Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #46631

Novice versus Experienced Near-Peer Mentors' Facilitation of a Discussion with a Student Avatar Facing Logistical Challenges on a Design Team

Pamela S. Lottero-Perdue Ph.D., Towson University

Pamela S. Lottero-Perdue, Ph.D., is Professor of Science and Engineering Education in the Department of Physics, Astronomy & Geosciences at Towson University. She has integrated engineering into courses for PreK-8 teacher candidates, developed and directed a graduate STEM program for PreK-6 teachers, and partnered with teachers to implement PreK-8 science-integrated engineering learning experiences. She has authored numerous engineering-focused teacher practitioner articles, chapters, and research articles, and presents her research regularly through the ASEE Pre-College Engineering Education Division, a division she has chaired, and more recently in the First Year Programs Division. Her current research includes investigating how K-5 students plan, fail, and productively persist, and how simulated classroom environments can be used to help educators practice facilitating discussions in science and engineering.

Dr. Haritha Malladi, University of Delaware

Haritha Malladi is an Assistant Professor of Civil, Construction, and Environmental Engineering and the Director of First-Year Engineering at the University of Delaware. She received her Bachelor of Technology degree in Civil Engineering from National Institute of Technology, Warangal, India, and her MS and PhD in Civil Engineering from North Carolina State University. She is a teacher-scholar working in the intersection of undergraduate engineering education, sustainable infrastructure, and community engagement. She teaches the introductory engineering course for all first-year undergraduate students in the College of Engineering at UD. Her undergraduate teaching experience includes foundational engineering mechanics courses like statics and strength of materials as well as courses related to sustainability and infrastructure. Her research interests are in foundational engineering education, sustainability in engineering curriculum, and green technologies in infrastructure.

Dr. Marcia Gail Headley, University of Delaware

Dr. Headley is a Data Scientist at the Center for Research in Education and Social Policy (CRESP) at the University of Delaware. She specializes in the development of mixed methods research designs for educational research.

©American Society for Engineering Education, 2025

Novice versus Experienced Near-Peer Mentors' Facilitation of a Discussion with a Student Avatar Facing Logistical Challenges on a Design Team

Introduction

In this Complete Research Paper, we describe how 21 near-peer mentors (NPMs) for a large (ca. 650-student) introductory engineering design course used questions and signaled support during a one-on-one simulated discussion with a student avatar experiencing logistical issues on a design team in conflict. The sample of NPMs included 12 experienced NPMs and 9 novice NPMs. This allowed us to explore differences in the strategies experienced and novice NPMs use to question and support engineering students. In what follows, we begin by providing background about engagement-related conflict on design teams and a conceptual framework about discussions, including those that occur in simulated environments.

Research Foundations

Engagement-Related Conflict in Design Teams

Grouping future engineers into teams to work together to solve design problems is now commonplace within undergraduate engineering programs, which often begin with a first-year design course for engineering majors. This is consistent with Outcome 5 for students in the 2024-2025 ABET criteria, which asserts that students should develop "an ability to function effectively on a team whose members together provide leadership, create collaborative and inclusive environment, establish goals, plan tasks, and meet objectives" (p. 6) [1]. There are several reasons to promote team-based learning within design courses, including that it emulates real design practice [2]; increases satisfaction among students in the course [3]; and helps to retain students, including those underrepresented in engineering [4].

An inherent part of working on a team is *conflict*. Conflict was explicitly included in team stages theory, i.e., forming, storming, norming, performing, and adjourning, most especially during storming [5-7]. In the early stages of teamwork, team members may "become hostile toward one another" as they express individuality and resist group structure, with interaction among team members being uneven and "infighting" and a "lack of unity" being common (p. 386) [7].

Of the myriad conflicts that may arise on a team, our concern in this paper is on conflicts that arise due to interpersonal dynamics among team members [8-10]. Such conflicts have been described in rich detail using ethnographic investigations and case studies of engineering education [11, 12]. Our work focuses on a type of interpersonal conflict that we refer to as "engagement-related conflict" in which one or more team members perceive that some other member is not engaging in the team's work as much as others expect. There are many labels for engagement-related conflict in the literature (e.g., taking a "free ride" [13]) and in everyday parlance (e.g., "slackers" or "hitchhikers" as we heard at a recent conference). We deliberately use engagement-related conflict to refrain from making a negative assumption about the individual who has been identified as not contributing as much as others might expect. In our collective experience and in the experiences of others at our institution, we have observed that

some students who appear to be less engaged than expected may be dealing with an issue that, if addressed, would resolve the team conflict. Students facing logistical issues or marginalization may appear to be so-called slackers [14]. Thus, the conflict that at first glance seems to be about a "free rider" may be about some other and deeper conflict that needs to be addressed.

Some teams experiencing engagement-related or other types of conflict can resolve the conflict; yet other teams are not able to do so on their own [11]. Our research is based on the premise that some teams in engineering education at large will need some support to resolve their conflicts. It is for this reason that the broader scope of our work examines how undergraduate teaching assistants or near-peer mentors (NPMs) may be able to help to resolve engagement-related team conflicts. Specifically, we are interested in how they might initiate discussions with individual team members to get a more robust sense of the nature of team conflict from multiple viewpoints. Towards this end, the present study sought to explore how NPMs facilitate one-on-one discussions with a student—viewed by others on her design team as not contributing as much as she should to the team—in a simulated environment. In the next section, we share our conceptual framework about conversations, discussions, and talk.

Conceptual Framework: Conversations, Discussions, and Talk

Our work is grounded in the idea that there is much to be learned from studying talk between people, what we might call discussions or conversations, i.e., "the coordinated contributions of speakers and addressees working together to achieve particular communicative goals" [15]. The study of conversation traces back to Harvey Sacks, who referred to the conversation as a "small phenomenon" that might provide "an enormous understanding of the way humans do things" (p. 24) [16]. Sacks characterized his work as being about the study of talk within conversations, largely to provide explanations for what transpires within those conversations.

Some general features of conversations are that they typically begin with pre-sequences, which are openings to start the discussion in a broad way before delving into a topic. Also, speakers in a conversation take turns, with a turn being a "distinct contribution to the discourse from a single speaker" (p. 31) [15]. More specifically, there are adjacency pairs, like questions followed by answers, within the sequence of a discussion. Further, the conversation occurs in a broader relevant context, and typically ends with some sort of closing [15, 17].

