

Chat-Based Role-Play for Preservice Teachers to Practice Eliciting Students' Arguments

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Abstract

In this article, we describe our implementation of an innovative approximation of practice in teacher education: chat-based role-play. In so doing, we share our collective experiences as teacher educators about how the preservice teachers (PSTs) across our four methods courses—two elementary science courses, one elementary mathematics course, and one middle school mathematics course—practiced eliciting students' initial arguments about a matter investigation (for science) or a fractions or ratio problem (for mathematics). The chat-based role-play to which we refer involves a one-on-one, 7-minute-long, teacher–student typed chat in which the teacher aims to elicit the student's claim and evidence-based reasoning (for science) or justification (for math). We used Eliciting Learner Knowledge (ELK; https://tsl.mit.edu/practice_space/eliciting-learner-knowledge/), a multiplayer option in the Teacher Moments online platform from the MIT Teaching Systems Lab that is free and available for public use, to support this role-playing experience; however, we also explain how other platforms (e.g., Google Docs) can achieve a similar effect. In this article, we describe (a) the affordances of typed chat-based role-play; (b) the ELK platform and elementary science chat as an example; (c) the ways in which we prepared PSTs for their chats, formatted their chat experiences, and asked them to reflect after the chats; (d) how our PSTs benefitted from preparing for, engaging in, and debriefing from these chats; (e) implementation challenges and associated suggestions; and (f) alternate ways of conducting typed chat-based role-play in methods courses. Content-specific examples throughout the article are from science.

Introduction

Taylor (a pseudonym) reviewed the transcripts of the two typed chats that she and her peer partner completed in which she played the role of the teacher and her partner played the role of a student named Charlie. As the teacher, it had been Taylor's job during each chat to figure out what Charlie's argument was with respect to whether matter was conserved in two simple investigations. Reflecting on this opportunity to practice eliciting Charlie's ideas, Taylor shared that she improved in her second chat with Charlie.

The first try, most of my [questions] . . . were only yes/no questions, and not very student-centered. I really tried to be more mindful of being both open-ended and student-centered the second time, as well as show them I'm really listening to them, and not just fishing for answers.

Practice-based teacher education suggests that preservice teachers (PSTs) like Taylor benefit from engaging in approximations of practice to support their learning as future educators (Stroupe et al., 2020). “Approximations of practice provide novices with the opportunity to enact elements of practice with a high degree of support and under conditions of reduced complexity” (Grossman et al., 2018, p. 9). This enables preservice teachers to focus their attention on certain aspects of practice while purposefully not attending to others—for example, focusing on how to elicit student thinking without also attending to classroom management.

Approximations of practice common to teacher education include field experiences and student teaching, which occur in P–12 classrooms. Other approximations that occur outside of P–12 settings include peer teaching, avatar-based simulations that utilize live actors, and digital clinical simulations. Peer teaching involves some PSTs playing the role of teachers and others playing the role of students (e.g., Benedict-Chambers et al., 2020). Perhaps less familiar to many teacher educators (TEs) are approximations involving PSTs teaching student avatars that are mediated through online platforms such as TeachLive and Mursion (e.g., Mikeska & Howell, 2020; Straub et al., 2015). Digital clinical simulations immerse participants in vignettes of school life and then call upon participants to respond to challenging moments. They can be facilitated by live human actors (Dotger, 2013; Self & Stengel, 2020) or can occur in digital environments without the use of those actors, such as in the freely available Teacher Moments platform, which includes a tool to help PSTs practice eliciting learner knowledge (Thompson et al., 2022; see https://tsl.mit.edu/practice_space/eliciting-learner-knowledge/).

In this article, we share how we supported the PSTs in our methods courses to practice eliciting students' arguments through chat-based role-play with particular attention to how this occurred in the science methods courses of coauthors Lottero-Perdue and Rillero. Eliciting student ideas is one of four essential practices in the “Ambitious Science Teaching” framework identified by Windschitl et al. (2018), and “eliciting and interpreting individual students' thinking” is one of the 19 “high-leverage practices” according to TeachingWorks (2023). Part of the description of this practice states: “Teachers draw out student thinking through carefully chosen questions and tasks and attend closely to what students do and say” (TeachingWorks, 2023). Effective elicitation strategies include probing and asking open-ended questions as well as avoiding teacher telling, evaluating students' ideas, or funneling students towards a “right” answer (Hagenah et al., 2018; Michaels & O'Connor, 2012; Wang et al., 2021; Windschitl et al., 2018).

