Facilitating Change in Instructional Practice in a Faculty Development Program through Classroom Observations and Formative Feedback Coaching

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Introduction

Faculty development, as it relates to teaching and learning, has been a persistent challenge in higher education. College faculty generally begin their careers with no formal training in teaching and, consequently, 'teach as I was taught' is the starting point for most new faculty. Responsibility for faculty development of teaching, therefore, falls to an administrative unit of the university. Many institutions have successful faculty orientation and mentoring programs, but those programs often fall short of moving new teachers to effective practice in engagement pedagogy using active learning strategies. Modifying the practices of experienced faculty is particularly difficult.

This paper explores how faculty development workshops along with classroom observations and formative feedback coaching, aided in the success of participants to implement active learning strategies in engineering education. This submission is a complete, evidence-based practice paper.

Background and Purpose

To increase active learning in undergraduate engineering education, faculty from seven engineering disciplines participated in an NSF professional development project. Faculty attended eight workshops on evidence-based instructional strategies (EBIS) in fall 2016 and six Community-of-Practice (CoP) discussion sessions in spring 2017.

There were 39 participants originally involved in this project from 2016-2017. They were from the following engineering disciplines: mechanical/aerospace engineering (11), civil and environmental engineering (12), and construction management (11). The cohort also included trainers who were being trained to lead the next cohort: biomedical engineering (2), materials science (1), and chemical engineering (2). This group consisted of eight lecturers, nineteen assistant professors, seven associate professors, and six professors. There were thirty males and nine females.

Invitations to be a part of the grant were extended through unit heads and faculty leaders in the various departments. For example, one unit handpicked participants to include those being fairly new to teaching along with those who were more experienced but might benefit from exposure to student-centered pedagogies. Most accepted the invitation (possibly in part, because the request came from unit head), but a few declined. Participants signed on for a year, receiving a modest stipend each semester. They agreed to attend workshops during the fall semester and participate in communities of practice during the spring semester.

E. Rogers, in his book called *Diffusions of Innovations*, designates various categories of people who adopt new ideas: innovators, early adopters, early majority, late majority, and laggards, based upon their rate of adoption [1]. Participants in this professional development opportunity who were future cohort leaders in the group who would qualify as early adopters of student-centered learning. Several participants had started to adopt some of the strategies and were beginning to see the value. They would probably be early majority or late majority. Those who had the

opportunity to join but declined, would be considered laggards as they are not using student-centered practices and currently do not see the value to change or adopt them.

Participants attended the eight workshops during the fall semester. The workshops focused on the theory and examples of learning strategies, under the following titles:

1. Introduction to the project
2. Learning objectives and Bloom's taxonomy
3. Overview of active learning
4. Active learning in lecture
5. Cooperative learning
6. Student motivation
7. Creating a positive learning environment
8. Classroom Innovation: Tech Tools and Formative Feedback

Participants subsequently attended six Community of Practice (CoP) sessions that focused on support for implementing the engaged strategies covered in the workshops the previous semester. These sessions were organized around the following topics:

1. Issues in Implementing Active Learning
2. Assessing Student-Centered Learning vs. Teacher-Centered Learning (RTOP)
3. Implementation of Tech Tools and Impact on Formative and Summative Assessment
4. Discussions of Observations of Active Learning in the Classroom
5. Implementation of Cooperative Learning and Motivation
6. Value of Communities of Practice

Participants also agreed to six classroom observations during the year. The observations were conducted using the Reformed Teaching Observation Protocol (RTOP)—a 25 item rubric that measures student-centered vs. teacher-centered instruction in science, math and engineering disciplines and measures the degree of inquiry-based learning that is happening in the classroom [2], [3]. Fig. 1 shows a sample RTOP score sheet with the 25 rubric items and the five main area groupings of those items. Each item is scored on a scale of 0 to 4 and rates the degree to which that line item occurs during the lesson. A score of 0 indicates that the item is not happening at all. A score of 1 or 2 indicate that the item is happening, but not that much. A score of 3 or 4 indicate that the item is happening a lot. The RTOP does not judge the quality of student-centered instruction, but it does measure if it is happening, and how much it occurs. Observers are trained through a standard set of videos to assure that the inter-rater reliability is high [3].

