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An Information Processing Perspective on the Efficacy of Instructional Feedback

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Abstract

Although feedback is understood to be an integral component in instruction, theoretical development of the concept has lagged. The shortcomings of current efforts to provide efficacious instructional feedback are highlighted by feedback intervention theory. However, the communicative mechanisms which lead to loss of effectiveness are not understood. This essay suggests that a dynamic relationship between the learner's attributions of feedback messages and activation of coping mechanisms is responsible for feedback efficacy. Pedagogical strategies for maximizing the effectiveness of instructional feedback, in light of the underlying psychological and physiological process components, are discussed.

Keywords: feedback, attribution, instruction, behavioral inhibition, behavioral activation.

While scholars give passing nod to the theoretical importance of feedback, the information processing features of the concept remain underdeveloped. Imported from the field of cybernetics (Littlejohn, 2002; Monge, 1982; Stacks, 1991), feedback is the conceptual component which differentiates closed and open systems. Simply stated, adaptation and learning require knowledge of progress (feedback). However, what one student may regard as helpful information, another may regard as inconsequent, unhelpful, or captious commentary. Information processing theory is informative in discerning the relationship between instructional feedback and student responses to criticism (King, Young, & Behnke, 2000). This essay will propose a model of feedback based on the concepts of stimul us recognition and processing, attribution of intent, and activation of behavioral inhibition systems.

Understanding Feedback Efficacy

Scholars have devoted significant attention to feedback systems and technologies (for a review, see King & Behnke, 1999) and relatively little attention to understanding or theoretical development of the process (Frandsen & Millis, 1993; Quigly & Nyquist, 1992). Conceptual elaboration of the feedback process is particularly salient to education professionals who evaluate public speaking performances. Such performances produce high levels of threat and anxiety for many students (Ayres, 1988; Bippus & Daly, 1999; Proctor II, Douglas, Garera-Izquierdo & Wartman, 1994). As a result, the ability to produce feedback which avoids negative student attributions is made difficult, particularly since educators accept the

professional responsibility of providing "objective, reliable, and valid" performance feedback (Booth-Butterfield, 1989, p. 120).

Difficulties such as anxiety and the disentangling of evaluation from feedback may be partially responsible for a lack of consistent findings in the feedback literature. While many scholars have found that post-performance feedback increases cognitive learning and motivation, others have found little or no improvement attributable to feedback interventions, or, in a few cases, regression (for reviews of the mixed results, see Balzer, Doherty & O'Connor Jr., 1989; Bangert-Downs, Kulik, & Morgan, 1991; Kluger and DeNisi, 1996). 1

Feedback Intervention Theory

In an effort to explicate these mixed results, a recent conceptualization, feedback intervention theory (FIT) has been proposed (Kluger and DeNisi 1996). FIT delimits feedback interventions to "actions taken by an external change agent to provide information regarding some aspect of one's task performance" (p. 255). Feedback unrelated to performance, naturally occurring feedback, such as homeostasis, and knowledge of performance without intervention, such as viewing one's speech on videotape, are specifically excluded from FIT. What remains are specific efforts by instructors, counselors, coaches, and others to utilize feedback as an intervention to performance improvement.

In developing FIT, Kluger & DeNisi conducted a meta-analysis of the feedback literature and uncovered two interesting and significant trends. First, feedback cues which draw attention to meta-task processes (threats or praise to self) retard performance while feedback which draws attention to task motivation or learning processes enhance performance. Second, feedback efficacy is moderated by the nature of the learning task. 2 The mechanisms involved in these two findings are not clearly understood; however, the purpose of this paper is to synthesizes the research into a model which explains the efficacy of instructional feedback.