Typed Chat-Based Role-Play

The approximation of practice that we describe uses one-on-one, typed chat-based role-play to support PSTs as they learn to elicit student thinking (Thompson et al., 2022). In this role-play, PSTs are divided into pairs; in each pair, one PST plays the role of the teacher, and the other plays the role of the student. Communication between the two is not voiced but rather typed, like two individuals text chatting with one another. Our introduction to this approximation was through our involvement in a larger project, the Online Practice Suite (OPS; <https://tarheels.live/onlinepracticesuite/>), that included an Eliciting Learner Knowledge (ELK) chat on the Teacher Moments platform (https://tsl.mit.edu/practice_space/eliciting-learner-knowledge/). ELK has been used across many different content areas for educators and others to practice facilitating 7-minute discussions through typed chat-based role-play. Studies have suggested that PSTs' engagement in ELK provided opportunities for PSTs to elicit and probe students' understanding and employ multiple questioning strategies (Thompson et al., 2022; Wang et al., 2021). Additionally, teacher questioning strategies may be enhanced when PSTs analyze their chats (Wang et al., 2021).

Two common questions about ELK are: Why text and not voice, and why 7 minutes? One way to reduce complexity and increase focus on teacher questions and student ideas is to use text instead of voice. Oral role-plays can be awkward for PSTs, and we have observed the use of humor to break the tension, which can distract from the goals of the role-play. Further, PSTs are familiar with typed chat-based communication in their personal lives and as a form of teacher–student discourse in online instruction during the pandemic. Typed chats also produce a transcript that is immediately available for subsequent analysis. The 7-minute timeframe provides just enough but not too much time for the PST playing the teacher to formulate and type questions and for the PST playing the student to type their reply. These decisions about typed text and chat duration arose from extensive testing by the ELK team (Wang et al., 2021).

In this article, we suggest that typed chat-based role-play (hereafter, chat-based role-play) is a simple yet innovative approximation of practice to add to the many tools that TEs use to support PSTs in learning and improving their practice. We share our collective experiences as TEs about how PSTs, across our four methods courses, practiced eliciting students' initial arguments about a matter investigation (for science) or a fractions or ratio problem (for mathematics) through chat-based role-playing. Although eliciting student thinking can occur for a variety of purposes in science and mathematics education, our focus is on eliciting students' arguments. In science, this means eliciting students' claims, evidence, and reasoning (McNeill & Krajcik, 2012). This attends to an aspect of the *Next Generation Science Standards* (NGSS) Scientific and Engineering Practice "Engaging in Argument from Evidence" (NGSS Lead States, 2013).

The four methods courses that we taught included two elementary science (one in spring 2021 and one in spring 2022), one elementary mathematics (spring 2022), and one middle school mathematics course (fall 2022) across four institutions in the United States. The science methods courses were offered in a fully synchronous online format, and the mathematics methods courses were offered in a face-to-face format. Although all our voices and experiences are included in this article, in keeping with the emphasis of this journal, the specific examples we use are in the context of science.

ELK Components and the Elementary Science ELK Scenario

There are two main components of ELK: (1) the scenario briefing, which includes teacher-facing materials and student profiles, and (2) a live, one-on-one chat experience. (Although we do not focus on it here, ELK also uses a three-question, post-chat quiz to determine if both PSTs can identify the ideas of the student they taught or played.) In the scenario, two students and their classmates made observations and collected data in two investigations: Changing Paper and Freezing Water. In Changing Paper, the children weighed a flat piece of paper, crumpled up the paper and weighed it again, and then tore the paper into pieces and weighed the pieces. They observed the changing shape of the paper and measured the weight of the paper in each of the conditions (4.6 grams for all three conditions). Consistent with the elementary grade-band endpoints within the NGSS (NGSS Lead States, 2013), in these elementary-level investigations, we do not differentiate between mass and weight, and we use grams as a measure of weight. In the Freezing Water investigation, the children weighed a plastic cylinder partially filled with water, marked a line at the top of the water in the container, and weighed the container and water. Then, they placed the water container in the freezer. The ice took up more space than the liquid water, but the weight was the same as before (390.5 grams).