Conversations occur and can be studied in a variety of settings, including in educational settings between teachers and students. In those settings, the terms discussion or discourse are used more frequently than the term conversation; the former terms signaling a more formal nature of classroom conversations. Teachers use questions and other prompts, often called "talk moves," as tools to respond to students and to elicit a wide range of student responses during discussions. Talk moves are studied in a wide range of science, mathematics, and engineering education research [18-21]. Video and transcript analysis allow for these discussions to be studied for the quality of the talk moves used and the student responses they encourage.

In addition to naturalistic classroom settings in which discussions can be investigated, researchers have studied discussions in simulated educational environments. Such simulated classroom environments are of "reduced complexity," i.e., less complex than the real

environments they model enabling the discussion itself to be the clear focus [22]. For example, a simulated classroom environment may reduce complexity by omitting student misbehaviors. Examples of simulated classroom environments include text-based chats between individuals playing roles of a teacher and student, respectively [23, 24], and a teacher facilitating a discussion with student avatars on a computer screen using Zoom video conferencing software and a software platform such as a Mursion® or TeachLivE [25-28]. In Mursion®, the platform used in our study, avatars are played by a highly trained actor called a simulation specialist (sim), and videos and transcripts of the discussion are generated for subsequent analysis.

Research Questions

In what follows, we describe our use of the Mursion® simulated environment to study the discussions that experienced and novice NPMs have with a student avatar, Ciara, whose team members suspect is not doing her fair share of the work. Specifically, we seek to answer the following research questions (RQs): (RQ1a) What eliciting and probing questions do NPMs use to explore the nature of the conflict from Ciara's perspective? (RQ1b) How do experienced and novice NPMs differ with respect to these questions? (RQ2a) What supportive statements do NPMs offer to Ciara throughout the discussion? (RQ2b) How do experienced and novice NPMs differ with respect to their use of these supportive statements?

Research Context

This paper presents selected RQs from Phase 2 of a larger study conducted in this context. To our knowledge, this larger study by our group is the first to use Mursion® to create a college-level learning environment. Phase 1 of the study was designed to explore the use Mursion® simulation as a research tool in the study of experienced NPMs' discussions with student avatars about engagement related team conflict [14]. The Phase 2 was designed to allow for the comparison of experienced and novice NPMs discussion strategies. Here, we provide details of the course, role of NPMs, and the simulation scenario, which are relevant to Phases 1 and 2.

Course and Role of NPMs

This study was conducted in an Introduction to Engineering course (hereafter, "the course") at a large university in the mid-Atlantic. This course is taken by all engineering majors (ca. 650 students) at the university and involves a semester-long, team-based design project. Students are assigned to teams with a target size of five members and a mix of majors. Each year, there are about 28 NPMs assigned to the course. Each NPM holds weekly discussion sessions and manages approximately five student teams within their assigned discussion session. They grade student assignments and review Comprehensive Assessment of Team Member Effectiveness (CATME) peer evaluations [29, 30] associated with team submissions related to the semester design project. Before the start of the semester, NPMs undergo a day-long orientation session that is primarily focused on course logistics. During the semester, NPMs attend a weekly group meeting with the course instructor where they can troubleshoot any concerns with their student teams [31]. NPMs are expected to notice, investigate, and address team conflicts, but do not go through any formal conflict resolution training. This study is part of our research agenda to develop a coaching program for NPMs to identify and respond to such conflicts.

Simulation Scenario

As a part of Phase 1, we created a simulation scenario that included both NPM-facing and sim-facing materials, more details of which can be found in our prior work [14, 32]. The NPM-facing materials, given to NPMs to prepare for their simulation experience, provide NPMs with necessary information prior to facilitating the discussion. The NPM scenario materials situate the participant as the NPM for the design team of five student avatars, Ciara, Stephanie, Jordan, Angela, and James, who were in their fifth week of course. The materials include qualitative and quantitative CATME peer evaluations results for the team, which suggest that three of its members—Ciara, Stephanie, and Jordan—may not be as engaged in the team as much as other team members expect. NPMs are informed that these students may be (a) having logistical issues that make it difficult for them to contribute to the team, (b) feeling marginalized by the team, or (c) lacking interest in the project or in engineering. The materials provide some additional information about team members that an NPM likely would know from having interacted with the students (e.g., major, disposition). In both Phases 1 and 2, participants facilitated a 15-minute maximum discussion with each of these three avatars. The purpose of each discussion was to gain a deeper understanding of that student's perspective and develop a hypothesis about what underlying problem is contributing to that student's apparent lack of contribution to the team.

The sim-facing materials, which are only available to the sim in preparation for the simulation experience, are designed to help the sim bring the avatars to life. The materials provide sample responses that each student avatar is likely to give, which the sim delivers like an improvisational actor. The sim in this study, the first author, received training from the project team, which included several rehearsals prior to data collection. Sim materials and training are essential in supporting the sim to respond as the students accurately and consistently across NPMs [22]. More details about the NPM and sim scenario materials can be found in our prior work [14, 32].

In this paper, we focus on one of the student avatars, Ciara. NPM-facing materials reveal that Ciara is a civil engineering major, is from a military family and commutes from a military base, and has attended all required discussion sessions for the course. Qualitative CATME comments indicate that Ciara missed some team meetings. The sim-facing materials state that Ciara is interested in the major, course, and project, but is experiencing logistical difficulties, making it difficult for her to contribute to the team. Ciara is able to make meetings that she schedules with the team in advance but cannot attend last-minute meetings and prefers not to meet in the dorms. Last-minute meetings and meetings in the dorm are outside of the agreed upon team norms.

Research Methods

Participants

Participants in the present study included the 12 experienced NPMs from Phase 1 and 9 novice NPMs from Phase 2. All NPMs consented to participate in the study, which was approved by the university's Instructional Review Board. See Table 1 for demographics. All 21 participants were engineering majors and had completed the course in a prior year as students. All experienced NPMs had completed one semester as an NPM for the course; and two also completed at least one additional semester as a teaching assistant (TA) for other design courses in the mechanical

engineering program. The nine novice NPMs were serving as an NPM in the course for the first time and had no prior experience as TAs in other design courses.

