Chapter 9
Contextual Influences on Feedback Practices: An Ecological Perspective

Rola Ajjawi, Elizabeth Molloy, Margaret Bearman, and Charlotte E. Rees

Abstract Critique has been levelled at the use of models for feedback practices that ignore context in health professions education. Models such as the 'feedback sandwich' are often adopted as rules to be followed regardless of the situation. In this chapter, we utilise an updated version of the Bronfenbrenner ecological framework of human development to unpack contextual influences on feedback practices at different levels. The framework seeks to integrate and conceptualise the environment and other influences on behaviour. The implication of the interplay of these networked systems on feedback practices and consequences for learners is that a one-size feedback intervention is not suitable for all situations. Promoting feedback by design involves taking context into account for each of the systems. A step forward in terms of scaling up effective feedback practices would be through using this contextual mapping to improve feedback literacy of students and staff. On the basis of our mapping, we highlight the usefulness of ecological models for research and practice in assessment for learning in higher education and propose recommendations for future research.

Introduction

Feedback is important for learning and is valued by staff and students. Meta-analyses show a beneficial effect of feedback on learning with detrimental effects highlighted in a subset of learners (Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Feedback from external sources such as teachers and peers is crucial to the development of learners during higher education (Hattie & Timperley, 2007; Sargeant et al., 2010), particularly given the lack of reliability of self-assessment (Eva & Regehr, 2005; Kruger & Dunning, 1999). Therefore, learners need external

R. Ajjawi (✉)
Deakin University, Burwood, VIC, Australia
e-mail: rola.ajjawi@deakin.edu.au

E. Molloy • M. Bearman • C.E. Rees
Monash University, Melbourne, VIC, Australia

D. Carless et al. (eds.), *Scaling up Assessment for Learning in Higher Education*,
The Enabling Power of Assessment 5, DOI 10.1007/978-981-10-3045-1_9

feedback in order to help them improve their performance and to calibrate their evaluative judgement. Despite consensus in the literature on the *potential* for feedback to promote learning, there are also multiple reports on the problematic nature of feedback in higher and professional education, such as feedback as information transmission (e.g. Barton, Schofield, McAleer, & Ajjawi, 2016; Boud & Molloy, 2013; Carless, 2006; Urquhart, Rees, & Ker, 2014).

Studies within the higher and professional education literature indicate that feedback is most often 'delivered' to the learner without invitation for the learner to engage in the process (Molloy, 2009; Nicol, 2010), the information is focused on deficits rather than on strategies to improve subsequent performance or learning (Fernando, Cleland, McKenzie, & Cassar, 2008), and that the emotive potential of a feedback interaction can inhibit productive and meaningful conversations that promote extension of learning (Carless, Salter, Yang, & Lam, 2011; Sargeant, Mann, Sinclair, Van Der Vleuten, & Metsemakers, 2008; Urquhart et al., 2014). Overly critical feedback may have damaging impacts on the quality of learning in the moment, as well as into the future (Henderson, Ferguson-Smith, & Johnson, 2005). In addition, models that ignore context, such as the 'feedback sandwich' where feedback givers ask formulaic questions focusing on positive elements of performance followed by constructive elements followed by positive comments, are often adopted as rules to be followed regardless of the situation. In the health professions, there is an additional layer of complexity; students work in real practice environments where feedback is often informal and verbal and is given by clinical supervisors as well as university-based academics. Observational studies of feedback in clinical education have demonstrated that educators or feedback providers can be so nervous about providing honest performance information to learners that they talk around the problem thus obfuscating the message (Molloy, Borello, & Epstein, 2013).

A recent definition in higher and professional education, called 'Feedback Mark 2', is 'Feedback is a process whereby learners obtain information about their work in order to appreciate the similarities and differences between the appropriate standards for any given work, and the qualities of the work itself, in order to generate improved work' (Boud & Molloy, 2013, p. 205). Some of the distinctive properties of this definition include foregrounding of learner engagement, acknowledging that learners require standards literacy as a baseline in order to evaluate the quality of their own work, recognising feedback is an iterative process not a one-off information exchange and, finally, that feedback leading to action is a key ingredient. This comprehensive definition is a good starting point for our investigation, although it does not explicate the role of context in feedback interactions.

The health professions domain, where feedback interactions occur across multiple settings and people, presents an opportunity to explore the impact of context upon feedback. The lack of satisfaction with feedback practices from the perspective of learners, educators and policy makers (Carless et al., 2011; Gibbs & Simpson, 2004; Williams & Kane, 2009) suggests that there is a need to apply

new frameworks to the feedback question. One such framework, Bronfenbrenner's (1979) ecological systems theory, helps to integrate and conceptualise the environment and other influences on behaviour. In this chapter, we use an updated version (Neal & Neal, 2013) to unpack contextual influences on feedback practices and student learning in health professions education.

