CONNECTIONS BETWEEN FEEDBACK AND STUDENT HAPPINESS AND ENGAGEMENT IN HIGH ACHIEVEMENT CLASSROOMS

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Researchers have investigated how teacher feedback contributes to students' learning, yet there is insufficient research into the connection between teacher feedback and student happiness, which is linked to engagement, socio-emotional well-being, and ultimately academic achievement. We coded lesson transcripts from elementary teachers to determine emergent patterns between types of teacher feedback and average student self-reports of happiness in mathematics. We found teachers to employ specific feedback more than general feedback. In addition, feedback for effort and ability accounted for a small percentage of feedback. Findings suggest that student happiness is linked to specific combinations of feedback dimensions.

Keywords: Affect, Emotion, Beliefs and Attitudes; Instructional activities and practices

The role of teacher feedback in the classroom is both instructional and affective. That is, teacher feedback is multi-dimensional, serving differing purposes. Teachers employ verbal feedback in evaluation of student responses and as a classroom management tool, such as evaluating student behavior (Brophy, 1981; Floress & Beschta, 2018). While learners desire feedback, not all feedback benefits academic performance (Black & Wiliam, 2009; Hattie & Timperley, 2007). In general, researchers agree that for feedback to be considered effective, it must be specific about the learner's performance or behavior (Black & Wiliam, 2009; Burnett & Mandel, 2010; Hattie & Timperley, 2007). However, in Burnett and Mandel (2010), the most prevalent type of feedback documented was general praise, in which the teacher makes a general statement but is not explicit regarding the relationship between a student's action and the awarded praise. Like other studies (e.g., Floress & Beschta, 2018), teachers rarely provide behavior-specific praise. Comparable to our cited literature, a large portion of research on teacher feedback focuses specifically on praise, a subcategory of feedback which goes beyond evaluating for correctness by expressing approval or assigning worth (Brophy, 1981). Interestingly, praise does not correlate with student academic achievement gains (Brophy, 1981). Thus, the types of feedback described as "effective" for supporting student learning in research literature may not be found in classroom interactions.

Classroom feedback and praise not only influences students' learning and behavior, but also influences students' orientation to learning. Mueller and Dweck (1998) found that praising students for ability rather than effort impacted students' orientations towards learning. Students praised for ability focused on the performance of themselves (and others), while students praised for effort adopted a mastery-oriented mindset. Students' orientations towards learning impact their disposition towards learning, especially when encountering failure. In short, praising students for their intelligence communicates that "they can measure how smart they are from

how well they do" (Mueller & Dweck, 1998, p. 43). Students' dispositions are also influenced by their preferences for feedback. A preliminary review of the research shows that elementary students prefer effort feedback to ability feedback (Burnett & Mandel, 2010), and prefer private praise to being spotlighted (Burnett, 2001). Thus, feedback type and student feedback preferences impact students' dispositions towards learning.

In this study, we ask: *Controlling for teachers' success at raising test scores, are there associations between the types of verbal feedback provided by teachers and measures of student self-reported engagement and happiness?* To answer this question, we examined lesson transcripts of twelve teachers who were effective at raising test scores but were either in the top or bottom quartile for student self-reported happiness (survey questions shown in Table 1). The twelve teachers were selected from a larger dataset where students were randomly assigned to classroom teachers. Given the teachers' success at improving students' academic performance, it is reasonable to suspect that teacher feedback satisfies the markers of effective feedback. However, the extremes in student-reported happiness that there may be differences in how often and what type(s) of feedback teachers provide.

Table 1: Student Survey Items Measuring Happiness in Class

This math class is a happy place for me to be.

Being in this math class makes me feel sad or angry.

The things we have done in math this year are interesting.