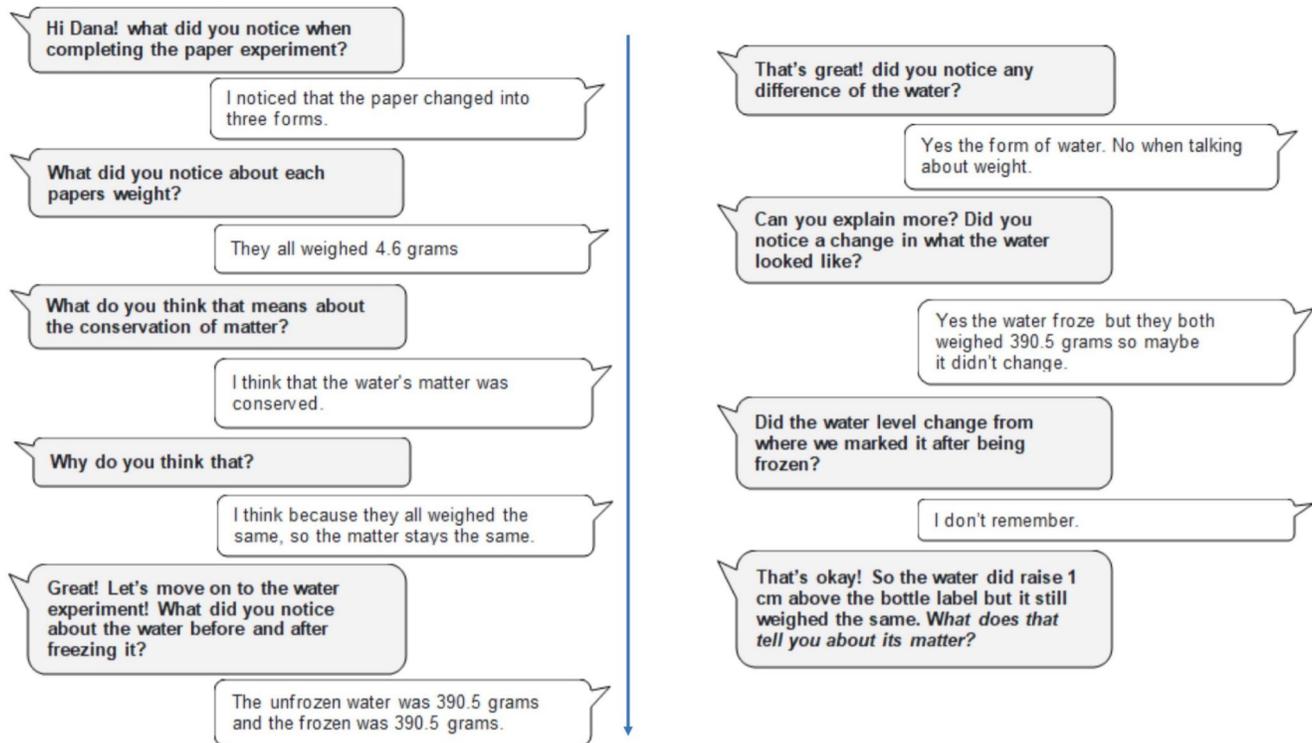
The PST playing the teacher receives teacher-facing materials, which include the background information shared above and the goals of the chat for the teacher. The goals are (a) to use questioning to determine the student's argument about whether matter was conserved and (b) to encourage the student to share evidence and reasoning to support their argument.