Bronfenbrenner's Ecological Systems Theory

Bronfenbrenner's (1977, 1979) ecological systems theory posits that individuals are influenced by interdependent systems at multiple levels. Originating in child development as a backlash to the scientific and experimental development psychology of the day, he argued that the natural ecological environment must be examined as an interdependent whole to fully understand the forces surrounding a developing individual. The developmental status of the individual is reflected in the substantive variety and structural complexity of the activities which he/she initiates (Bronfenbrenner, 1979). To understand human development, one must consider the entire ecological system in which growth occurs. The development of an individual is influenced by five environmental systems: microsystem, mesosystem, exosystem, macrosystem and chronosystem.

The original ecological systems theory considered multiple systems as nested concentric circles around a focal individual, therefore obscuring the important relationships between them. We will take a more contemporary view of these systems as 'networked' rather than nested as advocated by Neal and Neal (2013) lending greater theoretical clarity. In this conceptualisation, 'each system is defined in terms of the social relationships surrounding a focal individual, and where systems at different levels relate to one another in an overlapping but non-nested way' (Neal & Neal, 2013, p. 723). This approach promotes an exploration of social interactions (and patterns of social interactions) that comprise the different systems, each directly or indirectly connected to the others through direct and indirect social interactions of their participants (see Box 9.1 for further explanation of each system).

Box 9.1 The five networked environmental systems (Neal & Neal, 2013, p. 724) and exemplars

Microsystem: a set of people engaged in social interaction in one setting that includes the focal individual, for example, a learner engaging with informal feedback following a case presentation or work-based assessment of an observed task

Mesosystem: a social interaction between participants in different settings that all include the focal individual (i.e. the interrelations between

(continued)

Box 9.1 (continued)
microsystems), for example, a learner needing to shift his/her mode of seeking feedback as he/she moves between classroom, clinical and simulation-based microsystems

Exosystem: a set of people engaged in social interaction that does not include, but whose participants interact directly or indirectly with, the focal individual, for example, assessment policies in a university that dictate blinded feedback information provision to the learner on assignments or examination boards that set arbitrary feedback deadlines not in relation to sequencing of assignments

Macrosystem: the set of social patterns that govern the formation and dissolution of social interactions between individuals and thus the relationship among ecological systems, for example, professional feedback cultures within the health professions where mentors are also assessors

Chronosystem: the observation that patterns of social interactions between individuals change over time and that such changes impact the focal individual, both directly and by altering the configuration of ecological systems surrounding him/her, for example, developing more sophisticated feedback literacy in the transition from the preclinical to the clinical years.

Feedback and the Networked View of Ecological Systems Theory

Let us apply this approach to the development of a healthcare student, in particular with regard to feedback interactions. We take the case of Sarah our fictitious medical student and the influence of the various systems on feedback interactions and resultant effects. During her medical training, she will move (more or less) seamlessly between a number of microsystems each contributing to her learning including her personal home environment and the classroom, simulated and workplace learning settings. Sarah will engage in feedback interactions in each of these microsystems. She will also need to learn to negotiate feedback interactions between microsystems (i.e. mesosystem) and across broader macrosystems (e.g. institutional assessment policies) which Sarah might not have direct interaction with but which will have an influence on her development. Further she will negotiate exosystems of multiple cultures and subcultures, for example, in moving between different disciplines and wards. Finally we consider how her feedback interactions might change across her years of experience within the curriculum as a result of maturation and prior feedback experiences (i.e. chronosystem). Figure 9.1 presents an illustration of these systems.

