Evaluative judgement of working practices: reconfiguring assessment to support student adaptability and agency across complex settings

Evaluative judgement delle pratiche operative: verso una riconfigurazione della valutazione per supportare la capacità di adattamento e di azione degli studenti in contesti complessi

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ABSTRACT Research into sustainable assessment highlights that students must not only learn to evaluate their final products and performances but also the processes of learning they engage in while producing these final outputs. However, what is missing in this research is a focus on practices – the specific activities that are undertaken in completing tasks – and on how these are adapted to different, increasingly technologically-mediated environments. The capacity to improvise, to work around or subvert formal or expected procedures, and effectively adjust working practices, is critical for learning to operate across different situations, with different combinations of people, technologies and systems. Drawing on examples from sociomaterial research in educational and clinical environments, we argue that developing evaluative judgement of working practices will help students to overcome some of the challenges of moving between university and professional settings. To this end, we propose a reconfiguration of assessment to encourage visibility, creativity and dialogue around the idiosyncratic activities that students engage in while learning.

KEYWORDS Evaluative Judgement; Assessment; Process; Sociomaterial Research; Collaboration.

SOMMARIO La ricerca sul *sustainable assessment* sottolinea l'importanza del fatto che gli studenti apprendano a valutare non soltanto i propri prodotti e le proprie performances, ma anche il processo di apprendimento che hanno attivato per realizzare tali prodotti. Tuttavia, una lacuna della ricercain

questo ambito è l'attenzione alle pratiche, ovvero alle specifiche attività svolte per portare a termine i compiti oggetto di apprendimento, e su come esse si adattino ai diversi contesti, sempre più mediati della tecnologia. Essere in grado di improvvisare, modificare o sovvertire le procedure formali e tradizionali e adattare le proprie pratiche lavorative è una capacità fondamentale per imparare ad operare in diverse situazioni con combinazioni sempre diverse di persone, tecnologie e sistemi. A partire da esempi della ricerca socio-materiale in contesti educativi e clinici, sosteniamo che lo sviluppo di una capacità di *evaluative judgement* delle proprie pratiche lavorative aiuti gli studenti a superare alcune delle sfide del passaggio tra università e mondo del lavoro. A tal fine, proponiamo una riconfigurazione del concetto di valutazione che incoraggi visibilità, creatività e dialogo sulle attività idiosincratiche svolte dagli studenti mentre imparano.

PAROLE CHIAVE Evaluative Judgement; Valutazione; Processo; Ricerca Socio-materiale; Collaborazione.

1. INTRODUCTION

In this paper, we consider how assessment at university can be reconfigured to align more closely with evolving social and technological working practices. This, we suggest, should entail a focus on enhancing students' capacity to evaluate and adapt their ways of working to a range of complex, socially and materially distributed environments characteristic of contemporary workplaces. By focusing on practices, assessment becomes more sustainable and graduates are more likely to succeed in a variety of settings. To this end, we present some recommendations to support the development of evaluative judgement of working practices through assessments that encourage engagement and dialogue around «*the activity involved in getting work done*» (Brown & Duguid, 2002, p. 97).

1.1. *Principles of sustainable assessment*

A number of assessment and feedback scholars have argued for assessment in higher education that is sustainable - resonating beyond specific educational programmes and preparing students to continue to assess their own learning and learning needs (Boud, 2000; Boud & Soler, 2016; Lindberg-Sand & Olsson, 2008; Tai, Ajjawi, Boud, Dawson, & Panadero, 2017). A cornerstone of this thinking is that students should develop the capacity to understand quality within a domain, and evaluate and enhance their own work (Boud & Soler, 2016). It is this development of evaluative expertise that allows students to become independent practitioners, capable of operating apart from the scaffolding and supports of formal education, such as teacher comments, guidance and feedback (Sadler, 1989). Methods such as self-assessment (Higher Education Academy, 2012; O'Donovan, Rust, & Price, 2015), peer assessment (Nicol, 2014; Nicol, Thomson, & Breslin, 2014; Sadler, 2010), dialogic feedback (Boud & Molloy, 2013) and the use of exemplars of varying qualities (Nicol, 2010; Sadler, 1989) are considered effective means of developing the kind of evaluative judgement that students need to be able to make independent decisions about the quality of their work and that of others (Nicol et al., 2014).

