Beyond competence: an essay on a process approach to organising and enacting vocational education

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The competency-based approach to vocational education is premised on narrow and dated conceptions of human functioning, performance and development. Its adoption is more driven by administrative concerns about measurable outcomes than educational processes and outcomes. Informed by educational science, and earlier debates, this article discusses the goals for and approaches to realise the outcomes that governments and supra-governmental agencies want. It emphasises the centrality of (a) experiences promoting students' learning, (b) understanding the goals to be achieved by vocational education, and (c) aligning these with educational processes. Common to individuals, their communities, workplaces, professional associations and government needs are the development of applicable and adaptable occupational capacities. Yet these cannot be secured or assessed through competency-based education. The capacities required for current and emerging occupational practice, necessitate a focus upon processes, not measurable outcomes. Hence, there is need to focus on learners' personal practices and educational processes.

Keywords: learning processes; adaptable occupational capacities; vocational education; government imperative; informed practice

Competence and vocational education

Over the last three decades, in many countries governmental interest in competency-based training, with its emphases on measurable statements of competence, means of assessing students' competence against those statements and associated administrative procedures have been used to organise provisions of vocational educational and evaluate their worth. That interest has been championed by both national and supranational governmental agencies and in ways that position measures of competence and competency-based education as being orthodox and unquestionable. Questioning the concept of competence is deflected as being against governmental efforts to promote worker competence ('don't you want a competent workforce?'), yet the widespread adoption of this mode of vocational education, although well enmeshed within governmental discourses, privileges administrative over educational imperatives. It is also antithetical to the outcomes that governments claim they want from vocational education. As this stance indicates little or no understanding of educational or learning processes, it is questionable whether these measures of competence can capture and guide the kinds of learning intended by government. Such is merely the most recent in a long tradition by those in positions of influence (i.e., aristocrats, theocrats, bureaucrats, academics, industry spokespersons) that they know best about the qualities of occupations and their preparation (Billett, 2011). The administrative imperative evident here is indicative of governmental concerns about vocational education being directed towards achieving specific economic outcomes by closely aligning them to measurable statements of occupational requirements. There is little evidence to suggest, however, that these statements and the selected means of securing them are the most efficacious way to achieve these goals. It is erroneous to believe that central authorities can control what is taught, let alone learnt in these kinds of educational focuses or that these measures are those that can best secure adaptable learning outcomes as has been long proposed (Jackson, 1993; Stevenson, 1992).

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An assumption underpinning this imperative is that the knowledge required for the kinds of occupations prepared through vocational education is easily learnt and measured. This erroneous premise is supported by educational scholars such as Stenhouse (1975) and Oakeshott (1962) who denied or underestimated the extent and complexity of the knowledge required to perform occupational tasks. Like other kinds of privileged others, these scholars and those before them (e.g., Plato), without recourse to evidence, merely rehearse a societal sentiment that the kinds of occupations prepared in vocational education are of low order for which perfunctory educational provisions and measurable outcomes would suffice. Yet are not most university courses, including law and medicine, focused on the development of specific occupational capacities and, therefore, would they not be equally well served by such competency measures? Are not there elements of general schooling that would lend themselves to measuring attained knowledge (e.g., calculations, rules of grammar), even those best secured through rote methods? Untested and ill-founded precepts established by the likes of Aristotle (Russell 1952) and Plato in Hellenic Greece (Lodge, 1947) about the relative standing of occupations and the means by which they should be learnt still have credence, despite these proponents never engaging in, let alone investigating these occupations' tasks and their requiring conceptual as well as manual skilfulness.

In recent times, these views have been perpetuated and sustained by bureaucratic processes that are aligned with an approach that emphasises central control (see Billett, 2011, for an elaboration). Bases for such precepts appear no more informed than was Aristotle's thesis on human teeth.[1] When provisions premised on such fallacious premises are seen to fail, however, it is not they or their privileged sponsors who got it wrong. Instead, such failures are often blamed on those who merely failed to adequately implement them (i.e., teachers). This view simply echoes Plato's claims that artisans were incapable of adding value to what they do and that tutors were not of worth for anything other than tutoring (Lodge, 1947). Such sentiments still exist, despite evidence across human history of artisans' abilities and need to innovate (Barbieri-Low, 2007; Epstein, 1998) and teachers' important role in understanding and adapting to students' needs (Sahlberg, 2012). Not that there is anything particularly new here. In the 1990s, for instance, a large body of Australian research and scholarship addressed these issues, much to the frustration of government agencies. These agencies were tasked to develop and implement national standards and syllabi with a concern to impose a national uniform system of vocational education based on competency-based training. Researchers noting the tendency of government to resort to such measures in time of social and economic stress were ignored. Such critiques were most unwelcome and came at costs. Some of these are reviewed here lest their contributions be forgotten.