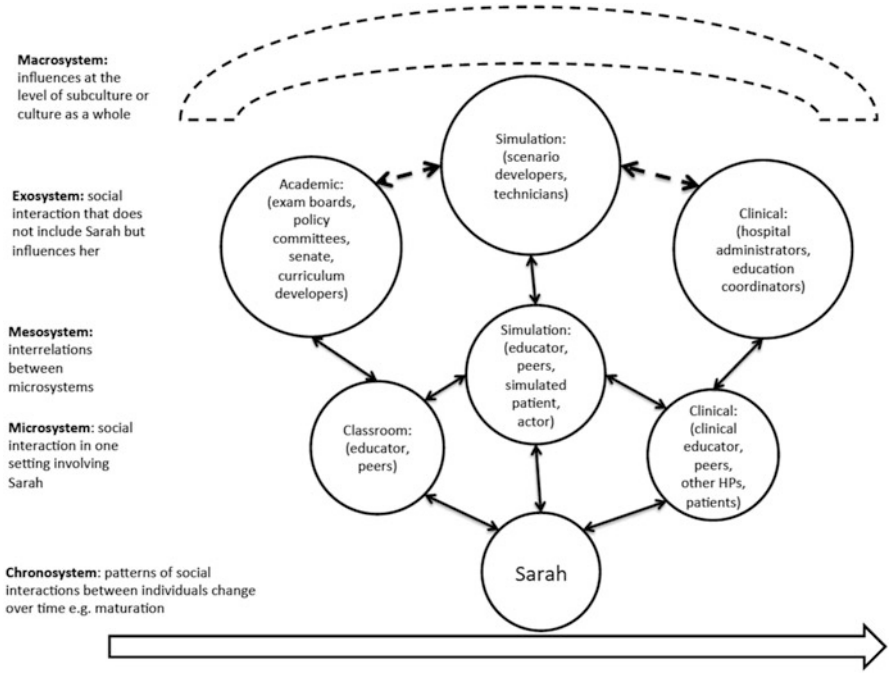

Fig. 9.1 Multiple networked systems that influence feedback interactions

Feedback Interactions Within the Microsystem

The microsystem is a 'pattern of activities, roles, and interpersonal relations experienced by the developing person in a given setting with particular physical and material characteristics' (Bronfenbrenner, 1979, p. 22). Sarah will experience her medical education in multiple settings, where she directly engages in feedback interactions with peers, patients (or care seekers), educators, assessors, tutors and administrators in classroom, simulated and clinical settings. In addition, she will have certain expectations and feedback experiences based on her life outside the medical school drawing from personal (e.g. work, hobbies, interactions with parents), work and prior educational experiences. Here we highlight findings from feedback research within the classroom, simulation-based and clinical microsystems in the health professions.

In the classroom/academic microsystem, feedback can be provided by peers and tutors, written or verbal, and is often included within formal summative assessment. Worryingly, medical students, like Sarah, generally understand feedback to be a one-way process of information giving rather than an active and collaborative process (Murdoch-Eaton & Sargeant, 2012; Urquhart et al., 2014). Sarah may come to view feedback as something 'done to her' and not 'with her'. This view of feedback as 'a destabilizing or debilitating act "done to them" by those in authority' (Molloy

& Boud, 2014, p. 422) goes against current recommendations that feedback be an active and collaborative process (Boud & Molloy, 2013) and certainly is not ideal as feedback should be deemed successful if shared understanding, learning or change in behaviour has been achieved.

In the clinical (workplace) microsystem, students learn through observing and participating in patient care. Students enter into the day-to-day work of healthcare environments, including hospital wards and general practices. The types of tasks undertaken are variable and depend both on the context and the students' capabilities and attitudes. For example, Sarah might follow a ward round, observing how patient care unfolds; or she may talk with a patient about their condition. Learning occurs through engagement with clinical supervisors, other health professionals, peers, patients and so on. Research on feedback interactions in the clinical microsystem has recently focused on the essential social and relational dimensions of feedback. Students make ongoing active judgements about the feedback source which influences their interpretations of, engagement with and future behaviours around feedback (Tai, Canny, Haines, & Molloy, 2015; Telio, Regehr, & Ajjawi, in press). Medical students make credibility judgements about their educators from the perspective of the educator's clinical credibility (Telio et al., in press). Others have described it in terms of the perceived beneficence of the feedback provider (Eva et al., 2012). Urquhart et al. (2014) additionally highlight how personal characteristics of the feedback provider (e.g. perception of authenticity) influence credibility judgements.

One way of conceptualising credibility judgements between learners and educators is through the lens of the educational alliance (Telio, Ajjawi, & Regehr, 2015). The educational alliance is derived from the concept of the 'therapeutic alliance' as evolved in psychotherapy (Telio et al., 2015). The quality of this alliance has been shown repeatedly to be the most robust predictor of therapy outcome, surpassing the impact of specific therapeutic techniques. In the same way that a patient can form a therapeutic alliance with the therapist, so a learner may be thought to form an educational alliance with their educator. The educational alliance is composed of:

1. The learner's belief that there is a mutual understanding of the purpose or goal of the relationship
2. The learner's belief that there is an agreement about how to work towards that goal and the activities involved
3. The learner's credibility judgements of the educator including liking, trusting, and valuing of the educator and belief that these feelings are mutual (Telio et al., 2015)

It is therefore Sarah's judgement about the quality of the educational alliance that matters here. Telio et al. (in press) found that feedback incorporation and the valence of emotion were related to the strength of the educational alliance rather than the direction of feedback. Indeed it is in the context of strong alliances that one can engage in 'negative' feedback with effective impact because this difficult feedback is likely to be received with the understanding that it is to help the learner improve rather than as an attack on or denigration of the individual. It is also in the context

of stronger alliances that learners are more likely to seek external feedback and to engage in open and constructive feedback encounters, which are the necessary conditions for the development of evaluative judgement. The educational alliance may help to reframe understandings of feedback from rules about content and delivery to a more nuanced appreciation of the role of relationships and feedback interactions in learning within the microsystem.

