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### Rectifying Errors

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# DISCUSSION

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**General Discussion**

# SESSION

Feedback is often considered a fundamental process in the improvement of students' learning and performance (e.g., Hattie & Timperley, 2007; Kluger & DeNisi, 1996). Recent feedback literature suggests that, in order to accurately predict and explain the effects of feedback, one needs to pay attention to the dialogic dimension of feedback (e.g., Mahoney et al., 2019; Winstone & Boud, in press; Winstone & Carless, 2019), and the interpersonal relationship between the feedback provider and recipient (e.g., Esterhazy, 2019; Heron et al., in press; Lewis, 2020), for an accurate prediction of and explanation for feedback effects. Simultaneously, recent research has stressed the central role of errors during feedback provision and processing (e.g., Aben et al., 2019; Fong et al., 2018; Timms et al., 2016), as errors can be considered as fundamental prerequisites for learning and development (Sitkin, 1996). Nevertheless, research investigating how intrapersonal factors and interpersonal factors may simultaneously affect feedback provision and processing, and how those factors relate to the process of dealing with errors during feedback provision and processing, is still scarce.

### **Aims of the Dissertation**

This dissertation had two central aims. The first aim was to explore how peer-feedback provision and processing behavior may relate to intrapersonal factors and interpersonal factors. The second aim was to contribute to a better understanding of what role errors play in feedback provision and processing, and the extent to which the process of dealing with errors during feedback provision and processing was related to intrapersonal and interpersonal factors. This was empirically investigated in the context of argumentative essay writing among 10th and 11th grade students (age range = 15-18) in the academic track of Dutch secondary education. In this general discussion, first the main findings of the chapters will be summarized and integrated. Hereafter, (methodological) limitations, and implications for the educational practice will be described.

## Summary of the Findings

Chapter 2 provided a model that conceptualized the concurrent interplay between intrapersonal and interpersonal factors and feedback provision and feedback processing in dyadic interaction. As a starting point, we assumed that errors, if identified and acted upon, offer a potential to revise performance. The model contained a conceptualization of the sub-phases that may be part of feedback provision and feedback processing. Feedback provision consisted of, subsequently, error identification, error decoding, error evaluation, and feedback encoding. Feedback processing consisted of, subsequently, feedback decoding, feedback evaluation, output encoding, and (changed) output. Both the feedback provision and the feedback processing phase were expected to be simultaneously affected by intrapersonal factors (e.g., error tolerance and feedback tolerance) and interpersonal factors (e.g., perceived language skills, friendship).

As such, the model embraced the theoretical complexity of feedback provision and processing, as well as the importance of errors for learning. We illustrated the model by applying it on a fictional example, showing how intrapersonal and interpersonal factors may affect feedback provision and feedback processing, resulting in contrasting ways of dealing with errors. In the remaining three chapters of the dissertation, we empirically tested different parts of this model.

Chapter 3 focused on the part of the model that conceptualized the association between interpersonal factors and feedback provision behavior. More specifically, the aim of the chapter was to investigate the extent to which 10th grade students' perceptions of their peers' language skills (i.e., interpersonal factor) affected the length, amount, function, and focus of feedback and provided grades on peers' written argumentative texts. Therefore, we manipulated the feedback recipient's language skills as perceived by the feedback provider. Dutch 10th grade students ( $N = 176$ ; age range = 15-16) provided peer-feedback on two texts, while being under the illusion that the texts had been written by two classmates whom the feedback providers perceived to have either weaker or stronger language skills than their own. In reality, students provided feedback on manipulated texts of the same quality.

Feedback provided to peers perceived to have stronger language skills than the own did not differ in amount, length, function, and focus from feedback provided to peers perceived to have weaker language skills than the own. Simultaneously, students provided higher grades

to texts of peers perceived to have stronger language skills than their own, than to texts of peers perceived to have weaker language skills than their own. A potential explanation for the absence of differences between feedback remarks to peers perceived to have stronger or weaker language skills than the own, was the small amount of provided feedback on higher order concerns (such as structure, content, and argumentation). These aspects often require more elaborate feedback compared with lower order concerns (such as spelling and grammar). Therefore, potential effects of perceived language skills may have been more easily visible in feedback on higher order concerns than in feedback on lower order concerns.

