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EDUCATIONAL ASSESSMENT & EVALUATION | REVIEW ARTICLE

The role of feedback literacy in written corrective feedback research: from feedback information to feedback ecology

Sin Wang Chong[1]*

Abstract: Research on written corrective feedback (WCF) has received sustained interest in the field of second language acquisition and language education. This viewpoint article extends the theoretical and conceptual discussion on WCF research by introducing the notions of "feedback literacy" and "feedback ecology". In this article, I first review three strands of WCF research. Then, I argue for the need to shift the focus of our investigation from feedback information (focusing on impact of feedback), to feedback process (focusing on learners "and teachers" perception of feedback), to feedback ecology (focusing on learners' and teachers' engagement of feedback and influences of such engagement). Putting forward a "feedback ecology" conceptual framework that is informed by Ecological Systems Theory, Actor-network Theory, and Complex Dynamic Systems Theory, I suggest three research tasks for future WCF studies, highlighting the affordances of qualitative research methodologies such as narrative inquiry.

Subjects: Mechanical Engineering; Power & Energy; Renewable Energy; Energy & Fuels; Renewable Energy; Civil, Environmental and Geotechnical Engineering; Design

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Sin Wang Chong

PUBLIC INTEREST STATEMENT

Written corrective feedback research has undergone several stages of development. Researchers were first interested in the effectiveness of various feedback strategies such as direct versus indirect written corrective feedback. In recent years, researchers have shifted their attention to examine not only the outcome of written corrective feedback but also the ways language learners interact with feedback. Given this new emphasis on learner engagement, I propose a reconceptualisation of written corrective feedback from an ecological perspective, coining the term "feedback ecology". In a feedback ecology, researchers' attention is on the presence of forces external to and internal of learners, and how these forces interact to shape learners' engagement with written corrective feedback. I also suggest a broadened understanding of feedback engagement to encompass both short-term and long-term engagement. I conclude the piece by highlighting the affordances of qualitative research methodologies such as narrative inquiry in written corrective feedback research.

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Keywords: written corrective feedback; feedback literacy; feedback ecology

1. Introduction

Written corrective feedback (WCF) has been a vibrant field of research for decades, especially after the publications of Truscott's (1996) opinion piece arguing against the usefulness of WCF and D. Ferris (1999) rebuttal. The former contended that WCF is not effective and in some cases, may even be harmful to learners, while the latter suggested that WCF can be useful for improving learners' grammatical accuracy if and when implemented effectively (e.g., adopting a focused approach to WCF). Since then, there has been a plethora of research on various forms of WCF. According to a recent systematic literature review (Chong, 2019), types of WCF investigated include direct/indirect WCF (explicit/implicit language error correction; e.g., Chandler, 2003), focused/unfocused WCF (selective/comprehensive language error correction; e.g., Lee, 2004), metalinguistic WCF (correction that offers explanations on the nature of language errors; e.g., Bitchener, 2008), (a)synchronous WCF (real-time or delayed error correction (e.g., Shintani, 2016)), dynamic WCF (language error correction strategy that is designed based on needs of individual learners; e.g., Evans et al., 2011), computer-generated/mediated WCF (language error correction assisted by educational technology; e.g., Li et al., 2015), and alternative WCF (alternative feedback sources, e.g., feedback provided by peers; e.g., Diab, 2016). Orientations of WCF research have progressed considerably in the past two decades. Chong (2018) categorised WCF research trends with reference to three assessment paradigms: assessment *of* learning (assessment focusing on certification and measurement), assessment *for* learning (assessment focusing on promoting student learning), and assessment *as* learning (assessment focusing on the roles of students in promoting their own learning). Reviewing the state-of-the-art of WCF research, Chong (2018) contended that WCF research with an assessment *of* learning orientation focuses on the effectiveness and efficacy of various types of WCF (e.g., Bitchener & Knoch, 2010), whereas WCF research with an assessment *for* learning orientation emphasises student-teacher dialogues on WCF (e.g., through examining teachers' and students' perceptions towards WCF in Amrhein & Hossein, 2010). More recently, WCF research has geared towards an orientation of assessment *as* learning, with researchers becoming more interested in exploring the psychology of learners in relation to the feedback they receive (e.g., Han, 2019).

