Effective Teaching Across Disciplines: Text Analysis of Themes in Faculty Reflections

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May 18, 2020

Executive Summary

While the basics of effective teaching do not vary by discipline, and ACUE's Course in Effective Teaching Practices is intended for all types of faculty, regardless of field, the content and format of courses do vary by discipline, particularly between science, technology, engineering, and math (STEM) fields and other fields. Therefore, examining the content of faculty's reflections by discipline can be useful in understanding how faculty use the evidence-based teaching techniques in their varying classrooms as well as how they reflect on their teaching.

The current study analyzed reflections submitted by 144 faculty who completed ACUE's course in effective teaching during the 2017–2018 academic year. These faculty came from nine cohorts at six colleges and universities. This study uses a quantitative bottom-up approach—the Meaning Extraction Method (MEM)—to explore common themes in these reflections, and also examines differences in use of themes by unit and discipline. Specifically, we investigated differences between reflections submitted by faculty in traditional STEM fields; social, behavioral, and health sciences; and non-STEM fields.

Six themes were observed: (1) learning outcomes, (2) grading and feedback, (3) leading class sessions, (4) active learning, (5) setting expectations, and (6) problem solving. While most of these themes aligned with the major theme of a particular unit, even themes that aligned almost exactly to a particular unit were observed in reflections from all units, suggesting that faculty incorporated what they learned from one module or unit into their implementation of techniques in other modules. In addition, the differences found between units were greater and more consistent than the differences between disciplines, demonstrating the relevance of the content to all types of faculty.

The differences that we did find between disciplines and the particular patterns are in line with the fact that social, behavioral, and health sciences are instructionally similar to traditional STEM fields in some ways, similar to non-STEM fields in other ways, and at times are somewhere in between STEM and non-STEM fields. This pattern of results demonstrates that the experience of faculty in the social, behavioral, and health sciences is distinct from both traditional STEM and non-STEM faculty and suggests the importance of distinguishing between traditional STEM fields and social, behavioral, and health sciences when exploring distinctions between STEM and non-STEM fields.

Effective Teaching Across Disciplines: Text Analysis of Themes in Faculty Reflections

In an effort to catalogue the evidence-based teaching practices that improve student achievement, ACUE reviewed more than 300 citations from the scholarship of teaching and learning and engaged with teaching and learning experts across the country to develop the ACUE Effective Practice Framework©. The Framework was independently validated by the American Council on Education and serves as a consensus statement of the teaching skills and knowledge that every college educator should possess in order to teach effectively, regardless of discipline. ACUE developed and offers online courses in effective teaching practices that are fully aligned to the Framework's five major units of study: designing an effective course and class, establishing a productive learning environment, using active learning techniques, promoting higher order thinking, and assessing to inform instruction and promote learning. ACUE's courses on effective college teaching recommend more than 200 evidence-based teaching approaches and are certified by Quality Matters. To satisfy course requirements, faculty engage with content and are required to implement evidence-based practices and write rubric-aligned reflections on their implementation, including citing changes in student behaviors. Faculty who satisfy course requirements for at least 25 modules earn a Certificate in Effective College Instruction endorsed by the American Council on Education.

While ACUE offers various courses and concentrations, such as in online instruction, the course in effective teaching is generally intended for all types of faculty, across varied types of institutions and fields. It is important to acknowledge that although the basics of effective teaching do not vary by discipline, the content and format of courses do vary, particularly between science, technology, engineering, and math (STEM) fields, which often include labs, and other fields. Thus, it is important to explore the differences in how faculty in STEM and non-STEM fields respond to the content. Previous research by Hanover Research (2018) has found that there are no significant differences across disciplines in reports of the content's relevance to their teaching. Examining the content of faculty's reflections can be useful for further exploration of how faculty use the evidence-based teaching techniques in their varying classrooms, as well as how they reflect on their teaching.

Previous qualitative analyses conducted by researchers at the Center for Advanced Study in Education ([CASE]; Hecht, 2019; Hecht & McNeill, 2018) have explored the themes in faculty reflections samples at two institutions. Examining the themes in faculty reflections using samples from multiple institutions and quantitative methods, and comparing across disciplines, will allow for a more thorough assessment of the content of faculty reflections, potentially uncovering additional themes due to the differences in methodology.

Method

Participants

These analyses focused on reflections submitted by 144 faculty from nine cohorts at six colleges and universities that completed ACUE's course in effective teaching during the 2017–2018 academic year. These cohorts were chosen because they had completed the course using the latest grading rubric at the time that analyses began. Due to constraints in exporting reflection data, only text entry submissions were used for analyses, which eliminated some faculty who submitted reflections as attachments.[1]

The goal of these analyses was to explore differences between disciplines. The differences between science, technology, engineering, and math (STEM) disciplines and non-STEM differences were investigated. Furthermore, the STEM fields were differentiated as

[1] There were no significant differences in the faculty demographics between text entry and attachment submissions.

traditional STEM fields and social, behavioral, and health sciences. Faculty who did not indicate a discipline on the enrollment survey, or whose discipline could not be categorized, were excluded from the analyses.