Chapter 4 addressed the part of the conceptual model visualizing potential associations between intrapersonal factors, interpersonal factors, and feedback processing behavior, based on data of a part of the students (Dutch 10th grade students,  $N = 160$ , age range = 15-16) that also participated in the experiment as described in Chapter 3. This chapter addressed three aims. First, it aimed to investigate the extent to which error tolerance and feedback tolerance consisted of emotional, cognitive, and meta-cognitive components. Second, the study investigated the extent to which the proportion of text revisions were associated with error tolerance, feedback tolerance, and writing self-efficacy (i.e., intrapersonal factors), and the perceived language skills of the feedback provider (i.e., interpersonal factor). Third, we studied the extent to which the potential associations between error tolerance and revision behavior were mediated by feedback tolerance. As part of the data collection for Chapter 3, the same students additionally received similar feedback on their writing performance, provided by trained research assistants. Half of students was led to believe that the feedback was provided by a peer perceived to have stronger language skills than their own, whereas the other half was led to believe that feedback was provided by a peer perceived to have weaker language skills than their own.

First, structural equation models showed that within both error tolerance and feedback tolerance three sub-components could be distinguished, being an emotional, cognitive, and meta-cognitive component. Second, results showed that perceived language skills of the feedback provider were significantly associated with the proportion of text revisions as prompted by feedback on writing style, but not with the proportion of text revisions as prompted by feedback on lower order and higher order concerns. These results indicated that students may



be partly guided in their decision to act upon feedback by the perceived language skills of a feedback provider. Simultaneously, the three error tolerance components (emotional, cognitive, metacognitive), the three feedback tolerance components (emotional, cognitive, metacognitive), and writing self-efficacy were not associated with the proportion of text revisions made in line with the peer-feedback. Third, although the three error tolerance components were statistically related to the corresponding feedback tolerance components, no mediation effect was found of the three feedback tolerance components in the relationship between the three error tolerance components and revision behavior.

In Chapter 5, the part of the model was investigated that conceptualized the process of dealing with errors, and the role of interpersonal relationships in this process. More specifically, the aim of the chapter was to investigate (1) which cognitive sub-phases could be distinguished during the process of dealing with errors while providing peer-feedback and processing peer-feedback, and (2) to what extent dealing with errors while providing peer-feedback and processing peer-feedback was affected by interpersonal factors. Six dyads of Dutch 11th grade students ( $N = 12$ , age range = 16-18) were asked to provide and process peer-feedback on an argumentative text while thinking-aloud, and they were also asked to reflect on the process during an interview afterwards. The think-aloud utterances and interviews were transcribed, and analyzed with a mixed-methods exploratory sequential design, applying a quantitative content analysis and a qualitative thematic analysis.

The process of dealing with errors while providing peer-feedback primarily displayed two patterns. In the pattern of ‘bumping into errors’, the identification of errors seemed to happen simultaneously with the decoding, and often any thoughts related to an evaluation phase were lacking. By contrast, during the pattern of ‘discovering of errors’, the identification of an error seemed to occur as a result of an interpreting/evaluating phase. Also during the processing of peer-feedback two main patterns were visible: students either knew immediately whether they agreed with received feedback, or they had to study the feedback more thoroughly first.

With respect to interpersonal factors, we detected differences between the feedback provision and feedback processing phases. During feedback provision, the interpersonal factors ‘perceived language skills’ and ‘perceived effort’ seemed to affect the students only implicitly, as almost all students said in the interview not to be

affected by the interpersonal relationship, whereas half of them showed before, after, or during the think-aloud activities to be aware of the recipient’s perceived language skills and/or perceived effort during. During feedback processing, interpersonal factors seemed to affect the majority of the students explicitly, as two third of the students declared in the interview to take the provider’s perceived language skills and/or the perceived effort into account while processing their feedback.

## **Integrative Findings**

In this section, we reflect on the two main aims of this dissertation, and on the extent to which the empirical studies in Chapters 3, 4, and 5 provide support for the conceptual model as proposed in Chapter 2.