The above demonstrates a paradigm shift of WCF research from a more positivistic worldview (i.e., whether WCF works) to a more social constructivist one (i.e., how learners make sense of and engage with WCF). Such paradigm shift warrants a re-examination of what WCF really means. Nevertheless, to date, there have been limited attempts to reconceptualise feedback, and more specifically WCF. To my best knowledge, Carless and Boud (2018) is the most seminal work in this area in which the authors discussed three types of student feedback engagement in their feedback literacy model. However, this framework focuses only on students' engagement without making explicit the influence of context (or more appropriately, *contexts*) where feedback activities are implemented. In view of this, this viewpoint article aims to explore the usefulness of incorporating feedback literacy, a recent notion that has gained considerable interest in assessment feedback literature in higher education, into WCF research and explore how learners' feedback literacy can be examined through the conceptual framework of "feedback ecology" which is informed by ecological systems theory and actor-network theory (Chong, 2021). From there, future directions of WCF research will be discussed. This article will be relevant to WCF and feedback researchers who are interested in not only investigating students' engagement with feedback but also exploring the plethora of contextual influences that influence students' feedback engagement.

2. Three strands of WCF research

To provide an overview of WCF research, I attempt to systematise the current state of the art into three strands of research orientations: (1) quasi-experimental studies (focusing on the efficacy of

WCF); (2) naturalistic classroom-based studies (focusing on stakeholders' experiences and/or perceptions of WCF); and (3) research syntheses (focusing on aggregated effects of WCF).

Early WCF research, which was mostly conducted in English-as-a-Second-Language contexts, usually employed a quasi-experimental design to investigate the effects of certain type(s) of WCF on learners' acquisition of grammatical items (e.g., Bitchener & Knoch, 2009; Ellis et al., 2008). These studies usually include a control group (learners receiving no feedback) and one or more than one treatment group (with different WCF interventions). Because of the nature of these studies, researchers focus on isolated grammatical items, usually word-level items (e.g., definite and indefinite articles). In general, researchers found that students who received any form of WCF treatments outperformed those who did not believe in terms of linguistic accuracy of the grammatical items in focus. Besides, it was found that learners benefited more from explicit and corrective WCF. However, inconclusive evidence was found regarding the effectiveness of focused WCF, which remains a focus of recent WCF research and debate (Lee, 2019).

There was a surge of WCF studies, starting from 2000s, focusing on reporting WCF practices with high ecological validity (Ene & Kosobucki, 2016; Ferris et al., 2013). These studies are often naturalistic classroom-based studies. Compared with the first strand of WCF research, this strand of WCF research is more learner-focused and longitudinal; researchers focus on few learners using such research methodologies as case study and collect data from multiple data sources (e.g., actual feedback, interviews, questionnaires). Important grounds covered in this second strand of WCF research include (1) learners' perceptions of types of WCF; (2) teachers' perceptions of types of WCF; (3) learners' perspective alongside teachers'; (4) descriptions of WCF practices in authentic classroom settings; and (5) learners' responses to teacher WCF.

The final strand of WCF, which focuses on synthesising research evidence on WCF, receives much less discussion than the first two. This strand of research employs various research synthesis traditions and methodologies to map the research landscape and development of WCF as a research field. The majority of these research syntheses are narrative reviews (e.g., Lee, 2012), meta-syntheses (e.g., Kang & Han, 2015), methodological syntheses (e.g., Liu & Brown, 2015), systematic literature reviews (e.g., Chong, 2019), and historical reviews (e.g., D. R. Ferris, 2012). There are, however, not so many qualitative research syntheses and practice-focused reviews.