After several observations and a session on understanding the RTOP, faculty participants became curious about their scores. The project planning group decided that an experienced instructional coach in K-12 (part of the RTOP observation team) would meet with interested participants to help them understand their scores. Coaching the faculty was not originally part of this project, but it seemed opportune.

Reformed Teaching Observational Protocol (RTOP)		
LESSON DESIGN AND IMPLEMENTATION		
1	The instructional strategies and activities respected students' prior knowledge and the preconceptions inherent therein.	0 1 2 3 4
2	The lesson was designed to engage students as members of a learning community.	0 1 2 3 4
3	In this lesson, student exploration preceded formal presentation.	0 1 2 3 4
4	This lesson encouraged students to seek and value alternative modes of investigation or of problem solving.	0 1 2 3 4
5	The focus and direction of the lesson was often determined by ideas originating with students.	0 1 2 3 4
CONTENT— Propositional knowledge		
6	The lesson involved fundamental concepts of the subject.	0 1 2 3 4
7	The lesson promoted strongly coherent conceptual understanding.	0 1 2 3 4
8	The teacher had a solid grasp of the subject matter content inherent in the lesson.	0 1 2 3 4
9	Elements of abstraction (i.e., symbolic representations, theory building) were encouraged when it was important to do so.	0 1 2 3 4
10	Connections with other content disciplines and/or real world phenomena were explored and valued.	0 1 2 3 4
CONTENT—Procedural Knowledge		
11	Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena.	0 1 2 3 4
12	Students made predictions, estimations and/or hypotheses and devised means for testing them.	0 1 2 3 4
13	Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures.	0 1 2 3 4
14	Students were reflective about their learning.	0 1 2 3 4
15	Intellectual rigor, constructive criticism, and the challenging of ideas were valued.	0 1 2 3 4
CLASSROOM CULTURE—Communicative Interactions		
16	Students were involved in the communication of their ideas to others using a variety of means and media.	0 1 2 3 4
17	The teacher's questions triggered divergent modes of thinking.	0 1 2 3 4
18	There was a high proportion of student talk and a significant amount of it occurred between and among students.	0 1 2 3 4
19	Student questions and comments often determined the focus and direction of classroom discourse.	0 1 2 3 4
20	There was a climate of respect for what others had to say.	0 1 2 3 4
CLASSROOM CULTURE— Student/Teacher Relationships		
21	Active participation of students was encouraged and valued.	0 1 2 3 4
22	Students were encouraged to generate conjectures, alternative solution strategies, and ways of interpreting evidence.	0 1 2 3 4
23	In general the teacher was patient with students.	0 1 2 3 4
24	The teacher acted as a resource person, working to support and enhance student investigations.	0 1 2 3 4
25	The metaphor "teacher as listener" was very characteristic of this classroom.	0 1 2 3 4

Fig. 1 RTOP Rubric, showing the 25 items within five major constructs of student-centered learning.

Using RTOP observations in conjunction with instructional coaching provided an opportunity to give instructors direct formative feedback on their teaching in the exact context of the teaching environment they experience. This hands-on approach amplified and solidified their learning about pedagogies of engagement that were provided in the more theoretical context of the work-shops. This combination shows promise as a tool for faculty development in teaching reform, and is the subject of this paper.

Literature Review

According to Brent and Felder, research shows that active learning strategies incorporate what we currently know about cognitive science to help students learn and apply the knowledge they need to be successful in their chosen field [2]. We know what to do to increase student-centered learning and instruction, but implementing these ideas can be a challenge when traditional teaching is embedded in the culture of our institutions and facilities like large lecture halls are designed for traditional lecture [2]. Conversations in higher education have typically centered more on content than pedagogy [4]. There have always been curriculum committees, but now through professional development and workshops, student-centered pedagogies are being addressed more and more in higher education.