The simulation learning environment or microsystem can be thought of as a bridge between classroom and clinical environments, as this is where learners rehearse the practices required of them as professionals. Within this broad notion of a simulation microsystem, we include different simulation methodologies ranging from psychomotor skills development (e.g. learning to suture on foam pads) to immersive acute simulation (e.g. fully body mannequins) and communication skills training (e.g. working with simulated patients or actors). One of the contrasting features of the simulation microsystem compared to the clinical education microsystem is the deficit of real patients and real responsibility and the (rich) dynamics of a real clinical environment. In simulation, student learning is the primary focus of the activity, rather than patient care. This means that feedback time can be scheduled and prioritised. In general, simulation offers a relatively feedback-rich experience, although there are obviously variations across simulation methodologies and particular programmes. It is also important to note that just because there are many opportunities for feedback, it is not necessarily *effective* feedback. There is some indication that, as in the other microsystems, the one-way flow of information from educator to student persists (Dieckmann, Molin Friis, Lippert, & Østergaard, 2009).

The notion of credibility judgement necessarily shifts in the simulation microsystem. For example, in a usual patient-learner encounter, the learner can be considered to be positioned as the powerful presence in the duo; in a simulated patient-learner encounter, the simulated patient may be positioned as more powerful, particularly if they are providing a judgement about the learner's progress (Hanna & Fins, 2006). Furthermore, as feedback in the simulation setting may be provided by non-medical practitioners, such as nurses, who are no longer working in the clinical environment, this may influence students' credibility judgements of the feedback. This notion of credibility and how it transfers from simulated to clinical environments is particularly thrown into relief when considering the mesosystem.

Feedback Interactions Within the Mesosystem

The mesosystem is constituted in the interactions between intersecting microsystems (Bronfenbrenner, 1979). As described in the previous section, Sarah will learn to engage with and negotiate feedback interactions across multiple microsystems: classroom, simulation-based and workplace-based settings and various sub-settings within those settings (e.g. primary and secondary care workplace settings). She will learn that there are different feedback expectations and practices embedded within

each of those different settings. Disconnects between microsystems through mixed messages, lack of alignment and the hidden curriculum have significant implications for Sarah's development as a doctor. For example, we know that students learn to expect and demand feedback interactions within the simulation environment but that they feel a burden on their busy clinical educators who are first and foremost clinicians caring for patients within the clinical environment (Urquhart et al., 2014). This means that Sarah might appear to be actively seeking feedback in one microsystem but may be reluctant and passive in another, thus negatively influencing her learning opportunities.

The potential variations in feedback practices between clinical and simulated environments within medical schools have been described (Urquhart, Rees, & Ker, 2015). A video-reflexive ethnography study conducted at one UK medical school, for example, found that feedback practices differed between clinical and simulated environments in terms of who the feedback providers were, what feedback was given in terms of content and style and when and where feedback was given (Urquhart et al., 2015). The authors found that learners' and tutors' perceptions of feedback depended on their perceptions about the primary purpose of the contexts in which students received feedback, that is, patient care (clinical context) versus student learning (simulated context) (Urquhart et al., 2015).

The movement between microsystems can be challenging, not just in terms of what feedback is given but how feedback may be applied. Yardley, Irvine and Lefroy (2013, p. 506) describe how 'the student rejects learning constructed from simulation that appears to conflict with the practice he or she observes in authentic workplaces'. In their subsequent discussion, they propose that educators have to learn to highlight, manage and be mindful of 'the gap' between simulated and real environments. This has implications for Sarah and her ability to engage in feedback across all three microsystems.

Feedback Interactions Within the Exosystem

The exosystem refers to 'one or more settings that do not involve the developing person as an active participant, but in which events occur that affect, or are affected by, what happens in the setting containing the developing person' (Bronfenbrenner, 1979, p. 25). In the case of our medical student, there are various individuals within the university and clinical settings who Sarah might not interact with personally but who influence her development. For example, the academic exosystem would include curriculum developers, assessment designers, high-level policy committees, examination boards and so on. The clinical exosystem includes hospital administrators, deans of education and high-level policy committees. Another important exosystem in Sarah's growth is the regulatory body which sets standards for practice and writes the language around these competency frameworks. This may become the language of feedback interactions, as Sarah learns what professional standards, values and qualities are expected of her, the neophyte doctor.