This short overview of the state of the art of WCF research shows the development of research orientations, from focusing only on the effectiveness of WCF to perceptions of WCF to learners' engagement with WCF. Underneath such change is a paradigm shift in the conceptualisation of feedback: from *feedback as information* to *feedback as process* (Boud & Molloy, 2013). To address how WCF research can better capture learners' engagement with feedback, Storch (2018) discussed extensively the usefulness of sociocultural theory to examine contextual influences on how learners engage with feedback. Storch's (2018) call for a sociocultural view towards WCF was widely acknowledged by researchers; nonetheless, only a handful of studies actually applied such an analytical lens. Lee et al. (2021), for example, is one of the few studies that examines WCF practices in relation to a naturalistic classroom setting. Luquin and Mayo's (2021) study on WCF examines an under-explored educational context, that is, primary school children learning English as a foreign language. Such a dearth of WCF research adopting a sociocultural perspective is possibly due to the absence of a WCF or feedback relevant conceptual framework. In light of this, I attempt to further theorise the notion of "contexts" using the metaphor of "ecology" and the relationships between contextual and individual factors using Ecological Systems Theory, Actor-network Theory, and Complex Dynamic Systems Theory.

3. Student and teacher feedback literacy
The recent interest in student and feedback literacy in the assessment and feedback community in higher education stems from a paradigm shift of assessment, from an old paradigm dominated by an (over)emphasis on a cognitivist perspective of feedback to a new paradigm which stresses

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| Table 1. Student feedback literacy (based on **Sutton, 2012**)		
Dimension	**Definition**	**Question learners need to answer**
Epistemological (knowing)	Feedback on knowing (corrective/evaluative), feedback for knowing (formative)	Do I know what the feedback is for?
Ontological (being)	Learners' self-identity and self-efficacy to handle feedback	Do I have a successful record of incorporating feedback into my work? Based on my experience, how confident am I in addressing the feedback?
Practical (acting)	Learners' feedback-prompted actions	How do I use the feedback to improve my work?

feedback as a co-constructive process between learners and the teacher (Winstone & Carless, 2020). The notion of feedback literacy has its origin in human resources management. In 2002, London and Smither reported on an instrument to measure feedback orientations of employees which includes four types of tendency: employees' tendencies to (1) realise the usefulness of feedback, (2) use feedback because of extrinsic motivation, (3) use feedback because of intrinsic motivation (e.g., to self-reflect), and (4) to feel equipped to use feedback. It was Sutton (2012) who first introduced the notion of feedback literacy into assessment literature in higher education. Sutton (2012) conceptualised feedback literacy as a construct consisting of three dimensions: epistemological, ontological, and practical (Table 1). The seminal paper by Carless and Boud (2018) further elaborated on the notion of student feedback. Feedback literate learners, according to the authors, exhibit the following characteristics: the capacities to (1) understand the value of feedback; (2) make accurate evaluative judgment with regard to quality; and (3) monitor emotional labour in the feedback process. Carless and Boud (2018) argued that the above attributes need to be cultivated for learners to engage meaningfully with feedback (Table 2).

Not only do learners need to be feedback literacy, so do teachers. In their conceptual paper, Carless and Winstone (2020) put forward the notion of teacher feedback literacy which comprises three interrelated dimensions: "design for uptake", "relational sensitivities", and "managing practicalities" (p. 4–7), referring to teachers' abilities to create space in curricula for feedback to be used, address the emotional and socio-relational needs of learners, and reconcile personal feedback philosophies with institutional expectations. Teacher feedback literacy is inseparable from student feedback literacy because they form a symbiotic relationship (Carless & Winstone, 2020). For instance, one of the features in Carless and Winstone's and Carless (2020) teacher feedback literacy model is "design for uptake", which refers to student-centred approaches to designing feedback activities, one that provides the opportunities for students to develop their feedback literacy such as exercising their evaluative judgment (Carless & Boud, 2018). This mutually dependent relationship between student and teacher feedback literacy is further explicated in Boud and Dawson (2021)—one of the features of their conceptual framework of teacher feedback literacy concerns developing student feedback literacy.

Table 2. Student feedback literacy (based on **Carless & Boud, 2018**)		
Dimension	**Feature**	**Question learners need to answer**
Conceptual	Understand the value of feedback	• What is the function/nature of feedback? • What is my role in the feedback process?
Cognitive	Make accurate evaluative judgment with regard to quality	• How do I tell my work (or my peers' work) is up to par against certain standards?
Emotional	Monitor emotional labour in the feedback process	• How should I react emotionally to critical or negative feedback?