Forty-five faculty were characterized as traditional STEM; 38 as social, behavioral, and health sciences; and 61 as non-STEM. There were no significant differences between disciplines in their teaching experience, χ^2 (8, N = 144) = 10.25, p = .248, or tenure status, χ^2 (10, N = 144) = 4.24, p = .936 (see Table 1). There was also not a significant difference between disciplines in the number of reflections each faculty member had that were included in the analyses, F(2, 141) = 0.23, p = .794, which ranged from 1 to 27 (M = 16.35, SD = 10.38).

Table 1

Demographics of Faculty by Discipline

		Traditional STEM	Social, Behavioral, & Health Sciences	Non-STEM
Teaching experience				
	None	-	1 (2.6%)	1 (1.6%)
	1–2 years	10 (22.2%)	8 (21.1%)	3 (4.9%)
	3–5 years	5 (11.1%)	7 (18.4%)	11 (18.0%)
	6–10 years	11 (24.4%)	7 (18.4%)	14 (23.0%)
	More than 10 years	19 (42.2%)	15 (39.5%)	32 (52.5%)
Tenure status				
	Non-tenure track	12 (26.7%)	12 (31.6%)	16 (26.2%)
	Tenure track	12 (26.7%)	12 (31.6%)	16 (26.2%)
	Tenured	15 (33.3%)	11 (28.9%)	17 (27.9%)
	Faculty at an institution with no tenure system	5 (11.1%)	2 (5.3%)	8 (13.1%)
	Non-teaching staff	-	-	1 (1.6%)
	Other	1 (2.2%)	1 (2.6%)	3 (4.9%)

Procedure

To fulfill the requirements for each module in ACUE's course in effective teaching, faculty members are required to choose one of the evidence-based teaching practices from the module and submit a written reflection on their implementation of the practice. The rubric requires faculty to incorporate a description of (a) the selected practice(s), including an explanation of this choice; (b) the successes and/or challenges they encountered; (c) the impact of their use of evidence-based strategies on student learning and/or engagement; and (d) their planned next steps for continuous refinement of practice.

Data Analysis

Extracting themes using the MEM. We used the Meaning Extraction Method in order to extract the themes in these reflections ([MEM], e.g., Chung & Pennebaker, 2008a, 2008b; Ramírez-Esparza, Chung, Kacewicz, & Pennebaker, 2008). The MEM utilizes principal components analysis to observe how words co-occur together to extract the most salient themes used by the participants. Then the components are named using a data-driven and bottom-up approach. The MEM has been used successfully to study a variety of psychological phenomenon, including personality descriptions (Chung & Pennebaker, 2008a, 2008b; Ramírez-Esparza et al., 2008; Rodríguez-Arauz, Ramírez Esparza, Pérez-Brena, & Boyd, 2017; Ramírez-Esparza, Chung, Sierra-Otero, Pennebaker, 2012), evaluative dimensions (Millar & Hunston, 2015), values (Wilson, Mihalcea, Boyd, & Pennebaker, 2016), and themes used in social movements (Ikizer, Ramírez-Esparza, & Boyd, 2018).

We conducted the MEM via the free automation software the Meaning Extraction Helper ([MEH], Boyd, 2016). The MEH uses automated text analysis tools to identify the most commonly used content words in written text, and then determines how these words co-occur in a given corpus of text (Ikizer, Ramírez-Esparza, & Boyd, 2018). The MEM output provides the user with a binary data file in which each participant is organized as a separate row and each word is organized as a separate column. If a word is used by a participant, it is coded by the MEH software as 1, and if a word is not used by a participant, the MEH software codes it as 0. We used this binary output in SPSS Statistics software to conduct principal component analyses. The results of the principal component analyses provided us with the words that co-occurred in the text files, i.e., the words that were simultaneously coded as 1.

To understand the themes used by our participants, we first carried out a meaning extraction using the whole sample. This allowed us to understand the broad themes that overlapped across all of our participants. Afterward, we split the sample in terms of the type of field and carried out 3 separate meaning extractions: (1) traditional STEM fields; (2) social, behavioral, and health sciences; and (3) non-STEM fields. This allowed us to observe any themes that were unique to the field. We then took each binary dataset produced from these analyses and conducted principal component analyses, which allowed us to observe which words co-occurred together in the overall sample and in each specific sample.[2]

Examining differences by discipline and unit. Once we finalized the words included in each theme, we calculated a “score” for each of the themes based on what proportion of the words in the reflection were part of the particular theme. This allowed us to then run two-way ANOVAs for each theme to examine differences in use of each theme by the faculty’s discipline

[2] The word “student” was observed in most of the reflections. Therefore, it would not be meaningful to investigate how it co-occurs with the other words, as it could not be unique to a specific theme. Thus, we excluded this word from the factor analyses.

and the unit the reflection was submitted for. When there were significant main effects, Bonferroni post-hoc tests were used to further examine the differences.

Results

Themes

Five themes were found in the whole sample.[3] When the meaning extraction was carried out for each discipline separately, variations on the original themes were found within each discipline, and one new theme was found only in the traditional STEM subsample.