While this scholarship has illuminated how students come to understand quality *work* (noun), there has been less focus on understanding the quality of *working* (verb). Sadler (2015) advocated helping learners to make judgements on their work as they produce it, and Nicol (Nicol, 2014; Nicol & Macfarlane-Dick, 2006) and others have focused on particular kinds of processes (e.g. peer review and self-assessment) to enhance the cognitive capacity of students to engage with products and processes. However, there remains a need for ways of helping students to evaluate the specific, social and material practices (i.e. activities produced through the emergent interactions between people, objects and technologies) that individuals or

groups employ in producing such work or in enacting such processes. Further, approaches to enhancing student agency are often directive in terms of which resources should be used and how tasks should be carried out. This constrains the possibilities for students to discover other or better ways of working, or achieving different, but still valid, outcomes (i.e. learning how to be adaptable through subversions, workarounds, and bottom-up practices).

While we recognise the value of students taking responsibility for their learning, following effective processes, and producing quality work, we also argue that no one can be given full control of these things. As Fenwick and Edwards (2016) pointed out, responsibility cannot be entirely rational and pre-determined, it is dynamic and relational, distributed across people working together, the environment in which activity takes place, contextual elements (e.g. rules, policy, laws), etc. Thus, beyond individual skills and capacities, students need to develop the potential to act effectively and appropriately in combination with available people, technologies and systems that limit and constrain or, indeed, facilitate and enhance their practices. The rapid pace of technological change makes this issue ever more pressing.

By acknowledging the situated nature of agency, we can adapt our teaching to better prepare students for the workplace. If employers are interested not just in what a student has done during university, but what they will come to be able to do in the future, it may be useful for students to understand, evaluate and articulate how they have learned to learn, and how they have been able to adapt their ways of working to suit the different contexts in which that learning has taken place. For this reason, we propose making explicit and assessable the practices through which processes of learning are enacted. If students can appreciate *how* they have gone about getting better at producing assessed work, *what* they have drawn on to do this, and *how* they can put this understanding to good use in subsequent tasks, then they are likely to be better placed to enhance their future learning and performance.

2. WHAT IS BEING ASSESSED?

2.1. *Product and process as performance*

Normally, in producing a submission for assessment, students will need to evaluate their work, whether that be a product (e.g. an essay, portfolio, examination paper) or a performance (e.g. a medical procedure, a presentation, a music recital). In other words, the assessment characteristically involves judgement on a bounded and discrete performative act or resource. It is the quality of the final work (noun) that has typically been assessed, rather than the quality of the work (verb) that went into producing it.

This traditional focus in educational assessment risks taking it for granted that the quality of a product reflects the quality of the activities that went into producing it. Assessment should, as Govaerts and van der Vleuten argued, not only «*focus on learning outcomes, but also* (and perhaps even more so) *on the processes underlying learning, performance and performance interpretations in dynamic, complex workplace settings*» (2013, p. 1169). Examples of this include disciplines such as art, architecture and mathematics, where importance is placed not only on the outcome but how that outcome has been achieved. Formal assessments of art submissions, for example, will often include preliminary sketches, rough notes and reflections which will be examined in relation to the thinking behind the composition (de la Harpe et al., 2009). In mathematics, it tends to be unacceptable to arrive at a correct answer via guesswork, and assessment requires an account of how the problem has been worked through and solved, both to evaluate and to support the student's ability to «*think mathematically*» (Brown, Collins, & Duguid, 1989, p. 37).

2.2. *Practices*

What is still missing is an examination of the practices behind *how* these processes of production are operationalised. Brown and Duguid (2002) characterised process as longitudinal, providing a structure for work to be planned and carried out, whereas practice is what actually happens. Reports of process are inevitably more systematic than practices because, as Suchman (2007) and Brown and Duguid (2002) have noted, we make retrospective sense out of what was actually a complex and largely unpredictable series of situated reactions. Practices often involve improvisation, workarounds and subversions that are necessary to bridge the gap between process and reality (Brown & Duguid, 2002; Suchman, 2007).

