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Rectifying Errors

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2

Embracing Errors for Learning: Intrapersonal and Interpersonal Factors in Feedback Provision and Processing in Dyadic Interactions

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Abstract

Previous feedback models in education (1) overlook that intrapersonal factors (i.e., factors describing personal characteristics) as well as interpersonal factors (i.e., factors describing the relationship between people) simultaneously affect feedback provision and feedback processing, and (2) only implicitly assume that dealing with errors during the provision and processing of feedback requires a set of sub-skills such as error decoding and error evaluation. This chapter proposes a model that conceptualizes the concurrent interplay between intrapersonal factors (e.g., error tolerance and feedback tolerance) as well as interpersonal factors (e.g., perceptions of the other and friendship) and feedback provision and feedback processing in dyadic interactions. As a starting point, the model assumes that errors, if identified and acted upon, offer a potential to revise performance. As such, the model embraces the theoretical complexity of interpersonal communication, as well as the importance of errors for learning.

Keywords

feedback provision; feedback processing; intrapersonal factors; interpersonal factors; errors

Feedback is often considered a fundamental process in the improvement of students' learning and performance (e.g., Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Despite numerous recent attempts to highlight the dialogic, interactive and socially-constructed nature of feedback in educational sciences, and predominantly in higher education settings (e.g., Ajjawi & Boud, 2018; Narciss, 2017; Steen-Utheim & Wittek, 2017; Van Gennip et al., 2009; Yang & Carless, 2013), feedback is still commonly defined and approached as "information provided by an agent (e.g., teacher, peer, book, parent, self, experience) regarding aspects of one's performance or understanding" (Hattie & Timperley, 2007, p. 81). Previous research, however, indicates that the effectiveness of feedback is likely to differ depending on the educational context in which feedback is provided and processed (e.g., Ajjawi et al., 2017; Dingyloudi & Strijbos, 2018a).

In the case of dyadic interactions, i.e., interactions between two human actors, the educational feedback context (e.g., teacher-student, student-student, student-teacher feedback, etc.) can vary in terms of, among other things, intrapersonal factors (Narciss, 2008; Winstone et al., 2017) and interpersonal factors (Levy & Williams, 2004; Strijbos & Müller, 2014). Intrapersonal factors are factors that describe one's personal characteristics. For example, a person's motivation and self-perception potentially play a role while providing or processing feedback (Black & Wiliam, 1998; Narciss, 2008; Winstone et al., 2017).

Interpersonal factors are factors that describe the relation between human actors. Those factors, such as how a feedback provider (e.g., teacher, student, peer) or recipient (e.g., teacher, student, peer) as well as the relationship between them is represented in the other's mind, can impact the provider's appraisal of the recipients' performance as well as the recipients' appraisal of the providers' feedback (Levy & Williams, 2004).

These intra- and interpersonal factors may be of particular importance as they potentially affect how people deal with errors while providing and processing feedback. Dealing with errors plays a central role in feedback processes, because effectively dealing with errors, also referred to as productive failure, can contribute to an effective learning process (Kapur, 2014; Rach et al., 2012). Since error-making and problem-solving are crucial for knowledge transfer and learning, and feedback is likely to function as a scaffold to reduce the gap between a current and a desired performance (Ramaprasad, 1983), errors viewed as opportunities for learning have a central role in the provision and processing of feedback (Fong et al., 2018).

The aim of this Chapter is to propose a feedback model that aims to capture the interplay of intra- and interpersonal factors and the provision and processing of feedback in education, with a specific focus on the process of dealing with errors. Such a model contributes to previous literature, as the concurrent influence and interplay of intra- and interpersonal factors, as well as the role of dealing with errors, are largely overlooked areas in the field of feedback in educational sciences (Strijbos & Müller, 2014; Vandewalle, 2003). By realizing the multifaceted and relational nature of feedback influenced by a complex web of intrapersonal and interpersonal factors, practitioners can design more flexible interventions that explicitly consider and address, for example, actors' relationships, perceptions of one another, as well as intrapersonal factors that relate to feedback provision and processing, and not only consider content- and message-related aspects.