### **The Role of Interpersonal Factors in Peer-Feedback**

With respect to the first aim, we found contrasting results in the empirical studies. Some results supported the view that the interpersonal relationship between the feedback provider and the feedback recipient may be associated with peer-feedback provision and processing. First, students provided higher grades on a text when they were under the illusion that this text had been written by a peer perceived to have stronger language skills than their own, compared with texts written by a peer perceived to have weaker language skills than their own (Chapter 3). Second, students revised their argumentative text more often in line with feedback on writing style when they believed this feedback had been provided by a peer perceived to have stronger language skills than their own, compared to feedback of a peer perceived to have weaker language skills than their own (Chapter 4). Third, in the think-aloud utterances and interviews, several students mentioned explicitly that while processing peer-feedback, they considered the perceived language skills and perceived effort that the writer had invested into writing the text (Chapter 5).

Simultaneously, other results from the same studies did not support the view that the interpersonal relationship between the feedback provider and the feedback recipient may be associated with peer-feedback provision and processing. First, no significant associations were found between perceived language skills and length, amount, function, and focus of provided peer-feedback (Chapter 3).

Second, perceived language skills were not significantly associated with text-revision behavior with respect to peer-feedback on lower order and higher order concerns (Chapter 4). Third, whereas students quite strongly indicated in the interviews that they were aware of their perception of the feedback provider while processing feedback, they hardly acknowledged such awareness while providing feedback (Chapter 5).

On the one hand, it is not surprising that we found effects of the interpersonal relationship on feedback provision and processing behavior. From a theoretical perspective, the importance of the social constellation in which dyadic interactions, such as peer-feedback exchange, take place, has repeatedly been emphasized (e.g., Back & Kenny, 2010; Esterhazy, 2019; Kenny, Mohr, & Levesque, 2001; Levy & Williams, 2004; Strijbos & Müller, 2014). Moreover, research has shown that peer perceptions may affect feedback provision and processing behavior. For example, students that provide anonymous feedback tend to provide more critical peer-feedback and provide different types of peer-feedback than students that provide non-anonymous peer-feedback (Panadero & Alqassab, 2019). Additionally, revision behavior of students that process peer-feedback may be affected by the writing competence of the feedback provider (Strijbos et al., 2010).

On the other hand, our results with respect to effects of interpersonal factors were not unambiguous. Interpersonal relationships primarily seemed to affect the feedback processing phase, and, to a lesser extent, the feedback provision phase. This difference may emphasize the complexity of the way in which contextual factors may interact during feedback provision and processing (e.g., Henderson et al., 2019; Molloy et al., 2020). That is, effects of the interpersonal relationship on feedback provision and processing may depend on various, potentially interacting, contextual factors such as whether a student takes the role of feedback provider and/or feedback recipient in a particular situation of feedback exchange.

For example, one of the contextual factors that may interact with potential effects of the interpersonal relationship on feedback-provision and processing, is the age of students that are involved in feedback exchange. More specifically, the value of peer-feedback for writing improvement may be questioned among students in secondary education, like the participants in our samples (e.g., Gielen et al., 2010b). This may be the case because students need considerable practice and training for the development of skills to deal with feedback efficiently

(Sluismans, 2002); that is, to become feedback literate (Carless & Winstone, 2020; Han & Xu, 2020; Molloy et al., 2020). By contrast, review studies show that peer-feedback may positively contribute to writing improvement with respect to students in higher education (Huisman et al., 2018; Huisman et al., 2019). The students involved in our studies were likely relatively unexperienced with peer-feedback practices due to their age, compared to students in, for example, higher education, which may have contributed to the partly contradictory results with respect to effects of the interpersonal relationship on peer-feedback provision and processing behavior.

Future research could continue to explore this potential interaction between the age of students involved in feedback exchange and effects of interpersonal relationships on feedback provision and processing. Especially in light of the increased focus on perceiving feedback exchange as a dialogue between actors (e.g., Mahoney et al., 2019; Winstone & Boud, 2020; Winstone & Carless, 2019), the impact of the interpersonal relationship between actors on feedback provision and processing may develop throughout the years. Therefore, future research will have to confirm the extent to which effects of the interpersonal relationship between the feedback provider and feedback recipient predominate in the feedback processing phase in comparison to the feedback provision phase, and whether the age of actors involved in peer-feedback exchange may be associated with peer-feedback provision and processing.