FIT proposes that perform ance is adjusted by comparisons of feedback to goals or standards, that attention is limited and that only "feedback standard gaps" are involved in behavior adjustment, and that feedback interventions affect performance by changing the locus of attention (Kluger & DeNisi, 1996, p. 259). The first of these claims, that behavior is compared to goal states, is consistent with goal setting theory and is an assumption underlying much current work in strategic communication (for example, see Daly & Wiemann, 1994). The second claim requires some explanation. When goals or standards for behavior are found to be inconsistent with feedback, a gap between goal and standard captures the individual's attention. This feedback standard gap may be positive (performance exceeds standard) although it usually negative (performance lag exists) since instructors are employed to manage situations in which learning, or adaptation, needs to occur. 3 According to control theory (Carver & Scheier, 1981), individuals are motivated to eliminate this discrepancy. The individual may change behavior (improve performance), change the standard, abandon the standard, or reject the feedback. For example in a public speaking context, criticism of speech content may result in the student rewriting the speech, lowering expectations of his/her ability to write speeches, beginning to view the activity as worthless, or believing that the instructor is inept and the feedback is incorrect.

The underlying mechanisms which account for a particular individual's reactions to eliminating the feedback standard gap in a given setting may hold the key to an understanding of feedback efficacy. Some insight is offered by FIT, which demonstrates that attention to meta-task processes attenuates the effectiveness of feedback interventions. This is observed when the student's attention is direct ed away from performance improvement and toward one's own standards and the source of the feedback. Attribution theory attempts to provide explanations for this kind of behavior.

Attribution Theory

Naïve explanations for the existence of the feedback standard gap may be key in the success of feedback interventions. First proposed by Heider (1958), attribution theory asserts that individuals want to explain the

causes of behavior, that they systematically assign causes to events, and that the resulting naïve explanations have consequent impact on their attitudes and future behaviors. A derivative of attribution theory, correspondent inference theory, suggests that, "behavior is seen as corresponding to or reflecting an underlying disposition of the actor, and the consequences it achieves are not only intended but would be characteristically intended by the actor" (Jones, 1990, p. 46). Negatively valenced feedback, according to correspondent inference theory, is likely understood as reflective of a negative and pedantically predisposed instructor. In other words, students receiving corrective feedback are predisposed to blame the messenger.

However, a more elaborated explanation of attribution is found in Kelley's (1971) covariation model which suggests two predicates: the covariation principle and the discounting principle. The covariation principle maintains that an effect is attributed to a cause with which it covaries over time. So, for example, a student may see the cause of a corrective comment as the negative orientation of the instructor if that instructor regularly makes such negative comments. The discounting principle maintains that a cause-effect relationship is discounted if other possible causes are also present. As a result, the extent to which corrective feedback is directly and exclusively tied to student performance is important in preventing discounting.

The utility of these attributional perspectives may be readily apprehended in an instructional context. Feedback which produces a negative standard gap may be understood as a reflection of the instructor's disposition (correspondent inference), particularly if the instructor tends to provide negative feedback over time (covariation), fails to provide positive feedback or successfully demonstrate a link between the feedback and the student's performance (discounting).

The distinction between communication which produces a positive or negative feedback standard gap is important in another regard. One of the most consistent findings in attribution research has been the presence of a self-serving bias (Cadinu, Arcuri, & Kokilja, 1992; Green, Bailey, Zinser, & Williams, 1994; Watt & Martin, 1994). Specifically, negative feedback is attributed to conditions, unrealistic expectations, or the feedback source while positive feedback is attributed to self and one's own merit. While this self-serving bias can be overcome (Hughes, Bass, & Hebert, 1997), its existence is important as we seek to understand the conditions under which instructional feedback is likely to be effective. In summary, it is not only the content of the feedback, but the learner's naïve explanations for the feedback, that determine feedback efficacy.

Personal Traits and the Processing of Feedback

The importance of individual differences and trait competencies in message processing has long been acknowledged (Greene, 1997; Meyer, 1997) but has received scant attention in feedback research. A notable exception to this trend has been the work of Edwards and Pledger (1990) in development of the feedback sensitivity concept. In elaborating the construct, Edwards and Pledger (1990) developed a measurement scale consisting of four factors: anticipation of response, sensitivity to socially undesirable feedback, sensitivity to socially desirable feedback, and sensitivity to attention.