Because of this teacher, I am learning to love math.
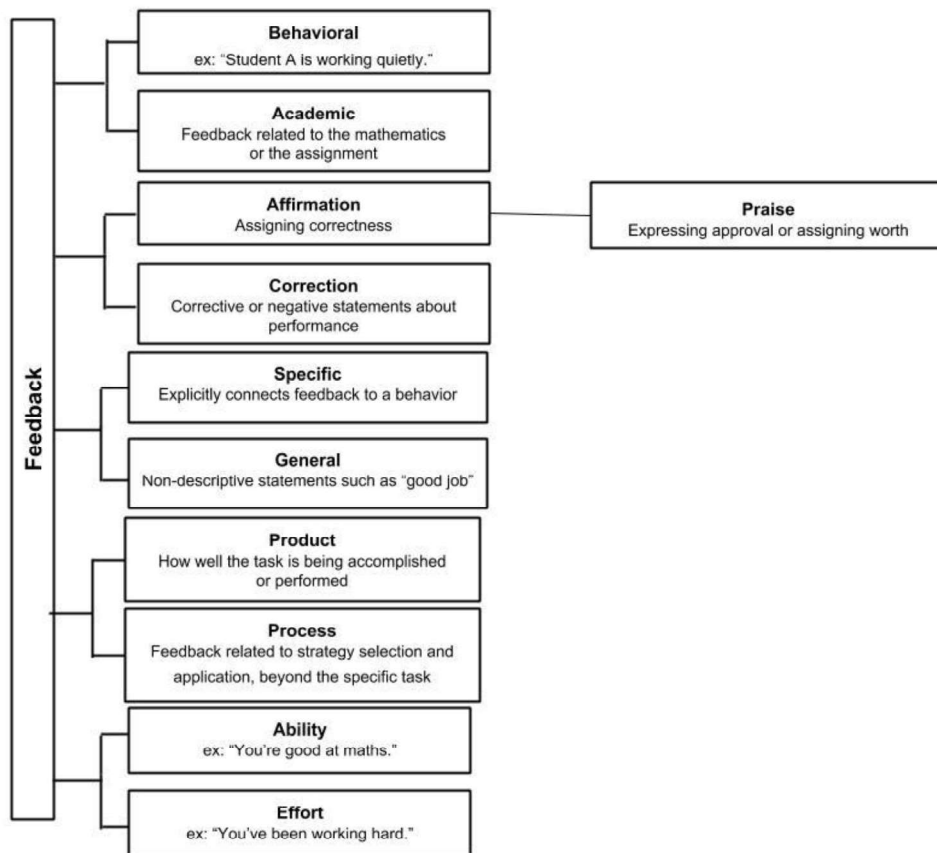
I enjoy math class this year.

From Blazar & Kraft (2017)

Our study extends the current research by examining instances of both academic and behavioral feedback, including corrective feedback. Previous studies report that general academic praise is not predictive of a positive classroom environment, but they have not examined the influence of social or behavioral feedback (Burnett & Mandel, 2010). Other studies have examined the use of praise as a classroom management tool, monitoring academic and behavioral praise but not documenting instances of feedback for correction (Floress, Jenkins, Reinke & McKown, 2018). Our research focuses specifically on feedback and praise during mathematics lessons because students' mathematical dispositions are linked to how they engage with the subject (Gresalfi & Cobb, 2006). We posit that students' perceived happiness in class is a component of their disposition towards the content. Thus, our proposed research has the potential to uncover links between feedback, praise, and students' self-reported engagement with and enjoyment of mathematics.

Conceptual Framework

We developed our conceptual framework based on current and seminal research on feedback and praise. Following Hattie and Timperley (2007), we define feedback as "information provided by an agent (e.g., teacher) regarding aspects of one's performance or understanding" (p. 81). As a component of instruction, feedback can be both informative and educative, in that feedback can