Data Collection

Each NPM participated in a prescheduled session that included three one-on-one discussions with Ciara, Jordan, and Stephanie, respectively. The order of the one-on-one discussions differed across NPMs. A host avatar played by the sim provided instructions for the simulation session and each discussion within it. One week before the session, participants received the six-page NPM-facing materials document. In Phase 1 of data collection, experienced NPMs facilitated their discussions over a two-week period in the summer. In Phase 2, novice NPMs facilitated theirs a few months later and over a two-week period in the fourth and fifth weeks of the fall semester in which they served as NPMs. Each one-on-one discussion lasted between 6 and 15 minutes and was video recorded through Zoom, which provided auto-generated transcripts that we corrected as needed. Phase 2 RQs are focused only on the NPMs discussions with Ciara.

Table 1. Participant Demographics

Category	Subcategory	Phase 1 Experienced NPMs (*n*=12)	Phase 2 Novice NPMs (*n*=9)	All NPMs (*n*=21)
Gender	Female	75%	56%	67%
	Male	25%	44%	33%
Race/ Ethnicity	Asian or Asian American	8%	0%	5%
	Black or African American	0%	11%	5%
	Hispanic or Latino	8%	0%	5%
	White or Caucasian	83%	89%	86%
LGBTQIA+	Yes	8%	0%	5%
	No	83%	67%	76%
	Prefer not to specify	8%	33%	19%
First Generation	Yes	8%	0%	5%
	No	92%	100%	95%
Year [a]	Sophomore or Second Year	0%	33%	14%
	Junior or Third Year	42%	22%	33%
	Senior or Fourth Year	58%	44%	52%
Major	Chemical Engineering	8%	22%	14%
	Civil Engineering	0%	11%	5%
	Computer Engineering	0%	22%	10%
	Electrical Engineering	0%	11%	5%
	Environmental Engineering	0%	22%	10%
	Materials Science	0%	11%	5%
	Mechanical Engineering	92%	0%	52%

[a] The year that experienced NPMs were rising towards (data collected over the summer) or year of novice NPMs at the time of data gathering (data collected during fall semester).

Analytical Methods

This study primarily employed qualitative analytical methods, in particular conversational analysis [15, 16], to characterize NPM talk moves within the discussions. The major codes, eliciting and probing, were derived from Wang and colleagues' work on eliciting learner knowledge [33]. We developed subcodes for describing the purpose of eliciting and probing questions (Table 2) and for describing the nature of the supportive statements (Table 3) [14].

The experienced NPM transcripts were initially coded during Phase 1 of the study [14]. During Phase 2, the first two co-authors began by collaboratively coding two novice NPM transcripts. Then they then divided the remaining seven novice NPM transcripts to code independently. Finally, they reviewed the others' coding assignments and collaboratively reconciled codes where there was disagreement. This process resulted in some refinements to the inclusion criteria for supportive subcodes described in the codebook (Table 3). We then collaboratively re-coded the experienced NPMs' transcripts according to the modifications.

Table 2. Eliciting/Probing Subcodes

Subcode Name	**Subcode Description: Asking eliciting or probing questions to learn more about …**
General	Ciara's general experiences and/or perspectives about being on the team
Interest	Ciara's experiences and/or perspectives about her own interest in the project or major
Logistics	Ciara's experiences and/or perspectives related to logistics (i.e., how the team is operating)
Marginalization	Ciara's experiences and/or perspectives related to her own possible marginalization
Team Members	What other team members are doing or how Ciara is getting along with other team members
Remedies	Ciara's perspectives about how to resolve the team conflict
Contributions	The skills, experiences, or perspectives Ciara has that would contribute to the group
Other	Ciara's experiences and/or perspectives related to a topic not captured in other subcodes

Table 3. Supportive Subcodes

Subcode Name	Subcode Description
Empathy	Empathizing with Ciara; saying they know how Ciara feels or have been in similar situations
Sympathy	Sympathizing with Ciara; saying that what Ciara is experiencing is difficult
Encouragement	Offering words of encouragement to Ciara, signaling hope or optimism
Assurance	Indicating that they have heard/listened to/understood what Ciara shared
Agreement	Indicating that they agree with an idea or perspective that Ciara shared
Praise	Offering praise to Ciara or to the team
Help	Offering that or how they can help Ciara or the team moving forward
Other	Provides another response to students not included by the above subcodes

We used qualitative content analysis [34] to describe and compare the codes and subcodes—which we applied to NPM turns in the transcripts—across all participants and with respect to the experienced and novice subgroups. Some turns received no subcodes and others had multiple subcodes applied to them. As a final and exploratory part of our investigation comparing the

experienced and novice NPMs, we used inferential statistics to compare the number of codes and subcodes applied to these two groups. We planned a one-tailed t-test with respect to the eliciting, probing, and supporting codes since we hypothesized that experienced NPMs would pose more eliciting and probing questions and offer more supportive statements. We planned a two-tailed t-test to compare subcodes since we were less certain about directionality and our interest was in whether the experienced and novice NPMs differed. Prior to running the t-tests, we performed a Kolmogorov-Smirnov (KS) normality test to confirm that the assumption of normality the t-test requires was met. For both the KS and t-tests, we used a significance level of $\alpha = 0.05$.

Research Results

We have organized this section into three parts. The first two provide broad results based on our qualitative content analysis and comparisons through t-testing, first for RQ1a and RQ1b (about eliciting and probing questions) and second for RQ2a and RQ2b (about supportive statements). In the third section, we show our coding in situ, providing a complete transcript from novice NPM Nicole and transcript excerpts from experienced NPM Dallas (all names are pseudonyms).

RQ1 Results: NPM Eliciting and Probing

We examined questions that NPMs used to: (1) elicit responses from Ciara about a new topic; and (2) probe on a response from Ciara or a thread of a question the NPM posed earlier to dig further into a topic. Table 4 is a summary of the number of codes for eliciting and probing that we applied across the NPMs. There was a statistically significant difference ($p \leq 0.05$, one-tailed) between the number of probing questions posed by the experienced NPMs and the novice NPMs, with the experienced NPMs asking more probing questions.

Table 4. Eliciting and Probing Codes across NPMs

Codes	Coded Turns								
	All NPMs (*n*=21)			Novice NPMs (*n*=9)			Experienced NPMs (*n*=12)		
	total # turns	mean per NPM	min – max*	total # turns	mean per NPM	min – max*	total # turns	mean per NPM	min – max*
Eliciting	144	6.86	3 - 15	70	7.78	3 - 15	74	6.17	5 - 10
Probing	165	7.87	1 - 24	51	5.67	1 - 9	114	9.50	1 - 24
Both**	309	14.71	7 - 29	121	13.44	10 - 16	188	15.67	7 - 29

* Min is the minimum codes assigned to any one NPM in each group; max the maximum. ** Eliciting + probing.