While the scale was developed for interpersonal, rather than instructional, transactions, it is of interest that two distinct information processing features appear to be involved. First, sensitivity to the presence of feedback is a component of the scale, illustrated by the construction of the scale items (e.g., "I know when, I can tell when"). All 19 scale items are constructed in this manner. Moreover, a positive correlation between feedback sensitivity and self-monitoring indicates some level of variation in attention to cues. It is accepted that individuals vary in their ability to separate information from background noise in a stimulus field. In communication studies, we may refer to these differences as listening ability, nonverbal sensitivity, attention level, or any number of other constructs. Second, sensitivity to the affective content of feedback is an important aspect of the concept. This is illustrated by differing reactions to socially acceptable and unacceptable feedback and by the orientation of the scale items toward feelings (e.g., "I can tell when I have upset someone, I know when my conversational partner is reacting positively to me").

The view that feedback sensitivity consists of objective (attending) and subjective (attributional) components is strengthened by findings indicating that high feedback sensitives are aware of a greater

number of potential sources of feedback but are less likely to incorporate the information obtained into self-concept than are low feedback sensitives (Edwards, 1990). Of course, it should not be assumed that these two phases of the decoding process function independently. Highly negative attributions (disparagement of communication source) could result in selective attention and perception. Likewise, a lack of awareness or understanding of feedback may alter subsequent attributions.

In an examination of attributional feedback, Booth-Butterfield (1989) demonstrated the importance of trait differences in feedback perception. High communication apprehensive (CA) students were found to generate more negative external attributions than were low CA students. While feedback efficacy was not examined, the study is important in establishing a link between trait differences (CA) and important processing outcomes such as positive/negative valence and internal/external (locus of credit/blame) attributions.

The following discussion advances a bio-communicative trait distinction which appears most relevant to the threatening and anxiety-producing conditions which are sometimes perceived to exist in instructional feedback.

Strong and Weak Nervous Systems

Pavlov (1928) proposed that the strength of one's nervous system was directly related to resistance to conditioning by external stimuli. By definition, individuals with weak nervous systems are more susceptible to stimuli (Eysenck, 1967) and may experience excessive and intense anxiety. Recently, scholars have utilized this heuristic to explain individual reactions to speaking anxiety (Behnke & Sawyer, 1999; Freeman, Sawyer & Behnke, 1997). Central to this explication are the neurological response mechanisms which are activated by perceived threats. Labeled behavioral inhibition system (BIS) and behavioral activation system (BAS), these evolutionary holdover mechanisms originally functioned to suppress behavior (hide and be quiet) or activate defenses (show of force) in the presence of a threat. Activation of specific subsystems allows the individual to suppress the behavior which is provoking the threat (BIS) or activate a learned response for dealing with the threat (BAS). Individuals with weak nervous systems are more likely to experience activation of these subsystems due to heightened sensitivity to the stimulus.

Feedback, particularly under conditions of a negative feedback standard gap, can be very threatening. It may presage both real (e.g., poor grade, inability to learn an important skill, inability to be accepted) and reified (e.g., loss of self esteem) consequences. When perceived threat is high, the BIS may reduce efforts to succeed or may lead to withdrawal while the BAS may evoke defensive reactions such as rationalization, anger, or denial.

The responses to apparent feedback standard gaps suggested by Kluger and DeNisi (1996) may be informative. Three of the responses (change the standard, reject the standard, reject the feedback) do not lead to performance improvement and could be brought to bear through activation of threat manage ment systems such as the BIS and BAS. It is also noteworthy that cognitive and primitive neurological systems are often co-dependent and form closed feedback loops. As an example, negative attributions regarding instructional feedback may lead to inhibition of performance or activation of defense mechanisms which result in even more negative attributions. Consequently, initial attributions may ultimately result in self-perpetuating spirals toward more and more negative judgments and behaviors. This learned helplessness could potentially affect future ability to manage feedback. Most important, this response could indicate that even modestly negative attributions are driven downward to a point where feedback efficacy is lost.

Development of a Cognitive-Physiological Model

Any model of feedback efficacy which hopes to explain individual reactions to particular messages should account for both cognitive and physiological elements related to the processing of threatening me ssages. The model outlined in the foregoing review should include at least three primary elements: detection ability, attribution, and neurological activation. A suggested arrangement of these elements in shown in figure 1.