While Brown and Duguid's (2002) description of process is useful in distinguishing it from practice, it should be borne in mind that their study focused only on business practices, where "processes" are formal, top-down and prescriptive: a set of activities to be gone through in the production of a product (or performance). By contrast, the educational assessment of process, as noted earlier, typically looks in retrospect at activities that have already unfolded. This might rely on students' accounts of what was done, risking a biased, systematic and coherent re-telling, both because this is how humans describe previous situated action (Suchman, 2007) and because students perform reflection and engagement in relation to assessment criteria (Macfarlane, 2015; Ross, 2014). Even where assessed process is made up of elements of work in progress (e.g. sketches, records of steps in the mathematical process), these are generally still retrospectively selected by the student according to what they think will create the most persuasive picture for the assessor. This kind of assessment seems unlikely to make fully explicit or evaluate the specific interactions between students, other people, objects and technologies that were undertaken in the activity of learning. How did the art student decide what tools to use? How did the architecture student use models to inform her drawings? Did the maths student look up a textbook to inform the steps of a solution?

While accounts of process can make it appear that tasks unfolded in a coherent sequence, in reality, practices work laterally, across multiple, serial processes (Brown & Duguid, 2002). Outside of very strict instructional designs, students do not undertake tasks in precisely the way that teachers intend – they develop practices to engage in processes of learning and working, but also to subvert and work around them; learning through creating tasks, switching between tasks, and mixing study and non-study tasks. It is only through the close examination of practices that there is meaningful assessment of what actually happens as students learn, and such assessment is often done in decontextualized settings or controlled environments (see below). Indeed, practice should not be too tightly bound to formal processes (or to the formal curriculum), since reaching across processes, people, technologies and environments can allow for the generation of new ideas, thinking and ways of working that create more adaptive lifelong learners.

Our aim here is not to argue against the assessment of process - formal structures and processes are needed to ensure that appropriate practices are developed (Brown & Duguid, 2002; Crook, Gross, & Dymott, 2006) - but to argue that it can be productively complemented by an assessment of practice. Thus, while we endorse the work of Nicol, Sadler, Boud and others (mentioned above) on the benefits of learning to evaluate the quality of work, and of articulating clear processes of learning more generally, we argue that actual practices are often lost in the formalised assessment of process, and that surfacing these practices within assessment and feedback activities can complement process-based approaches. In the next section, we show how departing from the traditional view of knowledge as residing only in the minds of individual students can help us to examine the significance of social and material practices in creating sustainable assessment.

3. SOCIOMATERIAL PERSPECTIVES AND EXAMPLES

A growing body of research from practice-led and sociomaterial perspectives (e.g. Engeström, Y., Engeström, R., & Kerosuo, 2003; Falk, Hopwood, & Dahlgren, 2016; Fenwick, 2014; Gourlay & Oliver, 2018; Nyström, Dahlberg, Hult, & Dahlgren, 2016; Orlikowski, 2007; Schatzki, Knorr-Cetina, & Savigny, 2001) illustrates the tangled relationship between the social and material, and the complexity of how students learn. Activity theory is one example of a sociomaterial perspective from which learning, rather than being the acquisition of stable and pre-defined knowledge or skills, is thought of as the expanding participation in social and material networks or "activity systems" (Engeström, 2014). Sfard (1998) reminded us not to take these metaphors of acquisition or participation literally: they are not mutually exclusive and are best used methodologically. Our purpose here is to use the practice perspective (Sfard's *learning as participation*) to illuminate issues that cannot be seen through a traditional, individual, internal perspective (*learning as acquisition*).