The PST playing the role of the student receives one of two student profiles: Charlie or Dana. Charlie's claim is that matter was not conserved in the investigations but rather was increased when the paper was balled up and when the water froze because those both took up more space. Dana's claim is that matter was conserved in the investigations because the weight stayed the same in each, even if the shape or volume changed. Whether playing Charlie or Dana, the students are reminded to only answer the first part of a multipart question, provide one piece of information at a time, answer closed-ended questions with short answers (e.g., *yes* or *no*), not volunteer additional information, and provide explanations or justification only when prompted.

To play an ELK scenario, a pair of PSTs log onto the Teacher Moments platform (Thompson et al., 2022) and select their assigned role as either the teacher or student (Charlie or Dana). They review the teacher information or student profile, respectively, and then begin the chat on a new screen. The chat begins when the PSTs press a button to start a countdown timer, and the PST playing the teacher poses the first question. The PSTs type text back and forth in the chat over the 7-minute period. Afterward, the transcript may be copied and pasted to a word processing document. Excerpts of sample chats between PSTs playing the roles of the teacher and Dana or Charlie, respectively, are shown in Figures 1 and 2.

Figure 1

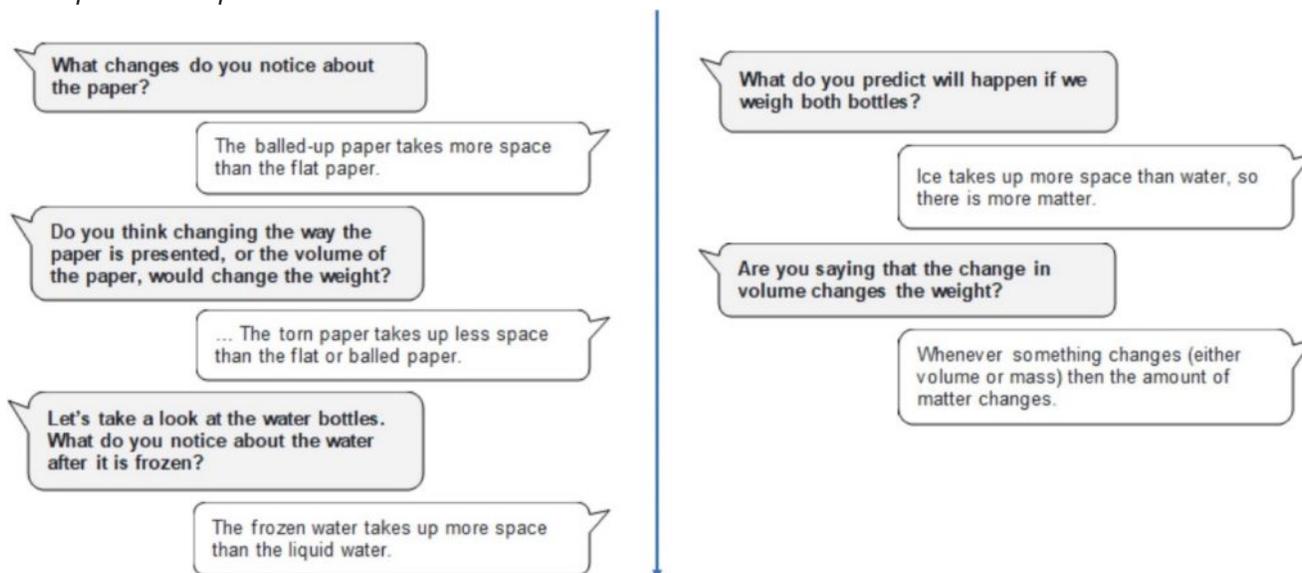
Excerpt of a Sample ELK Chat Between PSTs in the Roles of the Teacher and Dana



Note. In the above chat, the statements from the teacher are shaded.

Figure 2

Excerpt of a Sample ELK Chat Between PSTs in the Roles of the Teacher and Charlie



Note. In the above chat, the statements from the teacher are shaded.

Preparing for, Experiencing, and Reflecting on Chat-Based Role-Play

Through our participation in the OPS project, each of the coauthors used a series of online approximations of practice throughout the semester to help PSTs learn to facilitate argumentation discussions. The series of approximations began with the ELK scenario and included avatar-based simulations using Mursion. As TEs on the OPS Project, we helped our students prepare for, participate in, and debrief after each approximation.