What some of those critiques suggested, and emphasised here, is that it is necessary to go beyond narrow and detailed conceptions of competency-based training as driven by behavioural objectives. There needs to be, instead, more informed accounts of what constitutes skilled occupational performance driving statements of educational intent. As was argued earlier, statements of educational intents (i.e., aims, goals and objectives) that are commensurate with the kinds of knowledge required for occupational performance are needed (Stevenson, 2001, 2002) as are most appropriate means for this knowledge to be learnt through vocational education (Evans & Butler, 1992; Stevenson, 1991). This effort is directly aligned with the kinds of outcomes that many governments claim they want achieved, and are also what industry and employers claim they need, and what students and employees want to learn through vocational education. So, a consideration of contemporary accounts of what constitutes

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[1] Aristotle famously claimed that males had more teeth than females as a mark of male superiority. However, he never bothered to check his claim. Beyond failing to test his thesis, his lack of a felt need to verify it illustrates the risks of placing credence on the musing of such speculators (see Russell 1952:7).

occupational competence is required as is their alignment with the identification and selection of appropriate provisions and processes of vocational education.

Here, perspectives from educational science are used to inform these goals and forms of vocational education. A process approach to curriculum, instruction and assessment is held to more closely align with achieving goals associated with adaptability, work innovation and meeting particular workplace requirements than one based on prespecified statements of measurable competence and standardised content and education processes focused on such outcomes. The case is made by, firstly, outlining the current contradictions and conundrums faced by decision-making within vocational education. It then discusses what educational science has contributed and can contribute to developing occupational competence, which extends to adaptability of what is learnt through a consideration of processes, not just outcomes. Considerations then lead to the goals for, and administration and enactment of, curriculum and pedagogic practices supporting learning for adaptable occupational practice.

The contradictions between vocational education's goals and behavioural approaches

As has long been discussed, there are contradictions between governmental choice of a behavioural (e.g., competency-based training) approach to vocational education and goals intended to be achieved (Jackson, 1993; Stevenson, 2005). There are clear misalignments between explicit goals associated with developing adaptable, flexible and responsive workers and the choice of an educational approach focussed on demonstrable and measurable outcomes (Stevenson, 1991). It is processes of human thinking and acting that secure these kinds of outcomes as has been long recognised in studies of expertise. Long understood also is that measurable kinds of outcomes from observable performance (i.e., behavioural objectives) are only effective in reporting elements of human performances at the lower end of the scale, such as specific procedures and recounting factual knowledge (Hogben, 1970). While useful for these purposes, these kinds of objectives fail to capture and promote the kinds of higher order procedural and propositional knowledge required for demanding work activities, problem solving within a domain of occupational activities, not to mention adapting what is known to novel circumstances or tasks (Chi, Glaser & Farr, 1982; Ericsson & Lehmann, 1996; Glaser, 1989; Schmidt & Boshuizen, 1993). It is these kinds of outcomes that government claims it wants. The processes underpinning these kinds of capacities are neither observable nor measurable.

Such qualities are also evident in what are labelled '21st century skills'. These skills comprise critical and creative thinking; effective collaborating and communication; being literate with information, media and technology; and personal capacities of flexibility, initiative, sociality, productivity and leadership. These capacities are reliant on both learning processes to be acquired and dispositions to be applied, neither of which is adequately addressed by behavioural measures. So, as long argued, the capacities required by students and workers for being competent in the provision of goods and services, are vested in processes of thinking and acting that go beyond those that can be captured or guided by behavioural measures (Evans & Butler, 1992; Stevenson, 1992, 2001). The development of these capacities (i.e., what individuals know, can do and value in their situated practice) needs to be central to the kinds of statements of intent selected to drive provisions of vocational education and the kinds of educational experiences selected to achieve those outcomes.

These educational aims, goals and objectives have to account for the qualities of the occupational knowledge workers need to learn and apply (Velde, 1999). Such knowledge needs be to be occupationally adept (providing the bases for enacting individuals' occupations). It also needs to have capacities to adapt and respond to immediate challenges and reconfiguring their work and work practices to respond to the challenges of changing times and work requirements, as long argued. These capacities are more than technical knowledge (Stevenson,

1994). There is also the need to generate and evaluate skilled performance as work tasks become complex and as situations and processes change, to reason and solve work problems; to be strategic, and to innovate and adapt.

This means that students completing vocational education programs are expected to have developed the capacities that address (a) the specific requirements of their particular occupations, (b) how those occupational requirements are manifested in workplaces (i.e., requirements for actual work performance), and (c) the requirements to innovate and offer novel and viable solutions to emerging occupational and workplace changes. Whilst these are difficult-to-achieve educational goals, they reflect the challenges that working life presents graduates and what governments and employers are requesting of vocational education graduates (Billett et al., 1999). What such graduates can expect, moreover, are constant changes in their occupations, the kinds of work they do, how that work is undertaken and with whom they work (Billett, 2006; Noon & Blyton, 1997; Van Horn, 1996). Achieving these kinds of goals requires being guided by informed and adequate statements of intent, considered focus on content taught and sets of experiences that are directed towards the development of these kinds of thinking and acting. This leads to the question of why measures such as pre-specified behavioural educational outcomes as deployed in competency-based approaches (Hogben, 1970; Meijers, Lengelle, Winters, & Kuijpers, 2016) and the associated administrative measures are favoured by governments and supranational agencies.