Many decisions occur within the academic exosystem that impact Sarah's learning through feedback. Issues of curriculum design, feedback loops and opportunities to incorporate feedback into learning are important considerations that take place in the exosystem and are considerations that are frequently overlooked in the feedback discourse (Molloy & Boud, 2013). The dominant understanding of feedback in higher education is that it constitutes a teacher providing comments to a learner in relation to a task (e.g. a workplace procedure/task or an assignment). This limited view of feedback is challenged by looking to the engineering origins of the term where feedback necessarily requires action or change to occur (Boud & Molloy, 2013). To use an engineering example, a thermostat responds to a drop in temperature by generating heat to bring the room to a set and desired temperature. A thermostat flashing 'too cold' on the register screen is an example of information display, not a feedback process. It is the response of the system to the information that closes the loop and which meets the definition of feedback. Hence, how the curriculum is designed to promote further opportunities for Sarah to apply feedback to related tasks is crucial to her development.

Another example of the academic exosystem influencing student behaviour is through assessment policy and exam standard setting decisions that may seem arbitrary to Sarah but can have significant implications on her making it through the course. Furthermore, feedback role modelling by medical schools is an important consideration of the exosystem. We know from research that how a medical school role models feedback, through how student evaluation data is acted upon, influences learners' receptiveness to the feedback they receive (Urquhart et al., 2014). For example, if students see no action to improve teaching on the basis of their feedback, they may become cynical of the real value of feedback (Urquhart et al., 2014).

Feedback Interactions Within the Macrosystem

The macrosystem can be considered 'at the level of subculture or culture as a whole, along with any belief systems or ideology underlying such consistencies' (Bronfenbrenner, 1979, p. 26). There have only been a handful of studies in medical education that have aimed to explore the macrosystem in which feedback occurs. Watling and colleagues (Watling, Driessen, van der Vleuten, & Lingard, 2014; Watling, Driessen, van der Vleuten, Vanstone, & Lingard, 2013a, 2013b) explored and compared feedback experiences in three distinct learning cultures – medicine, education and music. Each of these cultures shaped learners' expectations of feedback in particular ways. Whilst music and education students expected constant observation and feedback, medical students felt a burden on their teachers who had to juggle patient care and student education and often received feedback on unobserved performance. The study highlighted how credible and constructive feedback is valued across all learning cultures but how that credibility and constructiveness are defined is culturally determined (Watling et al., 2013b). In both music and education, the prevalence of observation, feedforward and action plans acted to

improve the credibility of feedback. These were almost absent practices in medicine which compromised the value of feedback in the eyes of the learners.

In another study Watling et al. (2014) contrasted experiences of feedback by doctors who had expertise in music or sport. Participants explained the indispensable role provided by music teachers and sports coaches, yet medical teachers were described as role models who provide 'examples of desired performance rather than motivation and continuous guidance' (Watling et al., 2014, p. 717). This stemmed from recognition that the primary job of a clinical teacher is to treat patients, whereas in music and sports, teaching is a dedicated role. Trusting long-term teacher-learner relationships were much more readily identified within music and sport than in medicine. Worryingly doctors felt that although feedback was crucial to their development as musician and sportspeople, feedback was less central to their development as doctors. The elements described by Watling et al. (2014) as valued in sports and music yet missing from medicine echo the dimensions described by Telio et al. (2015) regarding the educational alliance. As Sarah will experience, the educational alliance between teacher and learner is fragmented within the medical macrosystem to the detriment of learning from feedback and the learning experience.

Feedback Interactions Across the Chronosystem

The chronosystem is the observation that patterns of social interactions between individuals change over time, and that such changes impact the focal individual, both directly and by altering the configuration of ecological systems surrounding him/her (Neal & Neal, 2013). In her journey to becoming a safe and competent doctor, Sarah will experience several key educational transitions. Factors that will influence Sarah's feedback interactions across these transitions include prior experiences with feedback and developments in her self-regulation capacities.

One study has highlighted maturational differences between junior and senior medical students' conceptualisations of feedback with senior students adopting more sophisticated understandings of the role of feedback in their learning, shifting to more active (rather than passive) utilisation and valuing informal and verbal feedback from senior clinicians (Murdoch-Eaton & Sargeant, 2012). This highlights a shift in feedback literacy as students experienced and engaged with the curriculum and feedback interactions resulting in adjusting their expectations of feedback and their role in it. Senior students were generally more aware of the important role of feedback in their learning, their need to adopt a more active stance in seeking and incorporating feedback into a longer-term change in learning approach (Murdoch-Eaton & Sargeant, 2012).