For example, when inquiring about logistics, Novice NPM Charlie first elicited from Ciara how scheduling was occurring, then probed once after Ciara's explanation about last minute meetings. Charlie probed: "And that's been happening a lot? They're just deciding without the rest of the team that they're just going to meet then?" Experienced NPM Blake began inquiring about logistics by saying "You're a commuter, right?" This was followed up with three probes about where she commutes from, how often, and if this is the reason for the team conflict.
We applied the following subcodes to eliciting and probing codes across all 21 NPMs: general (31% of 309 subcodes), logistics (25%), remedies (17%), team (8%), contribution (7%),

marginalization (3%), interest (1%), and other (7%) (Table 5). The t-tests indicated no statistically significant differences between experienced and novice NPMs for these subcodes.

Table 5. Eliciting and Probing Subcode Examples

Subcode Name	Subcode Description: Asking eliciting or probing questions to learn more about …
General	"How do you think Intro to Engineering has been going for you?" (Morgan, Novice NPM)
Interest	"Okay, and you like [the course] so far?" (Frankie, Experienced NPM)
Logistics	"So, what do you think the reasons are for not attending the meeting? You know, like your side." (Elana, Novice NPM)
Marginalization	"When you are at the meetings, uh, do you feel included?" (Cameron, Experienced NPM)
Team Members	"Um, I know Jordan hasn't really been showing up, um, they don't come to the Friday discussions, have you had any conflict with them?" (Noel, Novice NPM)
Remedies	"And so have you told them your side of the story and why you can't make it to meetings?" (Peyton, Novice NPM)
Contributions	"How do you see yourself contributing more?" (Kai, Experienced NPM)

NPMs often led discussions with general questions to start a discussion in a broad way before getting into the major discussion topic. The next most frequent question type was about logistics. This is consistent with the simulation scenario which describes logistics as Ciara's underlying issues. The next most frequent were questions about remedies that Ciara has considered or might consider to resolve the conflict. Fewer than 10% of subcodes were in the remaining categories. It is not surprising that marginalization and interest queries were infrequent since Ciara did not provide any evidence that she felt marginalized and signaled early and often that she was interested in her major and wanted to do well in the course and project.

Figure 1 compares the percentage of experienced and novice NPMs whose transcripts included one or more of each of the subcodes for eliciting and probing. Additional insights from this figure include that: (1) more novices than experienced NPMs inquired about team members, and (2) one third each of novices and experienced NPMs inquired about marginalization.

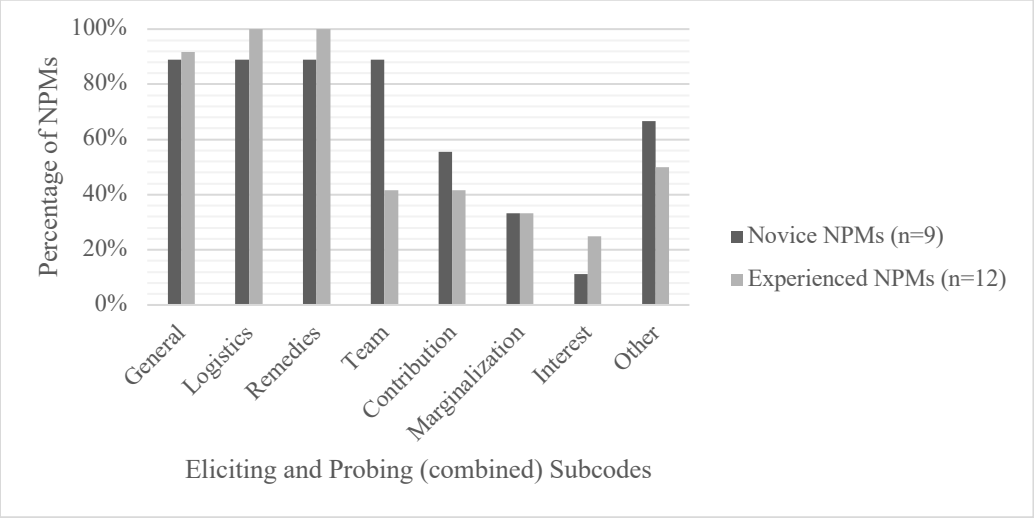

Figure 1. Percentage of Eliciting and Probing Subcodes for Experienced and Novice NPMs.

RQ2 Results: NPM Support During Discussions

Table 6 describes the total supportive subcodes that were applied, as well as the turns having one or more supportive subcodes applied. Although the means for supportive subcodes and turns were lower for novice NPMs than for experienced NPMs, these differences were not statistically significant. On average, there were about six turns in the discussions in which the NPMs used a supportive statement. This represents about one quarter of the NPMs' turns—each discussion had an average of 25 NPM turns (ranging from 16 - 38 turns across all NPMs).

Table 6. Total Supportive Subcodes and Turns across NPMs

Codes	Coded Turns								
	All NPMs (*n*=21)			Novice NPMs (*n*=9)			Experienced NPMs (*n*=12)		
	total # turns	mean per NPM	min - max*	total # turns	mean per NPM	min - max*	total # turns	mean per NPM	min - max*
Supportive Subcodes	175	8.33	0 - 21	58	6.44	2 - 14	117	9.75	0 - 21
Supportive Turns	130	6.19	1 - 16	48	5.33	1 - 12	82	6.83	0 - 16

* Min is the minimum codes assigned to any one NPM in each group; max the maximum.

We applied the following supportive subcodes across all 21 NPMs: assurance (32% of 176 subcodes), agreement (21%), encouragement (17%), sympathy (14%), offers of help (10%), praise (3%), empathy (2%), and other (2%). See Table 7 for examples. There was one statistically significant difference ($p \leq 0.05$, two-tailed) between experienced and novice NPMs with respect to the frequency with which NPMs offered help to Ciara. The experienced NPMs offered help more often than the novice NPMs.