Irrespective of our specific focus on feedback in education, our model also draws upon prominent feedback models in organizational settings, thus incorporating a wider spectrum of views on feedback. Indicatively, feedback literature in organizational psychology devoted more attention to the source (i.e., the feedback provider) and to dyadic interactions between provider and recipient (i.e., social exchange) underscoring the importance of intra- and interpersonal factors than feedback literature in education (Ilgen et al., 1979; Rubin et al., 2008).

Our model considers specifically dyads as important units of analysis, because feedback in educational settings usually involves two human actors (e.g., a teacher and a student, or two peers). Further on in the chapter, the model will be illustrated by means of an example of a peer-feedback situation involving two students that may occur in everyday classes.

Main Orientations of Current Feedback Models

Current feedback models in educational and organizational settings mainly agree upon the idea that feedback aims to inform the feedback recipient about (1) the gap between a desired state and a current state of knowledge or performance, and (2) how this gap can be closed (e.g., Black & Wiliam, 1998; Kluger & DeNisi, 1996). In parallel, most models share two important similarities in representing feedback processes. First, current feedback models either focus on the interplay between feedback processes and intrapersonal factors or on the interplay between feedback processes and interpersonal factors. By focusing on only one set of factors, these models overlook that both sets of factors simultaneously impact feedback provision and feedback processing. Second, current models only implicitly assume that dealing with errors during the provision and processing of feedback requires a set of sub-skills such as error decoding and error evaluation. Consequently, it is often neglected whether and how dealing with errors is being considered while providing or processing feedback.

The Concurrent Impact of Intra- and Interpersonal Factors.

Feedback provision and feedback processing are affected by an interplay of intrapersonal factors. Intrapersonal factors that appear to be related to feedback provision and processing may include intrinsic and extrinsic motivation (Ilgen et al., 1979), effort (Black & Wiliam, 1998), domain-knowledge (Butler & Winne, 1995; Timms et al., 2016), self-efficacy (Bandura, 1986; Nadler, 1979; Narciss, 2008), self-perception (Kenny, 1994), communicative skills (Bandura, 1986), reading skills (Timms et al., 2016), and the Big Five personality traits (Guo et al., 2017; Levy & Williams, 2004).

For example, the intrapersonal factor *domain-knowledge* could affect the feedback provision and processing in the following way: the prior domain-knowledge of the feedback provider may influence the ability to identify a domain-specific error in the target recipient's performance, as well as the ability to provide a feedback message that is grounded on deep domain-specific-knowledge. Similarly, a feedback

recipient's prior domain-knowledge may influence the ability to comprehend the feedback provider's domain-specific-remarks, as well as the ability to associate the domain-specific-information provided by the feedback provider with other relevant domain-specific-information, which could eventually support or hinder the feedback recipient's feedback uptake.

Besides the relevance of intrapersonal factors to feedback processes that involve dyadic interactions, every form of dyadic interaction contains, by definition, not only a flow *within* participating individuals (i.e., intrapersonal factors), but also *between* them (i.e., interpersonal factors). This implies that each actor of an interaction has to cope with his or her own acts and thoughts, and has to adapt them to his or her partner at the same time (Barnlund, 1968). This brings us to the second set of factors that are relevant to feedback processes in dyadic interactions, namely interpersonal factors.

The interpersonal factors affecting feedback processes, such as the perception of the other, are shaped over time. For example, in terms of friendship, students may invest more effort in providing peer-feedback when they consider the peer a friend (Finkelstein, Fishback, & Tu, 2016). These factors are gradually shaped over time through past experiences of the actor with the same partner, and consequently, the actor's developing perception of the partner (Gibson, 1969; Upshaw, 1978). The influence of past experiences may be illustrated by means of the concepts *dyadic meta-perception* and *dyadic meta-accuracy*. Dyadic meta-perception describes how one thinks one is viewed by another, and dyadic meta-accuracy refers to one's ability to know how specific others regard one differently (Kenny, 1994). Dyadic meta-perception and dyadic meta-accuracy are relevant, since feedback providers with a high level of dyadic meta-perception and dyadic meta-accuracy are more likely to tailor their feedback message to a specific feedback recipient.