There are two important implications of a sociomaterial perspective. Firstly, knowledge is emergent and cannot be decontextualized. It develops in situated activity in which people and non-human elements form an *assemblage* that cannot be reduced to its constituent parts. Secondly, technology is contingent rather than having essentialist or instrumentalist qualities (that is, as either an independent force or particular pedagogic tool). It is embedded in a specific context, it embodies specific knowledge practices in its design, and it shapes, constrains and creates forms of social interaction (Hamilton & Friesen, 2013). To examine these aspects of a sociomaterial approach, we will review examples that show the intricacies of how people go about learning in educational and professional domains.

3.1. *Learning in educational domains*

Thinking about the kinds of learning that happen at university, we are struck by an immediate linguistic challenge. Learning does not happen strictly *at* the institution, *on* the campus, *for* the qualification, nor *during* the formal curriculum. For us, learning crosses all of these bounds; it happens formally and informally, on campus and off, during class time and study time and free time. All of this unbounded learning overlaps and is difficult to deconstruct, although a focus on practices does allow us to see snapshots of how students go about negotiating their studies and connecting these spatial, temporal and conceptual territories together. This is illustrated by the following quote from Bhatt's (2017) ethnographic study of assignment writing at university.

> «*In a typical and very brief moment… a student discusses the contents of her assignment with the teacher, her friend sitting next to her, and another friend on Facebook via her own device (which contravenes college policies on classroom ICT use). While doing this she also scrolls through reports from her previous employer's website, and dips into a previous assignment on a related topic, among other things. The relations between these actors is not stable in this brief period; they rely on various elements working together collectively to hold the moment together, such as personal devices used beneath the table to avoid being noticed by the teacher, friends who are online and available, chat applications and Internet connections effectively working, etc.*» (p. 134).

Such activities are not just about interaction with study materials and information sources, they are also about seeking out and configuring environments and practices through which to learn. The development of these kinds of ways of working emerge against a backdrop of university policies and planned learning activities which, in our experience, are often out of step with some students' technological contexts – either ahead of what the student's available infrastructure can currently do, or behind. A study by Ackland and

Swinney (2015) shows how three students needed to problem-solve and compromise just to begin engaging with the intended learning activity.

- «*It has been quite a challenge upgrading software on my home PC in order to support the fancy bits and pieces we are being asked to use*».
- «*Work PC is out of the question; libraries ... don't have webcams, so a hangout is not possible there*».
- «*My Broadband speed at home is not quick enough to support the screen-share bit of hangout .... That part of task 2 is going to require a fair bit of problem solving ...*» (Ackland & Swinney 2015, p. 23).

These examples demonstrate how the gap between routine and reality (i.e. where what happens or needs to happen does not fit with the pre-prescribed process) is "bridged" by subversions (Suchman, 2000, p. 313) and improvisations (Brown and Duguid, 2002). Consider the following description from Oliver (2016) of student Yuki's subversion upon subversion, first of old, hard-copy books and then of her iPad.

«*She also used the iPad to store copies of books that were not available from the institution, and which she could not find online. In order to do this, she bought second-hand copies of the books she wanted; microwaved them, to melt the glue that held the pages together; put the pages through a high-speed scanner to digitize them; re-bound the books; then loaded the digital files onto her iPad. When she had assembled the resources she needed on the iPad, she ran a bath, put the iPad into a clear, zip-locked plastic bag, and took it into the bath to study*» (p. 5).

Such improvisations, Brown and Duguid (2002) argued, can be rich sources of information about the inadequacies in the processes of the systems or institutions in which they are enacted. By shining a direct light on improvisational practices, not only can we encourage students to develop problem-solving skills, but we can evaluate the systems in which students learn and perform. For Ackland & Swinney's (2015) students, we learned about issues with the mandated software and the library facilities. For Yuki, we learned about the lack of digitally available books from the library.

While there is good evidence within these studies of students coming up with reasonable solutions and clear preferences, many of these workarounds and solutions developed over long periods and there were often still unresolved issues (Gourlay & Oliver 2018). Similarly, not all problem-solving is effective in terms of long-term educational goals. Our own work on group assessment highlighted how practices developed to support engagement with the work of other group members could, in fact, undermine that shared authoring process (e.g. writing in a wiki using different coloured fonts led to disconnected fragments of text, fenced off from the group) (O'Shea & Fawns, 2014). Such challenges point to the role of teachers in helping students understand the complex implications of particular practices, to surface assumptions, purposes and contexts, and to develop ways of working that can be practised and revised as conditions and settings evolve. Questioning the unproblematic transfer of practice, while perhaps leading to feelings of uncertainty, is an essential step in realising that ways of working must often be refined and adapted to different settings and purposes.