In looking at ways to assess or evaluate teaching practices, the RTOP instrument has been used to collect data and evaluate reformed teaching in math and science in middle school, high school, community college, and universities. Applications range from environments that use socially constructed knowledge (constructivism) through environments based upon inquiry-based, active learning strategies. The studies report high inter-rater reliability among trained evaluators and suggest that scores can be used to predict improvement in learning in math and science [3], [5], and [6].

Gormally, Evans, and Brickman [7] state that the RTOP can be used to measure the degree to which an instructor is inquiry-based for the purpose of evaluative statistics. They did not, however, recommend it as a way to convey feedback to instructors, finding the RTOP challenging to interpret, and offering no support for feedback to those who are evaluated. Amrein-Beardsley & Osborn Popp [8], found that college instructors at a large university who surveyed faculty who had been observed using the RTOP by their trained peers did not see value in using the RTOP for summative evaluations, but found the RTOP to be a helpful tool for formative feedback. Most participants felt that it helped them acknowledge their teacher-centered behaviors, move them to more student-centered instruction, and "let go" enough so that students could engage and direct their own learning [8]. Participants also thought the RTOP assessments helped them diligently focus on incorporating active learning strategies on a regular basis in their lectures. Stephens, et al. [9] conducted a study with graduate student teaching assistants (future faculty) and found that less experienced teachers preferred direct feedback that gave specific suggestions on how to improve, as opposed to simply offering encouragement. They also found that those who started to incorporate student-centered practices were more receptive to critical feedback of their teaching,

In looking at teaching feedback that has been available to faculty in higher education, it is important to keep in mind the evaluator's status, the purpose of the evaluation, and how both of those things are perceived by the faculty. Administrators generally provide sporadic summative evaluations as part of the promotion and tenure process [4]. Peer evaluations have gained more popularity, but need to be part of a comprehensive professional development to be most effective [10]. Peer evaluators naturally focus on content, but are usually not trained in best-practice pedagogies or evaluation practices. Student evaluations some provide feedback, but questions generally focus on teacher-centered practices, not student-centered pedagogies [7]. Self-reflection is an important part of improving teaching effectiveness, but the practice can be greatly enhanced by encouragement from a coach to take risks and incorporate new ideas for effectiveness in their particular situation [11], [12]. If an instructor is worried about failure-based feedback from administrators, peers, or students, then they will most likely abandon implementation of new evidence-based strategies [7].

The best results of formative feedback from classroom observations happen in faculty who are intrinsically motivated and voluntarily coached [12], [13]. When participating in professional development, instructors are more likely to improve in their instruction and implement new pedagogical ideas when formative feedback (as opposed to summative feedback) is given [8], [12]. Instructional coaching is proving to help K-12 teachers transfer theory (from professional development) into practice (incorporating evidence-based strategies in the classroom) and also to aid teachers in self-reflection as a means to improvement in teaching [14], [15], and [16]. One of the drawbacks of incorporating evidence-based teaching strategies can be the lack of support to implement them [6], [7]. Denton and Hasbruck [14] found in the K-12 setting that giving feedback along with data not only improves teaching performance, but it also improves student performance as well. This same tendency was found to be true in undergraduate courses as well [17], including one study where higher scores on the RTOP correlated to higher student achievement [18].

Effective formative feedback helps teachers become intentional in their teaching practices [12], [13], and [19]. Using descriptive language about what happened in the observation to connect good practices that are already happening in the classroom to suggestions for improvement can improve the effectiveness of the feedback [13]. Positive reinforcement with constructive feedback increases receptiveness, whereas negative reinforcement—only listing what the instructor "should" be doing—generally does not [20]. A consistent, unbiased message is important in high quality feedback [7]. Suggesting improvements using one or two new strategies each semester/year, is realistic and important in building confidence and success to transforming teaching effectiveness over the long-term [2]. Steady growth over time should be the goal of formative feedback, in order to produce a culture where feedback for improvement is the norm for each instructor, rather than the exception at our universities. An instructor should not be wondering *if* they need to improve teaching, but instead should shift their thinking to, "What area am I going to work on improving *this* semester?"