An example of the process described above is the following: when a student X with an average domain-knowledge and a high dyadic meta-accuracy provides peer-feedback to a student with a high domain-knowledge (Y_1), X may give a more elaborate argumentation for an in-text correction than when X provides peer-feedback to a student with a low domain-knowledge (Y_2). This is the result of the assumption that, on the one hand, X will know that Y_1 has to be persuaded, since X will assume that Y_1 knows that X has a lower domain-knowledge than Y_1 . On the other hand, X will know that Y_2 does not have to be persuaded, since

X will assume that Y_2 knows X has a higher domain-knowledge than Y_2 , and that, therefore, Y_2 is more likely to accept in-text corrections than Y_1 .

The Role of Errors in Feedback. The second similarity of previous feedback models is the mere implicitness of the assumption that feedback providers and recipients have to deal with errors. Errors are often defined as deviations from a norm (e.g., Gloy, 1987; Oser & Spsychiger, 2005; Rach et al., 2012; Spsychiger et al., 2006). While errors and their negative consequences, such as faulty products and erroneous performances, typically receive considerable attention and are deemed undesirable and to be prevented, the field of error management considers errors and their positive consequences—such as learning, innovation and resilience—to be fundamental prerequisites for human development (Sitkin, 1996). Accordingly, learning through errors can take the form of (a) knowledge about the errors themselves to avoid them in the future, (b) understanding of a system after experimentation therein, (c) development of a mind-set of how to deal with errors, and (d) reducing one's negative emotions as a result of errors (Frese & Keith, 2015).

The central role of errors in the provision and processing of feedback is only implicitly visible in the purposes of feedback to support the problem-solving process, to facilitate learning overall, and to decrease the gap between a current and a desired performance (Hattie & Timperley, 2007). Consequently, how an individual deals with error-making and error-based feedback may interfere with the provision and processing of feedback that potentially leads to error correction or knowledge transfer. For this reason, dealing with errors is an inherent and crucial part of feedback provision and processing, and requires more systematic explication.

Although previous literature states that feedback can be primarily used to correct errors—or in other words, to decrease the gap between current and desired performance—it does not delineate *how* one deals with errors while providing or processing feedback (e.g., Gibbs & Simpson, 2005; Kulhavy, 1977). That is, the process of 'correcting errors' is introduced as a phenomenon that is perceived to be similar in every situation, whereas it may differ depending on the situation. For example, how does feedback recipient Y cope with elements of a performance that are in line with the criteria according to Y, whereas they are not in line with the criteria according to provider X? Can a performance be of high quality when it only partially meets the criteria? Such and

similar issues that relate to perceived quality, and therefore focus on how someone deals with errors, are not explicitly addressed in nearly all existing feedback models. An exception to this general observation is the model by Timms et al. (2016), in which the process of dealing with errors in a digital learning environment is explicit and central.

The Role of Errors, Intrapersonal Factors and Interpersonal Factors in Feedback Provision and Processing: A Model

In light of (a) the scarcity of feedback conceptualizations that focus on the interplay between feedback processes and intrapersonal factors, as well as on the interplay between feedback processes and interpersonal factors, and (b) the implicit treatment of the role of dealing with errors while providing and processing feedback, a more holistic feedback model is warranted. The proposed model specifically addresses error-oriented feedback influenced by intra- and interpersonal factors (see Figure 2.1), embracing the inherent complexity in interpersonal communication (Barnlund, 1968).

The model hypothesizes that both the feedback provider and the feedback recipient deal with errors while providing or processing feedback, albeit that the feedback provider and the feedback recipient do that in different ways. On the one hand, the feedback provider may identify an error or multiple errors in a particular performance of the target recipient, or at least have the idea that an error or multiple errors occurred. Thereafter, the provider has to decode this error, i.e., assign meaning to it in order to interpret the error (Akin et al., 1970), and evaluate it (Cowan, 2010; Tai et al., 2018) which could lead to the encoding of a feedback message on the specific error, i.e., the translation of the interpretation and evaluation into the production of verbal and nonverbal signs (Akin et al., 1970). Finally, this message may be sent to the recipient of the feedback in the form of a feedback message. The provider’s feedback provision process is depicted by rectangle A in Figure 2.1.