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Figure 1. Feedback Ecology 1.0
(**Chong, 2021**, p. 96).
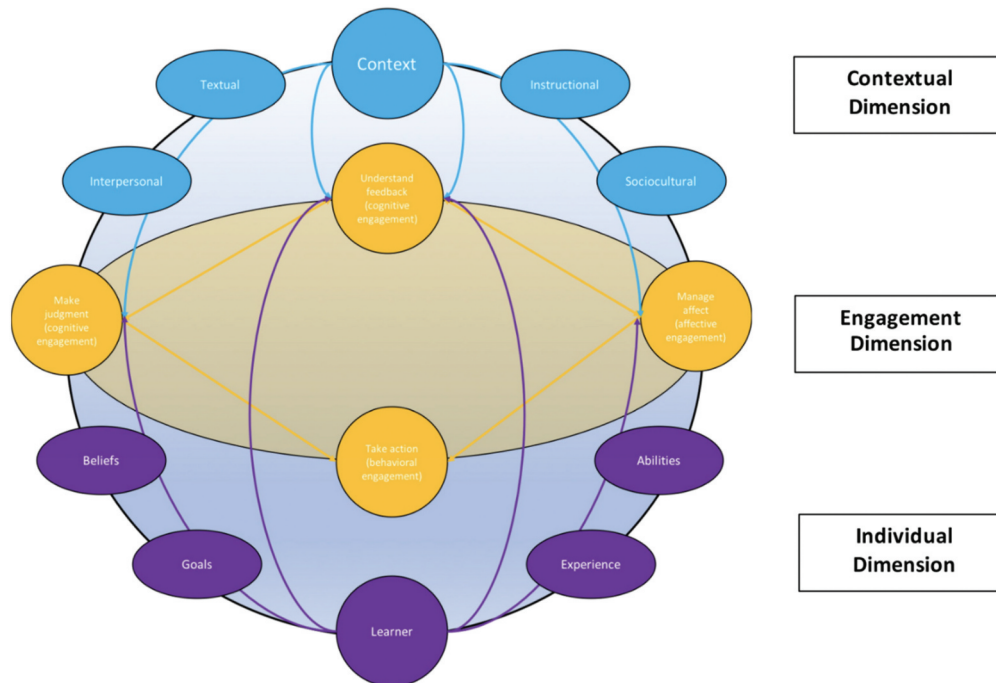
Feedback literacy is more than a buzz phrase; it represents and signifies a move in feedback research from focusing on feedback as a product (Hattie & Timerpley, 2007) to feedback as both an interpersonal (Ajjawi & Boud, 2018) and intrapersonal process (Nicol, 2020). A cornerstone in this transformative understanding of feedback is "engagement", which Winstone et al. (2017) termed "proactive recipience" (p. 17). Fundamentally, feedback is viewed as an activity with which learners engage actively, and thus feedback research should capitalise on "the fundamental contribution and responsibility of the learner" (Winstone et al., 2017, p. 17).

4. Two generations of feedback ecology model

4.1. Feedback ecology 1.0

Drawing on Ecological Systems Theory and informed by the recent literature on feedback literacy reviewed above, Chong (2021) put forward the notion of "feedback ecology" comprising three dimensions: engagement dimension, contextual dimension, and individual dimension. Figure 1 introduces the first generation of feedback ecology introduced in the paper.[1]

Referring to Carless and Boud (2018), the three components in the engagement dimension include cognitive engagement (ways learners understand feedback and their roles in the feedback process; ways learners make reliable judgements), affective engagement (ways learners address emotional labour; learners' attitudes towards feedback), and behavioural engagement (learners' actions based on feedback information). With reference to Bronfenbrenner's (1979) nested ecological systems theory, the context dimension includes four layers: textual-level (e.g., features of feedback), interpersonal-level (e.g., student-teacher rapport), instructional-level (e.g., curriculum, teaching materials), sociocultural-level (e.g., roles of teachers and students). Drawing on learner psychology and learner agency literature, the individual dimension relates to individual differences of learners including beliefs and goals (about feedback, about learning, and about self), learners' feedback experiences (e.g., the types of feedback experienced by learners, learners' experiences in responding to feedback), learners' abilities (e.g., academic skills, academic literacies, subject

knowledge, metacognitive knowledge). The key message of Feedback Ecology 1.0 is that the three dimensions do not operate separately but in tandem. In other words, the ways learners engage with feedback are contingent upon a band of contextual variables and individual variables. Not only that, but learners' feedback engagement is also informed by the *interaction* between the contextual and individual dimensions. To exemplify, a learner who had a successful experience with comprehensive WCF (learners' beliefs and experiences) is more likely to respond to the teacher's feedback when the teacher corrects every error in learners' compositions (textual-level and instructional-level contexts). In the same scenario, a learner who benefited from a focused approach to WCF in the past would be overwhelmed by the teacher's feedback and be hesitant to respond to it.