merely evaluate (denote correctness) or can provide additional information that moves learning forward (Black & Wiliam, 2009). As shown in the table, there are multiple facets, or components, of teacher to student feedback. Our framework posits five dichotomies: behavioral or academic, affirmation or criticism, specific or general, process or product, and ability or effort. As noted earlier, different types of feedback vary in their effectiveness for supporting student learning and disposition (Hattie & Timperley, 2007; Mueller & Dweck, 1998). Academic feedback addresses students' understanding of the content or task, while behavioral feedback includes other non-academic classroom behaviors (Brophy, 1981). For example, "I can tell Student A is ready to learn because she is sitting quietly," is a specific affirmation of Student A's behavior. Whether academic or behavioral, feedback is either affirmative or corrective (evaluative). In our framework, praise is a subcategory of affirmation. Brophy (1981) defines praise as "to commend the worth of or to express approval or admiration" (p. 5). According to Brophy, praise expresses positive teacher affect, providing feedback beyond affirmation or evaluation. Feedback will also be categorized as general or specific. General feedback consists of "any nonspecific verbalization or gesture that expresses a favorable judgment on an activity, product, or attribute of the student" (Floress, Jenkins, Reinke & McKown, 2018, p. 414). By contrast, specific feedback is explicitly linked to "an activity, product, or attribute of the student(s)" (Floress, Jenkins, Reinke & McKown, 2018, p. 414). Thus, "good job" is general feedback, while, "I like the way you are organizing your work on your paper" is specific feedback.

Figure 1: Conceptual Framework: Categories of Teacher-student Feedback

Otten, S., Candela, A. G., de Araujo, Z., Haines, C., & Munter, C. (2019). *Proceedings of the forty-first annual meeting of the North American Chapter of the International Group for the Psychology of Mathematics Education*. St Louis, MO: University of Missouri.

Not all feedback can be assigned to categories on the final two dichotomies: product or process, and ability or effort. Feedback about the product is typically corrective feedback about how well a task is being performed (Hattie & Timperley, 2007). Process feedback addresses the underlying processes of the specific task, potentially linking processes across tasks, or relating to students' error-analysis (Hattie & Timperley, 2007). Consequently, behavioral feedback, such as correcting a student for speaking too loudly, is often not linked to the specific mathematical task, and thus would not be categorized as process or product feedback. Finally, ability feedback is related to intelligence or personal attributes, while effort feedback is characterized by the use of the word "try" or a similar term which emphasizes that the student is putting forth effort (Floress & Beschta, 2018). General feedback, such as telling a student "Good job" for providing a correct response, would not be categorized as effort or ability feedback.

Methods

The primary focus of data analysis is to investigate if teacher feedback (type, frequency, etc.) is associated with student self-reported engagement and happiness.

Data

The transcripts analyzed in this study are from a dataset from the National Center for Teacher Effectiveness (NCTE) (as described in Blazar & Kraft, 2017). The teachers in this study are either 4th or 5th grade comprehensive teachers, who self-selected the lessons to be recorded. The recorded lessons were subsequently transcribed. As part of a larger research study, we first identified teachers who are effective at raising students' test scores. Then, we selected a subset of twelve such teachers who are either particularly effective or ineffective in making their classrooms happy and engaging places for students (as self-reported by students on end-of-year surveys). Six teachers score in the upper quartile of student happiness and engagement ratings while six teachers score in the bottom quartile. For each teacher we have three mathematics lesson transcripts, for a total of 36 lessons. The lessons ranged in length from 33 minutes to 79 minutes with an average length of 52.6 minutes.

Analysis

We coded lesson transcripts in NVivo. Our conceptual framework serves as our coding scheme, with each evidence of teacher feedback coded as behavioral or academic, affirmation or criticism, praise, general or specific, process or product, and ability or effort. For example, the statement "Not seven. Negative seven" was coded as academic, correction, specific, and product. Comparisons across codes, such as instances of affirmation versus criticism, aim to provide evidence for classroom climate and measures of student happiness. The lesson transcripts do not include descriptions, such as non-verbal gestures or how students are configured. Thus, our analysis only examines verbal feedback, which is presumed to be public.