On the other hand, the feedback recipient has to identify a received feedback message as feedback and acknowledge from that message that he or she made an error. Thereafter, the recipient has to decode

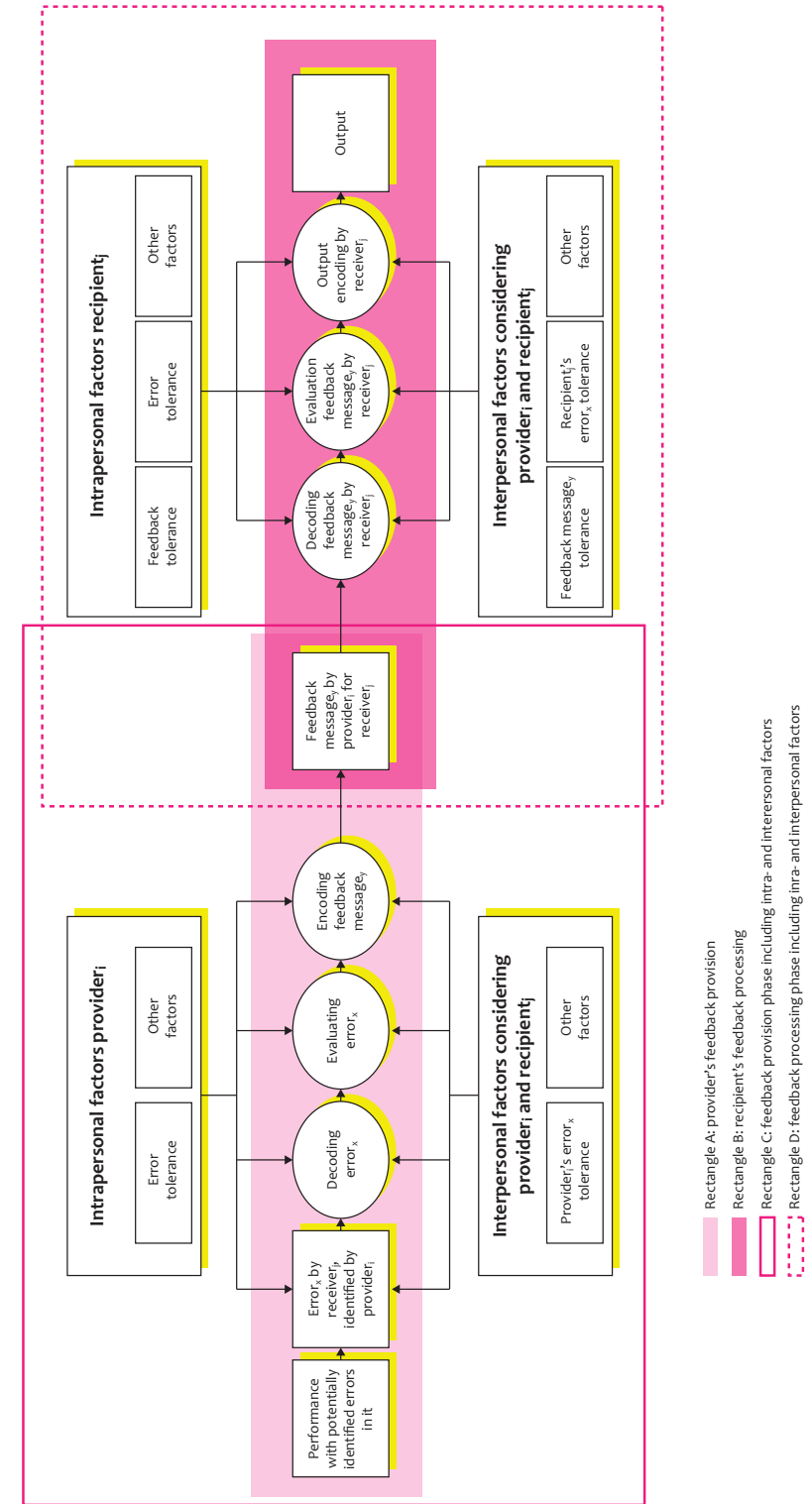


Figure 2.1. Conceptual model for the processes of providing and processing feedback and the assumed dynamic interplay with intra- and interpersonal factors

the feedback message, evaluate this message, and finally (potentially) encode an ‘output’ (e.g., product, performance, response to the feedback). This output may express disagreement with the feedback or may show the intention to act upon the feedback and to correct the error. If the feedback recipient acts upon feedback, this leads to a revised performance, which ideally is an improved performance, implying that the initial erroneous performance is (partially) rectified. The feedback processing by the recipient is depicted by rectangle B in Figure 2.1.