Methodology

RTOP Classroom Observations

Six classroom observations were conducted over the course of the year—two in the fall and four in the spring using the Reformed Teaching Observation Protocol (RTOP) administered by trained observers. Observations were scheduled at least a week in advance and always announced. Table 1 shows the number of classes observed, their level (graduate or undergraduate) and the nature of the learning environment (lab, recitation, or lecture) for each observation set. Due to maternity leaves, sabbaticals, travel schedules, and course tests to schedule around for the various participants, the number of participants varied from one observation set to another. Undergraduate courses in engineering were top priority to observe, but if a participant was only teaching a graduate level course, then a graduate course was observed.

Four classroom observers were trained to administer the RTOP. Notetaking was used to describe the lesson, events, classroom facilities and areas of reinforcement and refinement during the observation. Scores were then entered into Qualtrics for data purposes.

Table 1. Courses observed FA16 and SP17

Observ. No.	Semester	# UG	# Grad	# Lab	# Rec	# Lect	Total
1	Fall	25	8	8	0	25	33
2	Fall	26	7	5	3	25	33
3	Spring	22	6	2	1	25	28
4	Spring	26	6	2	0	30	32
5	Spring	20	6	3	3	20	26
6	Spring	20	5	2	3	20	25

Coaching Sessions Incorporating Formative Feedback

In session two of the CoP discussions, participants learned about the RTOP instrument and what it measured. Faculty became interested in their RTOP scores and, subsequently, 23 out of 27 participants signed up for individual conferences with an experienced instructional coach, who had seen each of them teach during the observations. This formative feedback, using the RTOP results to guide the discussion, proved to be effective in getting faculty to embrace active learning.

The format for the individual coaching conferences included a review of the RTOP rubric constructs and scoring, self-reflection on their instruction, and brainstorming specifics strategies learned in the workshops the previous semester to incorporate into their future teaching. In addition to the RTOP scores, participants were provided with one to two areas of reinforcement (what went well) and one to two areas of refinement (areas to improve) from each observation, using the language from the RTOP rubric. Table 2 shows the typical agenda for the coaching sessions, which were held during the SP17 semester.

Table 2. Agenda for One-on-One Conferences/Coaching Sessions in SP17

1. Review the RTOP/Understanding the rubric content and scoring. A score below 50 shows more teacher-centered practices and a score above 50 shows more student-centered teaching practices.
2. Ask the faculty member to self-reflect about their class—what has gone well (reinforcement) and where would they like to improve (refinement)?
3. Brainstorm how to use the faculty's area of reinforcement (what went well) to help them improve in their area of refinement (area of improvement). List several specific strategies to help them improve, drawing on active learning .strategies that were discussed in the previous semester's workshops.
4. RTOP scores are given to the participant along with discussion about what they mean. Feedback given from the observer includes *specific evidence from the observation.*
5. Lastly, discuss other issues in their educational endeavors that the faculty member would like to discuss.
6. Looking ahead: at the end of the semester faculty could request to receive their last two RTOP observation (post) scores, the reinforcement/refinement information for all four spring observations, along with another conference.

A coaching format similar to the TAP™ Rubric [21] post-conference was followed, giving feedback on the RTOP scores along with reinforcements (what went well) and refinements (area for improvement). The TAP Rubric is used in K-12 programs around the country and uses research-based best practices to improve teaching and student achievement. The format for conferencing uses self-reflection on areas of strength (reinforcement) and areas to improve (refinement), specific evidence notes from the lesson during feedback to justify the scoring on the rubric, and finally specific suggestions by the observer for improvement along with brainstorming specific strategies to incorporate.

When explaining the RTOP instrument and how it relates to their score, participants responded well to the fact that it measures student-centered learning. How can you get a high score if you gave a traditional lecture? You simply cannot. Discussing student behaviors and pedagogies is straightforward. But how do you discuss a score of 30 or 40 out of 100? What is the difference in feedback strategy for someone who scores really low vs. someone who score really high? After being in their specific course and classroom, it is quite simple to start the discussion, by asking them how they felt about it. If the large lecture hall setting was hard to overcome, you can simply start the discussion about that.