Imperatives driving provisions of vocational education

Most education systems in Western-style democracies were formed and are now organised and ordered by the state. There is no questioning here of the right of democratically elected governments to decide the goals for, and shape and form of, national vocational educational systems or to direct teachers to achieve the educational outcomes that nation states want achieved. It is also accepted that desired outcomes and preferred practices will change in response to societal or economic imperatives. There is also a democratic obligation given the expenditure of public funds to consult widely in the decision-making processes within and about vocational education so they are fully informed. This includes accounting for and reconciling the various views and preferences of those who can inform the shape and form of the educational provisions. That part of educational science addressing curriculum emphasises the garnering of diverse views and filtering their contributions using disciplines of sociology and psychology to mediate the influences of powerful voices (Brady, 1995; Print, 1993), through the former, and how desired learning might be understood and learnt, in the latter. Then, the filters of philosophy order the worth of what is intended and enacted (e.g., in whose interests is it enacted). Sociology helps to consider in whose interests these arrangements are being progressed and how that is achieved; psychology informs how these arrangements support the required kinds of learning. Recourse to these filters is not to inhibit or deny governments of their purposes, but to assist making the decisions about those purposes the most appropriate, their presentation as intents coherent, their content well aligned and their preferred educational processes considered and comprehensively informed. Yet, such practices present now as an anathema in an era of executive government that is seemingly driven with the equivalent of Aristotle's dental nous.

The reason for such filters is that the curriculum processes can become distorted when particular interests dominate deliberations about and outcomes of generating intents, content, and selecting educational processes. Beyond the claims of governments about vocational education being 'industry led' are those who are excluded from this leadership. Also, what qualifies 'industry' to unilaterally provide educational leadership when their competence is partial and only can offer one perspective? Whilst industry representatives have long suggested that teachers do not understand the business of business, there is little evidence that these

representatives understand the processes of education or learning (Billett, 2004). Moreover, as many of the teaching work force in vocational education have had extensive industry experience and have been employed on that basis, surely their voices should be included, rather than excluded, from the process of curriculum development and they should be centrally involved in decisions about its enactment (Baverstock, 1996; Brennan Kemmis & Green, 2013; Marland, 1987). Not the least here are understandings about the diversity of occupational practice, and how they can be learnt. Progressing in mature, inclusive and responsive ways, the range of contributions to decision-making about vocational education, including perspectives of educational science, is in the interests of students, workers, workplaces and stakeholder groups within nation states (Billett, 2013). All of this goes to the heart of the worth of vocational education and how it is perceived societally as a form of education.

Beyond governmental imperatives and those of professional bodies and employers are the needs of individuals who work and learn, and also who invest time and money in such a system. Broadly, what governments propose as being central to realising positive national economic and social outcomes are aligned with what individuals often want and need to learn. The capacities required for employability are likely to be shared: to engage effectively in paid work, have the capacities for advancement, transfer to other fields of employment and sustain employability across lengthening working lives through adapting to changing work requirements. Of course, there are complications in the detail amongst broad industry requirements, specific capacities that enterprises want and those that individuals need for their employability. There is probably more overall commonality than differences, however, in what individuals, enterprises, communities, professional bodies and national governments want. The task and responsibility that falls to those contributing to and utilising educational science, broadly cast, is to offer viable contributions to the decision-making and effective practice within vocational education associated with those constraints. Yet to do so also requires acknowledging that vocational education faces the particular conundrums that limit is potential.

Conundrums of vocational education

A fundamental conundrum for vocational education is its positioning as an educational sector that needs to develop capacities for particular kinds of occupations and in instrumental ways; however, it requires rich educational processes to be successful in that task. Its instrumental focus has consequences for how it is perceived in the community, the status and standing it attracts, the expectations it raises and how it is to be governed and enacted (Billett, 2014). Many vocational education systems were initially established and their subsequent form and direction shaped by imperatives of newly formed nation states and industrialisation (Greinert, 2002; Hanf, 2002). These imperatives were often associated with (a) the collapse of the existing modes of skill development in family and small businesses because of industrialisation (Greinert, 2002), (b) the development of the kinds of skills that were required for industrialisation, and (c) nation states seeking to avoid high levels of youth unemployment and disengagement (Gonon, 2006). The standing of occupations such as those served by vocational education provisions is deeply rooted in societal values (Billett, 2014). This influences how they are valued and the processes of preparation adopted. Much of those societal values have been generated and sustained across human history by societal elites who knew little about them nor appreciated their complexity and demands, yet often made judgements about what forms of education were required for their preparation. It is possible to draw a parallel with what Giddens said about state schooling in the UK: that is, that for the last hundred years the people who have legislated about state schools would never dream of sending their children to them (Giddens, 1997). The issue for many occupations is that such judgements have been perpetuated across very many centuries.