3.2. *Learning in professional settings*

Students operate within and move between different settings (e.g. classrooms, workplaces, home, online spaces), each with a different set of people, materials and conditions.

In this section, we draw on studies of clinical practice - a field rich with research into difficult transitions, e.g. in medicine (Brennan et al., 2010), nursing (Arrowsmith, Lau-Walker, Norman, & Maben, 2016; Duchscher, 2009) and interprofessional education (Edwards, Daniels, Gallagher, Leadbetter, & Warmington, 2009, p. 121). Graduates experience high levels of stress and feel unprepared to deal with dynamic, collaborative and multidiscplinary environments where working practices have outpaced «*insti-*

tutional responses to them» (Edwards et al., 2009). Indeed, Howe and Kumar (2017) showed that long after graduation, anaesthesia professionals can still find it difficult to transition between workplaces in related domains. While our educational examples drew on technological examples, our professional examples focus on the material and situational, reflecting a notable absence of up-to-date, published sociomaterial research into interaction with technology in clinical workplaces.

Since context is so crucial to learning, assessment and feedback, the requirement to move between settings should be key to educational approaches (Ajjawi, Molloy, Bearman, & Rees, 2017). Yet a focus on individual learners and internalised knowledge in professional domains such as medicine has led to a dominant view of learning as «*a 'thing' or product located in the mind of the learner*» and, therefore, «*relatively independent of context*» (Govaerts & van der Vleuten, 2013, p.1166). In contrast, Govaerts and van der Vleuten considered performance to be «*inherently contextualised*» (p. 1169), such that it can only be validly interpreted *in situ*. Drawing on Engestrom and Sannino (2010), they pointed out that the emergent nature of workplace learning means learning things that do not yet exist. Knowledge is contextual and emergent, rather than universal, packagable and reproducible. This perspective challenges the notion of teaching pre-determined professional practices at university, as highlighted by the following examples of workplace practices.

1) Registered nurse discussing the nuances of knocking on the registrar's door: «*You can knock on the door and I guess depending on how important it is what you've got to say is going to depend on the type of reaction you're going to get from the people behind the door ... you wouldn't go there for something silly... you feel like you go in and have a quick word and you don't linger around ... I don't think that there is any specific rule ... it's just a feeling that you get [...] I don't know how you make that decision. It's just based on how soon do you think something has to be done about a particular thing.*» (Gregory, Hopwood, & Boud, 2014, p. 203).

2) Observation of nursing student interacting with a medical student who is overly focused on process (specifically, the Advanced Trauma Life Support protocol) to the neglect of more immediate concerns: «*The nursing student tries to prompt the medical student that they need to suture the wound, but the medical student does not listen... She proceeds with her examinations following the ATLS protocol. The nursing student assists when requested, measuring the temperature etc. Otherwise the nursing student remains quiet but starts to prepare for the suture by arranging gloves and aprons, and a tray with syringe, anaesthetic and bandages. When the medical student has completed the examination according to the ATLS protocol she focuses on the wound...*» (Nyström et al., 2016, p. 445).

3) Paramedic describing the collaborative handling of an aggressive patient with a broken leg: «*...Thrashing about, you know, this leg is flailing about. Obviously this is causing more damage ... we had to sit on the guy to hold him down until finally we got a doc from NHS 24 hours to sedate him.*» (Fenwick, 2014, p. 270).

4) Paediatric nurse demonstrating that clinical outcomes are often beyond an individual's control: «*In cases like these you have to act as fast as possible. Whether this is possible depends on a lot of things you cannot control, like the situation on the ward. Today we were lucky… You cannot afford an unexpected admission in the middle of a crisis of another patient, you know. What else was very convenient for us was the fact that the admission was not brought in during one of our control and feeding rounds, but in between the rounds. This made it possible for my colleagues to help me.*» (Mesman, 2012, p.36).