Table 3 describes the coaching conferences of the 23 faculty who elected coaching. The rank and gender of the faculty member are included, along with which sessions had coaching (either mid, post, or both) and a typical comment that characterizes the session. The following example gives the reinforcement and refinement notes that were documented for Professor J (who scored 77):

> **Example:**
>
> *Reinforcement (feedback on strengths)*
>
> RTOP #17. *The teacher's questions triggered divergent modes of thinking.*
> Many questions were asked throughout the lecture, pushing students further into thinking critically about the topic. For example, "Tell me more…Give me an example…What is the difference? Can you explain that? Can you tell me another way to solve this problem? Why is this true? How did we get to those numbers?"
>
> *Refinement (feedback for improvement)*
>
> RTOP #18. *There was a high proportion of student talk and a significant amount of it occurred between and among students.*
> How can discussion amongst students occur even more? Students could solve various practice problems together, in addition to comparing answers with other groups during the in-class exercise, justifying their results with a brief share-out on the whiteboard.

One of the J's strengths were his skills in asking higher level questions to promote critical thinking. So in looking at an area for him to refine, the coach used this strength to encourage him to offer opportunities for the students to discuss and learn from each other as well, since rich opportunities for learning can happen when students solve, discuss, and debate problems or concepts with each other.

In observing the comments that were made during the conferences, it is important to think about what kind of formative feedback would be helpful and engaging in the faculty member's particu-

lar situation. Some of the participants who were fairly new to teaching, were already incorporating some active learning strategies, and were eager for more. Others were the more typical 'teach as I was taught' traditional lecturers. Some of the class environments lent themselves more naturally to things favored by the RTOP (e.g., labs, recitations, or capstone courses). Others did not. There were also basic cultural differences among the participants.

Table 3. Individual coaching conferences of instructors who sought feedback from the RTOP observations. Conferences were conducted during the SP17 semester after the 'mid' and 'post' observations.

Name	Rank	Gender	Conf.	Comments from Conferences
Prof A	Asst	f	both	I don't like to force students to work with partners.
Prof B	Asst	f	both	I am thinking about group presentations and how I can engage the audience more.
Prof C	Prof	m	mid	For my online courses, how can I apply more engaged strategies?
Prof D	Assoc	m	both	I have been incorporating objectives into each lecture.
Prof E	Asst	m	mid	I wish there was a better way to share ideas—like a bank where we could go for different topics we are teaching about.
Prof F	Lect	m	both	What surprised me was when the students were learning from each other during group work through sharing their experiences as well as content.
Prof G	Asst	m	both	How can I solve tension in group work when students are having difficulty working together?
Prof H	Asst	m	both	My focus is shifting from what am I going to teach to what are my students going to do?
Prof I	Asst	m	both	I am trying one engaging activity per lecture this semester in my course.
Prof J	Asst	m	both	I would like to learn more about clickers/polls to use during class.
Prof K	Asst	f	both	Could you write a letter for my P and T case about my participation in the grant and observations?
Prof L	Lect	m	both	I think it would be a good idea to keep this with me each semester as a reminder of what I should be doing
Prof M	Lect	f	both	I like to hear your suggestions and ideas about my class.
Prof N	Asst	m	mid	I have all kinds of Think, Pair Share added into my lesson today.
Prof O	Asst	m	mid	I am trying to make my PowerPoint more interactive
Prof P	Asst	m	mid	I group the students according to pre-test results so that group work is more successful.
Prof Q	Prof	m	mid	Group work is the basis for this course.
Prof R	Assoc	m	post	I feel that the students have changed so much over the years.
Prof S	Asst	m	both	I am thinking about how I can apply what I have learned to a large section of undergraduates that I will be teaching next fall.
Prof T	Asst	m	mid	How do you solve lengthy problems during a short class period?
Prof U	Prof	m	mid	I am working with my colleagues to try to improve this course.
Prof V	Asst	f	both	I am feeling like I don't have to "cover" everything, but with engaged learning, they are still learning a lot.
Prof W	Lect	m	mid	I have already incorporated many engaged learning strategies and I am looking for more ideas to get to the next level.