Table 7. Supportive Subcode Examples

Subcode Name	Subcode Description
Empathy	"Yeah, I can imagine it would be frustrating. You know, I was a commuter myself. You know, your schedule's not really your own sometimes." (Lennox, Experienced NPM)
Sympathy	"Yeah, that's definitely not fair to you." (Tatum, Novice NPM)
Encouragement	"You definitely do [have skills to offer] and you should get the chance to always contribute." (Sam, Experience NPM)
Assurance	"I understand." (Charlie, Novice NPM)
Agreement	"That's definitely true, and I definitely agree with you there." (Peyton, Novice NPM)
Praise	"I'm sure you're very talented." (Lennox, Experienced NPM)
Help	"Once I get a chance to meet with everyone, we should be able to work through it." (Frankie, Experienced NPM)

See Figure 2 for our comparison the difference between novice and experience NPMs regarding offers of help and empathy. It is notable that, although novice NPMs used sympathetic moves in their discussions, none employed empathy.

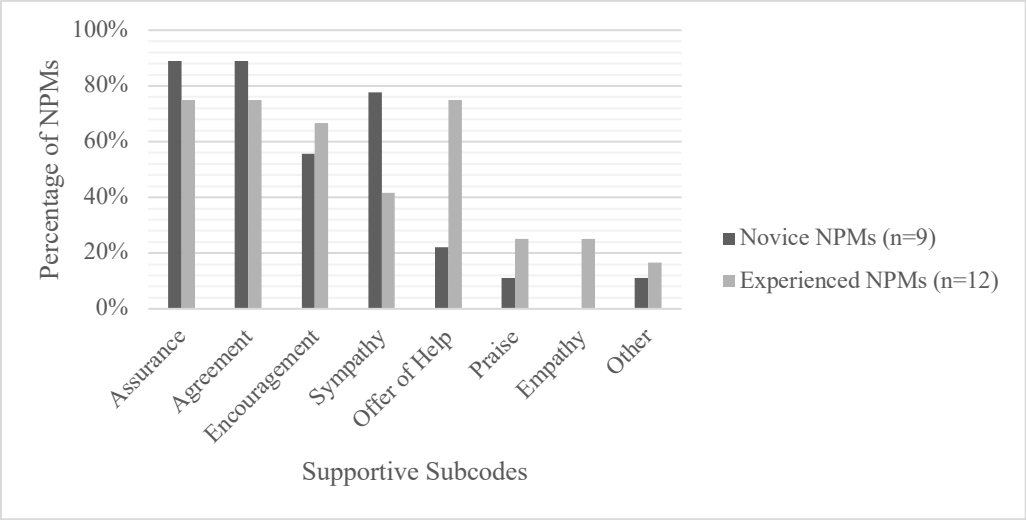

Figure 2. Percentage of Supportive Subcodes for Experienced and novice NPMs.

Novice NPM's Coded Transcript and Additional Examples from Coding

Thus far, we have provided descriptions, descriptions, and some examples of the codes and subcodes in our study. Here, we share a transcript from one of the novice NPMs, Nicole, as well as excerpts from one of the experienced NPMs, Dallas, to provide coding examples in context.

Novice NPM: Nicole

We selected Nicole because she used the widest range of eliciting and probing subcodes (using all but the other subcode) and supporting subcodes (using all but the empathy, help, or other subcode) of any novice. No novices used the supporting subcode, empathy, and just two used the help subcode. We have divided Nicole's transcript into four parts (Tables 8a, 8b, 8c, and 8d). Note that throughout the forthcoming tables, we provide major codes in all caps (ELICITING, PROBING, and SUPPORTING); eliciting and probing subcodes in **bold** (e.g., **General**, **Remedies**); and supporting subcodes in unmodified text.

As is evident in Table 8a, Nicole opens the discussion by asking Ciara how she is doing and inquires generally about how things are going on the team. Ciara reveals some information and Nicole probes to learn more.

Table 8a. Novice NPM Nicole's Complete Transcript with Coding, Part 1

Speaker	Turn	Coding
Nicole	Hi Ciara, how are you?	
Ciara	Hi ma'am, how are you? I'm good.	
Nicole	I'm good too. Thank you. Uh, so do you know why we're here today?	

Speaker	Turn	Coding
Ciara	Um, I believe you, you said something about talking about what's going on in the team, in, in the engineering class.	
Nicole	Yes. So, I- Your teammates mentioned some things about you and I know you mentioned some things about your teammates. I was just wondering if you could give me an idea of what's going on in your group?	ELICITING, **General**
Ciara	Well, for one thing, I know I'm better than what they probably are saying in the CATME data.	
Nicole	And why do you think that?	PROBING, **General**
Ciara	Well, I think they think that I'm not contributing, but I want you to know that they make it hard for me to contribute.	
Nicole	How do they make it hard for you to contribute?	PROBING, **General**
Ciara	Well, they aren't following the group norms about where and when we would meet.	

In Table 8b, Nicole elicits and then probes what Ciara has done so far to try to remedy the situation. In the meantime, Nicole supports Ciara by agreeing with Ciara's complaints.

Table 8b. Novice NPM Nicole's Complete Transcript with Coding, Part 2

Speaker	Turn	Coding
Nicole	Have you talked to them about this before?	ELICITING, **Remedies**
Ciara	Well, when they've scheduled meetings at the last minute, instead of when we said we would meet, and I've told them that, you know, I'm already at home, right? Because I don't live on campus and I can't come, they've just said, "Oh well, we're going to meet anyway and sorry about that." And they go ahead with the meeting. Right? And I've told them that I, I need to meet when we say that we are going to. But the problem keeps repeating.	
Nicole	Yeah, definitely. Have you mentioned your group norms document to them yet?	SUPPORTING, Agreement PROBING, **Remedies**
Ciara	Oh yeah. It's a really important document to me. I really like it when we write down what we say we're going to do and then it's important that we follow through on it.	
Nicole	I agree - Do you think there's anything else that you can do to get them to listen to the team norms?	SUPPORTING, Agreement PROBING, **Remedies**
Ciara	I really don't know because, again, the problem keeps happening … So, anyway, it, it makes it seem like I'm not interested in being in the meetings and that's not it at all.	
Nicole	Mm-hmm. Definitely. Do you think there's any other ways for you to meet not in person if this continues happening?	SUPPORTING, Agreement ELICITING, **Remedies**

In the next part of the transcript, Table 8c, Nicole sympathizes with Ciara and then elicits whether anything aside from the timing of meetings has been problematic, leading Ciara to share that Ciara is not comfortable meeting in the dorms. Nicole then asks about whether some team

members are not listening to her ideas or allowing her to contribute, which we coded as an inquiry about whether Ciara was feeling marginalized.