### **The Role of Errors in Peer-Feedback**

With respect to the second aim, several findings supported the view that errors play a central role during the provision and processing of feedback. Although Chapter 3 addressed in particular the associations between perceived language skills and length, amount, function, and focus of provided peer-feedback, this chapter, as well as Chapter 5, showed that feedback remarks had more often an error- or improvement-related nature (e.g., negative comment) than a plus-related nature (e.g., positive comment). Chapter 4 showed that error tolerance was strongly associated with feedback tolerance, implying that the extent to which one is resilient towards having performed in a way that is perceived as deviating from a norm predicts the extent to which one is resilient towards performance-relevant information provided to promote one's learning.

The extent to which previous research is in line with this error-oriented approach of feedback, processes appears to be domain-dependent. For example, in the domain of English as a Second Language (ESL), error correction is perceived as fundamental for feedback provision (Amara, 2015), as errors in this domain are perceived as all differences between the language behavior from an ESL-learner and a native speaker (Lennon, 1991). As such, a native speaker's language behavior is perceived as the 'norm', and ESL-learners' deviation from this norm as an error. Hence, awareness of errors offers a crucial possibility to improve one's English language capabilities, and therefore the abilities to learn from errors and deal with errors are perceived as substantial prerequisites for human development (Kapur, 2016; Sitkin, 1996).

By contrast, the field of feedback and assessment tends to approach feedback as a means that may contribute to closing the gap between a current and desired performance (e.g., Black & Wiliam, 1998; Narciss, 2008; Ramaprasad, 1983). As such, 'deviations from a norm' are not (by definition) perceived as an error, but as a performance element that needs to be changed in order to meet the criteria by which the performance will be judged (Moore & Teather, 2013). As a result of the focus on the gap between a current and desired performance, the importance of the role of errors during feedback provision and processing seems to have moved to the background in this field of research.

Nevertheless, the domains of ESL and feedback and assessment have in common that the subjectivity of perceived errors or gaps between a current and desired performance remains mainly underexposed. Both domains seem to imply that it is possible to establish objectively to what extent a performance (element) deviates from a norm and the extent to which there is a gap between a current and desired performance. However, as argued in Chapter 5, the notion of a 'norm' is ambiguous: norms may refer to (a) implicit, personal codes of conduct, e.g., situation-specific behavioral expectations (Lapinski & Rimal, 2005); (b) generalized written rules, e.g., grammar prescriptions in a specific language (Zwicky, 1980); (c) the minimum performance for a passing grade, e.g., examinations (e.g., Prince, 2016); or (d) anything in between. As such, the interpretation of those norms may depend on the actors involved in feedback exchange (e.g., teacher-student, student-student) and their interpersonal relationship. Therefore, it can be argued that the extent to which a performance (element) is perceived to contain

errors, or a gap between a current and desired performance, may not only be determined by the type of performance, but also by the interpersonal relationship between the performer and the perceiver of the performance.

By focusing on the interpersonal relationship between the feedback provider and feedback recipient, this dissertation provides ground for a reconceptualization of the role of errors in the context of learning and more specifically in the context of interpersonal processes during feedback exchange. That is, errors can be perceived as particular instances of deviations from either one's own, or someone else's expectation. This perception of errors emphasizes that (1) the extent to which a performance is erroneous can be subjective, meaning that there is likely no objective truth of whether a particular performance (element) *is* or *is not* erroneous; and (2) from the range of potential deviations from expectations, a part may be perceived as erroneous, and a part may not. This implies that every element perceived as erroneous is perceived as a deviation from an expectation, but simultaneous also that not every deviation from an expectation should be perceived as erroneous by definition.