At the end of the spring semester, 14 participants had follow-up conferences/feedback (through email, informal discussions after class, and scheduled conference times) that confirmed implementation of some of the strategies discussed earlier and afforded the opportunity to reflect on their success.

Results

Observations from the RTOP Data

Table 4 shows the five main RTOP areas along with the average score obtained by faculty in the program over the two-semesters that they were observed. For each observation period (pre, mid, or post) the scores are the average of two observations and each value is the average of the five subcategories within that RTOP area. The table also gives the ranking of the area for that observation period. (Each item has 5 sub headings, which total 20 points each).

Table 4. Average RTOP Scores in the five main rubric areas

RTOP Area	(Pre) FA16		(Mid) SP17		(Post) SP17	
	Score	Rank	Score	Rank	Score	Rank
Lesson Design and Implementation	9.3	4	9.1	5	11.8	4
Content Propositional Knowledge	16.8	1	17.1	1	17.9	1
Content Procedural Knowledge	9.0	5	9.6	4	11.5	5
Classroom Culture Communicative Interactions	9.4	3	10.4	3	12.5	3
Classroom Culture Student/Teacher Relationships	11.5	2	12.8	2	15.1	2

The results of the aggregated RTOP data collected from this first group of faculty will be considered to guide coaching strategies for future cohorts. In looking at the data in Table 4, the areas of 'Lesson Design and Implementation' and also 'Content Procedural Knowledge' are the lowest score overall. Both of these areas that would require a change in the structure of a course that may not have the student-centered framework. Conducting pre-conferences before the semester starts to work on the design of a specific course (Lesson Design and Implementation) would be a way to give feedback before the semester even begins. Selecting a few active learning strategies to commit to for a semester (e.g., Content Procedural Knowledge), would be a way to improve these areas on the RTOP, thus improving student learning.

Table 5 gives the details of which areas were used for reinforcement and refinement for each of the coaching sessions for each of the participants along with the RTOP score from the observation that preceded the coaching session. An asterisk (*) in the refinement column indicates that the only refinement question was "What do you want to work on?" Those were generally used

for instructors who had high scores on the RTOP. Note that no more than two rubric items were called out in the reinforcement or refinement part of each coaching session. Focusing on a few things is consistent with suggestions in the literature.

Table 5. Individual RTOP rubric areas for reinforcement and refinement, along with composite RTOP score from the observation, for the four observations conducted during the SP17 semester.

Name	Observation 1			Observation 2			Observation 3			Observation 4		
	Rein.	Ref.	RTOP Score	Rein.	Ref.	RTOP Score	Rein.	Ref.	RTOP Score	Rein.	Ref.	RTOP Score
Prof A	18	13	64	11	18	41	8	13,18	49	13,18	17	70
Prof B	1,21	18	64	14	18	42	25,18	13	70	21,18	14	79
Prof C	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Prof D	13,18	*	96	24	21	94	14,15	*	88	13,18	*	90
Prof E	11,13	*	86	10	18	52	11,12	14	74	NA	NA	NA
Prof F	21	18	47	10,11	13	53	21,8	13,18	57	13,24	14	73
Prof G	21	18	75	11	14	57	13,24	18	72	13,18	21	87
Prof H	13,14	17	53	11	13	40	8	13	43	13,18	17	77
Prof I	13, 14	*	85	18	17	71	21	13	74	17,21	16	76
Prof J	21	5	73	17,21	18	77	21,22	*	85	19,15	*	81
Prof K	7,8	18	43	8,11	18	40	13,18	15	75	13,18	17	83
Prof L	21	25	80	23	21	75	21	15	75	13,18	21	84
Prof M	2,18	*	82	21	17	75	13,18	21	84	24,25	17	80
Prof N	25	19	37	8	21,18	40	13,18	23,24	76	21,18	13,18	44
Prof O	18,13	21	67	11	14,18	60	11,12	13,18	61	11,8	13,18	63
Prof P	14,2	17	47	14,24	*	64	13	21	74	13,18	16,19	73
Prof Q	11,15	14	91	2	21	88	13,15	*	84	11,15	21	83
Prof R	13	14,18	62	11,13	18	66	14	18	55	11	13	54
Prof S	11	18	65	10,11	18	61	15,18	*	77	15,11	*	91
Prof T	8	18	41	13	18	28	21	13,18	56	21,14	13,18	50
Prof U	21	18	45	14	18	40	11	18	58	13	10	64
Prof V	7,8	18	45	14,17	11,18	52	13,14	22	73	7,13	18	60
Prof W	13	*	78	1	17	51	6,7	18	67	13	2	71

* indicates that the refinement question was "What do you want to work on?"

