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Feedback to Support Learning in the Leadership Institute for Teachers

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Feedback to Support Learning in the Leadership Institute for Teachers[1]

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Abstract: Feedback is a type of formative assessment used to inform instruction and advance learning. Feedback serves as a mechanism to connect teaching and learning at the student level. Learners receive feedback, formally or informally, as they engage in learning experiences. Within the Leadership Institute for Teachers, a National Science Foundation funded research project, we are exploring feedback as a research-informed process to support learning and improvement for individuals, teams, and university courses. There is an explicit focus on creating a culture of critical thinking and reasoning, taking ownership for learning both individually and collectively, and understanding how to improve teaching and scholarship through an iterative feedback process.

Keywords: Formative assessment, feedback to advance learning, course improvement, mathematics teacher leaders

How do mathematicians, math educators, and teacher leaders utilize feedback to support learning in the Mathematically Connected Communities Leadership Institute for Teachers (MC²-LIFT or "LIFT")? This article provides an opportunity to understand how feedback is used to improve MC²-LIFT courses, lessons, and learning experiences for the mathematics teacher leader project.

Mathematicians and math educators are engaged in MC²-LIFT, a National Science Foundation (NSF) project focused on developing teacher leaders in mathematics. This project provides opportunities for building content and pedagogical content knowledge

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(Shulman, 1986) for effectively teaching K-12 students mathematics. Six semesters of coursework are designed to build professional knowledge, skills, and dispositions for the teacher leaders. This article (a) introduces our interest in feedback as a research-informed process for improving learning, (b) provides an overview of the LIFT project, (c) and presents specific examples of how and why feedback is used and what we are learning through these processes.

Feedback is a type of formative assessment used to improve instruction and provide mechanisms to support continued learning. Learners receive feedback, formally or informally, as they engage in learning experiences. Feedback can be motivational, evaluative or descriptive and based on standards or learning goals. Within our research project, we are exploring descriptive feedback as a research-informed process to support learning and improvement for individuals, teams, and courses. There is an explicit focus on creating a culture of critical thinking and reasoning, taking responsibility for learning both individually and collectively, and understanding how to support learning as a reflective process, within the LIFT project. These foci afford rich opportunities to provide and receive oral or written feedback on lessons, mathematics writing, classroom videos, and a variety of course experiences to move learning forward.

Provide Constructive Feedback

The course designers utilize a reflective implementation and learning cycle to improve the course experiences and strengthen individual learning. Within this cycle, feedback provides data to assess practices, inform instruction, and to give information that is used to adjust and improve the academic experiences. This feedback process includes receiving input based on learning goals or agreed upon expectations, acting upon the

feedback to make revisions, and determining next steps for an individual assignment or perhaps for a lesson within the LIFT courses. A central tenet of the LIFT project is that everyone's ideas contribute to the learning and assessing the impact of those experiences on individual and collective scholarship. An overview of the LIFT project is followed by our exploration into how feedback can be useful in supporting learning and how to solicit that feedback effectively.

Overview of the MC²-LIFT Project

The MC²-LIFT project is a 5-year research partnership between New Mexico State University (NMSU) and southern New Mexico school districts. This collaborative project is funded through the NSF Math and Science Partnership program (NSF #DUE-0928867). Mathematicians, education faculty, and school leaders collaboratively design the MC²-LIFT project. Each LIFT cohort is comprised of about 30 mathematics teacher leaders who develop their knowledge and understanding of K-12 mathematics and the leadership skills for improving teaching and learning.

The goals of the project are:

(1) Increase teacher leaders' knowledge of K-12 mathematics and expand and enrich pedagogical practices through blended courses that are team-taught by mathematicians and math educators.

(2) Develop intellectual leaders who understand what students should learn and who can differentiate instruction in their own classrooms and support other teachers to meet the needs of diverse learners.

(3) Implement LIFT Institute learning in their classrooms and schools with mentoring from the school support team.

(4) Build and sustain viable partnerships between mathematicians, education faculty, and school districts.

MC²-LIFT provides participating teachers and math coaches with two years of coursework involving intensive summer study, as well as a follow-up academic year program that includes application of their learning to their school or district settings. Each semester as well as during the summer, pairs of courses are designed and team-taught by NMSU mathematicians and educators, blending mathematical concepts with knowledge and skills in pedagogy and leadership. Cohort members work together for two years and have the opportunity to earn a Master of Arts degree in teaching mathematics. Teacher leaders come from elementary, middle, and high schools or serve as math coaches in a school district.