Returning to the educational alliance, there are further implications of the influence of the chronosystem on learners such as Sarah. Early findings suggest that evaluations about the strength of the educational alliance not only affect a learner's engagement with a particular piece of feedback at the moment of delivery but also

have consequences for future engagement in (or avoidance of) further learning interactions with the supervisor (Telio et al., in press). There is early indication that such conditions can be generated even within brief encounters if educators are willing to invest in discussions around feedback expectations, co-construction of goals and embedding of feedback loops (Farrell, Bourgeois-Law, Ajjawi, & Regehr, 2016).

Another important factor to consider in relation to the chronosystem is the emotional legacy that students are left with as a result of feedback interactions during medical school. Urquhart et al. (2014) in their narrative study of feedback in the workplace highlighted how students positioned themselves as passive recipients (or victims) within their feedback narratives, with their feedback providers constructed as villains utilising 'us and them' language. They demonstrated the real emotional toll of feedback practices and the prevalence of negative experiences including verbally abusive and humiliating feedback comments and adversarial relations between students and tutors (Urquhart et al., 2014).

Scaling Up: What Are the Implications of the Ecological Model?

Scaling up has been conceptualised in relation to four interrelated dimensions: spread, depth, sustainability and shifts in ownership (Coburn, 2003). We believe that a significant step forward in terms of scaling up effective feedback practices is through improving feedback literacy of students and staff. This relates to notions of depth and sustainability, which can be promoted through considered 'feedback by design' practices and through shifting the onus of responsibility towards students who are better at navigating the feedback landscape (as judge, seeker and user). Often interventions to improve feedback practices are unilateral, typically focusing on teacher behaviours, feedback content or feedback delivery within a single microsystem. This ecological view could explain why such a landscape is resistant to change and why feedback interventions can (and often do) fail (Ferrell, 2012). It also highlights the challenges involved in changing feedback practices at scale (see introductory chapter in this book). The learner moves through a range of different systems with different feedback practices, which on the one hand lack cohesion but on the other provide a vast range of different and important opportunities and experiences. How might we better prepare students to navigate these systems in efficient and informed ways that enable effective feedback interactions? How might academic staff design feedback interactions to establish conditions in which students can operate with agency? How might the enabling conditions of context be harnessed to promote the positive effects of feedback in sustainable ways?

The implication of this brief examination of networked systems for the scaling up of effective feedback practices is that a one-size intervention is not suitable for all. Promoting feedback by design involves taking into account the multiplicity of

factors for each of the interdependent systems. We may choose to intervene early by improving feedback literacy of students in the first year of professional programmes. This potentially sets up the student to understand the ecological landscape of their professional formation so that future encounters in the curriculum build on realistic expectations and healthy feedback practices (e.g. seeking feedback, active self-evaluation and mindful development of evaluative judgement) when the tasks get increasingly complex. Perhaps if learners are socialised into this feedback landscape early, their future roles as feedback users and providers might look different.

Changing beliefs and practices of staff through improving feedback literacy would require teachers to work differently. There are particular interactional considerations such as establishing trust in the educational alliance, explicitly agreeing on the purposes of feedback and goals of the interaction and structuring dialogue and linguistic and non-verbal choices in the feedback episode to actively include the learner (Farrell et al., 2016). Collaborative models, such as Feedback Mark 2, place less emphasis on telling and more focus on designing of experiences across a programme of study and, in particular, nested tasks that give learners a chance to respond to previous performance information exchanges and put new strategies into practice. It is understandable that educators should wish to focus on the immediate microsystem within faculty development workshops. Yet it would be beneficial for them to also consider the students' journey through the broader landscape. Feedback on concepts learned in the classroom may be applied within a simulated environment and feedback given on a simulated performance may be applied within a 'real' clinical environment. Feedback givers can specifically highlight the challenges which may be experienced in the movement from working with a paper problem to working with a simulated patient or mannequin to providing supervised care to a real patient but also to consider alignment and graded complexity in the design of tasks across these microsystems. Effective feedback cultures may be promoted through the engagement of higher education leaders and policy developers in examining the effects of their policy and infrastructure decisions on feedback cultures, learners and learning. Another strategy might be in facilitating different stakeholders (from the different systems) to come together to collaborate in seeking understanding of synergies and tensions across the networked systems and to use this understanding to inform change strategies. It behoves all those invested in the development of students to consider the emotional legacy of assessment and feedback interactions on learners and their developing professional identity.