In looking at the data for reinforcement and refinement, there are several areas that were emphasized the most. RTOP #18 *There was a high proportion of student talk and a significant amount of it occurred between and among students* under 'Classroom Culture Communicative Interactions' and #13 *Students were actively engaged in thought-provoking activity that often involved the critical assessment of procedures* under 'Content Procedural Knowledge' were two areas that

were mentioned 37 and 23 times, respectively, under reinforcement and refinement. These two areas concern discussion and engaging activities, which are the two areas that have a great effect on how student-centered the classroom can be. The coach often used these two areas as a starting point (pointing out anything that was positive in this direction) and also made specific suggestions for ideas on how to provide structure for these to happen.

RTOP #21 *Active participation of students was encouraged and valued* under Student Teacher Relationships was part of the data 19 times, and as mentioned about #18 and #13, when focusing on what the students are doing, the classroom begins to open up to student-centered approaches.

RTOP #11 *Students used a variety of means (models, drawings, graphs, concrete materials, manipulatives, etc.) to represent phenomena* under 'Content Procedural Knowledge' was under reinforcement 11 times, but not mentioned any times under refinement. This area was often focused on using PowerPoint slides as a mode of delivering content during the class period. Most instructors use this tool already so the emphasis was on how to make the slides more interactive. Focusing on what the students were *doing* during class seemed to help the instructors make the connection to what engaged pedagogy looks like.

Lastly, RTOP #6-10 'Content Propositional Knowledge' wasn't emphasized in reinforcement and refinement because most instructors at the college level have a high level of knowledge in their specific field. The next level in instruction is knowing how to use what students say and think, in order to connect to their understanding and take them to the next level of understanding, but when first learning about engaged pedagogy it seems more important to stress the other part of content which is 'Content Procedural Knowledge' which scored low (see above) compared to the other areas of the RTOP. *How* to help the students understand the content, is different from the instructor *knowing* the content [3].

Discussion

Observations on Conferences and Coaching

The faculty were very open and interested in talking about their teaching. Very few had ever been observed—most had not. A few had taken a new-faculty workshop seminar and one had participated in a week long program through his professional society. Faculty were willing to be vulnerable and did not hesitate to share what their struggles and difficulties were for their course/teaching. They were extremely skilled at self-reflection. They wanted someone who would discuss *their* specific teaching issues (teaching in a large lecture hall, how to engage students who are on social media, etc.). Some asked if the RTOP observer could come and observe a specific activity or lesson. This was often when they were trying a new strategy that reflected engaged learning. They asked how their course could be structured in an engaged way and *what was the pathway for getting there*? By far, the most discussed issue was how to engage large classes of students in large lecture hall environments. Many voiced that it was difficult to figure out where to start to take on the task of an engaged classroom. The overall feeling was that participants wanted to discuss their teaching in an environment where they could freely discuss what was happening in their classrooms in a nonjudgmental environment.

In the context of higher education, there are several things to consider. As noted earlier, there were various types of classes observed. Obviously, observing a lab is very different from observing a lecture in a large lecture hall. In looking at an entire course (lecture plus recitation, lecture plus lab, lecture only) a coach could discuss broader implications of the RTOP. Questions like,

"What activities could you do in the lecture environment to connect to the lab data and discoveries that students have made?" or "How can information from several RTOP observations be used to improve the course overall?"

Several principles of coaching were developed during this first year. Because the feedback was formative, conversations centered on how to use the information for improvement. Formative feedback from instructional coaching provided a roadmap for improvement, and helped move the conversation away from final, summative evaluations of teaching ability that are commonly a part of performance reviews. Feedback was specific and timely.