Detection

In order to create an environment where performance can be adjusted, feedback enables a comparison of actual performance to goal performance. The receiver must detect a deficiency between the two, or a feedback standard gap. Unless this gap is detected, the student will not be able to make use of the feedback in a constructive way. It is assumed that individuals will vary in detection ability (e.g., ability to listen competently, detect nonverbal cues, be sensitive to relational messages, etc.). It should not be assumed that individuals who are sensitive in detecting feedback will be sensitive in the sense that psychological defense mechanisms are more easily activated. Of course, absent the detection of a feedback standard gap, no activation of defense mechanisms is necessary.

Attribution

When a feedback standard gap is detected, an attribution is attached. As per the previous discussion of attribution theory, self-serving bias may provide explanations for corrective feedback other than deficient performance (e.g., "The teacher doesn't like me anyway.") and careful attention to the discounting principle is necessary. Attributions vary in level of valence (positive/constructive to negative/critical) and ego involvement. Most important, it is not the presence of the feedback which activates the BIS or BAS systems, but the preliminary attribution.

Behavioral Inhibition or Activation

If a feedback standard gap is detected but defense mechanisms are not activated, learning or behavior change is likely. At some level of feedback potency (which varies individually based on nervous system strength) BIS and BAS will be activated and adaptation, or learning, becomes highly unlikely. Thus, it should be noted that nervous system strength is consequential in the model. Moderately negative attributions can activate defense mechanisms for individuals with weak nervous systems (high sensitivity) but fail to activate the BIS or BAS for individuals with strong nervous systems.

The model contains its own internal feedback mechanisms, with negative attributions influencing neurological defense mechanisms, which in turn drive down future attributions and decoding ability. Individuals with weak nervous systems are of interest since they will more readily detect and apprehend feedback standard gaps, yet are more likely to experience activation of defense mechanisms. Interestingly, if activation of BIS/BAS can be avoided, possibly through generation of initial positive attributions, these individuals are best able to utilize instructional feedback.

While there is presently no direct method for measuring the strength of an individual's nervous system, the feedback sensitivity concept holds some promise for permitting insight through self assessment. As previously discussed, many of the items involve affective reactions to feedback and likelihood to react defensively to feedback. Research currently underway is providing preliminary evidence in this regard, linking two of the scale items (sensitivity to socially undesirable feedback and sensitivity to socially desirable feedback). Future development of feedback sensitivity holds some promise in at least two areas. First, the scale can be developed to enhance ecological validity in the use of feedback in learning by placing the items in an instructional, rather than general interpersonal, context. Second, the concepts of sensitivity to the presence of feedback and sensitivity to content of feedback itself (nervous system strength) should be clarified and disentangled.

Using Feedback to Improve Learning

Most importantly, the proposed model is informative in developing strategies to improve the effectiveness of instruct ional feedback. First, the best opportunity to impact student learning and behavior occurs when initial positive attributions are drawn of the feedback. Reducing the evaluative nature of learning assignments can be helpful in this regard. Feedback serves the purpose of communicating differences between actual performance and performance standards. It also serves to evaluate, summate, or grade student performance. Yet there is no reason why evaluations and grades must be attached to every student performance, particularly since such evaluation creates defensiveness which reduces feedback efficacy. As

indicated by FIT, evaluative (meta-task) feedback attenuates performance. The model described in this paper suggests the mechanisms by which this performance reduction occurs.

Booth-Butterfield (1989) suggests more informal, less public performances, a balance of attention between feedback on content and feedback on delivery, and feedback which takes the form of clear and specific description of behavior. This last suggestion is particularly noteworthy because generalized and poorly phrased feedback messages are interpreted as evaluation even if no grade is attached (e.g., "your introduction just wasn't very interesting").