Feedback Ecology 1.0 continues Storch's (2018) call for a sociocultural turn in WCF research by specifying the types of variables in a sociocultural space (e.g., the types of engagement, types of individual and contextual variables). This paper takes an extra step to identify additional types of variables present in a sociocultural space and clarify the relationships between the variables within such space or ecology. The proposal of Feedback Ecology 2.0 is underpinned by three theories: Ecological Systems Theory (Neal & Neal, 2013), Actor-network Theory (MacLeod et al., 2019), and Complex Dynamic Systems Theory (Larsen-Freeman, 2020). I will first present the conceptual framework of Feedback Ecology 2.0. Then, I will discuss how each of these theories informs my conceptualisation and how this framework opens up new avenues for future WCF research.

4.2. Feedback ecology 2.0

Figure 2 presents the conceptual framework of Feedback Ecology 2.0. Focusing on one individual learner, Figure 2 shows more holistic sources of influence affecting the learner's engagement with feedback. These sources of influence include the multiple ecological systems in which the learner is immersed in (microsystem, mesosystem, exosystem, macrosystem, and chronosystem; Neal & Neal, 2013). Aligned with Feedback Ecology 1.0, within each ecological system, it is crucial for the scope of examination to focus on the interactions between contextual and individual variables (Chong, 2021). Another modification of the framework has to do with the types of feedback engagement by learners (feedback loops and feedback spirals; Carless, 2019).

Building on Bronfenbrenner's (1979) and Neal's and Neal's (2013) Ecological Systems Theories, this modified conceptual framework aims to examine not only a single ecosystem of individual

Figure 2. Feedback Ecology 2.0.
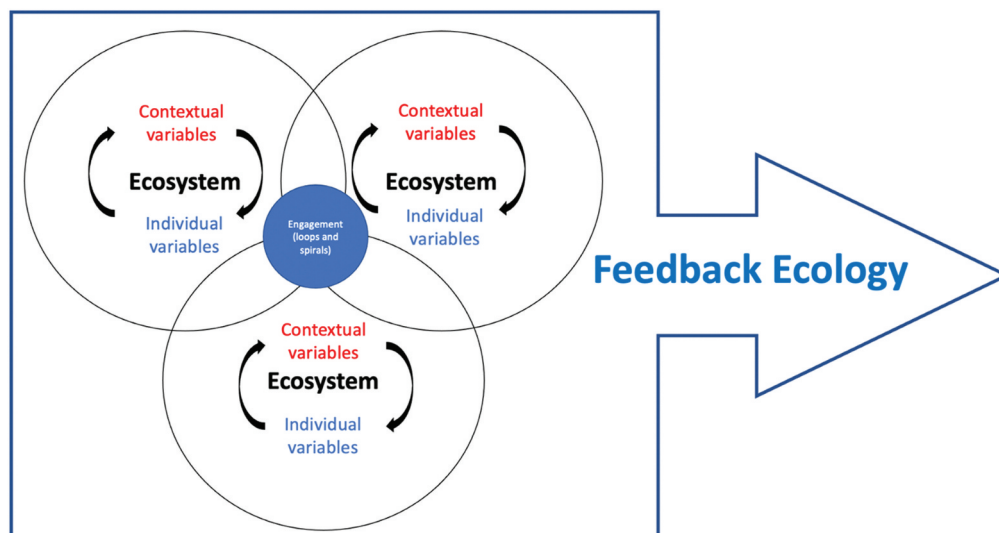
learners but also multiple ecosystems, including *microsystem, mesosystem, exosystem, macrosystem*, and *chronosystem*. Microsystem refers to a setting where the learner maintains direct interactions with others (e.g., in a language classroom). Mesosystem is a setting where the learner maintains indirect interactions with others (e.g., in a parent-teacher meeting where the learner is not directly involved but indirectly because both parents and teachers know the learner). Exosystem, as the name suggests, is a setting where the learner maintains no interaction with people in this context but has information about the context (e.g., a language classroom in the learner's friend's school). Similar to the context discussed in Vygotsky's sociocultural theory, macrosystem focuses on the societal, cultural, and political values that exert influences on the learner's interactions with others in microsystem, mesosystem, and exosystem. Finally, Neal and Neal (2013) postulated that there is a temporal dimension in each of the four aforementioned ecosystems that they name "chronosystem" (as exemplified by the arrow in Figure 2).