Cohort members in the LIFT program gain a new lens for learning mathematics by studying how concepts progress through the K–12 continuum, connecting within and across grade levels in the LIFT institutes. Cohort members, referred to in this article as *teacher leaders*, are developing a deeper understanding of mathematical concepts through engaging in rigorous math tasks to strengthen mathematical thinking and reasoning, sense making, communication, and math connections. Then, by developing a range of models and strategies to represent mathematical ideas, teacher leaders support other teachers at their respective schools to differentiate their instruction and to meet the needs of diverse learners in their classrooms. The LIFT coursework is developed from the premise that effective mathematics teaching requires a deep understanding of mathematics, pedagogy, and pedagogical content knowledge (Shulman, 1986) to advance K–12 students' learning and achievement.

Principals also engage in professional learning during MC²-LIFT courses to gain an understanding of how to foster a collaborative culture for teaching and learning mathematics in their schools. Principals and teacher leaders are working together to develop a shared vision for the teacher leaders' roles in their classrooms, schools, or districts, communicate expectations for professional learning among school staff, and gauge the progress that their schools are making toward student learning goals. The LIFT school support team helps to connect the university institute experiences to school and classroom practices. LIFT utilizes these school-based team structures for supporting professional learning throughout the year. The school support team provides onsite ongoing mentoring for teacher leaders and utilizes extensive feedback in shaping support at the campus, connecting research and practice, and informing course development.

Feedback Process in LIFT Team Structures

The structure of the LIFT research project includes four teams: Development, School Support Team, Management, and Research. The Development Team designs and facilitates the institute courses; it includes mathematics educators and research mathematicians who collaboratively create and teach courses for LIFT K-12 educators. The entire project is set up to provide feedback and data to each of the four LIFT project teams through iterative feedback loops, utilizing feedback processes and strategies as resources for supporting learning.

Connecting University and School-Based Learning

Teachers need a strong background in mathematics and must understand how to teach math content so students can make sense of the concepts, apply their ideas, and communicate their learning. Teachers utilize research-based pedagogical practices; in

particular, how to facilitate a student-centered classroom with an emphasis on developing conceptual understanding and applying thinking and reasoning skills and practices. A central aspect of the LIFT institute is that facilitators model effective teaching practices that are applicable both at the university and when implemented in K–12 classrooms. For example, lessons have explicit learning goals and instructors model a launch-explore-summary lesson structure and facilitator questioning, rather than lecturing and answering questions.

LIFT goals include course improvement; consequently, feedback is a research-based practice currently under exploration in the project. Course content and pedagogy are studied, analyzed, and possibly modified. Both individual and collective responses are valued in constructing a culture focused on utilizing feedback to support learning. A synthesis of research on feedback is followed by application of feedback within the LIFT courses.

A Research Perspective on Feedback

Assessment is a bridge between teaching and learning. Feedback is usually situated within a context of assessment, specifically, formative assessment that shapes instruction (Wiliam, 2012). Originally, "feedback" was used in engineering to refer to an explicit feedback loop (Weiner, 1948). For engineers, it was the explicit elements needed to move from the current state to the desired state. A feedback process must include a progression for future actions toward directing attention to what is next; it promotes significant thinking. Wiliam (2012) added that the form of feedback is not as important as its effect on learners. It should create cognitively engaging next steps for the recipient, be focused,

relate to the shared learning goals, and increase responsibility for learning by activating students as learning resources through peer feedback.

Evidence for the effectiveness of feedback as a significant activity to improve learning and achievement has been prevalent in the literature (Bangert-Drowns, 1993; Black & Wiliam, 1998; Hattie & Timperley, 2007; Sadler, 1889). Feedback is essential in learning contexts and can serve many purposes, including development of competencies, understanding, motivation, and confidence (Hyland & Hyland, 2001). Hattie and Timperley (2007) indicated that feedback is an important part of communication to support learning if it focuses on attributes of students' work, is descriptive, and is clearly understood and sufficiently detailed. One cited purpose of feedback is to utilize effective communication of timely strategic information to the learner in order to modify thinking and improve learning. Students should have an active role in their own learning; including assessing and monitoring their own progress toward goals to clarify or modify their strategies or reassess their knowledge or skills (McDonald & Boud, 2003; Nicol & Macfarlane-Dick, 2006). When students realize that feedback from teachers, peers and themselves can improve their learning they put in more effort and become more self regulated learners (Brookhart, 2006).