Gaps and Recommendations for Research

Based on this conceptual framing of feedback and the ecological systems theory, we have highlighted gaps in the literature from which we draw some recommendations for future research. Whilst much of the research on feedback has occurred within the *microsystem*, opportunities exist in understanding the value of the educational alliance to the broader spectrum of medical education. The applicability of this

concept to the undergraduate arena and to other health professions (and indeed beyond the health professions) is unknown. An interesting line of inquiry would be to identify the types of credibility judgements that different health professions learners make and how these influence future feedback behaviours (seeking, utilising and designing feedback). In addition, exploring the conditions that strengthen the educational alliance would be profitable to pursue. Research is also needed to better understand how students learn to navigate the *mesosystem* and how they calibrate their expectations of feedback flexibly within and across different microsystems. Exploring synergies, tensions and contradictions in feedback practices between microsystems (i.e. identifying the hidden curriculum of feedback in the mesosystem) and how this may be used to improve feedback literacy would be valuable.

Further research on collaborative models of feedback and implementation on a large scale is needed to identify key design features that promote learning beyond the immediate task (exosystem). Effecting culture change within a macrosystem is not easy, and research shows that feedback cultures within medical education can act as a hindrance. Interdisciplinary work is needed to better understand the effects of feedback cultures on learners and to dismantle some of the structures that act to fragment feedback practices. Within the chronosystem it is not clear if improvements in feedback literacy (and resultant improvements in self-regulation) could be achieved through explicitly educating students about feedback and their role in seeking and using it, early in a curriculum. This could be one area of future research. How trust evolves over time, the establishment of strong educational alliances and the influence of multiple feedback sources (patient, educator, peer) on building pictures of learner performance in complex systems are other areas for future research.

Conclusion

We have highlighted how feedback interactions occur through our student Sarah's journey through multiple networked systems. Promoting feedback by design involves taking account of the contextual factors relevant to each system. As we have explored, this may be at the microsystem (e.g. reflecting on the educational alliance, establishing trust), at the mesosystem (e.g. setting up expectations for effective feedback behaviours for students and staff to navigate across microsystems), at the exosystem (e.g. designing curricula), at the macrosystem (e.g. critically examining feedback cultures) and at the chronosystem (e.g. explicitly promoting feedback literacy aligned with key transitions). The key message here is that feedback is influenced by individual, interpersonal, social, contextual and cultural factors. Educational interventions that only take into account the individual are bound to be less effective and may explain the wave of feedback dissatisfaction in the higher education literature. On the basis of mapping the ecological systems theory with feedback practices, we highlight the potential usefulness of ecological models for research and scaling up practice in assessment for learning in higher education.

References

Barton, K. L., Schofield, S. J., McAleer, S., & Ajjawi, R. (2016). Translating evidence-based guidelines to improve feedback practices: The interACT case study. *BMC Medical Education, 16*(1), 1–12.

Boud, D., & Molloy, E. K. (2013). Rethinking models of feedback for learning: The challenge of design. *Assessment & Evaluation in Higher Education, 38*(6), 698–712.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*, 513–531.

Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.

Carless, D. (2006). Differing perceptions in the feedback process. *Studies in Higher Education, 31*(2), 219–233.

Carless, D., Salter, D., Yang, M., & Lam, J. (2011). Developing sustainable feedback practices. *Studies in Higher Education, 36*(4), 395–407.

Coburn, C. (2003). Rethinking scale: Moving beyond numbers to deep and lasting change. *Educational Researcher, 32*(6), 3–12.

Dieckmann, P., Molin Friis, S., Lippert, A., & Østergaard, D. (2009). The art and science of debriefing in simulation: Ideal and practice. *Medical Teacher, 31*(7), 287–294.

Eva, K. W., Armson, H., Holmboe, E., Lockyer, J., Loney, E., Mann, K., et al. (2012). Factors influencing responsiveness to feedback: On the interplay between fear, confidence, and reasoning processes. *Advances in Health Sciences Education, 17*(1), 15–26.

Eva, K. W., & Regehr, G. (2005). Self-Assessment in the health professions: A reformulation and research agenda. *Academic Medicine, 80*(Suppl), S46–S54.

Farrell, L., Bourgeois-Law, G., Ajjawi, R., & Regehr, G. (2016). An autoethnographic exploration of the use of goal oriented feedback to enhance brief clinical teaching encounters. *Advances in Health Sciences Education*, 1–14.

Fernando, N., Cleland, J., McKenzie, H., & Cassar, K. (2008). Identifying the factors that determine feedback given to undergraduate medical students following formative mini-CEX assessments. *Medical Education, 42*(1), 89–95.

Ferrell, G. (2012). *A view of the assessment and feedback landscape: Baseline analysis of policy and practice from the JISC Assessment & Feedback programme*. Retrieved from http://www.jisc.ac.uk/media/documents/programmes/elearning/Assessment/JISCAFBaselineReportMay2012.pdf

Gibbs, G., & Simpson, C. (2004). Conditions under which assessment supports students' learning. *Learning and Teaching in Higher Education, 1*, 3–31.