The authors established the codebook, as defined by our conceptual framework, then completed independent coding on their assigned transcripts. Two randomly assigned researchers coded each lesson transcript. During independent coding, the authors regularly met to renorm and examine problematic codes. The authors examined conflicting codes (such as feedback being coded as both academic and behavioral) and were able to reach consensus. Ambiguous feedback where categories of feedback were influenced by potential student interpretation was brought up for review and ultimately excluded from analysis. Examples of ambiguous or interpretable feedback include instances where teachers praise a student, or group of students, in a manner that

admonishes the other students ("Student G's group figured it out, so what seems to be the hold-up for this group?").

           Limitations. We only have access to lesson transcripts, which do not include video recordings of the lessons, or descriptions of teachers' or students' paralinguistic and nonverbal behaviors. Consequently, we cannot make conclusions about the credibility of teachers' praise or feedback, or how it is received by the students (Brophy, 1981). Another limitation of the data is that measures are collected at the classroom level. Students differ in their preferences for praise and feedback (Brophy, 1981; Burnett, 2001; Burnett & Mandel, 2010), which in turn may influence their self-reported feelings of happiness and engagement. However, we are unable to link specific classroom instances with students' self-reports - we can only examine larger classroom trends.

Findings

We identified a total of 1588 instances of feedback across twelve teachers and thirty-six lessons. Table 2 shows instances and rates of overall feedback and affirmative (positive) feedback per teacher per lesson. Given our strict definition of praise, we are comparing our more inclusive category of affirmative feedback with other authors' reports of teacher praise, which tends to be more encompassing.

Teachers' rate of affirmative feedback (instances per hour) are within the ranges of rate of praise of 4th and 5th grade teachers, as reported by Floress et al (2018). Floress et al (2018) observed an average rate of 22.5 praise statements per hour for 4th grade teachers and an average of 30.9 praise statements per hour for 5th grade teachers. In our data, teachers with high measures of student self-reported happiness and engagement are within these averages, with 24 affirmative statements per hour, while teachers with low measures are about the same rate, with an average of 39.5 statements per hour. Overall rates of feedback are higher for teachers with low measures of happiness and engagement ($m = 58.5$ statements per hour), compared to those with high measures ($m = 43$ statements per hour).

Table 2. Amount and Rates of Feedback Per Teacher and Lesson

	High measures of happiness	Low measures of happiness
Total instances of feedback	721	867
Rate of feedback*	43	58.5
Percent of affirmative feedback	56	68.6
Rate of affirmative feedback*	24	39.5

*Calculated in terms of feedback per hour.

Other studies found teachers to provide more general than specific feedback and praise (Burnett & Mandel, 2010; Floress et al, 2018). However, both groups of teachers provided specific feedback more often than general feedback. Specific feedback accounts for 77% of all feedback for teachers with high measures of happiness and engagement and 83.7% of all feedback for teachers with low measures. Feedback for effort and ability accounted for a small

percentage of feedback, across all teachers. Together, effort and ability related feedback accounted for only 6% of total feedback for teachers with high measures and 7% for teachers with low measures.

Table 3: Corrective Feedback Counts and Percentages

	Teachers with high measures of student happiness	Teachers with low measures of student happiness
Total corrective feedback	318 (44.1%)	268 (30.9%)
Academic corrective feedback	129 (40.6%)	164 (61.2%)
Behavioral corrective feedback	189 (59.4%)	104 (38.8%)

Number of instances of feedback with percent of total feedback.

Our study extends previous research on teacher-student feedback by examining corrective feedback (Table 3). Nearly half of all feedback provided by teachers with high measures of student happiness is corrective feedback. As shown in Table 3, teachers with high measures of happiness gave more behaviorally-focused corrective feedback while teachers with low measures provided significantly more academically-focused corrective feedback than behaviorally-focused corrective feedback.