The model also depicts the intra- and interpersonal factors that may affect those feedback provision and feedback processing phases. First, rectangle C represents the feedback provision phase including intrapersonal factors (i.e., the provider’s personal characteristics) and interpersonal factors (i.e., the provider’s representation of the recipient) that affect the feedback provision phase. Second, rectangle D represents the feedback processing phase including intrapersonal factors (i.e., the recipient’s personal characteristics) and interpersonal factors (i.e., the recipient’s representation of the provider) that affect the feedback processing phase.

The model assumes that both intrapersonal and interpersonal factors are involved in the process of dealing with errors while providing or processing feedback (Black & Wiliam, 1998; Butler & Winne, 1995; Strijbos & Müller, 2014). Because the model explicitly takes errors as a starting point, two factors are considered especially important: error tolerance and feedback tolerance. In dyadic interactions, both factors are expressed on both the intrapersonal and the interpersonal level. In the context of this dissertation, error tolerance is defined as one’s resilience towards the experience of having performed in a way that is perceived as deviating from a norm. One’s tolerance towards errors in *general* can be considered as an intrapersonal factor, whereas one’s tolerance towards a *specific* error made or identified by a specific other person can be considered as an interpersonal factor since it is likely to be additionally affected by the particular person that made or identified the error. For example, tolerance towards an error might be lower when it is identified by a less liked feedback provider compared to the tolerance towards an error identified by a liked provider (likeableness serving here as an interpersonal factor).

Something similar may hold for feedback tolerance. In the context of this dissertation, feedback tolerance in *general* is construed as one’s resilience towards performance-relevant information provided to promote one’s learning, and it is therefore an intrapersonal factor.

Likewise, a feedback recipient’s tolerance towards the feedback of a *specific* other person might be additionally influenced by interpersonal factors. For example, a recipient’s feedback tolerance may be low when the feedback was provided by a provider who is not considered a credible source by the recipient. Moreover, the recipient’s feedback tolerance towards a specific message from a specific provider is likely to be affected by that specific feedback message.

Illustration of the Model on a Fictional Example

The model conceptualizes feedback provision and reception in dyadic settings on a generic level. In this section, we will illustrate the model using a peer-feedback example, because interpersonal factors are likely to be even more prevalent and influential in peer-feedback compared to a teacher-student setting, due to potentially multiple types of relationships between peers that move beyond the ‘student-student in-class interactions’ (Dingyloudi & Strijbos, 2018a). Since a significant portion of peer-feedback research has been performed in the area of writing (e.g., Huisman et al., 2019; Patchan & Schunn, 2015; Strijbos et al., 2010; Wichmann et al., 2018), we will present an example of the model in the domain of writing. In this example, we focus on two first year Bachelor students, named Monica and Chris. Monica has high-level communicative and writing skills (intrapersonal factors), and Chris has low-level communicative and writing skills (intrapersonal factors). Despite Monica and Chris being in the same seminar, they do not really like each other: Chris is one of the popular, talkative students in their class, and Monica is a student that prefers to be a silent listener. Most of the times, Monica tries to avoid any interactions with Chris, but that does not always work out, since they are in the same seminar.

Imagine that Monica and Chris have to write an argumentative text on the impact of social media on elections. As part of the seminar assignment, they are randomly paired to provide feedback to and receive feedback from each other. Monica is not happy to provide feedback to Chris, since she prefers to avoid any interactions with him. When reading Chris’ text, she notices quite some errors. Monica, not wanting to antagonize Chris, decides to point out only a few minor errors, and even makes some unearned compliments about Chris’ text. Chris, on

the other hand, immediately recognizes the quality of Monica's text. Not being able to provide high quality feedback, he quickly writes down some short alternatives for already well-written sentences.