Theme 1: Learning outcomes. Results demonstrated that the first component included words such as *outcome, align, apply, objective, assessment*, and *learn* (see Table 2). Reviewing reflections with high factor loadings for this component showed that these reflections focused on learning outcomes and objectives, particularly revising learning outcomes, aligning course activities and assignments to learning outcomes, and communicating that alignment to students (see Table 3).

Theme 2: Grading and feedback. Results demonstrated that the second component included words such as *grade, rubric, assignment, feedback, improve, and review* (see Table 2). Reviewing reflections with high factor loadings for this component showed that these reflections focused on grading and feedback, including feedback from instructors and peers, grading policies, and weighting of assignments (see Table 3).

Theme 3: Leading class sessions. Results demonstrated that the third component included words such as *question, lecture, material, concept, start,* and *lesson* (see Table 2). Reviewing reflections with high factor loadings for this component showed that these reflections focused on how faculty use class time, including descriptions of how faculty segment a class

[3] An additional theme was found that contained words from the reflection instructions. This was due to a technical error in which the instructions were extracted along with the text that faculty wrote when they used the reflection guide. Thus, this theme was excluded from the results and all analyses.

session and use different types of activities to increase student understanding and engagement (see Table 3).

Theme 4: Active learning. Results demonstrated that the fourth component included words such as *discussion*, *group*, *engage*, *participate*, *respond*, and *talk* (see Table 2). Reviewing reflections with high factor loadings for this component showed that these reflections focused on active learning, particularly discussions, group activities, and encouraging class participation (see Table 4).

Theme 5: Setting expectations. Results demonstrated that the fifth component included words such as *syllabus*, *semester*, *early*, *expectation*, *set*, and *introduce* (see Table 2). Reviewing reflections with high factor loadings for this component showed that these reflections focused on setting expectations and the beginning of the semester (see Table 3).

Theme 6: Problem solving. The problem solving theme was found as a component only in the traditional STEM subsample. Results demonstrated that this component included words such as *problem*, *decide*, *solve*, *math*, *realize*, and *result*. Reviewing reflections with high factor loadings for this component showed that these reflections focused on both the instructor trying to solve problems related to teaching as well as on students engaging in problem solving activities (see Table 3).

Table 2

Themes Extracted From Faculty Reflections

Learning Outcomes		**Grading and Feedback**		**Leading Class Sessions**		**Active Learning**		**Setting Expectations**		**Problem Solving**	
Outcome	.579	Grade	.571	Question	.453	Discussion	.416	Syllabus	.451	College	.375
Align	.472	Rubric	.487	Answer	.433	Group	.408	Semester	.412	Problem	.367
Step	.427	Assignment	.465	Lecture	.420	Professional	.395	Day	.405	Decide	.360
Process	.39	Paper	.46	Material	.41	Engage	.36	Early	.37	Solve	.32

	8		4		1		0		0		2
Apply	.380	Feedback	.424	Concept	.375	Goal	.359	Begin	.307	Math	.305
Objective	.363	Final	.398	Topic	.351	Technique	.338	Classroom	.303	Realize	.303
Assessment	.359	Provide	.392	Cover	.329	Participate	.321	Talk	.296	Together	.292
Design	.351	Improve	.389	Minute	.314	Activity	.308	Point	.264	High	.266
Learn	.349	Receive	.340	Problem	.308	Challenge	.303	Start	.250	Level	.228
Revise	.335	Opportunity	.336	End	.297	Classroom	.299	Sure	.247	Understand	.211
Share	.308	Write	.325	Note	.285	Participation	.296	Expectation	.241	Hard	.211
Task	.303	Review	.322	Class	.279	Peer	.276	Name	.237	Result	.209
Specific	.300	Peer	.301	Response	.272	Discuss	.262	Instructor	.235		
Helpful	.300	Give	.286	Time	.271	Session	.249	Experience	.233		
Level	.291	Complete	.282	Start	.258	Small	.231	Week	.224		
Assignment	.279	Due	.267	Present	.257	Talk	.229	Set	.222		
Activity	.275	Project	.259	Give	.251	Respond	.210	Module	.222		
Skill	.272	Exam	.247	Week	.239	Approach	.208	Address	.222		
Develop	.248	Week	.224	Discussion	.236	Effective	.205	Important	.220		
Understand	.242	Point	.222	Understanding	.224	Encourage	.204	Encourage	.214		
Syllabus	.237	Work	.221	Engage	.224	Implement	.201	Introduce	.208		
Identify	.231	Offer	.221	Test	.215			Hope	.205		
Concept	.224	Require	.217	Hand	.212			Past	.204		
Teach	.221	Online	.215	Lesson	.210			Class	.204		
Project	.218	Assign	.210	Information	.203			Effort	.203		
High	.215	Test	.208					Add	.201		
Order	.213	Detail	.206								
Relate	.212										
Clear	.208										