It is not surprising, therefore, that considerations of vocational education systems are at risk of being premised on views about them having low value and worth. Beliefs, such as that the knowledge required for performing these occupations is non-demanding, simple, easily learnt and not requiring higher order capacities, leads to views that these educational provisions need to be commensurate. Yet the evidence suggests that requirements for non-routine problem solving and, therefore, higher order cognitive capacities are apparent across all occupations and not markedly different across classes of occupations (Billett, 1994; Billett, 2015). This requirement seems to be acknowledged in countries such as Germany, where skilfulness is valued (Deissinger, 2002), but rejected in Australia. This is despite the OECD claiming that workers in Australia perform the highest level of problem-solving of the 34 countries surveyed to date (OECD, 2013). Focused on occupations that have low status, and premised within pragmatic purposes, vocational education has often become accordingly organised and enacted. The result is that vocational education is often being viewed as highly instrumental and non-educational, and subject to disdain by educators, the schooling system and parents. Views that these occupational capacities are simple or easy to learn (i.e. short-term training, low-level certification), as noted, justify reducing the duration of preparation,[2] and support the notion that they can be captured with measurable outcomes (e.g. competency-based assessment), and can be ordered in hierarchical qualification frameworks (e.g. Australian Qualifications Framework, European Qualifications Framework, German Qualifications Framework). There are beliefs about the limited capacities of those who undertake these occupations, which translates into them not requiring a voice in deliberations about curriculum, with others speaking on their behalf. Almost universally absent are the voices of those who study and learn through vocational education. It is the learners who are the key objects of this educational provision, and whose efforts and engagements will ultimately shape their effectiveness.

Within such arrangements, those who perhaps know the students best and are well positioned to provide for them – vocational educators – are positioned as mere implementers of what others have decided is good for their students (Marland, 1987) through educational provisions that are often lowly ranked on qualification frameworks. Because this occupational knowledge is held to be easy to learn, vocational education can also be burdened by unrealistic expectations. As vocational education is presumed to be straightforward, failures in the ability of vocational education provisions to secure the kinds and level of occupational and enterprise-specific knowledge employers state they want and in the time they expect, leads to inevitable blaming. Not the least consideration here is that it is not usually known where vocational education students will find employment upon graduation. Making them 'job ready' is, therefore, difficult given workplace requirements are diverse, even when the same occupation is being practised. Hence, it is important to provide an education that prepares students for adaptions, not just uniform, measurable, industry-level outcomes.

The positioning of vocational education as very pragmatic comes at the cost of its being of low status in societal sentiments and set apart from the valuing of education in terms of its potential for expanding opportunities, rather than narrowing them. Most notably, in countries where academic achievement is most prized and competitive (such as Singapore, South Korea, France), vocational education is seen as a least preferred option, restricted to low academic achievers. The clash between societal sentiments and perceptions of vocational education and the occupations it serves, is characterised by a lack of engagement by community, parents and students (Cho & Apple, 1998). In countries that champion the development of occupational capacities (e.g. Germany), conversely, they are embraced as having great educational worth and deserving of dedicated institutions and robust educational practices, including having

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[2] It is noteworthy that at the end of the Second World War, medical education and apprenticeships were both six years in duration in Australia; whilst the former remains unchanged; the latter have been reduced to three and occasionally four years.

occupationally specific pedagogies (Deissinger, 1994, 2002). Hence, there are costs associated with the positioning of vocational education as highly instrumental and then limiting its reach by viewing the knowledge it seeks to secure as being easy and straightforward to learn. Not the least of these costs is the barriers it creates in terms of engaging young people, their parents and communities. Competency-based binary assessments (e.g. fail/pass) used in countries such as Australia, for instance, do little to promote a sense of engagement with an education system that distinguishes itself in non-graded assessments of competence. The students either pass or are deemed not yet competent.

This issue of student engagement is often underplayed, which is surprising given the issues of engagement and retention that plague these systems. It is important that those practising an occupation come to view it as their vocation (Dewey, 1916). Vocations are something with which they elect to identify and be associated. This likely drives their intentions and energies in learning about and sustaining their occupational competence. That need for such engagement is perhaps never more important than when educational processes require demanding effort for learning content that is unlikely to be able to be taught, such as the list of 21st-century skills. Most of these skills are of the kind that need to be learnt rather than taught. Given the changes in work requirements, the need to adapt and respond to emerging challenges, that sense of vocation is important for sustaining occupational competence across lengthening working lives. Hence, educational outcomes and processes that are not commensurate with the quest for vocation, may work against achieving these outcomes.

In sum, vocational education is an important and worthwhile project for (a) developing the capacities required for meeting societal needs and wants (e.g. social and economic goals), (b) assisting individuals identify with and become competent in their selected occupation, and (c) sustaining that competence across lengthening working lives, all of which are dependent on processes of thinking and acting. Vocational education suffers, however, from low status, domination by external interests, negative societal sentiments, and unhelpful regulation, and is often inadequately supported by appropriate educational practices. Beyond advising how vocational education should best progress, educational science also needs to contribute to redressing negative societal sentiments that have tolerated the imposition of narrow behavioural approaches to an educational project that requires stronger standing and educationally grounded approaches.