This view on errors is partly in line with main perceptions from the domain of ESL and the domain of feedback and assessment. On the one hand, the emphasis on the subjectivity involved in identifying and evaluating errors contradicts with the objective nature of errors as implied by perceiving errors as a deviation from a norm (e.g., Gloy, 1987; Rach et al., 2012; Spychiger et al., 2006) and a gap between a current and desired performance (e.g., Ramaprasad, 1983). On the other hand, this view partly connects to the 'gap'-approach, in the sense that not every deviation from a norm should be perceived as an error, whereas research in the domain of ESL does define every deviation from a norm as an error.

### **The Conceptual Model in Light of the Empirical Findings**

The findings in the empirical Chapters 3, 4, and 5 partly support the model as conceptualized in Chapter 2. The model hypothesized an impact of intrapersonal and interpersonal factors on feedback provision and feedback processing. With respect to the intrapersonal factors *error tolerance*, *feedback tolerance*, and *writing self-efficacy*, the findings of Chapter 4 did not support the conceptual model in the context of argumentative essay writing in secondary education, that is, those intrapersonal factors were not associated with feedback processing

behavior. This result was unexpected, as an extensive body of empirical research has shown that various intrapersonal factors are associated with feedback provision and processing, such as domain knowledge (e.g., Butler & Winne, 1995; Timms et al., 2016). With respect to the interpersonal factor *perceived language skills*, the results in Chapters 4 and 5 indicated that the language skills of a feedback provider as perceived by the feedback recipient may relate to the extent to which the recipients' textual revisions were in line with received feedback, and Chapter 3 showed that grades provided to peers perceived to have stronger language skills than the own, were higher than grades provided to peers perceived to have weaker language skills than the own.

Moreover, the model hypothesized that the process of dealing with errors consisted of four sub-phases for feedback provision—i.e. error identification, error decoding, error evaluating, and feedback encoding—and three sub-phases for feedback processing—i.e. feedback decoding, feedback evaluating, and output encoding. In Chapter 5, we found partial support for the occurrence of all sub-phases, except for the error and feedback decoding phases. However, the order in which the sub-phases occurred seemed to differ within students, depending on the pattern in which students dealt with errors. Taken together, the conceptual model in Chapter 2 largely holds up based on the results in the three empirical studies.

However, future research could aim to establish whether rectifications of the conceptual model as proposed in Chapter 2 are needed. Based on the findings in this dissertation, it may be questioned whether effects of intrapersonal factors and interpersonal factors are comparable for the feedback provision phase and feedback processing phase, as is suggested by the symmetrical visualization of the corresponding boxes in the model. In fact, previous research has already implied that learning effects may differ between the provision of feedback (e.g., Gan & Hattie, 2014; Van Popta et al., 2017) and the processing of feedback (e.g., Gielen et al., 2010b; Huisman et al., 2018).

Furthermore, it may be questioned whether the unidirectional visualization of the process of dealing with errors justifies the order in which the sub-phases seem to occur in practice. In fact, the different patterns as found in Chapter 5 show that students may skip sub-phases or go back and forth between sub-phases during the process of dealing with errors, which provides ground for a non-linear visualization of the process of dealing with errors. Such a visualization would also be more in line with one of the current trends in feedback research that

conceptualizes feedback exchange as a process of reciprocal turn-taking (Winstone & Boud, in press; Winstone & Carless, 2019).

## Limitations

Each chapter discussed the limitations of the respective study. In this section, several limitations of the dissertation as a set of studies will be discussed. First, inherent to perceiving peer-feedback provision and processing as affected by numerous—likely interacting—intrapersonal, interpersonal, and contextual factors, is the impossibility to fully capture this complexity in research. This dissertation acknowledged the theoretical complexity of peer-feedback processes by including and even emphasizing the concurrent impact of both intrapersonal and interpersonal factors (Chapter 2). However, empirically, we studied the impact of only a few intrapersonal factors (i.e., error tolerance, feedback tolerance, and writing self-efficacy), and focused mostly on one interpersonal factor (i.e., perceived language skills of the peer-feedback provider or recipient as relative to the students own language skills in Chapters 3, 4, and 5), in only one domain (i.e., argumentative essay writing), and in one sample (secondary education). However, the model as proposed in Chapter 2 is more generic, and discusses intrapersonal and interpersonal factors more broadly.