Continuing the train of thought in Feedback Ecology 1.0, the focus of investigation within each ecosystem should be on not only the discrete individual and contextual variables but also the *interplay* between them. The emphasis on relationships or interactions is underpinned by Actor-network Theory which argues that "objects, and even individuals, are not static, pre-formed substances but rather surface through a series of *negotiations* between an ever-evolving assemblage of actors" (italicised by author; MacLeod et al., 2019, p. 178). Actor-network Theory provides a more symmetrical perspective to examine social phenomena through considering interactions between "actors", a term used to refer to human and the non-human, the material, and the immaterial. This theory is a useful addition to Feedback Ecology 2.0 because it puts forward the notion that humans are agentic beings and that they do not passively receive from their surroundings; instead, stimulated by their surroundings, they identify and explore affordances in their environments. This resonates with Gravett's (2020) argument that feedback processes are in fact sociomaterial practices. From a sociomaterial perspective, feedback ecology is not merely about individual learners or feedback practices but "the relationships between humans, things, technologies and texts and what these relationships produce" (Zukas & Malcolm, 2019, p. 261). In the context of language learning and teaching, learners actively discover learning opportunities in the multiple ecosystems which they are involved in and harness those affordances to their own learning (Han, 2019). Actor-network Theory suggests that interactions between WCF and learners are not unidirectional but two-way. Nonetheless, WCF research thus far has emphasised the influence of types of WCF on learners (e.g., effect of direct WCF on language acquisition; learners' perception of focused WCF) but not vice versa.

The nature of the different levels of ecosystem and the relationships within is one that is "dynamic, nonlinear, open, interconnected with the environment, and comprised of many components" (Larsen-Freeman, 2020, p. 1). Echoing the "complexity turn" in second language acquisition (Mercer, 2011, p. 61), Complex Dynamic Systems Theory offers additional insights into the negotiatory mechanisms at work within each ecosystem—the interplay between contextual and individual factors is not one that is straightforward and linear (e.g., cause and effect); rather, their relationship is complex (not complicated) and animate (Morrison, 2008). In other words, complexity perspectives view contextual variables in Feedback Ecology 2.0 as "integral parts of the system rather than as external variables affecting the system from outside" (Mercer, 2011, p. 63). Feedback ecologies as complex systems also consider feedback as organic processes, arguing that components within each layer of ecosystems are emergent, often as a result of the actors within the ecosystem or external influences from other ecosystems (Haggis, 2008). In short, complex theories perceive ecosystems and relationships within ecosystems as intricate and emergent, leading to a need to unravel these complexities through conducting longitudinal research; it also points to the untapped potential of practitioner research in which the actors living within the ecology share insider information in relation to the mechanisms and phenomena leading to learner engagement of WCF in such complex systems as feedback ecologies.

The final addition to the Feedback Ecology 2.0 model is the types of learner engagement with feedback. Informed by Carless (2019) notions of feedback loops and feedback spirals, *single-loop engagement* refers to the use of feedback to solve a problem or complete a task, while *double-loop engagement* entails, in addition to single-loop engagement, learners use feedback to reflect on how the problem is solved or the task is completed. It is equally important to emphasise long-term feedback engagement which Carless (2019) depicts metaphorically using a spiral. *Feedback spirals* refer to "unresolved learning puzzles" because the feedback loop is not closed (Carless, 2019, p. 710). Instead, it may take multiple rounds of feedback and a sustained exposure to various feedback sources and types to resolve this area of learning. Applying this understanding to WCF, it is important to acknowledge that feedback uptake by learners takes time, and sometimes, it may take longer than a delayed post-test for the influence to become observable and evident. It is thus vital to examine both immediate and long-term engagement with WCF by learners.

