Honest discussion and regular review of practice were used strategically to promote learning and improvement.

GP registrars had ad hoc discussions with colleagues, especially where clinics had an "open door" policy for involving each other during consultations. There were opportunities for registrars to observe expert GPs by sitting in on their consultations. Registrars' learning groups and one-to-one sessions typically explored what it meant to be a GP through patient case reviews, role plays and creative, reflective exercises.

Carpentry apprentices used everyday opportunities to "chew the fat" with their co-workers. Bonds were created through physical hardship, joint problem solving, and humour. Carpentry apprentices also had reflective space with their training advisors whose visits were deliberately organised as a conversation about learning, using formative, not just summative, assessment.

Engineering technician cadets' mentoring meetings allowed them to step back from project details

and think about engineering mind-set. Cadets also had reflective space in team debriefings about approaches that had not worked and could be improved. Discussions with peers in weekly ITP-provided classes might also have provided some reflective opportunities.

3. People in designated support roles

All three fields had people in designated learning support roles who helped facilitate vocational threshold crossings for learner-practitioners. It is no coincidence that these workplace mentors, advisors and teachers were also very reflective about their own practice. They made it clear that their support was grounded in real practice. They did not have a focus on transmitting knowledge or providing the right answers. Their focus was on the development of independent work and judgement through practice, and supported by a sense of shared endeavour. They drew learner-practitioners into a "community of practice" where they could *inhabit* the practice landscape.[7]

GP teachers particularly engaged registrars in "approximations of practice",[8] role-playing consultations or difficult conversations with patients. GP teachers modelled collegiality. This was not just a "giving back" or for congenial workplace relations. This was to help registrars develop a disposition and way of practising that counterbalanced the tendency to become isolated and overwhelmed, ultimately affecting patients.

Carpentry trainers (usually the employer) and training advisors referred to the independent identification and correction of mistakes as key to developing carpentry attitudes and values. Employers and foremen deliberately pushed apprentices into taking full responsibility for important parts of projects. They supported apprentices doing "perk" jobs (paid or unpaid work for friends and relatives) to build this independence. Employers and training advisors also took a pastoral care role with young apprentices, using the apprenticeship as a gateway to the adult world.

Engineering mentors and team leaders played complementary roles in support of cadets. Mentors focused on career development and engineer world-view issues. Team leaders focused on technical development. They liaised to rotate cadets through different teams for the experience. They also tried to coordinate workflow with the cadets' ITP-based, part-time studies.

Things to consider

Workplace-based mentors, advisors, and teachers

- Where and how do learner-practitioners get opportunities to actually *practise* their work?
- Are there ways to break down the big picture *and* pull it together so learner-practitioners see how it works?
- What opportunities exist to critically reflect on where practice goes well and what could be better?

Employers

- Does your workplace and broader landscape culture foster honest reflection so that mistakes and anxieties can be used positively for learning?
- Do opportunities for reflection extend to all practitioners (not just less expert ones)?
- Who is designated to support learners and keep an overview of their progress (not only their technical abilities but their dispositional development)?

Tertiary institution-based educators

- How can you harness some of the authenticity that practice-based learning offers in order to help learners develop vocational dispositions and identity?
- How aligned is the institution-based work programme with the workplace-based practice in terms of supporting learners to cross vocational thresholds?
- How much is known about the most significant learning experiences of learner-*practitioners* who are also tertiary students?

Careers educators

- Can you harness a vocational thresholds perspective to support people's development of meaningful career management competencies?[9]
- How can you foster understanding of vocational thresholds in people's changing relationship with their field of practice or their career options?

And everyone in a learning support, education, employer, or practice-leading role can ask themselves a question to help pinpoint their own vocational thresholds:

> ***What is the most significant learning experience I have had that led to a change in my practice and/or a change in how I saw myself as a practitioner? What happened? What has been different since?***

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The full report and this summary can be downloaded at: www.akoaotearoa/knowing-practice

This summary and the full report is also available at www.nzcer.org.nz/research/knowing-practice-project

Endnotes

1 Meyer, J. H. F., & Land, R. (2003). *Threshold concepts and troublesome knowledge: Linkages to ways of thinking and practising within the disciplines*. London: Economic and Social Research Council.

2 We adapted this from a question in a study about tertiary education courses and experiences prior to entering careers in clinical psychology, the clergy, and teaching. See Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. W. (2009). Teaching practice: A cross-professional perspective. *Teachers College Record, 111*(9), 2055–2100.

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8 Grossman, P., Compton, C., Igra, D., Ronfeldt, M., Shahan, E., & Williamson, P. W. (2009). *Teaching practice: A cross-professional perspective*. Teachers College Record, 111(9), 2055–2100.

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