A second limitation of the dissertation is the way in which the interpersonal relationship between peers was measured in the empirical chapters. Interpersonal relationships are multidimensional constructs and therefore difficult to capture (Back & Kenny, 2010). In Chapters 3, 4, and 5, interpersonal factors were measured by asking students to indicate on a five-point scale how they perceived their relationship with peers in terms of perceived language skills compared to their own language skills. However, perceived language skills may be subconscious, and questions about those perceptions may be subject to social desirability, in the sense that students may not be completely comfortable to provide their actual perceptions of peers' language skills. As a result, the multidimensionality of interpersonal factors such as perceived language skills may not be fully expressed in the way we measured this construct. To deal with this friction, future research could investigate the possibilities of measuring interpersonal factors by using Implicit Association Tests, which capture implicit perceptions



of, for example, peers, by examining automatic associations between those peers and evaluative attributes (Karpinski & Hilton, 2001).

Third, the theoretical approach in this dissertation makes it difficult to determine the robustness of the effects we found. We deliberately adopted the perspective of an interpersonal, error-oriented conceptualization of feedback processes to emphasize the interpersonal constellation in which feedback processes take place and the crucial role that errors play in those processes (Chapter 2). Consequently, our empirical studies (Chapters 3, 4, and 5) were primarily aimed at testing the hypothesis that interpersonal factors may be associated with peer-feedback provision and processing, and the hypothesis that errors have a central role in those processes. Although the findings across the chapters, both contesting and supporting specific hypotheses, have been collected in the most careful way possible, it is difficult to say whether similar findings would have surfaced if the underlying theoretical perspective was different. This would call for more mixed-methods research, similar to the study in Chapter 5, combining multiple data sources and analytical techniques in order to better understand feedback provision and processing.

## **Implications for the Educational Practice**

The findings have several implications for the way teachers may deal with errors and interpersonal relationships in the peer-feedback practice. Although no explicit link between error or feedback tolerance and feedback revision behavior was found in Chapter 4, this chapter showed that error tolerance is a strong predictor of feedback tolerance, meaning that dealing with errors plays a crucial role in the process of dealing with feedback. Hence, it could be argued that a fundamental prerequisite in becoming feedback-literate, is developing persistence when faced with errors and feedback (Carless & Winstone, 2020; Han & Xu, 2020; Molloy et al., 2020). Therefore, future endeavors could be aimed at developing interventions that may contribute to an error-tolerant classroom culture (e.g., Rach et al., 2012), by creating an atmosphere in which error making is approached as a valuable learning opportunity.

Additionally, the research in this dissertation should, in an ideal

scenario, raise awareness of the relationship between actors (e.g., teachers, students) involved in peer-feedback exchange among students, and between the students and their teacher(s). We emphasized in Chapters 2, 3, and 5 that the learning gains of peer-feedback activities could be optimized if students and teachers involved in peer-feedback exchange were aware of the potential role that interpersonal factors may play in peer-feedback provision and processing. Such awareness of effects of interpersonal factors may improve students' feedback literacy, and hence their peer-feedback provision and processing. Similarly, it may improve the quality of teachers' peer-feedback instructions when teachers would help students becoming aware of the role of interpersonal factors. Moreover, the awareness may lead to teachers consciously composing peer-dyads, for instance, by avoiding friendships within dyads.

## **To Conclude**

This dissertation added to existing feedback models, by conceptualizing the simultaneous impact of intrapersonal and interpersonal factors on feedback provision and processing, as well as the central role of errors in those processes. The empirical studies testing the hypothesized associations in the model had a high degree of ecological validity. That is, the studies using experimental designs measured outcomes of real behavior (i.e., provided feedback in Chapter 3, and textual revisions in Chapter 4), and the study using a non-experimental design was embedded in school contexts and in genuine school tasks (Chapter 5). As such, the development of a conceptual model of feedback processes in combination with empirical studies testing the hypothesized associations signifies the added value of this dissertation to the field of feedback research. Therefore, we hope that the conceptual perspective and adopted methodologies form a fruitful ground and a source of inspiration for future research in the field of (peer-)feedback and (peer-)assessment, and beyond.