Supplemental Digital Appendix 1

Detailed Information About the Anesthesiology Residency Program at the Massachusetts General Hospital, Where the LEAF Method Was Tested and Description of the LEAF Process. From a Study of Improving Learner Satisfaction With and Reflection on Feedback, 2018

Information about the residency program where the LEAF Method was tested

At the time of this study, our residency program had 74 residents. Every week a resident works with a faculty member, we request written feedback from that faculty member. Program Director meetings are scheduled every 6 months, and we used all written feedback from the preceding 6-month period as the basis for each LEAF session. During the study window, this comprised feedback comments from 10-25 distinct faculty (see Figure A1). The length of each comment varied, with the majority falling between 50 and 300 characters (see Figure A1).

Figure A1. A) In a six-month window, the typical trainee received comments from between 10 and 22 different faculty (mean +/- SD). B) The typical number of characters per comment is fewer than 300 characters.

A)
Steps of the LEAF Method

Step 1. Before any LEAF Sessions: The one-time cost and process of identifying feedback themes for the entire cohort

Narrative feedback comments across a cohort of learners are coded to determine the attributes (“themes”) faculty typically highlight in written feedback. Attributes are continually identified until thematic “saturation” is reached (i.e., no new attributes are identified). This stage also includes an assessment of how frequently each attribute is commented on for the typical learner. For this study, all learners’ comments were coded together (i.e., all the CA1s, all the CA2s, all the CA3s).

At our institution, this analysis uncovered approximately 50 distinct themes. To organize these themes and connect them to a conceptual framework, we grouped them according to the six ACGME Core Competencies (see Figure 2 in the paper). In qualitative research, this organized list of overarching themes and subthemes is sometimes referred to as a “coding index”.

We estimate that this process required approximately 20 hours at our institution. It would have been feasible for the process to be performed by a research assistant. Notably, it can alternatively
be done over time during meetings with learners. In other words, even without a codex, a coach-learner pair can code words inductively during coaching sessions. The identified themes during many of these sessions can then be combined to develop a more representative codex.

Once this is done once, it does not have to be re-done every six months. Importantly, the feedback that a cohort of learners receives can change over time (e.g., as programmatic values or emphases change). Thus, the table of themes (coding index) should not be static. If new themes repeatedly emerge during LEAF sessions, they should be added to this list and used in future LEAF sessions. For example, “humble” was not an attribute discovered in our original qualitative analysis; when it emerged for more than one learner over time during LEAF sessions, it was added to the coding index. At our institution, we have been reassessing our coding index every 6-12 months, though the changes we have made are minimal.

**Step 2. During the LEAF Sessions: The ongoing costs and process of discussing and co-constructing themes with learner**

Each LEAF session involves a coach and a learner. The coach should be familiar with the coding index and with the process of qualitative coding. To achieve this, a few supervised exercises with someone who has used the LEAF Method should suffice. The coach should also be someone with experience working with learners on goals. Because the learner will need to reflect on strengths and weaknesses, it is important that the coach be someone with whom the learner feels psychologically safe. Emphasizing the informational and non-judgmental nature of the method upfront is essential in fostering the honest and collaborative space needed for this process to thrive.

At our institution, the Program Director serves in this coaching role. No scores or evaluative information are provided. The overall goal of using feedback for growth is emphasized from early in the training program. As such, LEAF sessions are held in person in a private office with no distractions and no other individuals present. The sessions take between 30-60 minutes. LEAF sessions at our institution have been performed as a part of our semi-annual Program Director meetings.

**2a. Identifying feedback themes with the learner**

Prior to looking at the learner’s individual feedback, the coach first describes the LEAF Method and shows the learner the table of themes (coding index). Learners are provided enough time to familiarize themselves with the themes and to ask any questions regarding the meaning of each theme.

The learner and coach will then review and “code” the collection of written feedback received by that learner for a defined time period. The process of “coding” data entails assigning each narrative comment from a faculty member to one or more of the themes in the coding index. Additionally, we determine the valence of each code (positive or negative feedback).

For us, positive feedback is logged as a checkmark to the right of the theme and negative feedback is logged as a checkmark to the left of the theme. For example, the comment “the resident knew the patients’ histories well and did a nice job of presenting them” would map to the following two themes under Patient Care - “Preoperative assessment” and “Cognitively organized/presents well.” In this example, both of these would receive a checkmark to the right of the theme, as it is positive feedback. As another example, the comment “Should call me more frequently for help” would receive checkmarks to the left of the following themes: Systems-Based Practice - “Calls on resources or for help appropriately” and Interpersonal and Communication Skills - “Communicates well with attendings.”
To increase learner buy-in and proficiency with appropriately interpreting comments, learners select the relevant theme(s), with guidance from the coach as needed. Throughout the process, learners are reminded that the overall goal is to see which themes emerge as all the feedback is aggregated. This helps prevent learners from dwelling on any single piece of feedback.