A worthwhile and mature national vocational education and training provision, instead, needs to (a) focus on securing students' vocations as outcomes, (b) identify ways of engaging with and giving discretion to those participating and enacting it (e.g. students and teachers), (c) deploy curriculum models and pedagogic processes that accommodate local needs and requirements within a national set of goals, regulations and content, (d) elevate the standing of vocational education and the occupations it serves, and (e) promote the excellence individuals want, not just the competence somebody else pre-specifies for them (Billett, 2013). These five educational outcomes are beyond the scope of a competency-based approach to vocational education. So, to realise such outcomes, it is necessary to consider what alternatives can be derived through a consideration of curriculum and pedagogic practices for vocational education, as informed by educational science.

Curriculum and pedagogic practices: developing adaptable vocational knowledge

Having critiqued current orientations, approaches and outcomes, in this section, considerations of how curriculum and pedagogic practices can develop adaptable or robust vocational knowledge are advanced. Curriculum here is taken broadly to refer to the kinds and sequencing of experiences that are intended, enacted and, ultimately, engaged with by learners. Pedagogic practices are those that can augment those experiences to secure intended learning outcomes. They extend to how learners can be actively engaged in learning processes. There are no

guarantees in either curriculum or pedagogic practices, however. How the curriculum and pedagogies are enacted and engaged with by learners (students, apprentices and workers) will always be subject to a range of factors. Not the least of these factors are learners' interests, capacities and readiness. The considerations here, however, offer bases that might best generate the kinds of outcomes that governments, employers, communities and learners themselves seem to want: adaptable occupational knowledge.

Curriculum practices

The key challenges for vocational education curriculum are to develop in students (a) an understanding about their selected occupation, (b) the canonical knowledge of the occupation, (c) occupational principles and practices that can be adapted to particular work settings and tasks, and (d) the broad range of capacities required to achieve these goals. Dewey (1916) broadly captured these goals as assisting individuals identify the occupations to which they are suited and then assisting them develop the capacities required to practise that occupation in ways that are important to individuals and those with whom they associate. When I was teaching in a clothing design and production course in vocational education, it was necessary to provide students with a range of capacities associated with garment construction, pattern-making, pattern-grading, textiles and so on. These comprised the knowledge required to manufacture garments commercially. It was also necessary to engage students in understanding the variations brought about by different styles, fabrics, production requirements and cost factors. Students would learn how to cut a pattern for and construct a skirt. But they also had to know about how different fabrics required more or less stride room, and would be more or less suited to being made into a skirt. They needed to know a range of manufacturing techniques that would be required for different kinds of skirts, fabrics, their waistbands, openings and hemming and so on and at different costs. Then, sitting within all of this was an overall set of concerns about the standards and quality of production, their fit to a particular size and, of course, marketability of the garment. Beyond teaching canonical occupational knowledge it is necessary to develop the students' informed principles and practices (Glaser, 1984) that permitted them to adapt what they knew, could do and value to the garments they would design and manufacture. A way of achieving this outcome was for students to design and produce their own garments that exposed them to a range of considerations required to conceptualise the garment, produce patterns from which the garment components would be cut and how it would be manufactured. All of this occurred in highly engaged and personally relevant ways (i.e., it was their garment). This process was founded on students developing informed principles and practices.

Not all occupations might lend themselves to this approach but many would. The development of informed principles and practices appears to apply to a range of occupations such as professional cooking, hairdressing, building and construction, metal fabrication and so forth. These informed understandings and procedures that come to comprise individuals' personal domain of occupational knowledge are helpful for responding to changing work situations and circumstances. When preparing photocopy repair technicians, for instance, it was found the problem-solving tasks required for this work (fixing machines that were not working) was premised on technicians having a foundation of concepts and procedures associated with the operation of photocopiers (Orr, 1996). Once established, that foundation could be subsequently enriched with 'war stories' told by experienced technicians that assisted problem solving. These provided the heuristics (i.e. 'tricks of the trade' to achieve outcomes) that assisted this role. Aircraft technicians' base of informed principles and practices was also central to their being able to utilise heuristics and 'least-effort' strategies when maintaining combat aircraft (Gott, 1989). Importantly, these foundations mediate individuals' process of experiencing what might be novel problems.

This approach is not the only way to develop domains of personal knowledge founded on informed principles and procedures, and to develop abilities for responding to non-routine tasks, novel circumstances and emerging requirements for work. An alternative is for learners to have experience of the occupation in practice and then use that as a basis for engaging the canonical domain-specific concepts, procedures and dispositions offered through a vocational educational program.[3] Such an approach positions learners as informed mediators of what they have experienced, including what is taught them, and reconciling it with what has been previously experienced. A further variation is a well-established alternate approach, found in many apprenticeship schemes combining experiences in practice settings with those in educational institutions within the same period of time (i.e. day release, block release) requiring learners to mediate experiences in two distinct kinds of setting as a way of generating these principles and practices.