In the first example, Gregory and colleagues (2014) proposed that the nurse had figured out her door-knocking practice through experiencing and participating in dialogic spaces; a combination of lived experience, authentic tasks and discussion. This practice was contingent on the situation and on her knowledge of the registrars and the workplace culture. In the second example, the nursing student's behaviour became attuned to that of the medical student, suppressing the urge to follow her preferred process (attending to the wound) in order to establish an effective cooperative approach (Nyström et al., 2016). The third example

illustrated the need for first-responders to use intuition and judgement in "dealing with" the material and social dynamics of unpredictable situations. Finally, the fourth scenario highlighted the collaborative nature of performance, the distribution of agency and responsibility across the team and the ward, and the contingence of outcomes on unpredictable, situational factors.

The emergent learning of these kinds of professional practices (and, thus, the difficulty of pre-prescribing such learning) creates challenges for congruence between university and professional settings in terms of learning and assessment. Since we cannot teach practices that do not yet exist (Engeström & Sannino, 2010), the role of the teacher is to help the students develop the capacity to recognise, evaluate and enhance their own practices, and to adapt them to a range of situations and settings

4. ASSESSING COMPETENCE VS. SUPPORTING AGENCY

Since improvisation and collaboration are necessary to get work done in fluid, complex settings, assessment priorities in professional education require some reframing. While many programmes in higher education claim to produce competent and independent graduates, the goal of autonomy should be pursued alongside the capacity to make effective use of other people and materials in dynamic and unpredictable conditions. For instance, consider a popular competence-based assessment like the Objective Structured Clinical Examination (OSCE), which examines clinical skills (Harden & Gleeson, 1979). Here, the aim is to assess the underlying, independent ability (i.e. competence) of the student to do a specific task by standardising the assessment conditions and breaking the marking scheme into easy-to-follow components. This deliberately excludes situational constraints of the people, environments and materials clinicians work with in professional practice (Rethans et al., 2002), while inescapably introducing different constraints particular to the assessment setting (Russell, 2002).

The standardised, highly-structured setting of the OSCE seems very different from the description of clinical performance by Mesman's (2012) paediatric nurse (above). In pointing out limitations of competence-based assessments such as the OSCE, Rethans et al. (2002) called for frequent assessments of different, authentically-situated performances to create an overall picture of a student's ability that accounts for variability in personal and environmental influences. However, even then, there remains a tension for assessment. Not only is performance dependent on the individual *and* the system in which they are operating, but students also move from system to system. They must, therefore, take with them some kind of stable benefit from their educational programme that can help them when moving between workplaces (Sfard, 1998). The resolution to this tension, as we see it, is that students must strive not for independence but for *agency* (i.e. the capacity to influence distributed systems) across different settings, by recognising the challenges and opportunities presented through available social and material resources and engaging with them effectively (Engeström, 2014). Agency is important not only for performance but also for learning, as it facilitates active participation and enables exposure to meaningful experiences (Meyer, Van Schalkwyk, & Prakaschandra, 2016).

Students can increase their agency in different situations both by making good use of available resources and by configuring the conditions in which activity takes place. As such, students will benefit from knowing what materials and practices are available, which ones work for them under what circumstances, and how to change between different technologies and technological practices (Fawns & O'Shea, 2018). This is particularly important in the ubiquitous presence of technology, since the individual is rarely, if ever, without some form of technological support. Similarly, the social nature of professional work means that students need to understand not only what works for them but what will work in combination with other people and, indeed, what expertise is available in potential collaborators (Edwards et al., 2009). Such knowledge is used

to enhance what Edwards and colleagues called "relational agency". If used in conjunction with effective communicative practices, it can facilitate the development of learning partnerships that are, in turn, valuable products of distributed learning (Fawns & O'Shea, 2018).