Table 8c. Novice NPM Nicole's Complete Transcript with Coding, Part 3

Speaker	Turn	Coding
Ciara	… But it really is less … about Zoom or face to face and more about us being able to schedule a reliable time that we know for any given week is going to happen. And that's what we said we'd do in our norms document.	
Nicole	Okay. Yeah, I think you should probably keep talking to them about that. That's really hard but maybe you talk to your other teammates to see if they feel the same way. If Angela and James are the ones that are planning the meetings all the time, you can start to figure out and maybe come together as a group and have a big discussion about it.	SUPPORTING, Sympathy
Ciara	Yeah. Okay.	
Nicole	Do you- Are you having any other problems with your team besides that?	ELICITING, **General**
Ciara	Well, there's another norm that they're not following related to the meetings. And that's where we'd meet. And in our norms document, we said that we would meet in, like [the engineering buildings], right? … You know, I'm more comfortable there but James and Angela, they live in the same dorm and so, they just want to meet in the dorm and whenever it's convenient for them …	
Nicole	Mm-hmm. Do you know if your other team members feel the same way about your meeting place?	ELICITING, **Team**
Ciara	I don't know. I mean, I think I'm the only one who doesn't live on campus. But I think the others don't live in the same exact dorm that Angela and James live in. And I don't know how they feel.	
Nicole	Okay. So, maybe you could also try talking to them about this issue too to see if you're, if you have the same feelings. Have you mentioned to Angela and James about the meeting places?	PROBING, **Remedies**
Ciara	Um, I have that I didn't want to meet in the dorm but most of the time, I can't make it anyway when it's a last minute meeting. But … - there have been times where they wanted to meet there even during our scheduled time. And I, I just would rather not.	
Nicole	Okay. Yeah. I think along with the discussion about the meeting times, this also needs to be addressed as a group. Um, I think you mentioned that some people don't listen to some of your ideas, or they don't recognize that you have, that you can contribute. What did you mean by that? Is that just you not being in the meetings?	ELICITING, Marginalization
Ciara	Yes. It's, it's mostly that … It's hard for me to contribute when I'm not there. And then, when we see each other again for the next meeting, you know, for the next discussion session, I just have to do a lot of catching up … I think, when I'm able to catch up and then share my ideas, they do seem to listen to me. So, it's not like they're completely ignoring or disregarding me. It's just hard for me to catch up all the time when I keep missing those meetings.	

At the end of the discussion, Table 8d, Nicole asks some more questions including about team logistics. She also closes the conversation by asking if Ciara has any other things to share about

her teammates and checks in about whether Ciara enjoys the project. Meanwhile, it is during this part of the discussion that Nicole offers support through encouragement, praise, and agreement.

Table 8d. Novice NPM Nicole's Complete Transcript with Coding, Part 5

Speaker	Turn	Coding
Nicole	That's good, yes. That's very understandable. Do you only do work on these projects in your group or do you do work outside of your group meetings, as a whole, your whole team?	SUPPORTING, Praise SUPPORTING, Encouragement ELICITING, **Logistics**
Ciara	I think we could do more work asynchronously … maybe some more asynchronous work would be something that I could fit in more easily.	
Nicole	Yes, I think that would be very helpful for you. So when you're in these group meetings, ones you are able, able to attend and once you're caught up, do you feel like you're contributing to your team.	SUPPORTING, Agreement ELICITING, **Contribute**
Ciara	Yes. I think so. I'm, I have a lot of good ideas, I think. Just like the other people on the team and, and I can- Yeah, that's not a problem.	
Nicole	Okay. Great. Is there anything else that you wanted to talk about, about your teammates? Do you enjoy the project?	SUPPORTING, Encouragement ELICITING, **Team** ELICITING, **Interest**
Ciara	Yes. I find it to be an interesting project. I'm really interested in engineering and, even though civil is my specialty, and we're not exactly doing civil. It's still really interesting.	
Nicole	That's good. Um, if there's nothing else then I think you're free to go.	SUPPORTING, Encouragement

Experienced NPM: Dallas

Dallas's transcript provides examples of how Dallas supported Ciara by using empathy (Table 9a) and, later in the discussion, stating that Dallas was available to help (Table 9b). These codes were not applied in Nicole's transcript. Dallas, featured in our prior work [14], had the most supporting subcodes of any NPM.

Table 9a. Excerpt 1 from Experienced NPM Dallas Featuring Empathy

Speaker	Turn	Coding
Dallas	And you have your own car and everything?	PROBING, **Logistics**
Ciara	I do sort of, but I do have to share it with my mom and my dad sometimes. Depending on what's happening.	
Dallas	I understand. I had to share a car with my brother for a year. It was so hard. Really was.	SUPPORTING, Assuring, Empathy
Ciara	Yeah, sometimes two people need it at the same time and it's difficult.	

Table 9b. Expert 2 from Experienced NPM Dallas Featuring an Offer of Help

Speaker	Turn	Coding
Dallas	Right. No, I totally get it. And it seems like you've been like so polite to me and like very responsive to your teammates, so I'm sure there's definitely a way that we can get everyone on the same page about these meetings.	SUPPORTING, Encouragement Assuring, Praise
Ciara	I hope so.	
Dallas	Yeah. Is there anything else that you want to let me know about any team dynamics or anything that I can do as your TA to help?	PROBING, **General** SUPPORTING, Help
Ciara	Really, what I've already shared with you is, are the big things that are of concern to me right now. It's just, you know, making it so that everyone can possibly come to the meetings and contribute.	

Discussion and Conclusion

This work provides insight into the questioning and support moves NPMs use without having benefited from professional learning experiences to develop strategies to address team conflict. We found the following statistically significant differences between the experienced and novice NPMs in our sample: (1) novice NPMs were less likely than experienced NPMs to probe after asking an initial question or after being presented with new information from Ciara, and (2) novice NPMs were less like to use empathy and articulate that they are available to help in their discussions with Ciara. Also, a broad pattern that we found is that while most NPMs inquired about whether Ciara was experiencing logistical challenges, few inquired about whether Ciara was being marginalized or about Ciara's interest in the major, course, or project.

We studied the "small phenomenon" of a conversation between an NPM and a student across 21 NPMs, which led to these insights. The simulated environment enabled the same discussion context and purpose across all participants, as has been done in other studies [25-28]. We observed patterns related to eliciting and probing during this talk [33], how the NPMs offered support during the discussion [14], and how the NPMs inquired about potential reasons for the engagement-related conflict as related to Ciara. We were able to glean these patterns from conversational analysis [15, 16] and subsequent qualitative content analysis [34], noting the overall structure and content of each of the NPM discussions and applying codes and subcodes to NPM turns [15, 17].