Curriculum considerations: learners' mediation and experiences provided

The important points for curriculum here are the provision of experiences that give access to canonical occupational knowledge, contextualised through instances where that knowledge is practised, and also for students to engage in an active mediation of that knowledge through those experiences. This is not necessarily a hierarchy of canonical knowledge, as general, and practice experiences, as specific. Instead it is the importance of the relationship between them that is central to students' development of personal domains of occupational knowledge. These domains are what individuals draw on when engaging in occupational tasks. They are founded on informed practices that are applicable to particular work settings, and adaptable to others, as well as new and emerging occupational challenges and transformations in work. Indeed as Lave and Wenger (1991) suggest, 'the generality of any form of knowledge always lies in the power to negotiate meaning of the past and future in constituting the meanings of present circumstances' (p. 34).

What is suggested here is not to focus on achieving specific and nationally consistent measurable outcomes. More appropriate is an educational focus on identifying the kinds and sequencing of experiences through which students' principled understandings and adaptable procedures are acquired. This is likely to be far more appropriate and efficacious. Students' mediation and negotiation of what they experience within work and educational settings is more aligned with generating the kinds of knowledge being requested of vocational education by governments, industry, workplaces and learners. The ability of these experiences and individuals' mediation to generate the kinds of higher order thinking and acting required for demanding human performance such as effective work is supported across Vygotskian (Vygotsky, 1987), socioculturalist (Rogoff, 1995), cognitivist (Van Lehn, 1989), anthropological (Ingold, 2000) and sociological (Giddens, 1991) accounts. These perspectives commonly emphasise the salience of individuals' acts of meaning-making, not just the focus on teaching or detailed educational specifications. The desired outcome for vocational education students, whether neophytes or old-timers, is the appropriation of what they learn through these experiences (Leontyev, 1981). This is distinguished from engaging in processes of mastery (Wertsch, 1998). That is associated with efforts directed towards meeting the requirements of educational institutions, their teachers and assessments. Appropriation drives individuals' intentionalities as workers and learners, and directs their efforts in engaging in work and associated learning.

Central here also is the important goal for vocational education of learners coming to assent to that occupation being their vocation. Coming to identify and engage subjectively as

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[3] In one Danish radiography course the students are sent into hospitals on the second day of their program and participate in an extensive period of practicum prior to the college-based components of their course.

occupational practitioners who have appropriated its cannons and are able to adapt them to different tasks and circumstances is made intentional by such vocations. This is what governments, employers, communities, workers and students all state they want. Such an outcome centres on learners and the provision of experiences and the augmenting of those experiences to secure these outcomes.

Rather than just sequencing of a set of activities, the qualities of those activities in terms of adapting more broadly what is being learnt, means that opportunities for honing and development of specific procedures are required. Also, coming to understand how procedures need to be enacted in particular ways and sequences, and taking to account a range of crucial factors, can promote adaptability.

Monitoring/evaluating the curriculum as enacted

In terms of monitoring, evaluating and auditing the enactment of curriculum, these factors suggest that more than being fulfilled by indications of content covered (i.e., industry competencies checked), the focus should be on processes. The requirements for institutions and teachers offering vocational education might focus on the degree by which, and frequency of, experiences provided for student support in addressing specific requirements. There could be particular requirements to identify how what is taught is also combined with experiences that press students into intentionally extending what they have been taught and learnt to other circumstances and situations. The frequency with which students are engaging in non-routine activities such as domain-specific problem solving, sharing, comparing and evaluating responses through group processes (Collins, Brown & Newman, 1989) is a helpful measure for evaluating the development of these kinds of capacities. Evans (1991) claims that the more students learned through discovery or discussion of these kinds, the less they applied rules in an unconsidered and non-critical way, and the more they learned to be selective about how they applied those rules. These discussions may benefit from support or guidance of some kind by more expert others (teachers, workplace supervisors) as it is insufficient just to bring students together (Fischer, Bruhn, Gräsel & Mandl, 2002); tools such as visualisation or some other device can assist in this developmental activity. The frequency of students' engagement in these activities stands as a more effective means of evaluating the enacted curriculum than checking whether industry standards have been adhered to in its enactment.

It follows that curriculum processes should be directed more towards the provision of experiences than focused on the measurement of prespecified outcomes. Particular kinds of experiences are required to develop individuals' domain of canonical occupational knowledge. This knowledge comprises what is needed to be known, done and valued as canonical occupational knowledge, including the development of informed principles and practices. Having considered these questions of vocational curriculum, it is helpful to consider how pedagogic practices can be used to augment and support these experiences.