5. Future research directions

As argued earlier, the value of introducing feedback literacy into WCF research is the emphasis on learners' engagement with WCF, which has only recently gained attention (e.g., see a dedicated section on learner engagement with feedback in Hyland & Hyland, 2019). In fact, the significance of engagement in leading to learning outcomes is not new in our field. Ellis (2010), for example, proposed a framework for written and oral corrective feedback research which addresses the interplay between individual differences and contextual factors. This framework, nevertheless, was not taken up by WCF researchers until recently. Two publications aptly respond to Ellis' call to focus on learners' engagement with WCF. Han and Hyland (2015) examined how a group of Chinese EFL university learners respond to teacher WCF. Employing Ellis (2010) model of cognitive, emotional, and behavioural engagement, they collected data from interviews, stimulated recalls, learners' compositions, and feedback dialogues between teachers and students, their findings suggest that "there is a dynamic relationship between three dimensions of engagement". Han (2019) examined not only the interactions between types of engagement but also the contextual and individual variables leading to such engagement from an ecological perspective. Adopting a similar research design as Han and Hyland (2015), the researcher pointed to the indispensable agentic role of learners who "explore learning opportunities afforded by WCF and other related learning resources … embedded in the context and act upon the opportunities that they deem accessible and useful" (Han, 2019, p. 299). Following this emergent line of WCF research, I propose the following research tasks informed by the notions of feedback literacy and feedback ecology, emphasising not only *learning*-centredness but also *learner*-centredness in WCF research (Table 3).

5.1. Retold stories in feedback ecologies

Addressing the complexity perspectives of feedback ecology, WCF researchers can conduct narrative inquiries to understand lived experiences and capture memorable vignettes within the ecology (Connelly & Clandinin, 1990). Through prolonged observation and immersion into the feedback ecology, researchers collect these stories of teachers and learners using interviews, or by asking teachers and learners to complete reflective diaries, feedback logs, or record reflective videos. Researchers can also encourage participants to include authentic WCF examples in their reflections as stimuli or points of departure. In addition to recounting these stories in a narrative manner, researchers can refer to Ecological Systems Theory (Neal & Neal, 2013) to categorise these stories into various "storylines" (e.g., micro-stories, meso-stories, exo-stories, macro-stories, chrono-stories) and examine how various storylines exemplify and contribute to learners' engagement with WCF.

5.2. Reflective stories in feedback ecologies

An insider's perspective is a valuable source of information to understand how and why learners engage with feedback within a feedback ecology. Thus, practitioner research into WCF practices and engagement is a less-treaded yet essential pathway of research. Practitioner research can take multiple forms, including action research (to explore how learners engage with various feedback interventions; Edwards & Burns, 2016), autoethnographies (to reflect on thoughts and

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first-hand experiences of teachers; Sardabi et al., 2020), and collaborative autoethnographies co-authored by teachers and learners (to compare and contrast multiple perspectives related to feedback engagement; Rose & Montakantiwong, 2018). Ultimately, these reflective stories offer a glimpse into teachers' and learners' personal feedback philosophies.

5.3. Meta-stories in feedback ecologies

Retold stories and reflective stories reported in individual studies can be systematically synthesised into meta-stories to demystify learner engagement in feedback ecologies in different educational milieus. Given the predominantly qualitative nature of the data collected in these stories, research synthesis techniques, namely, qualitative research synthesis (Chong & Plonsky, 2021; Téllez & Waxman, 2006), can be used to synthesise the interactions between individual and contextual variables which take place over time and in various contexts, addressing the macrosystem and chronosystem of feedback ecology (Neal & Neal, 2013). Qualitative research synthesis employs various methods, namely, grounded theory (e.g., Chong & Reinders, 2020), thematic analysis (e.g., Yükselir, 2017), and narrative analysis (e.g., Liu et al., 2002), to synthesise qualitative data to inform decisions made by practitioners and policymakers. Another focus of the synthesis can be on the WCF strategies employed in individual studies resulting in a synthesis of practices with rich contextual information and a collection of artefacts to bridge the gap between WCF research and practice (Chong, 2020).