There is more to unpack from our work that we did not have room to explore here. For example, while we are confident that the most frequent form of support used by NPMs—assuring that they were listening and following what Ciara was saying—is helpful, we do not know how impactful this is. We also wonder if supporting through agreement, the next most frequent type of support used by NPMs, is necessarily helpful and may be context dependent; neutrality may be more favorable than agreement towards the goal of learning more about the student's perspective without immediately taking a side in the conflict.

In addition to growing understanding of how NPMs interact with students on teams experiencing interpersonal conflict [8-10], these findings suggest how both experienced and novice NPMs might benefit from professional learning experiences about how to facilitate one-on-one

discussions with team members. Some of the transcripts that we have gathered in this study and in our larger project, which includes NPM discussions with team members Stephanie and Jordan, might serve as useful examples of productive or less productive talk moves to use during these on-on-one discussions; see [35, 36] for similar use of transcripts. They could provide examples of how an NPM asks a question and responds with a follow-up probe to learn more. Also, transcripts could provide examples identifying missed opportunities like what could have been asked to explore potential marginalization or other ideas more deeply with probing questions.

We have a few caveats to share as we close. First, we acknowledge that quantifying qualitative data, as is common in qualitative content analysis [34], has its limitations in conversational analysis. The process strips what is contextually bound to a conversation and isolates it for the purpose of generalizability in the quantitative tradition [15]. We shared excerpts from NPMs Nicole and Dallas to highlight the nature of the qualitative context. We also acknowledge that Ciara is an avatar that we created and who is situated in the midst of a fictitious scenario, albeit one based on an amalgamation of students that we have observed and from the research literature [11, 12]. Despite the broad use of simulations to investigate the nature of discussions between educators and students [23-28, 33], we cannot know for sure how discussions with real students in face-to-face settings might be different even given a similar scenario and the same NPMs.

Our future work includes analysis of the discussions that this same group of 21 NPMs had with Jordan and Stephanie to explore how NPMs discuss engagement-related team conflict related to disinterest in the major and marginalization, respectively. We are refining our scenario with the support of an advisory board of experts in diversity, equity, and inclusion. The updated version will be used to extend our understanding of how NPMs approach one-on-one discussions and whole-team discussions with student avatars experiencing similar conflicts. We look forward to growing our understanding of how NPMs facilitate discussions related to engagement-related conflict and considering how to craft professional learning experiences to improve the quality of these discussions.

Acknowledgments

The University of Delaware General University Grant and Towson University Faculty Development & Research Committee Award provided funding for this work. We would like to thank the NPMs who participated in this research, as well as the First-Year Programs Division reviewers for their helpful feedback.

References

[1] Engineering Acreditation Commission, "ABET criteria for accrediting engineering programs," Baltimore, MD, 2025.

[2] C. L. Dym, A. M. Agogino, O. Eris, D. D. Frey, and L. J. Leifer, "Engineering design thinking, teaching, and learning," *Journal of Engineering Education,* vol. 94, no. 1, pp. 103-120, 2005, doi: ttps://doi.org/10.1002/j.2168-9830.2005.tb00832.x.

[3] B. A. Oakley, D. M. Hanna, Z. Kuzmyn, and R. M. Felder, "Best practices involving teamwork in the classroom: Results from a survey of 6435 engineering student respondents," *IEEE Trans. Educ.,* vol. 50, no. 3, pp. 266–272, 2007.

[4] D. W. Knight, L. E. Carlson, and J. F. Sullivan, "Staying in engineering: Impact of a hands-on, team-based, first-year projects course on student retention," in *American Society for Engineering Education (ASEE) Annual Conference and Exposition*, Nashville, TN, 2003, doi: 10.18260/1-2--11855.

[5] D. A. Bonebright, "40 years of storming: a historical review of Tuckman's model of small group development," *Human resource development international,* vol. 13, no. 1, pp. 111-120, 2010, doi: 10.1080/13678861003589099.

[6] B. W. Tuckman and M. A. C. Jensen, "Stages of small-group development revisited," *Group & organization studies,* vol. 2, no. 4, pp. 419-427, 1977, doi: 10.1177/105960117700200404.

[7] B. W. Tuckman, "Developmental sequence in small groups," *Psychological bulletin,* vol. 63, no. 6, pp. 384-399, 1965, doi: 10.1037/h0022100.

[8] M. G. Headley, A. Trauth, H. Malladi, and J. Buckley, "Examining the me in team-based projects: Students' perceptions of time and tasks," in *American Society for Engineering Education Virtual Annual Conference Content Access*, Online, 2021. [Online]. Available: https://peer.asee.org/37122

[9] M. Borrego, J. Karlin, L. D. McNair, and K. Beddoes, "Team Effectiveness Theory from industrial and organizational psychology applied to engineering student project teams: A research review," *Journal of Engineering Education,* vol. 102, no. 4, pp. 472-512, 2013/10/01 2013, doi: https://doi.org/10.1002/jee.20023.

[10] B. Linder, M. Somerville, Ö. Eris, and N. Tatar, "Taking one for the team: Goal orientation and gender-correlated task division," in *ASEE/IEEE Frontiers in Education Conference*, Washington, DC, 2010, pp. p. F4H–1.

[11] H. E. Rodríguez-Simmonds, A. Godwin, T. Langus, N. Pearson, and A. Kirn, "Building inclusion in engineering teaming practices," *Studies in Engineering Education,* vol. 3, no. 2, pp. 31-59, 2023, doi: 10.21061/see.84.

[12] K. L. Tonso, "Teams that work: Campus culture, engineer identity, and social interactions," *Journal of Engineering Education,* vol. 95, no. 1, pp. 25-37, 2006, doi: https://doi.org/10.1002/j.2168-9830.2006.tb00875.x.

[13] C. Gabelica, S. De Maeyer, and M. C. Schippers, "Taking a free ride: How team learning affects social loafing," *Journal of Educational Psychology,* 2021, doi: 10.1037/edu0000713.