Table 3

Excerpts From Sample Reflections With High Factor Loadings for Each Theme

Theme	Sample reflection excerpt with high factor loading
Learning Outcomes	"Definitely, students will benefit from **clear** and concise **learning outcomes**. The **revised** version will ensure that students can connect between the course activities and the **outcomes** and **relate** the **outcomes** of the course I am **teaching** to the program **learning outcomes**. Also, they will be able to **identify** how important these **outcomes** [are] to future courses. For me, this **activity** will make the **process** of **designing** courses easier than before and assure that course **objectives** are coherent and connected within the course **learning outcomes** and program **learning outcomes**."
Grading and feedback	"Providing multiple opportunities to earn course **points** is crucial. Some students are not confident **test** takers and these individuals need other forms of assessment to be successful. Homework **assignments**, group **work, projects, papers** dispersed throughout the semester promote further learning and help **improve grades.** . . . The success with non-**graded assignments** is the students have an **opportunity** to **receive feedback** that promotes future achievement."
Leading class sessions	"I taught this **lesson** right after grading **Test** 1**.** For the first four **weeks** of **class**, I **lectured** and asked students if they were **understanding**. Some of the same students would ask **questions** from the homework, but most seem to be **understanding**. The contrary was demonstrated after the first **test** when half of the **class** did not do well. . . . I **started** the **class** by providing my students with an overview of the **material** that I was going to **cover**. I also kept the **lesson** focused on one major **topic.** . . . At the **end** of each chunk of **information**, I asked students to work on a couple of **problems**. . . . I like providing my students with skeletal **notes**. This way they don't waste **time** copying the **questions** and can **start** working out or copying my explanations."
Active Learning	"As a professor, my **goal** is to make sure that all my students are fully **engaged** in the learning process. [Course], which was my largest class this year, was a **challenge** because I wasn't sure how to actively **engage** my students and **encourage participation.** . . . I **implemented** a modified version of the "3-2-1" **activity** . . . rather than simply teaching the readings or lecturing, I assigned students to **small groups** and assigned each **group** a specific genre. I then asked each **group** to come up with 3 key elements of the genre, provide 2 popular examples of the genre, and to **talk** about the questions from the reading that they brought to class and from those pick 1 question that they still had about genre. . . . As I walked around the room I saw students **discussing** and debating the most important elements of their genre and getting excited by picking their examples. I also heard them **responding** to and building on the[ir] **group** mates' questions."

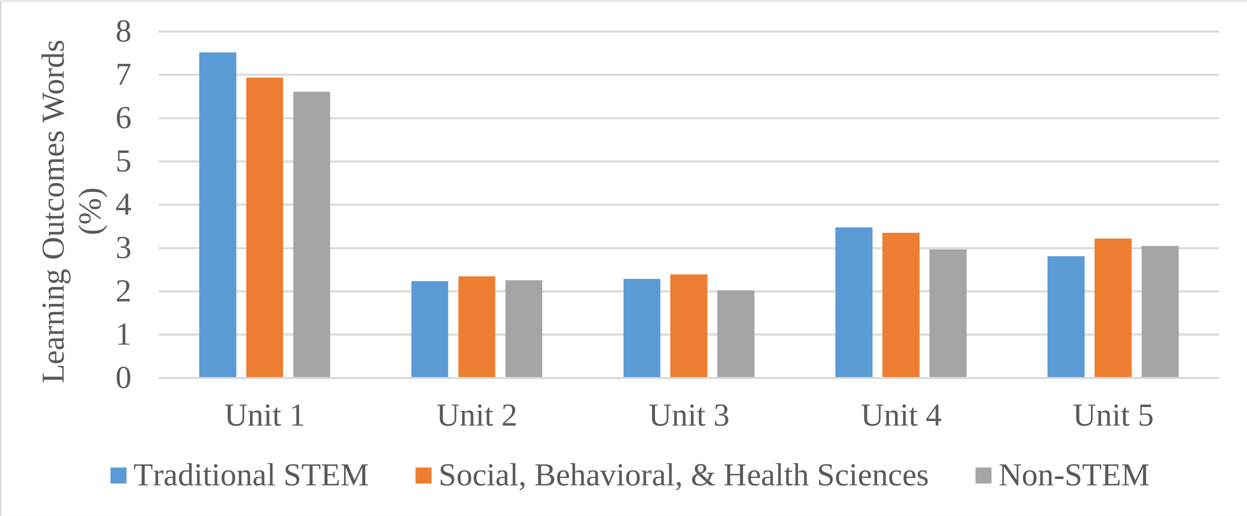
Theme	Sample reflection excerpt with high factor loading
Setting Expectations	"An **instructor's** behavior is critical when it come[s] to course outcomes and overall **classroom** behavior/attitude. This is one thing that I make **sure** to focus on because, as we saw in the video, an **instructor** heavily influences the students. First and foremost, having guidelines that the students agree with from the **beginning** of the **semester** is vital to success. The first **day** of the **semester** we go over the **syllabus**, and as a **class** we discuss appropriate and inappropriate behavior."
Problem Solving	"Having only two students, or maybe four, work **together** in **solving problems**, explaining their thought process, and discussing techniques will hopefully create a safe environment where students feel they can work. . . . Perhaps having the students work **together** will make them **realize** they both share the same struggles, but they can both overcome them. One of the greatest challenges for me is to help students **realize** they do not need to be good at **math** to be able to **solve** the **problems**. They do need to be able to accept their difficulties and to work **hard** by practicing."