6. Conclusion

This viewpoint article aims to reconceptualise WCF using the notion of *feedback ecology*. Traditionally, WCF, similar to other types of feedback in educational settings, is understood as information, or more accurately, evaluative information provided by teachers to learners. Recently, taking a learning-centred approach, WCF has been defined as a dialogic process between teachers and learners, emphasising the active role played by learners in making sense of and incorporating feedback into their assignments. Building on an existing ecological framework of student feedback literacy proposed by Chong (2021), this article challenges the above views and suggests that WCF needs to be conceptualised as ecologies (a metaphorical term for "contexts"). From an ecological perspective, feedback as information and feedback as process is a limited view because these two notions only offer a narrow vision towards the influence of feedback engagement. For example, feedback as information focuses on the usefulness of information presented in the form of feed-back (e.g., comments written by teachers at the end of an assignment), while feedback as

Table 3. A paradigm shift of WCF research from learning-centred to learner-centred		
	Learning-centred WCF research	**Learner-centred WCF research**
Type of research	• Quasi-experimental studies* • Naturalistic classroom studies • Meta-analyses	• Naturalistic classroom studies • Practitioner research, grounded theory • Longitudinal and reflective studies • Qualitative research syntheses, meta-ethnographies, meta-narratives, syntheses of practice
Focus of analysis	• Effectiveness* • Perception	• Perception • Insiders' perspectives • Personal experiences • Learners' engagement
Theoretical underpinning/ worldview	• Positivism* • Intrepretivism	• Sociocultural theory • Ecological and sociomaterial perspectives • Actor-network theory • Complexity theories

Note: * refers to its dominance in WCF research

a process emphasises the roles played by teachers and students. What these two notions fail to account for is the micro and macro contexts where feedback activities take place. The notion of feedback ecology offers such potential.

Three theories were referred to inform the conceptualisation of feedback ecology: Ecological Systems Theory, Actor-network Theory, and Complex Dynamic Systems Theory. Ecological Systems Theory challenges the singular view of "context" or "environment" and suggests that individual learners are situated in and are influenced by multiple layers of context. Complementary to this view is Actor-network Theory, which posits that the relationship between people and environment is not unidirectional. Instead, there is an interchange between the two, meaning that while environments shape people's beliefs and behaviours, people also actively reconstruct the environments they are in. Finally, Complex Dynamic Systems Theory contributes to the discussion by underscoring the "dynamic" nature of the interactions between people and environment. In short, the notion of feedback ecology refers to the everchanging environment where students and teachers engage in feedback activities. By environment, it includes but extends far beyond the classroom and educational setting to encompass past and present contexts where learners and teachers are directly or indirectly involved.

Compared to Feedback Ecology 1.0 (Chong, 2021), Feedback Ecology 2.0 is a more theorised attempt to conceptualise feedback ecology. In terms of the value of this notion, I acknowledged that there are methodological challenges related to designing studies that aim to examine feedback ecology. For instance, it is difficult to capture the complexity and fluidity of contextual influences using purely quantitative and statistical methods. I suggest alternative research methodologies that are more compatible with the feedback ecology notion, especially the use of qualitative research methodologies such as narrative inquiry. The usefulness of the notion of feedback ecology is not only applicable to researchers but also teachers and policymakers. For example, understanding feedback as an ecology enables teachers to design their feedback strategies in accordance with the learning and sociocultural environments, taking into account learners' prior knowledge and experience (chronosystem). As for policymakers, the notion of feedback ecology can inform the formulation of feedback guidelines and evaluation mechanisms that are cultural and context-specific.

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Note
1. Discussion on the theoretical tenets of Feedback Ecology 1.0 is beyond the scope of this paper and would be redundant. For related information, please refer to Chong (2021).

Disclosure statement
This commentary is based on an invited presentation that the author delivered for Swansea University in the UK. The video recording of the presentation can be viewed using this link: https://swanseauniversity.cloud.panopto.eu/Panopto/Pages/Embed.aspx?id=65d2fdd5-7eb6-4662-90d7-acc4011f354bhttps://files.eric.ed.gov/fulltext/EJ944129.pdf

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