Pedagogic practices

Pedagogic practices are those that enrich or augment experiences provided for students. Learning the kinds of knowledge required for effective occupational practice is often demanding. It is necessary to variously support, guide and press students in that learning process. The development of these understandings and procedures is subject to learners' engagement and effort. It is learners who have to exercise their conscious efforts to develop the propositional links and associations (e.g., the sewability of different fabrics), and rehearse both specific and strategic procedures (e.g., the ability for items be manufactured consistently). These kinds of outcomes are unlikely to be the product of didactic presentations or one-off events because sustained engagement in conscious thinking and acting is required by those who

are learning. Engaging students in activities in which concepts are applied episodically, and also providing opportunities for procedural capacities to progress from awkward approximations of observed performance to honed performances of those practices (Gott, 1989) is helpful. There is nothing particularly fanciful here. These capacities and suggestions for their development have been long acknowledged in cognitive science (Chi et al., 1982; Larkin, McDermott, Simon & Simon, 1980) and are what differentiate experts from novices (Ericsson, 2006).

These differences can be divided into three sets of interrelated qualities: the memory of relevant problem details, modes of categorising problems, and problem-solving strategies (Sweller, 1989). Such capacities arise from the kinds of experiences individuals have had and how they come to engage with them, far more than being taught. Educationally related activities that engage and contextualise tasks can promote their recall and utilisation through being embedded in particular physical and social settings. Engagement in activities requiring problems to be addressed, and solutions appraised and monitored, is likely to develop the means by which problems will be categorised by individuals, and also to develop understandings of the efficacy of different kinds of solution strategies. From a sociocultural constructivist perspective, Scribner (1984, p. 23) states that:

> Skilled practical thinking incorporates features of the task environment (people, things, information) into the problem solving system. It is as valid to describe the environment as part of the problem-solving system as it is to observe that problem-solving occurs "in" the environment.

Scribner (1984) notes that novices become more expert through becoming more familiar with the setting (i.e., the specific social, symbolic, technical, and material resources) and actively using it to complete assigned tasks with ever greater success. These experiences lead to the construction and development of domain-specific occupational schemas. These are what individuals construct and which subsequently permit them to recognise problems and problem states as belonging to a particular category that likely requires a particular action (i.e. solution strategy) (Sweller, 1990) and whose progress can be monitored on the basis of predicted responses. It is these processes used by experts to generate responses to a problem that lead to their developing and using them in a forward-working solution strategy; that is, to engage them in goal-directed work activities.

Enacting pedagogic practices

It may be inefficient and not always helpful, however, for the development of these schemas to arise just through engagement in multiple problem-solving tasks and episodes (Sweller, 1989). Activities that include support for learners such as those with 'half-worked' problems are held to be effective, for instance. They reduce the demands (i.e. the cognitive load) of tasks, thereby permitting individuals to consciously focus their thinking on aspects of the tasks to be learnt. When I was teaching a process called pattern making, part of that task was to understand how the pattern is to be manipulated to generate the range of pattern sizes. Additional opportunities for students to assess the novel pattern pieces were provided to reinforce the principles students already knew about where and how to increase/decrease pattern sizes, and extend these to unfamiliar garment patterns and components. This activity was presented to students in the form of pattern pieces scaled down onto a single A4 sheet of paper and the students had to indicate how the pattern components would need to be manipulated to create the range of sizes. The intention here is to focus activities on particular aspects of the learning process, not just to provide an experience.[4]

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[4] At the time, as a novice teacher, I recognised the need to augment the students' experiences, but only later found the explanation of its efficacy.

The quality of educational experiences can be understood, in part, by the degree to which they generate task environments conducive to utilising and developing the kinds of knowledge needing to be learnt. The organisation and enrichment of those experiences arise in ways that effectively develop these occupational-specific informed principles and practices. This outcome includes an understanding of what activities or actions are appropriate or inappropriate for the completion of (work) tasks (Goodnow, 1990). These experiences can develop capacities to make judgements about how they might come to think and act when responding to engaging in their work and also to novel tasks (Collins et al., 1989) within the domain of occupational activities. Such experiences are also particularly helpful for developing capacities premised upon both conceptual and procedural learnings, as they are brought together and integrated (Billett, 2015).

When students come to engage as conscious, creative members of a work community they can adopt and/or adapt the kinds of practices of that community (Brown, Collins & Duguid, 1989). This engagement is salient as the kinds of activities occurring in educational settings are often quite remote from, or at best substitute for, those that vocational education students need to learn about. Hence, efforts to engage students in activities that are authentic in terms of the occupation being learnt are potentially important. As stated much earlier: activity structures cognition (Rogoff & Lave, 1984). So, approaches to supporting that learning might aim to place the learners at the centre of the educational processes. The focus on cognitive apprenticeships (Collins et al., 1989) and reciprocal teaching and learning (Palinscar, 1990; Palinscar & Brown, 1984) places students in the role of the practitioners to encourage their thinking and acting to be that of occupational practitioners; hence, activities embedded in the tasks undertaken by those practising their occupation are likely to have outcomes (i.e. kinds of learning) that are distinct from those which arise through schooling-type activities (Billett, 2003). Medical students and junior doctors are told to remember medical conditions by associating them with the patients whom they first encounter with those symptoms (Sinclair, 1997). The consideration here is about how experiences are provided for students to develop these principled understandings and procedures through pedagogic practices.