Differences by Discipline and Unit

Learning outcomes. There was a significant main effect of unit, $F(4, 2339) = 350.11$, $p < .001$, with post-hoc tests showing that reflections for Unit 1 modules focused more on learning outcomes than reflections for all other units, ps < .001, followed by Units 4 and 5, which both had significantly more words from the learning outcomes themes than reflections for Units 2 and 3, ps < .001 (see Figure 1). Units 4 and 5 did not differ from each other, $p = 1.000$, and Units 2 and 3 also did not differ from each other, $p = 1.000$. There was a significant main effect of discipline, $F(2, 2339) = 4.18$, $p = .015$, but none of the post-hoc tests was statistically significant. The interaction between discipline and unit was not significant, $F (8, 2339) = 1.86$, $p = .062$.

Figure 1

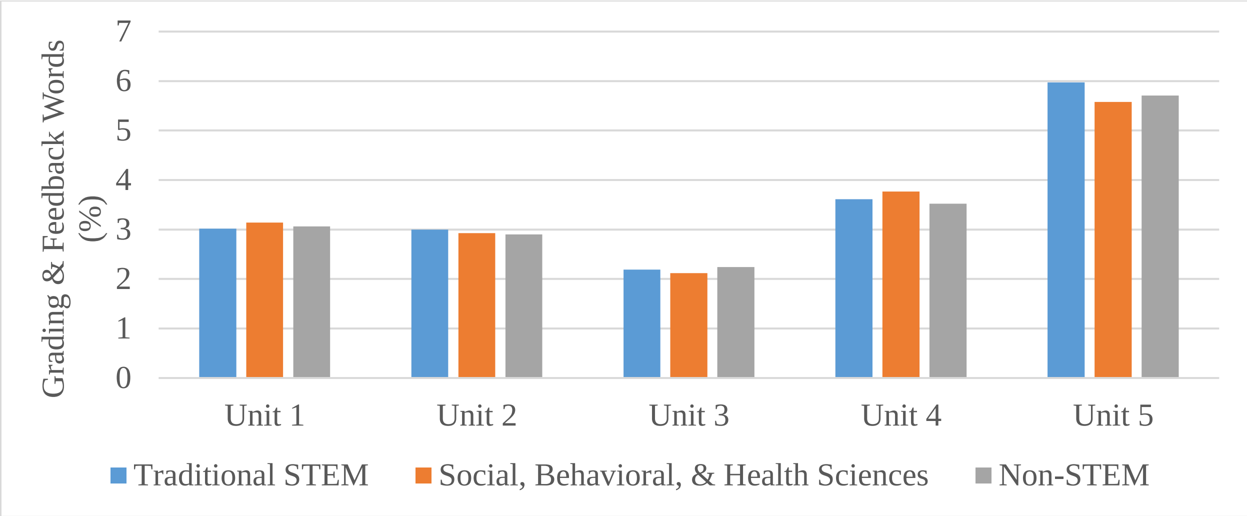
Average Proportion of Learning Outcomes Words by Reflection Unit and Discipline



Grading and feedback. There was a significant main effect of unit, $F(4, 2339) = 129.39$, $p < .001$, with post-hoc tests showing that reflections for Unit 5 modules focused significantly more on grading and feedback than reflections for all other units, *p*s < .001, followed by Unit 4, which focused significantly more on grading and feedback than Unit 1, $p = .011$, and Units 2 and 3, *p*s < .001 (see Figure 2). Units 1 and 2 both contained more words from the grading and feedback theme than Unit 3, *p*s < .001; Units 1 and 2 did not differ from each other, $p = 1.000$. The main effect of discipline was not significant, $F(2, 2339) = 0.18$, $p = .836$, nor was the interaction between unit and discipline, $F(8, 2339) = 0.32$, $p = .958$.

Figure 2

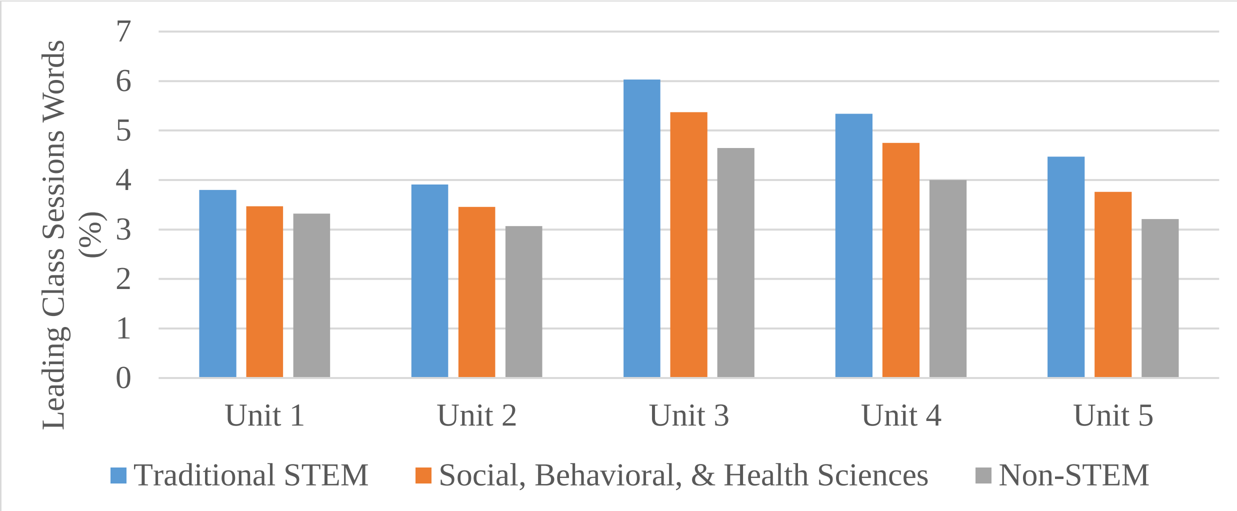
Average proportion of Grading and Feedback Words by Reflection Unit and Discipline