The following are important nuances we have learned from this process:

- Some feedback is specific enough that writing additional information beyond simply coding it to a theme is useful. For example, “resident needs to practice fiberoptic intubations” would be coded as a negative checkmark under Patient Care “Technical skills,” and the coach-learner pair may choose to write down “fiberoptic intubations” next to the theme to note the specific area and distinguish from, say, intravenous line placement.
- Some feedback can be ambiguous. For example, “organized” may mean that the learner is cognitively organized or that the learner’s physical workspace was organized. In such cases, the coach and learner will discuss which is more likely based on context and self-reflection. They may choose to put a checkmark on either of these (or neither).
- Some feedback contains data that are too vague to code (e.g., “good job” or “great in all respects”). Such feedback is not coded.
- In the rare case that a piece of feedback does not conform to one of the pre-determined themes in the coding index, the coach and learner may create a new theme. If this happens repeatedly across learners, it may warrant adding it to the coding index.

2b. Comparing the learner’s feedback themes with those of a “typical” learner

Because learners do not generally see feedback that is given to the rest of their cohort, they may struggle to determine which of their comments diverges from the feedback typically received. This step enables learners to see which of their themes align with or diverge from overall frequencies for their cohort. For example, at our institution, a learner who receives two positive comments under “hardworking” may actually be negatively divergent, since this theme is typically mentioned much more frequently in comments. Conversely, a learner who receives three positive comments for “self-reflection” may be positively divergent, since this is a theme that is rarely mentioned in comments.

In this step, the coach highlights which themes appear on target (the learner receives the typical number of comments for a theme), positively deviant (the learner gets more than the typical number of comments for a theme) or negatively deviant (the learner gets more than the typical number of negative comments or gets substantially fewer than the typical number of positive comments). (Figure 2B) We do not emphasize exact quantitative measures with this. This would be challenging because each resident does not receive the same “denominator” of comments each period and imposing such a degree of precision would not be supported by validity data. Beyond making the process more logistically onerous, we believe that imposing such a level of precision would make this exercise feel much more like an evaluation than a formative exercise. We also think that using that layer of precision could make residents focus on questioning the validity of the process instead of focusing on reflection. We emphasize throughout the process that this is aimed to be a tool to inform self-reflection, not an evaluation.

2c. Reflection and Goal Setting: Integrating feedback and planning behavior change

The final step involves a discussion of and reflection on themes that have emerged for the learner through the LEAF session. The learner is encouraged to select a single growth goal until the next LEAF session (six months at our institution). This goal is not necessarily related to be the area of greatest weakness. In general, learners will be more successful if they are motivated and
committed to achieving their goals. Therefore, unless there is a competency issue, we suggest not imposing goals on the learner. After the goal is selected, the coach and the learner discuss specific implementation strategies.

After the session, the coach summarizes the themes for the learner and sends them a written copy of that summary, the selected goal, and the implementation plan. At our institution, this is an email to the learner and their program mentor.
### Supplemental Digital Appendix 2

**Anonymized Resident Comments About the LEAF Method, Results of Qualitative Analysis, Organized by Theme, With Supporting Quotes. From a Study of Improving Learner Satisfaction With and Reflection on Feedback, Massachusetts General Hospital, 2018**

| Theme                          | Description                                                                 | Positive Themes                                                                 | Example quotes                                                                 |
|--------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Understanding the big picture, n=20 | Statement indicating that the process helped them get a broader perspective on their strengths and weaknesses. | “I thought it was a wonderful exercise which allowed me to focus on areas for improvement and success, rather than just having a vague sense of how I was doing overall.” “very fruitful - helped put what looked like generic feedback into a framework that was much more informative and effective showing me areas I needed to improve (and areas that were my strengths).” |
| Setting goals, n=8              | Statements indicating that the process helped them set goals                | “Very helpful to pick out weakness to work on over the next 6 months.” “Tells what kind of impression I was making to colleagues and if there was any mismatch to the kind of clinician I strive to be. I focused on modifying my behavior.” |
| Uncovering blind spots, n=4     | Statements indicating that the process helped them identify weaknesses/strengths they were previously unaware of | “Thorough and revealed things about myself I wasn't really aware.” “Helpful... looking at areas where positive feedback is lacking as a way to pinpoint areas of improvement.” |
| Interpreting feedback, n=3      | Statements suggesting that reviewing comments with a coach helped them better interpret the meaning of comments | “I think this helped de-code the random comments from meaningful trends” “Allowed me to pull out nuances from my comments beyond ‘nice to work with.’” |

| Theme                          | Description                                                                 | Negative Themes                                                                 | Example quotes                                                                 |
|--------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Questioning validity, n=7       | Statements indicating skepticism about the validity of findings              | “It is an attempt to make a very subjective method more objective and thus inherently flawed.” |
| Session length, n=4             | Statements suggesting that the session felt long or had high opportunity cost | “I felt the exercise was quite time consuming and maybe the meeting time could have been better spent in other ways.” “It took a fair amount of time.” |