Discussion

Our analysis captures the natural rates of feedback for twelve teachers, six of whom scored highly on measures of happiness and engagement and six who scored low, all who are successful at raising students' test scores. Our results show that teachers with low measures of happiness and engagement give more verbal feedback overall. Both groups of teachers have high rates of feedback, tend to give more affirmative than corrective feedback, provide specific feedback, and have low instances of effort and ability feedback.

Burnett (2001) found that 4th and 5th grade students desire teacher praise more than any other group of students under investigation, "indicating that this is a phase of development where students are looking for reassurance and recognition from their teachers" (p. 21). Yet, in our analysis the highest instances of affirmative feedback come from teachers with low measures of student happiness. Thus, the existence of affirmative feedback alone is insufficient to bolster student happiness and engagement in mathematics. Hence, the content of the feedback must be examined more closely. There were observed differences in the types of specific affirmations awarded to students. For example, teachers with low measures of engagement had a total of 278 instances of specific affirmations (including praise), 51 (10.7%) of which addressed students' processes and strategies, compared to teachers with high measures, who had 281 instances of specific affirmations, 53 (19%) of which addressed students' processes and strategies. Furthermore, there are differences in the process and strategies that are affirmed by teachers. For instance, students in low engagement classrooms were praised for helping a peer ("Good. That's what a partner should do."), or for following an algorithm ("I like how you wrote the clusters in

there, not the products."). In contrast, students in high engagement classrooms were affirmed for their higher-order thinking ("I like the connections that are being made. You're connecting these fractions to division and your multiplication, correct?"). Surface level process feedback (such as successful use of an algorithm) may support student confidence, but feedback related to underlying processes supports students in transferring strategies across tasks (Hattie & Timperley, 2007). Corrective feedback also influences students' disposition. Teachers with high measures of engagement provided surface level corrections to processes, while teachers with low measures were more likely to reject student ideas related to processes ("I don't think this is a good idea. Let me show you how I would do it, okay?"). We posit that students may enjoy mathematics more when they are supported in making connections across tasks, and when their thinking is "taken up" by the teacher.

Our proposition is further supported by the differences in effort feedback provided by teachers. Teachers with high measures of happiness and engagement affirmed students for asking questions and for collaborative work, and corrected students for passivity. In contrast, teachers with low measures of happiness and engagement affirmed students for following procedure, being organized, and following along, and corrected students for rushing through tasks and "being messy." In both sets of classrooms, students are provided feedback about how they are engaging with the content. Students' interest in or affiliation with mathematics is linked to the ways in which they engage with the content (Gresalfi & Cobb, 2006). The feedback from teachers with high measures of happiness indicates that students are expected and encouraged to be actively engaged with the tasks, ask questions, and work together - all of which we presume to have a positive effect on students' disposition towards mathematics. Conversely, the feedback provided by teachers with low measures of happiness and engagement reinforces the concept of mathematics as rule-bound and highly structured (Gresalfi & Cobb, 2006).

In addition to the analysis of teacher to student feedback, this study also presents a conceptual framework to investigate a more layered view of teacher feedback. However, our framework did have limitations. Since our definition of feedback was limited to teacher statements that were distinctly evaluative, we did not code instances of teachers revoicing or posing questions in response to a student. While coding transcripts, we did see teachers responding to students in these ways. In fact, there appeared to be an abundance of parroting as revoicing, where the teacher repeats the student response verbatim. Further research should include examining the connections between additional forms of teacher feedback (parroting, revoicing, and responding with a question), and students self-reported happiness and engagement in mathematics.

Conclusion

This study adds to the growing body of literature around teachers' classroom interactions with students and the influence of those interactions on student engagement and disposition. Our findings provide a new aspect of classroom interactions and feedback by combining student survey results with transcript review. Using this approach, we found that both teachers with high and low measures of student happiness use specific feedback in their classrooms more frequently than general feedback. Contrary to popular discussions about 'growth mindset' classroom practices, our analysis did not find evidence that students with teachers who are effective at raising test scores are providing students with high levels for feedback on their effort or ability regardless of the classroom's designation as either a high or low engagement setting.

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