Even though the effects of feedback can be strong, they are variable (Hattie & Timperley, 2007). Negative or judgmental feedback, lack of specificity, lack of clear learning goals, and gratuitous praise did not help learners know how to improve (Brookhart, 2007). Findings from Black and Wiliam's (1998) research indicated that feedback during instruction through formative assessment leads to large achievement gains. Stiggins (2005) focused on assessment to support learning through diagnosing students needs, planning

the next steps, and providing feedback to improve the quality of students' work. This requires understanding how learning develops, determining a student's current level of understanding, and deciding on explicit actions to meet or exceed learning goals.

Educators can determine the current level of a student's understanding within a learning progression of related goals and can communicate to the student the next steps to support learning (Heritage, 2008). Learning can result from students providing feedback and monitoring their work against criteria for success or rubrics to provide guidance for improvement (Brookhart, 2007). Students as peers can learn to provide useful accurate feedback to teachers or each other about the quality and effectiveness of their own work or learning experiences (Leahy, Lyon, Thompson, & Wiliam, 2005). The goal is not to compare students but to provide an explicit process for developing understanding and utilizing models for "learning how to learn" (OECD, 2005). However, Burke (2009) indicated that students should have opportunities to develop strategies and engage in conversations to understand how to use feedback effectively as part of a learning process. Wiliam (2012) reiterated the notion that feedback functions formatively if the information fed back to the learner is used by the learner to improve performance and understanding and moves the learner toward shared goals.

Feedback as a Process to Support Learning

Research on feedback often centers on supporting student learning and achievement within an assessment cycle. In the LIFT research project, everyone is a learner, from teacher leaders to course instructors. Feedback processes are based on the project goals and feedback is utilized to assess, stimulate critical thinking, and inform next steps. In LIFT, feedback is used not just to transmit comments from course instructors to

teacher leaders. Rather, it is a process that includes ongoing dialogue between instructors and teacher leaders. Instructional practices are congruently designed to model, explore, and extend thinking and learning, with the goal of improving both the courses and teaching.

Feedback Examples From LIFT

Both mathematics and education courses incorporate a variety of feedback strategies. There are explicit pause points for reflecting on teaching practices and LIFT teacher learning in the university courses. The LIFT program includes a variety of assessments; the focus here is on strategies within the courses that can be used to improve instruction, not on evaluation. Examples of course feedback strategies include daily written and oral reflections, written feedback on assignments, feedback from teacher leaders on instruction, and peer tutoring or peer feedback. Peer-to-peer feedback is also utilized during performance tasks and presentations. The LIFT teacher leaders engage in structured peer group edits by using reflection questions to make comments on a peer's math work (Leahy et al., 2005). This work is evolving, as it takes time and focused experiences to learn to provide and receive feedback that supports learning effectively.

Education Coursework Daily Feedback. Daily feedback provides a model for giving and receiving feedback. It illustrates to the LIFT teacher leaders that feedback is expected and valued as a learning opportunity. A variety of tools, such as a plus/delta, are used to find out what worked and what could be improved in the day or lesson. Teachers are given class time to complete a feedback form. The data are analyzed and summarized. The synthesis of feedback data is shared with the cohort members at the beginning of the next class together with the modifications and justification for the changes that will occur as a result of the written feedback. For example, one strategy that was used after studying

assessment practices was to ask teacher leaders for an "assessment pulse." Teacher leaders had a variety of responses to the day's activities focused on assessment. The course developers read each of the "assessment pulse" responses, noticed themes, issues, or concerns and then shaped the subsequent learning experiences with these ideas in mind. One response by a teacher leader was

> My understanding of assessment is much clearer as a result of class discussions. The questions that were used helped to focus the dialogue and make us think below our assumptions. It is important to consider not just the types but also the purposes of assessment and how they support learning. I am curious how I might engage students in an assessment process that supports their continued learning. (LIFT teacher leader, 2012)

Another example of feedback is the Daily Reflection Form. It was used each day of an entire week and included questions such as "What was a big idea of today's lesson? What did you learn today? What challenges did you encounter? What questions do you have or what would help you to better understand the big idea?" The responses were read by course instructors and used to share collective ideas and make adjustments to instruction. It was a conversational strategy for feedback. The course development team writes questions to individual teacher leaders on their reflection sheets or asks them to share their thinking at that point with a colleague during class, providing an opportunity for dialogue. These daily feedback activities provide opportunities to understand the student's experiences and learning in relation to course goals and to act upon their written comments and be explicit about any revisions that are made based on their feedback.