Preparation

We prepared our PSTs for ELK through a variety of means. All of us prepared students with respect to the content of the chats and helped PSTs learn the logistics of logging on and engaging with ELK. One or more of us also had the PSTs anticipate what students' arguments (or responses) might be after engaging in the investigation (or when solving the problem), examine resources about argumentation and teacher questioning, or consider questions or prompts they might use during the chat. Preparation for ELK occurred primarily in the first week of instruction for elementary science methods TEs and authors Lottero-Perdue and Rillero because ELK chats occurred during the second week of their fully online semesters.

Content

Lottero-Perdue and Rillero engaged PSTs in content by having them make predictions about weight or volume changes in the Changing Paper or Freezing Water investigations, observe the investigations, and construct arguments based on their observations. Lottero-Perdue's

and Rillero's classes were online via Zoom, and the PSTs did not have access to digital scales at home, so the investigations were done largely as TE demonstrations. In Lottero-Perdue's class, students were also asked to anticipate what arguments children might make—including both correct and creative or alternate conceptions—about whether the amount of matter was conserved. The PSTs suggested, for example, that although some students might have the accurate conception that because weight is the same, matter is conserved, other students might think that matter is not conserved because matter is “lost” when the paper is ripped or because the shape of the matter changes. Rillero shared with PSTs the Arizona state science standard relevant to matter conservation, which is similar to NGSS Performance Expectation 5-PS1-2 (NGSS Lead States, 2013, p. 43).

Learning About Scientific Arguments

PSTs in Lottero-Perdue's class learned about parts of a scientific argument, namely claims, evidence, and reasoning, drawing from The Argumentation Toolkit (www.argumentationtoolkit.org) argument structure resource (The Lawrence Hall of Science, University of California, Berkeley, 2014). Lottero-Perdue also referred to two aspects of high-quality argumentation discussions relevant to the ELK discussions: (a) attending to student ideas, specifically the need to elicit student thinking, and (b) engaging in argumentation, in particular, attention to eliciting students' scientific arguments (Mikeska & Howell, 2019). PSTs in Lottero-Perdue's class also read the introductory chapter about science and science education from the course e-text, which included some discussion of claims, evidence, and reasoning and introduced the NGSS (Contant et al., 2018). Rillero had the PSTs in his class discuss with one another and depict the differences between claims, evidence, and reasoning after reading the article “The Four Elements of the Claim, Evidence, Reasoning, and Rebuttal (CERR) Framework” by Alegado and Lewis (2018).

Preparing for the Chat

The PSTs in Lottero-Perdue's class did not have experience facilitating discussions in the course prior to engaging in ELK. Because Rillero was part of the experimental portion of the OPS project, each of the PSTs in his class had one prior experience facilitating an argumentation discussion in the Mursion simulation prior to doing ELK; this was a pre-course experience with no preparation before or debrief afterward by Rillero. Thus, for both Lottero-Perdue and Rillero, preparing prompts for the ELK chats was a novel endeavor for their students. Lottero-Perdue asked each PST in the course to share one question or prompt that they might use in the chat discussion (e.g., “What did you notice?”) but did not evaluate those questions. Rillero put the PSTs into breakout groups to prepare a sequence of questions, prompting PSTs to consider whether they would address the two investigations together or separately and how they would ask students to share their observations, analyze and interpret the data, make claims based on evidence, and determine whether the amount of matter changed.

Enactment

There were some noteworthy differences in our enactment approaches. First, science TEs Lottero-Perdue and Rillero taught during a fully online semester; thus, all PSTs were in different locations during their chats. The PSTs maintained a connection to Zoom in case they needed assistance from the TE or an ELK representative who was there to provide technical support. This also enabled the PSTs to chat with one another over Zoom because they logged in together; however, Zoom did not serve as the platform for the typed chat. ELK chats occurred either during regular instructional time or, in Rillero's class, during a combination of instructional time and blocks of time outside of class during which PSTs could receive support from an ELK representative.