Leading class sessions. There was a significant main effect of discipline, $F(2, 2339) = 55.01$, $p < .001$, with post-hoc tests showing that traditional STEM faculty focused the most on leading class sessions, and non-STEM faculty focused the least on leading class sessions (see Figure 3); all comparisons were significant, *p*s < .001. The was also a significant main effect of unit, $F(4, 2339) = 68.12$, $p < .001$, with post-hoc tests showing that reflections from modules in Unit 3 focused significantly more on leading class sessions than all other units, *p*s < .001, followed by Unit 4, which focused significantly more on leading class sessions than Units 1, 2, and 5, *p*s < .001. Unit 1 did not differ from Unit 2, $p = 1.000$, or Unit 5, $p = .641$, and Unit 2 and Unit 5 were also not significantly different, $p = .103$. The interaction between discipline and unit was not significant, $F(8, 2339) = 1.52$, $p = .145$.

Figure 3

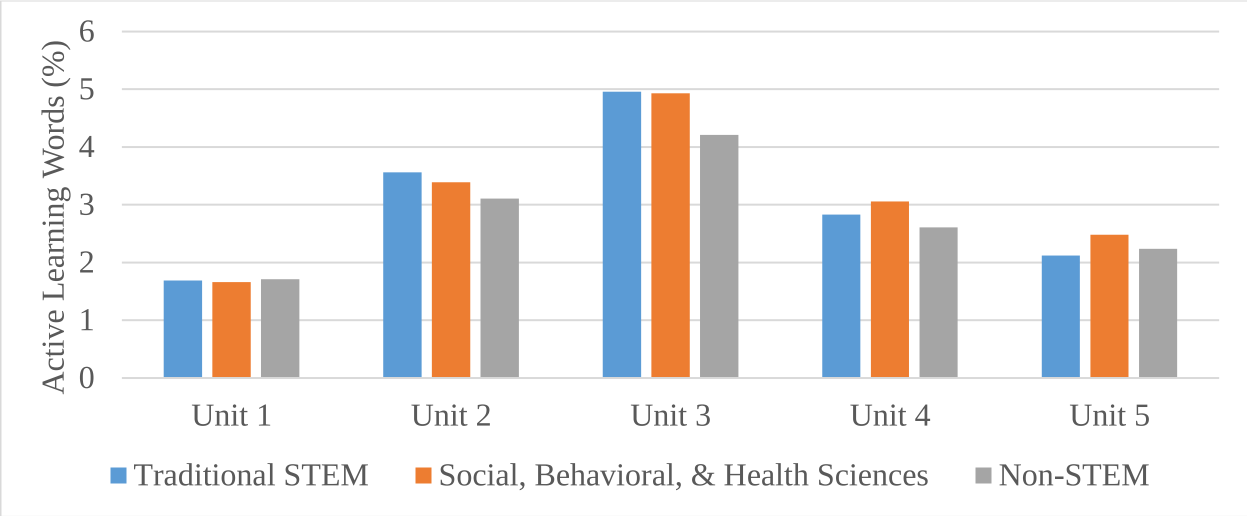
Average Proportion of Leading Class Sessions Words by Reflection Unit and Discipline



Active learning. There was a significant main effect of discipline, $F(2, 2339) = 6.86$, $p = .001$, with post-hoc tests demonstrating that faculty from non-STEM fields focused significantly less on active learning than both traditional STEM faculty, $p = .013$, and social, behavioral, and health sciences faculty, $p = .004$ (see Figure 4). The two types of STEM faculty were not significantly different from each other, $p = 1.000$. There was also a significant main effect of unit, $F(4, 2339) = 155.93$, $p < .001$, with post-hoc tests demonstrating that reflections from modules in Unit 3 focused the most on active learning, followed by Unit 2, Unit 4, Unit 5, and finally, Unit 1. All differences between each unit and each other unit were statistically significant, *p*s < .001. The interaction between discipline and unit was not significant, $F(8, 2339) = 1.84$, $p = .066$.