In this feedback provision phase, Monica and Chris formulated comparable feedback messages. The messages focus on lower order concerns (e.g., layout, grammar, and spelling), rather than on higher order concerns (e.g., line of reasoning, structure, and argumentation) and do not reveal any thorough text evaluation. The procedures of feedback message composition, however, were different. Whereas Monica's writing skills (i.e., intrapersonal factors, rectangle C) were likely to enable her to provide useful feedback, the interpersonal relationship with Chris (rectangle C) withheld her from doing so. This resulted in Monica identifying errors made by Chris, decoding them, evaluating them, and deliberately not encoding a feedback message focusing on all identified errors (rectangle A). In contrast, Chris' writing skills (i.e., intrapersonal factors, rectangle C) were unlikely to enable him to provide useful feedback, and the interpersonal relationship with Monica (rectangle C) did not encourage him to invest effort in trying. The result was Chris poorly identifying errors in Monica's text, not being able to decode and evaluate them, and failing to encode a feedback message focusing on errors regarding higher order concerns (rectangle A).

After the feedback provision stage, Monica and Chris are asked to revise their texts and potentially act upon the provided feedback. Monica, aware of Chris' poor writing skills, does not expect much from Chris' feedback. This low expectation is confirmed when Monica receives the feedback comments by Chris. She immediately recognizes that Chris' comments can hardly be called corrections of errors, and therefore she just scans the remaining comments, ending up ignoring most of them. "Chris is not the one that can correct my text", Monica thinks (rectangle D). In contrast, Chris is willing to correct his text based on Monica's feedback comments. Consequently, Chris corrects most of the errors as suggested by Monica. Chris is quite happy about the final product, further confirmed by Monica's compliments. "Apparently", Chris thinks, "my text is not that bad" (rectangle D).

In this feedback processing phase, Monica and Chris reacted differently upon each other's feedback. Monica started the processing negatively biased and consequently mainly ignored the comments, whereas Chris started the processing positively biased and consequently mainly acted upon the comments (rectangle B). As a result, both

students were positive about their final products. Monica saw her own writing skills confirmed, since Chris did not provide useful feedback. Chris was positively surprised about the quality of his text, because even Monica did not provide substantial feedback.

As such, this fictional situation demonstrates that both intra- and interpersonal factors may fundamentally impact the processes and outcomes of feedback provision and feedback processing. Monica did not comment on identified errors, mitigated the perceived quality of Chris' text, and processed feedback prejudiced. Chris invested little effort in feedback provision, wrote inappropriate feedback comments, and probably overestimated the quality of his text. Maybe even more important, Monica's and Chris' interpersonal relationship did not ameliorate at all and may even have degraded.

Limitations of the Model

The model is not directly applicable to every feedback situation: it cannot be directly applied in the case of confirming feedback, which has a perceived performance that is up to standards as a starting point, and it may be experienced differently in situations of anonymous and automated feedback. First, since the model takes an identified error as the starting point, it inherently does not deal with confirming feedback messages. Confirming feedback, that does not focus on errors, is not included in the model out of a practical consideration: the model stresses improvement-oriented feedback that can potentially be taken up to 'close the gap'. Nevertheless, the exclusion of confirming feedback does not imply that one should not provide confirming feedback or ignore non-erroneous performances (Hattie & Timperley, 2007; Shute, 2008).

Second, interpersonal factors differently impact the process of dealing with errors in the case of anonymous feedback, compared to non-anonymous feedback. In the case of anonymous feedback, the feedback provider has no knowledge of the feedback recipient, and vice versa. Although the interpersonal relationship may initially not seem to impact the feedback process, it may do so as one builds a mental representation of the inferred other when providing anonymous feedback (Strijbos & Müller, 2014) or receiving feedback anonymously (Karabenick, 2011). Elements of this mental representation are, for

example, inferred domain knowledge, inferred skills and inferred competence. Since these characteristics of the other are merely inferred from performance or the feedback message, they may or may not correspond to the 'real' characteristics of the other or even the characteristics of the other as perceived by that other. Moreover, one may not only infer characteristics of the other, but also a potential other individual; for example, in the case one knows the pool of potential others such as in classroom settings.