Hanna, M., & Fins, J. (2006). Power and communication: Why simulation training ought to be complemented by experiential and humanist learning. *Academic Medicine, 81*(3), 265–270.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*(1), 81–112.

Henderson, P., Ferguson-Smith, A. C., & Johnson, M. H. (2005). Developing essential professional skills: A framework for teaching and learning about feedback. *BMC Medical Education, 5*(1), 1–6.

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*(2), 254–284.

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology, 77*(6), 1121–1134.

Molloy, E. K. (2009). Time to pause: Feedback in clinical education. In C. Delaney & E. K. Molloy (Eds.), *Clinical education in the health professions*. Sydney, Australia: Elsevier.

Molloy, E. K., & Boud, D. (2013). Seeking a different angle on feedback in clinical education: The learner as seeker, judge and user of performance information. *Medical Education, 47*(3), 227–229.

Molloy, E. K., & Boud, D. (2014). Feedback models for learning, teaching and performance. In J. M. Spector, M. D. Merrill, J. Elen, & M. J. Bishop (Eds.), *Handbook of research on educational communications and technology* (4th ed., pp. 413–424). New York: Springer.

Molloy, E. K., Borello, F., & Epstein, R. (2013). The impact of emotion in feedback. In D. Boud & E. Molloy (Eds.), *Feedback in higher education* (pp. 50–71). London: Routledge.

Murdoch-Eaton, D., & Sargeant, J. (2012). Maturational differences in undergraduate medical students' perceptions about feedback. *Medical Education, 46*(7), 711–721.

Neal, J. W., & Neal, Z. P. (2013). Nested or networked? Future directions for ecological systems theory. *Social Development, 22*(4), 722–737.

Nicol, D. (2010). From monologue to dialogue: Improving written feedback processes in mass higher education. *Assessment & Evaluation in Higher Education, 35*(5), 501–517.

Sargeant, J., Armson, H., Chesluk, B., Dornan, T., Eva, K., Holmboe, E., et al. (2010). The processes and dimensions of informed self-assessment: A conceptual model. *Academic Medicine, 85*(7), 1212–1220.

Sargeant, J., Mann, K., Sinclair, D., van der Vleuten, C., & Metsemakers, J. (2008). Understanding the influence of emotions and reflection upon multi-source feedback acceptance and use. *Advances in Health Sciences Education, 13*(3), 275–288.

Tai, J. H.-M., Canny, B. J., Haines, T. P., & Molloy, E. K. (2015). The role of peer-assisted learning in building evaluative judgement: Opportunities in clinical medical education. *Advances in Health Sciences Education.* doi:10.1007/s10459-015-9659-0.

Telio, S., Ajjawi, R., & Regehr, G. (2015). The "educational alliance" as a framework for reconceptualizing feedback in medical education. *Academic Medicine, 90*(5), 609–614.

Telio, S., Regehr, G., & Ajjawi, R. (in press). Feedback and the educational alliance: Examining credibility judgments and their consequences. *Medical Education*.

Urquhart, L. M., Rees, C. E., & Ker, J. S. (2014). Making sense of feedback experiences: A multi-school study of medical students' narratives. *Medical Education, 48*(2), 189–203.

Urquhart, L. M., Rees, C. E., & Ker, J. S. (2015). *Exploring feedback in context at medical school through video-reflexive ethnography*. Paper presented at the Association for Medical Education in Europe, Scottish Exhibition and Conference Centre, Glasgow, Scotland. Paper retrieved from https://www.amee.org/getattachment/amee-news/AMEE-2015-Abstract-Book/Final-Abstract-Book-as-at-3-SEptember-2015.pdf

Watling, C., Driessen, E., van der Vleuten, C. P. M., & Lingard, L. (2014). Learning culture and feedback: An international study of medical athletes and musicians. *Medical Education, 48*(7), 713–723.

Watling, C., Driessen, E., van der Vleuten, C. P. M., Vanstone, M., & Lingard, L. (2013a). Beyond individualism: Professional culture and its influence on feedback. *Medical Education, 47*(6), 585–594.

Watling, C., Driessen, E., van der Vleuten, C. P. M., Vanstone, M., & Lingard, L. (2013b). Music lessons: Revealing medicine's learning culture through a comparison with that of music. *Medical Education, 47*(8), 842–850.

Williams, J., & Kane, D. (2009). Assessment and feedback: Institutional experiences of student feedback, 1996–2007. *Higher Education Quarterly, 63*(3), 264–286.

Yardley, S., Irvine, A. W., & Lefroy, J. (2013). Minding the gap between communication skills simulation and authentic experience. *Medical Education, 47*(5), 495–510.