Figure 4

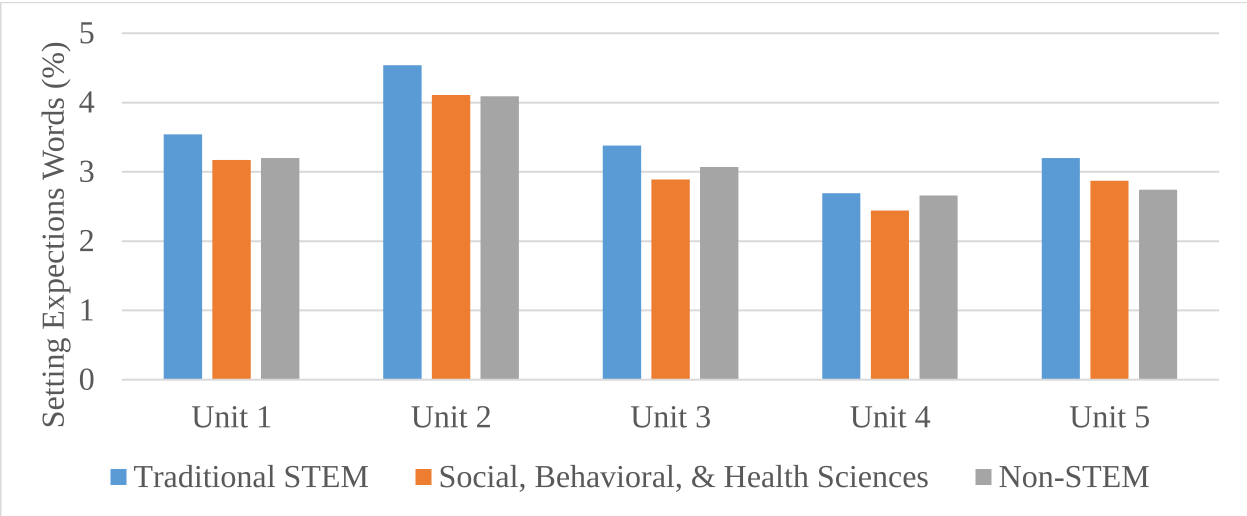
Average Proportion of Active Learning Words by Reflection Unit and Discipline



Setting expectations. There was a significant main effect of discipline, $F(2, 2339) = 10.17$, $p < .001$, with post-hoc tests demonstrating that faculty in traditional STEM fields focused significantly more on setting expectations than faculty in both social, behavioral, and health sciences and non-STEM faculty, *p*s < .001 (see Figure 5). Non-STEM faculty and social, behavioral, and health sciences faculty were not significantly different from each other, $p = 1.000$. There was also a significant main effect of unit, $F(4, 2339) = 71.71$, $p < .001$, with post-hoc tests demonstrating that reflections for modules in Unit 2 focused significantly more on setting expectations than reflections for all other units, *p*s < .001. Reflections for Unit 1 focused significantly more on setting expectations than reflections for Unit 4, $p < .001$, and Unit 5, $p = .010$, but were not significantly different from reflections for Unit 3, $p = 1.000$. Reflections for Unit 3 focused significantly more on setting expectations than reflections for Unit 4, $p < .001$, but were not significantly different from reflections for Unit 5, $p = .964$. Units 4 and 5 were not significantly different from each other, $p = .062$. The interaction between discipline and unit was not significant, $F(8, 2339) = 0.51$, $p = .847$.

Figure 5

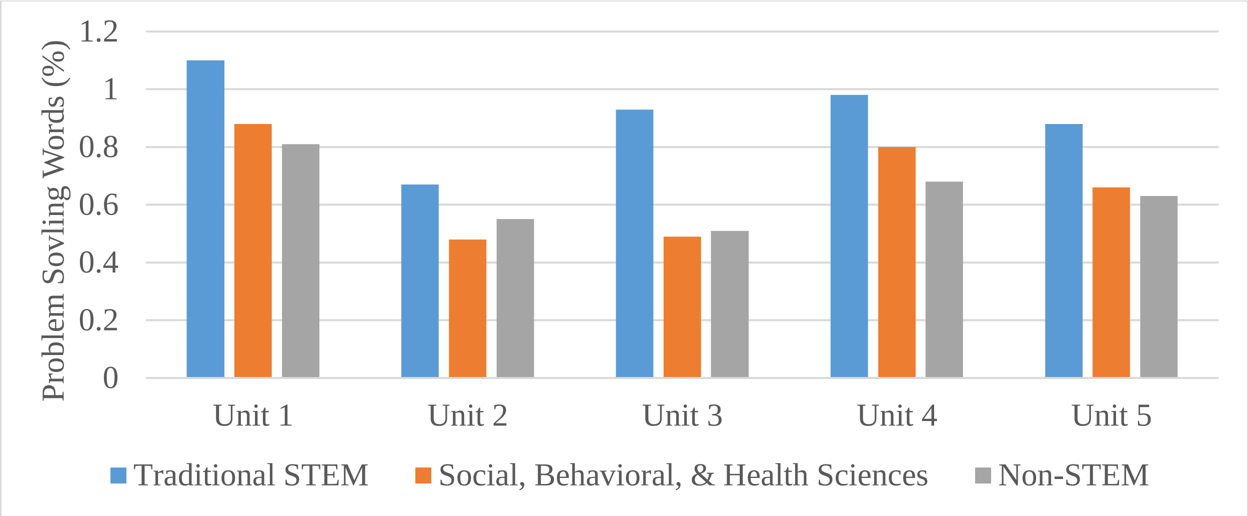
Average Proportion of Setting Expectations Words by Reflection Unit and Discipline