Engagement by students

More than what is provided for students, what they learn from these provisions is primarily based on how they elect to engage in them (Posner, 1982).The extent to which students engage in thinking and acting through curriculum provisions and pedagogic practices is held to be commensurate with the quality of learning outcomes. Stevenson (1991) compared two approaches used in vocational education classrooms – one with students progressing through set tasks and only seeking teachers' help when faced with an insurmountable problem, and one in which each step was managed by the teacher. The former developed higher order thinking and acting of the kind required for adaptable occupational competence. So, pedagogic approaches that position learners as engaging in the thinking and acting are those likely to secure the adaptability required for addressing novel problems and circumstances.

Developing 21st-century skills

Finally, it is worth discussing the development of what are referred to as 21st-century skills. This set of capacities, as outlined above, is the latest in a series of broad competences held to be key requirements for contemporary employment and employability. Sometimes, these are referred to as generic competencies, employability or core skills. There has been much written about such capacities, including their worth (Beven, 1997). The degree by which these are either stand-alone or needing to be embedded in occupational tasks for both their efficacy and their learning is an important consideration. Typically, such broad sets of competence are held

to be meaningless unless they are embedded within a particular occupational practice. No amount of general problem-solving capacities can respond to problems, when there is a lack of domain-specific knowledge. Also, the qualities of communication, problem solving, creative thinking, technical literacy, and so on can only be understood in the context in which communication, problem solving, critical or creative thinking, technical literacy, and the like have meaning, are deployed and can be judged. The requirement for these capacities to be broadly applicable suggests that measures need to be undertaken to secure that outcome.

As discussed above, rather than assuming that teaching such skills would lead to transferability or adaptability to other contexts, it is proposed that such capacities are best situated in and identified as part of a particular practice and problem scenarios. That identification extends to the appropriateness of communication, problem solving, and so on. Something such as etiquette or safety, for instance, can be understood in one context and then considerations extended to other contexts. Hence, when understood, pedagogies can be used to assist students identify the applicability of such skills to other circumstances. Through the development of informed principles and practices, these kinds of capacities are most likely to be adaptable elsewhere.

Vocational education beyond competence

In sum, this paper has proposed that there is a need for vocational education provisions to go beyond organisation through narrow behavioural measures of competence and the accompanying administrative measures. In keeping with what governments claim they want, what workplaces claim they need and what workers desire, the focus should shift to a consideration of learning *processes* to develop adaptable occupational knowledge. There can be no guarantees, but approaches focusing on developing individuals' personal domains of occupational practice comprising a foundation of canonical knowledge, with well-informed principles and practices, offer a means by which routine and new tasks, novel requirements and emerging requirements for work can probably best be addressed. As clearly indicated by the choice of literature, there is nothing particularly novel about the suggestions here. These suggestions arose earlier and were part of an original critique of competency-based training in vocational education. What they rehearse is largely what is known about what constitutes human expertise within particular domains of activities and the development of that expertise. However, what is distinct from the current focus on competence is a clear shift away from the privileging of external standards, measurable performances and institutional requirements, to a process approach focussing on learners' needs, what experiences are provided for them, how they come to engage and how curriculum and pedagogic practices can guide and support that learning.

The requirements for contemporary and emerging work life suggest that educational intents and provisions need to meet both occupational and situational requirements for effective work performance. Greater discretion is probably required for those who variously teach and support learning in workplaces to provide experiences that can meet local circumstances. Rather than being top down and prescriptive, such arrangements necessarily require rebuilding partnerships with local enterprises and communities. After several decades of using narrow competency measures, national standards and the deskilling and deprofessionalisation of vocational teachers, additional effort is now required to enhance their curriculum knowledge and pedagogic competence. Here, it might be helpful to consider the models from Germany where each discipline has its own pedagogies and these are developed and refined collaboratively between those who prepare teachers and those sectors that employ graduates of the vocational education programs in which they teach.

Yet, probably the greatest challenge for vocational education is the perennial issue of its standing. It is difficult to summon interest, engage parents, and engage industry and

enterprises in productive ventures, let alone garner governmental support, when the knowledge required for effective occupational practice is downplayed and marginalised, and the shortest and most cost-efficient models of education are selected for implementation. Hence, revitalised efforts to champion the importance of these occupations, the demands and complexity of their skilful requirements and the intricacies associated with the learning of this occupational knowledge may well be required. What has been proposed here is that just as those who are experts in their fields recognise the importance of the processes they deploy in being occupationally competent, these kinds of processes need to be adopted and enacted in vocational education. Rather than a focus upon narrow measurable outcomes, going beyond competence requires a consideration of thinking and acting processes as central to the focus of the intended outcomes of vocational education, privileged in its enactment and something developed in its students.

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