Feedback on a Project or Presentation. Feedback on a project or presentation was a course routine. Teacher leaders helped design and apply a rubric, which delineated the criteria for accomplishment on their end-of-course performance task. Teacher leaders utilized the rubric for providing peer feedback as they gave and received descriptive written comments. Each person had time to analyze the feedback and it was used as evidence in his or her final write up for the performance based task. Teacher leaders cited this process as very useful for making revisions to their projects based on peer feedback aligned to the rubric and learning goals before submitting their final work.

Feedback Based on Protocols. Feedback based on protocols was a strategy to provide guidance on effective math lessons. Teacher leaders and mathematicians studied the *Thinking Through the Lesson Protocol* (Smith & Bill, 2004) as a resource for designing and implementing effective math lessons. A mathematician planned a lesson with the protocol in mind. Teacher leaders experienced the math lesson in class and then provided written descriptive feedback to the mathematicians based on the *Thinking Through the Lesson Protocol*. The mathematician read, reflected on, and shared with the teacher leaders what they had learned through this process. This process had an impact on subsequent math lessons in the coursework. Specifically, it influenced the learning targets and summary aspects of the math lessons.

*Lesson Study***.** Feedback from peers, mathematicians, and math educators was used in the formal process of Lesson Study. The Lesson Study cycle included shared lesson design, agreed-upon lesson implementation, and reflection on the lesson and students' learning. Feedback acknowledged the teaching process toward meeting lesson goals and student outcomes and provided guidance for enacting lessons at high levels of cognitive

demand. Peers giving and receiving feedback about successes and improvements of lesson enactment allowed for clear, nonjudgmental communication in a trusting, respectful learning climate. Because the lesson was collaboratively designed, the focus of feedback was on instructional strategies, cognitive demand of math tasks (Smith & Stein, 1998), uses of specific models or representations, or how language and interactions supported or limited students' learning. The feedback process was structured during the debriefing session following the lesson. It was used to guide the next iteration and revisions of the math lesson. The feedback was the central goal of informing the next steps for redesigning and teaching the research lesson based on what students in the classroom understood or what additional opportunities for learning were needed.

Mathematics Coursework

In each institute course, participants were given math tasks and asked to write about their solutions. Initially, the four instructors reading math papers rotated whose papers they read, controlling for variability of instructors' rating standards. After a couple of semesters, it seemed clear that getting written feedback from multiple instructors was not as much of a benefit as had been expected, and it did not facilitate tracking students' progress. Rotating papers may have also hindered developing trust between the participant and the instructor, which led to participants not talking to instructors in order to get clarity on the feedback despite frequent encouragement to do so. Noting this unintended consequence, we then moved to having each participant's papers read by the same instructor for an entire semester. Within this way of organizing the reading of course papers, it became easier for us to push a consistent group of students on developing the

ability to convey reasoning and improve communication of their thoughts. The effect was that the participant's writing became more focused.

To give an example, one participant had been having considerable difficulty in conveying his thinking. We did not give him very useful feedback early on, in part because we did not realize the extent of his confusion on some mathematical topics. By reading his papers only once in a while, it was hard for each instructor to get a clear picture of this student's understanding. Only when one instructor read his papers for an entire semester were we able to give him helpful feedback that allowed him to improve in his ability to explain his reasoning from one assignment to the next. The participant was not clear on several mathematical ideas and had difficulty in putting his ideas on paper. The instructor first focused on correcting the expression of mathematical ideas and then moved on to working with the participant on getting the ideas written clearly. By grading the participant over a full semester, the instructor was able to give increasingly detailed comments, as the participant understood more deeply both the mathematical ideas and how he was describing them in writing. The instructor could also see how the participant's ability to write a coherent introduction and conclusion evolved over time. As the participant got consistent, detailed feedback from one instructor for a semester, his papers improved considerably.