Problem solving. There was a significant main effect of discipline, $F(2, 2339) = 31.69$, $p < .001$, with post-hoc tests demonstrating that faculty in traditional STEM fields focused significantly more on problem solving than faculty in both social, behavioral, and health sciences and non-STEM faculty, *p*s < .001 (see Figure 6). Non-STEM faculty and social, behavioral, and health sciences faculty were not significantly different from each other, $p = 1.000$. There was also a significant main effect of unit, $F(4, 2339) = 17.50$, $p < .001$, with post-hoc tests demonstrating that reflections from modules in Unit 1 focused significantly more on problem solving than reflections from Unit 2, $p < .001$, Unit 3, $p < .001$, and Unit 5, $p = .001$, but Unit 1 and Unit 4 were not significantly different from each other, $p = .261$. Reflections for Unit 4 focused significantly more on problem solving than reflections for Unit 2, $p < .001$, and Unit 3, $p = .015$, but were not significantly different than Unit 5, $p = .866$. Reflections for Unit 5 focused significantly more on problem solving than reflections for Unit 2, $p < .001$, but were not significantly different than Unit 3, $p = 1.000$. Units 2 and 3 were not significantly different from each other, p = 1.000. The interaction between discipline and unit was not significant, $F(8, 2339) = 1.33$, $p = .225$.

Figure 6

Average Proportion of Problem Solving Words by Reflection Unit and Discipline



Discussion

Most of the themes we found through the MEM aligned with the major theme of a particular unit of the training. For example, the theme of *active learning* aligns exactly with *Unit 3: Using Active Learning Techniques*, and *learning outcomes* is very closely tied to *Unit 1: Designing an Effective Course and Class.* However, some themes, such as *setting expectations*, cut across units. Moreover, even themes that align almost exactly to a particular unit, such as *active learning*, were observed in reflections from all units. This may occur because faculty incorporate what they have learned from one module or unit into their implementation of techniques in other modules. It may also be the case because these are broad themes that are present and repeated throughout the course.

The themes we found using MEM differ from what CASE found in their qualitative analysis of faculty reflections (Hecht, 2019; Hecht & McNeil, 2018). Rather than being problematic, these differences show the value of using a mixed-methods approach to content analysis. In addition, the differences in themes might not be due only to the difference in quantitative versus qualitative methods, but also to the difference in the unit of analysis. CASE's coding was done at the phrase level, and as such it focuses on the smallest units of content, uncovering more specific themes, particularly when it comes to sub-themes. In contrast, we used the MEM at the reflection level, and thus it is not surprising that we uncovered broader themes. Furthermore, it is important to note that the themes from these two types of analyses of faculty reflections are not mutually exclusive. For example, a reflection could score high on leading class sessions and also include references for all of the major themes that CASE found: instructional techniques, students' emotional response, students' engagement and learning, classroom environment, classroom communications and interactions, learning objectives and lesson plan, challenges faced during instruction, possible solutions to challenges, and future plans and goals (Hecht, 2019; Hecht & McNeil, 2018).

For the most part, the differences that we found between units were greater and more consistent than the differences between disciplines. In fact, while there were significant differences between units for all themes, there were not significant differences between disciplines for all themes. Given that many of the themes align closely with the units, it is not surprising that there are considerable differences between units in the presence of these themes. More interesting is the fact that the discipline differences are relatively small and not always consistent. This demonstrates the relevance of the content, particularly surrounding these themes, to all types of faculty.

The differences that we did find between disciplines and the particular patterns demonstrate the importance of distinguishing between traditional STEM fields and social, behavioral, and health sciences when exploring distinctions between STEM and non-STEM fields. Social, behavioral, and health sciences are sometimes, but not always, considered to be part of STEM. For example, the National Science Foundation includes social, behavioral, and economic sciences under the STEM umbrella, but does not include health sciences. In contrast, many universities include health fields, but only some social and behavioral sciences, as part of STEM. In terms of the format of classes, social, behavioral, and health sciences may be more similar to non-STEM fields, but the content and ways of thinking may be more similar to traditional STEM fields.

Our findings are in line with the fact that these “sometimes” STEM fields are similar to traditional STEM fields in some ways and similar to non-STEM fields in other ways, and sometimes are somewhere in between. Social, behavioral, and health science faculty were no different from non-STEM faculty in their use of words related to setting expectations, with traditional STEM faculty using these words more than both of the other groups. In contrast, for the active learning theme, social, behavioral, and health science faculty’s reflections were no different from those of traditional STEM faculty, and both types of STEM faculty scored higher than non-STEM faculty in their use of active learning words. Additionally, reflections written by faculty in the social, behavioral, and health sciences scored significantly higher on the theme of leading class sessions than those written by non-STEM faculty, but were also significantly lower than those written by traditional STEM faculty. The fact that these “sometimes” STEM fields scored in between the traditional STEM and non-STEM fields in some cases, while in other cases were no different from traditional STEM but different from non-STEM or vice versa, demonstrates the unique experience of these faculty as distinct from both traditional STEM and non-STEM faculty. Other research seeking to understand distinctions between STEM and non-STEM fields would be wise to similarly subdivide STEM, rather than simply providing a definition of which fields they are considering to be part of STEM.

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