Third, in the case of automated feedback, interpersonal factors differently impact the processing of errors. When feedback is automatically provided, the recipient may doubt its quality. For example, one may question the specificity and usability when feedback pops up immediately after submitting a product (e.g., Roscoe et al., 2017).

Implications for Feedback Effectiveness in Research and Practice

Our model highlights that when examining disconfirming feedback, in which the role of errors or erroneous performance or behavior is central, researchers need to bring to the fore and explicitly investigate how oneself deals with error-making (either by oneself or by others), namely one's error tolerance. A closer examination of individuals' error tolerance in disconfirming feedback has the potential to contribute to our understanding of the role of errors in feedback provision and feedback processing, whose role seems to be taken for granted without necessarily being examined. Consequently, the 'taken for granted' role of errors in disconfirming feedback leads to feedback models and empirical studies that consider the 'feedback message' as the starting point and not the 'error' itself from which the feedback cycle emanates and potentially returns to in the form of improvement of performance or learning, by either not repeating the same error in the future or by being able to deal with such error making (either as a provider or recipient).

In addition, our model highlights that when examining disconfirming feedback, which aims to alter or correct an error or one's erroneous performance or behavior, researchers as well as practitioners need to realize that the individuals involved in a feedback interaction enter the 'feedback space' with (a) intrapersonal characteristics (e.g., personality

traits, concepts, values, attitudes, expertise, knowledge, skills), indicated as intrapersonal factors, (b) past interpersonal representations of each other, and (c) relationships, which influence the provision and processing of feedback. This implies an 'agential' perspective on disconfirming feedback (and feedback in general). In other words, feedback is not merely a feedback message that is simply sent and received, it is rather a set of processes that involve individuals and constellations of individuals (e.g., dyads), who consciously or unconsciously identify themselves and others, as well as the relationship between them during all involved processes and as such influencing these processes.

It should be noted that merely evaluating the performance by a specific person, in combination with the interplay of how one views that specific person and one's intrapersonal factors, can already contribute to one's learning—regardless of whether one subsequently receives feedback from that specific other person or not (cf. evaluative judgment; Boud, Ajjawi, Dawson, & Tai, 2018; Cowan, 2010). However, a deeper discussion is beyond this chapters' perspective on the feedback process as an interpersonal communication exchange and the aim of the model and example presented in this chapter.

Moreover, our model implies that feedback can make a difference even when the product quality and learning capabilities did not change after feedback uptake. In other words, the effect of feedback is not solely reflected by the refined product, knowledge or learning. The interpersonal exchange of feedback may affect the interpersonal relationship and may thereby influence the social-interactive learning process. That is, although we conceptualize intra- and interpersonal factors as affecting feedback provision and feedback processing, we do not exclude the possibility of a reciprocal dependence between provider and recipient. As this idea is beyond the scope of this chapter, future research could elaborate on this.

Concerning the effectiveness of feedback in the classroom, the proposed model implies that teachers should at least be aware of the existence of the complex interplay of intra- and interpersonal factors during feedback processes, since a first step towards increasing feedback effectiveness in practice involves feedback actors that are consciously acting. In the case of peer-feedback, as arranged in classroom settings, it is important that teachers are aware of these relationships given their central role in the organization and management of feedback exchange (Yang & Carless, 2013). A second step regarding implementation of the model in practice is to help teachers manage the feedback exchange.

Therefore, future research could aim to develop instruments to assist them in the composition of dyads. For instance, if a digital program would know relevant intrapersonal factors of—and interpersonal relationships between— human actors within a group (e.g., a classroom), such a program could propose suggestions for the composition of dyads that are likely to exchange feedback effectively.

Not only from a ‘feedback manager’ point of view, but also from the point of view of a feedback recipient, awareness is key. Since processing feedback is likely to evoke negative emotions—especially in response to disconfirming feedback (e.g., Ryan & Henderson, 2018), being mentally prepared for the central role that errors play in feedback may contribute to an effective and congenial feedback processing experience. Consequently, future research could additionally focus on increasing feedback recipients’ awareness of the importance of errors for learning.