Another change was to incorporate peer feedback. When we began this, we organized the participants into feedback teams and asked them to read drafts of each other's papers and provide feedback. We did not provide much structure to how they should give feedback. After doing this for a couple semesters, we saw that their feedback was more along the lines of cheerleading. For example, participants were giving each other

comments such as "way to go" and "I wish my paper was as good as yours" but not giving descriptive feedback about the mathematics. The participants commented that they were not getting much out of this process. Thereafter, we changed to a structured peer feedback mechanism. For each paper, we posed two or three focus questions to be addressed when someone read a paper and gave feedback. For example, we had participants address whether the mathematical point of the paper was made and whether it was made clearly. Having participants address these questions gave them specific ideas for giving useful feedback. Participants found the new format to be much more useful for revising their writing. In particular, they saw that they could give one another constructive feedback without being critical.

Individual Teacher Leaders Comments on Feedback

The selected written comments made by teacher's leaders listed below provide insights into their thoughts about feedback within the LIFT courses or their own K-12 classrooms. Notice how the teacher leaders are beginning to understand how to utilize feedback in their own classrooms or they relate to feedback in support of their own learning within the LIFT courses.

- We get feedback in class via peers and from the LIFT instructors (both formally and informally along the way- like with our action research projects). I do something similar in my class through homework, in class feedback, and through one on one interaction.
- I use feedback in my classroom in the same manner that the LIFT facilitators use with use. For example a self-reflection with rationale.

- Through peer editing I had the opportunity to see someone else's perspective. I also got ideas on what I needed to change in my work. This happened through peer editing and the school support team.
- Feedback can be in the form of questioning. The questioning of my thinking and the questioning of my action research project really made me examine my own practices.
- The LIFT feedback processes are developing and refining our understanding of how to learn. I find that as we continue to provide and receive feedback, we get more explicit and focused thinking and open doors for alternative considerations or perspectives ...it both clarifies and stimulates thinking.
- In LIFT, I use feedback to reflect on my own understanding and communication to improve my work. At work- as an educator I offer questions and comments to promote my student's thinking and understanding. I try to be timely, the more immediate and focused the feedback the more impact on learning.
- When we give feedback to our instructors, it is very evident they read and reflect on it and make needed changes to instruction. I try to follow this in my practice because it provides evidence to students that their needs and thoughts are being considered. The feedback process is a dialogue and includes all of us as learners.

Feedback: Our Learning

It takes trust, time, ongoing conversations, and opportunities to develop a shared learning culture. LIFT participants know that their ideas and thoughts are valued. Formal and informal feedback is incorporated in both the instructional and leadership components of MC^2-LIFT. Through feedback, adjustments are made in lessons, assignments, and

courses. We have learned that when we solicit feedback from LIFT teacher leaders, we must take explicit action and respond in a timely manner in ways that support the participants' learning.

The innovative processes and structures for feedback ensure opportunities for collaboration, input, and continuous deliberation in order to study and learn in mathematics classrooms at the university and in schools. In many schools and classrooms the general analysis of school data does not impact individual student's thinking and does not advance their learning. Assessment data from a variety of sources needs to get to the level where it guides students' opportunities to learn. Students themselves should understand the role of assessment in learning and actively contribute to a generative assessment process. Effective teaching requires ongoing assessments that provide evidence of students' understanding and a collaborative process for continued learning.

In the LIFT project, teacher leaders' voices are essential in designing the academic experiences and building a culture focused on collective responsibility for learning. Through this process, teacher leaders understand that their ideas matter. We engage in a descriptive feedback process that has the potential to accelerate movement towards shared learning goals. The teacher leaders in the first cohort have provided feedback for the LIFT research project that stimulated revisions to strengthen the courses and the program for the second cohort.

We are continuing to think about feedback as an integral aspect of formative assessment to bridge instruction and lead to robust learning. We began with a focus on the courses but are expanding to other project domains. Perhaps, feedback loops could be strategically planned in advance or built into the project through teaching experiments and

design-based research (Design-Based Research Collective, 2003; Lesh & Sriraman, 2010) in LIFT. We are also curious about relationships of power and identity in socially constructed learning environments, the dynamics of hierarchies or status in classrooms, the role of grading, and how teacher leaders and instructors collaboratively engage in assessment for learning. The LIFT research project will deepen the study of feedback as an assessment process in both the LIFT coursework and the K-12 classrooms of mathematics teacher leaders to better understand how to support mathematics learning.

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