[14] P. S. Lottero-Perdue, H. Malladi, and M. G. Headley, "Near-Peer Mentors' discussions with a student avatar experiencing logistical Issues on a first-year design team," in *American Society for Engineering Education Annual Conference and Exposition*, Portland, OR, USA, 2024. [Online]. Available: https://peer.asee.org/47801

[15] W. S. Horton, "Theories and approaches to the study of conversation and interactive discourse," in *The Routledge Handbook of Discourse Processes*, M. F. Schober, D. N. Rapp, and M. A. Britt Eds., 2 ed. United Kingdom: Routledge, 2018, pp. 22-68.
[16] H. Sacks, "Notes on methodology," Cambridge University Press, 1985, pp. 21-27.
[17] J. D. Robinson, "Overall structural organization," in *The Handbook of Conversation Analysis*, T. S. Jack Sidnell Ed.: John Wiley & Sons, Incorporated, 2012, pp. 257-280.
[18] S. H. Chapin, M. C. O'Connor, N. C. Anderson, and S. H. Chapin, *Classroom discussions in math : a teacher's guide for using talk moves to support the common core and more, grades K-6*, Third edition. ed. Math Solutions, 2013.
[19] C. A. Chinn, "Classroom interaction in science: Teacher questioning and feedback to students' responses," *International Journal of Science Education,* vol. 28, no. 11, pp. 1315-1346, 2006.
[20] S. L. Carpenter, J. Kim, K. Nilsen, T. Irish, J. A. Bianchini, and A. R. Berkowitz, "Secondary science teachers' use of discourse moves to work with student ideas in classroom discussions," *International Journal of Science Education,* vol. 42, no. 15, pp. 2513-2533, 2020.
[21] S. Michaels and C. O'Connor, "Talk science primer," TERC: An Education Research and Development Organization, Cambridge, MA, 2012.
[22] R. Bondie, Z. Mancenido, and C. Dede, "Interaction principles for digital puppeteering to promote teacher learning," *Journal of Research on Technology in Education,* vol. 53, no. 1, pp. 107-123, 2021, doi: https://doi.org/10.1080/15391523.2020.1823284.
[23] G. Hillaire *et al.*, "Digital clinical simulation suite: Specifications and architecture for simulation-based pedagogy at scale," in *Proceedings of the Ninth ACM Conference on Learning@ Scale*, New York, NY, 2022, pp. 212-221, doi: https://dl.acm.org/doi/pdf/10.1145/3491140.3528276.
[24] M. Thompson *et al.*, "Eliciting Learner Knowledge: Enabling focused practice through an open-source online tool," *Behavioral Sciences,* vol. 12, no. 324, pp. 324-324, 2022, doi: 10.3390/bs12090324.
[25] L. A. Dieker *et al.*, "Using virtual rehearsal in a simulator to impact the performance of science teachers.," *International Journal of Gaming and Computer-Mediated Simulations,* vol. 11, no. 4, pp. 1-20, 2019.
[26] J. N. Mikeska and H. Howell, "Simulations as practice-based spaces to support elementary teachers in learning how to facilitate argumentation-focused science discussions," *Journal of Research in Science Teaching,* vol. 57, no. 9, pp. 1356-1399, 2020, doi: http://dx.doi.org/10.1002/tea.21659.
[27] J. N. Mikeska and P. S. Lottero-Perdue, "How preservice and In-service elementary teachers engage student avatars in scientific argumentation within a simulated classroom environment," *Science Education,* vol. 106, no. 4, pp. 980-1009, 2022. [Online]. Available: http://dx.doi.org/10.1002/sce.21726.
[28] D. M. Levin, D. L. Grosser-Clarkson, N. G. Molina, A. A. Haque, E. E. Fleming, and A. K. Chumbley, "Preservice middle school science teachers' practices of leading discussion with virtual avatars," presented at the Simulations in Teacher Education Conference, 2019. [Online]. Available: https://www.ets.org/research/centers/k-12/simulations-in-teacher-education-conference.html.

[29] M. W. Ohland, R. A. Layton, M. L. Loughry, and A. G. Yuhasz, "Effects of Behavioral Anchors on Peer Evaluation Reliability," *Journal of Engineering Education,* vol. 94, no. 3, pp. 319-326, 2005, doi: 10.1002/j.2168-9830.2005.tb00856.x.

[30] M. W. Ohland *et al.*, "Developing a peer evaluation instrument that Is simple, reliable, and valid," in *American Society for Engineering Education Annual Conference and Exposition*, Portland, OR, 2005, pp. 10.430.1 - 10.430.5, doi: 10.18260/1-2--14413.

[31] H. Malladi, J. Enszer, and J. Buckley, "Work In Progress: Evolution of a near-peer co-instructional model for a large-enrollment first-year engineering course," in *American Society for Engineering Education (ASEE) Annual Conference and Exposition*, Minneapolis, MN, USA, 2022. [Online]. Available: https://peer.asee.org/41459

[32] H. Malladi, Headley, M.G., Lottero-Perdue, P.S., Buckley, J., "Experienced teaching assistants' perceptions of a simulated environment for facilitating discussions with individual student avatars from a design team in conflict [Paper presentation]." in *American Society for Engineering Education (ASEE) Annual Conference and Exposition*, Baltimore, MD, 2023. [Online]. Available: https://peer.asee.org/43545

[33] X. Wang *et al.*, "Practice-based teacher questioning strategy training with ELK: A role-playing simulation for eliciting learner knowledge," in *Proceedings of the ACM on Human-Computer Interaction*, 2021, vol. 5, no. CSCW1, pp. 1-27, doi: https://doi.org/10.1145/3449125.

[34] M. Schreier, "Qualitative content analysis," in *The SAGE Handbook of Qualitative Data Analysis*, I. U. Flick Ed. Norway, Europe: SAGE Publications Ltd., 2014, pp. 170–183.

[35] P. S. Lottero-Perdue, J. N. Mikeska, and M. S. Nester, "Using preservice teachers' transcript coding of simulated argumentation discussions to characterize aspects of their noticing about argument construction and critique," *Contemporary Issues in Technology and Teacher Education (CITE Journal),* vol. 22, no. 1, pp. 105-139, 2022. [Online]. Available: https://citejournal.org/volume-22/issue-1-22/science/using-preservice-teachers-transcript-coding-of-simulated-argumentation-discussions-to-characterize-aspects-of-their-noticing-about-argument-construction-and-critique/.

[36] L. Kucan, "Insights from teachers who analyzed transcripts of their own classroom discussions," *The Reading Teacher,* research-article vol. 61, no. 3, p. 228, 2007, doi: 10.1598/RT.61.3.3.