5. RECOMMENDATIONS

5.1. *Creating opportunities for context-rich assessment and discussion of practices*

Assessments in abstract, highly-scaffolded settings (e.g. classrooms or simulation labs) require different kinds of practices from those needed in complex, authentic settings (e.g. workplaces), and this creates context-specific challenges (Ajjawi et al., 2017). Many kinds of social and material interaction that would be appropriate in the workplace (e.g. looking up information, asking people for guidance) are sometimes suppressed or discouraged in the classroom. To more fully recognise and prepare students for distributed and interdependent ways of working, it seems appropriate to create a diversity of context-rich assessments at university that encourage working with people, materials and technologies, informally and formally, to develop students' agency and allow opportunities to practise their practices.

At the same time, while the assessment of process can be useful in capturing logical steps taken in developing products and performances, placing too much emphasis on the formal reporting of process can undermine the natural learning activity that occurs during assessed work (Crook et al. 2006), and lead to distorted and revised accounts (Macfarlane, 2015; Suchman, 2007). As Crook et al. (2006, p.98) argued, it is useful to «*probe what goes on behind process descriptions of production activities; questioning their scope as accounts of people's action…*» and to produce «*useful discoveries about how the work is actually done*». Thus, we recommend that assessments of process be accompanied by open and dialogic evaluation of practice.

5.2. *Role of the teacher and student*

We have argued that student agency and the capacity to adapt to different settings is best served by teaching approaches that are not overly directive in relation to the development of practices. While teachers have an important role to play in providing structure and continuity for emerging practices (Sfard, 1998), they should be open to creating possibilities for students to discover their own innovations and subversions. Teachers may be unaware of the diversity of forms that effective practices can take beyond their specific teaching context, and so may benefit from exploring practices with their students as they develop and evaluate ways of working (Brown & Duguid, 2002; Lave, 1994). A significant proportion of a student's learning environment exists outside of formal courses (Boud & Molloy 2013), and the materials they use outside of course structures will transform their practices within other systems (Russell, 2002). While Boud and Molloy (2013) argued that the role of the teacher is to design and sustain learning environments in which students «*can operate with agency*» (p. 710), for us, learners must also be actively involved in designing these environments (Carless, 2007). If developing effective practices, like producing quality work, requires self-assessment and evaluative judgement, then students are likely to benefit from making choices about the materials and technologies they use, how they use them, and reflecting on the implications of those choices for the quality of their work.

5.3. *Feedback and Dialogue*

Assessment literature frequently calls for effective feedback that is timely, supports self-assessment and

reflection, clarifies what constitutes good performance, encourages discussion, and creates opportunities for improvement (e.g. Boud & Molloy, 2013; Gibbs & Simpson, 2004; Nicol, 2014). We would add to this call specific attention to the development of evaluative judgement of working practices and to students' adaptability across complex sociomaterial settings. Such feedback is not the sole responsibility of teachers, striving to stay up-to-date with the technologically-mediated practices of their students (MacLeod, Kits, Mann, Tummons, & Wilson, 2017); nor of students, identifying and generating their own feedback and agency within the educational system (Boud & Molloy 2013; Nicol 2014). Instead, we propose that a shared responsibility for feedback, through ongoing dialogue between students and teachers, should lead to mutual benefit. Teachers can better understand each student's experience of the technologies and sociomaterial systems of the institution and what practices can be developed to negotiate the demands of their studies. Students can better understand how teachers go about engaging and evaluating their own work and that of the students, the constraints they face, and the ways in which they make use of social and material resources. Such dialogue should also lead to the constructive critiquing of all participants' ways of working, providing valuable opportunities for understanding and refining practice (Brown & Duguid, 2002).

6. CONCLUSIONS

While products, performances and processes of learning are undoubtedly crucial, we have argued that a focus on the evaluative judgement of working practices could support students' adaptation to, and agency within, different academic and professional settings in the face of constant technological change. Understanding the sociomaterial nature of learning can help educators to develop assessments that pay attention to student practices of engaging with and producing knowledge. This, we argue, is a potentially productive avenue for achieving sustainable assessment and for helping students learn how to learn during their studies and beyond graduation.

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