Professor K (see Table 3) asked, "Could you write a letter for my P and T case about my participation in the grant and observations?" K's unit head was very receptive to including such a letter in the promotion dossier. Observations made by a trained professional using the RTOP instrument are a reliable supplement and possible replacement for peer observations that are often used to support the promotion and tenure process. RTOP-based observations providing information on student-centered practices and can therefore provide a counterpoint to standard course evaluations which usually measure mostly teacher-centered practices. Collaboration with a coach also provides evidence of teaching progress.

Having the common language of content from the workshops and the RTOP rubric aided communication in the coaching process. Discussing pedagogy with a coach who had actually been in their classroom multiple times seemed to enhance rapport. Using the CoP to discuss disciplinary content as it related to teaching complimented the pedagogy discussions participants had with the instructional coach. This helped participants move from theory to practice.

The initial plan for the grant was to conduct classroom observations using the RTOP for data purposes. Did the scores improve and in what areas? What does this tell us about the effects of the workshops and their content? What we did not anticipate was the faculty's requests for their scores, to understand the RTOP instrument and what it measured, and their desire to get feedback on their teaching. There were informal conversations and emails that happened as well that did not make it into the data. But if that is any sign of motivation and enthusiasm for teaching in higher education, we need more models and more research for data to show how instructors improve over time and as a result, how their students improve as well. We do not need to hope that our instructors will be naturally great teachers. We know the route to get there and with the right emphasis, teachers with career long efforts to improve, will have lasting impacts in the future of higher education.

Summary and Conclusions

The first goal of this project—shift faculty beliefs, strategies, and practice toward student-centered learning—fits well into Rogers' model of diffusion of innovation (see Fig. 2). In looking at the model, professional development through the workshops can be associated with the 'knowledge' level of the model. For many of the participants it was the first time they had encountered some of the ideas of engagement pedagogies. The communities of practice fall across the lines of 'knowledge' and 'persuasion.' Having a community helps to persuade the members to try things that they might not on their own. Having a coach give formative feedback is on the high end of 'persuasion', it helps with the decision to adopt, and it interacts with 'implementation' of some of the student-centered practices. For confirmation, ongoing adoption would be the

best outcome, but how to continue to encourage or measure that would be a worthwhile endeavor to pursue.

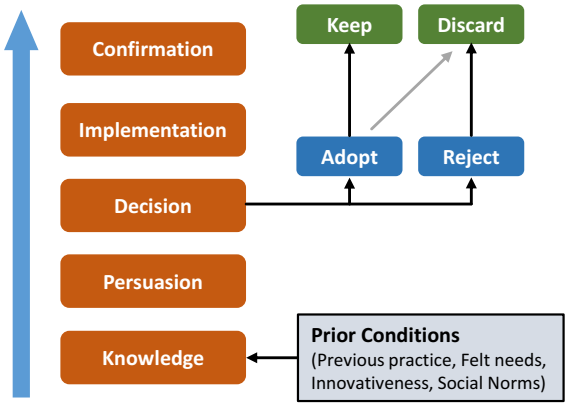

Fig. 2. Innovative Stages in Roger's Model of Diffusion [1]

Another study from this project looks at RTOP scores and the effects of coaching of those participants who were observed six times during the year in a more formal statistical analysis [22]. This study also concludes that the formative-feedback coaching was effective in changing instructor practices.

The receptivity of the faculty to having a professional observer in their classroom, the willingness of the faculty to be coached, and the effectiveness of organizing the coaching around the RTOP instrument could have important implications in moving faculty toward student-centered teaching in general. The faculty participants in this study were better able to convert theoretical concepts of engagement pedagogy into actual classroom activities with the additional direct feedback that the observations and coaching provided. This observation/coaching mechanism also helped to motivate the faculty to make changes because the level of expectation of change was higher than it would be if the faculty were left to implement on their own. Finally, the possibility of using the professional observations in the promotion and tenure process could be a positive step forward from a system that relies almost exclusively on student evaluations, and could significantly improve how faculty perceive the value and evaluation of their teaching.

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