Aspects of attribution theory also yield specific suggestions for communication instruction. First, based on the principle of correlation, instructors should be careful to include as many positive comments as possible. Since students regularly compare themselves with peers, it could be helpful to communicate feedback to skill deficient students in a non-public manner. This could prevent comparisons with the feedback provided to other students. Second, based on the principle of discounting, it would be most helpful if students receive feedback from multiple sources. Most importantly, the development of a warm and immediate student/teacher relationship outside of the context of performance feedback could prevent negative attributions. Finally, attributions could be managed by a cards on the table approach, particularly with more mature students. Specifically, a discussion of the purpose of feedback and mature ways to view criticism could precede performance. Moreover, common self-defeating attributions could be identified and discussed. There is some evidence that teachers rarely provide attributionally informative feedback (Foote, 1999).

Every classroom instructor must find a way to balance the competing goals of equal treatment and individualization. One way to accomplish both is to de-link instructional feedback, with its primary objective of performance improvement, from evaluation, with its goals of validity and reliability. With this accomplished, the instructor is free to recognize and adapt to the unique ways in which students process information. Feedback which would go unnoticed by feedback insensitive (strong nervous system) students would be at an appropriate level for feedback sensitive students ("Adding another reference would strengthen your claim"). Feedback of greater potency could yield good results with feedback insensitive students while creating defensiveness on the part of feedback sensitives ("Your first argument is not adequately supported").

A necessary step in individualizing instruction and improving feedback effectiveness is further theoretical development of the feedback concept. Investigation of the mechanisms which influence the processing of feedback messages and efforts to develop psychometric techniques for assessing relevant individual differences are most important in this regard. The cumulative result of even small positive, or negative, changes over long periods of time can be quite powerful. Once the psychological mechanisms are clearly understood, research should focus on development of psychometric instruments, such as feedback sensitivity scales, which allow insight into individual differences in information processing. At that point, educators will be empowered by science, as they presently are by art, to adapt their comments to the individual needs of students. As an inherent and essential part of interpersonal and instructional processes, feedback deserves this increased attention from educators.

Summary

While feedback is an integral component in the teaching/learning process, the concept has not undergone much theoretical development. This is particularly true from an information processing viewpoint. As communication instructors should understand, meanings (of feedback) are in people, not in words. This essay was limited to feedback interventions--intentional efforts to adjust and improve behavior and learning through instructional communication. To date, the scholarly literature shows mixed results regarding efforts by teachers and researchers to utilize feedback in learning. An initial effort to explain the pattern of failures and successes was advanced in FIT, but the theory does not explicate the cognitive mechanisms utilized in processing feedback.

This essay proposed a model of feedback efficacy based on the inferred existence of three interrelated information processing filters. The first of these was a detection filter. This portion of the model may be less

salient with regard to instructional feedback, which is intentional and largely verbal. Nonetheless, some students may hear the statement, "Your eye contact is pretty good," as reinforcement of correct behavior while others see it as a feedback standard gap indicating the need for improvement to reach a point of "very good." To this extent, some students detect correctional feedback while others do not. A second filter operates on the level of internal attributions. The potential for a self serving bias can exist and is related to the framing and context of the feedback. A third filter operates on the basis of primitive defense mechanisms such as BIS and BAS.

The emerging complex picture is important if instructors are to be successful in facilitating learning. For example, feedback must be sufficiently pointed for the learner to realize that improvement is warranted, but if it becomes too pointed, or confrontational, misattributions can occur and fight or flight responses can result. In those cases, feedback can do more harm than good. Future research should address these issues.

Authors' Note

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Notes

1 Kluger and DeNisi (1996), in a meta-analysis, found that, while feedback increased performance on average, over 1/3 of attempted feedback interventions decreased effective task performance. These mixed findings exist despite the positive result bias expected of scientific literature. Specifically, a lack of research findings tends not to get published.

2 King , Young & Behnke (2000) recently provided support for this second, less well-known postulate by demonstrating that feedback type (immediate vs. delayed) interacts with nature of the learning task (automatic vs. effortful processing) in explaining feedback efficacy.

3 When a student meets or exceeds performance expectations, feedback is frequently given in the form of praise which reinforces the behavior. While reinforcement is a consequential aspect of learning , most of the attention relative to instructional feedback has

focused on shaping behavior to meet performance standards.

Figure 1