Math TEs Goldberg and Liebars taught during face-to-face semesters; thus, their PSTs were all physically present in the same room utilizing their laptops to engage in ELK. Troubleshooting could occur face-to-face, if necessary, with additional support from an ELK representative who Zoomed into the face-to-face class. We address challenges and suggestions for each of these modalities—using ELK with PSTs in different locations and using ELK with PSTs in the same location—at the end of the article.

Another difference in our implementation had to do with the number and format of the chats. The two math TEs planned for the PSTs to participate in two chats, enabling the PSTs to play each role (teacher and student) once. The two science TEs planned for the PSTs to participate in four chats, enabling the PSTs to play each role twice. The reason for doing two chats in the math methods courses instead of four had to do with constraints on instructional time. A significant benefit of having four chats is that the PSTs were able to reflect on the questions and responses from the first two chats and then use those to inform a second try at playing the teacher or student. Table 1 shows patterns of ELK chats within Lottero-Perdue's and Rillero's methods courses. A key difference is in the approach to Chats 3 and 4. In these chats, Lottero-Perdue had the PSTs try to elicit ideas from the same student (e.g., if PST A tried to elicit Charlie's argument in Chat 1, they would again try to elicit Charlie's argument in Chat 3). Rillero had the PSTs try to elicit ideas from a different student (e.g., if PST A tried to elicit Dana's argument in Chat 1, they would try to elicit Charlie's argument in Chat 3). Each approach has an affordance: The approach by Lottero-Perdue enables direct comparison across the first and second tries (i.e., Chats 1 and 3 or Chats 2 and 4), whereas the approach by Rillero provides PSTs with experience eliciting ideas from different students.

Table 1*Patterns of ELK Chats Within Two Science TEs' Methods Courses*

	TE Lottero-Perdue	TE Rillero
Chat 1	PST A plays Charlie's teacher, and PST B plays Charlie.	PST A plays Dana's teacher, and PST B plays Dana.
Chat 2	PST B plays Dana's teacher, and PST A plays Dana.	PST B plays Charlie's teacher, and PST A plays Charlie.
Chat 3	PST A plays Charlie's teacher again, and PST B plays Charlie again.	PST A plays Charlie's teacher, and PST B plays Charlie.
Chat 4	PST B plays Dana's teacher again, and PST A plays Dana again.	PST B plays Dana's teacher, and PST A plays Dana.

Between Chats 2 and 3, Lottero-Perdue and Rillero prompted the PSTs to reflect on their chats. After completing Chat 2, Rillero posted the following prompt that asked each PST pair to discuss the following and share their responses in larger breakout groups: "Read through your pasted transcript where you were the teacher. What was one question that you think worked well? What is your evidence that it worked well? What is it about the question that made it work well?" In the whole-class discussion that followed, Rillero shared that in the breakout rooms, he heard PSTs talking about how questions asking students about their evidence worked well and how closed-ended questions that could be answered with *yes* or *no* did not work as well.

Lottero-Perdue facilitated a whole-class discussion to reflect on Chats 1 and 2. This discussion asked PSTs to share what they noticed from the activity, presented PSTs with informative slides about open-ended versus closed-ended questions and the difference between eliciting student thinking and telling or evaluating students' ideas, and shared suggestions for how PSTs might want to open the discussion and use talk moves such as revoicing and pressing for reasoning. Liebars also facilitated reflection between Chats 1 and 2 in which the PST teacher–student pairs reviewed the chat transcripts, discussed what they noticed, considered what worked well or did not work well, and shared their observations in a whole-class discussion.

Reflection

Collectively, we supported reflection by having PSTs (a) analyze their own transcripts, (b) write responses to reflective questions about their chats, (c) analyze similar chats aside from those in which they played a teacher or a student, and (d) participate in whole-class debrief discussions. Lottero-Perdue and Rillero asked PSTs to code both or one of their chat transcripts in which they were the teacher. PSTs coded their transcripts using the system of highlighting shown in Table 2. Although coding was a new experience for many of our PSTs, they were able to use the process to identify many examples of productive questioning

strategies, such as when they used open-ended questions to elicit claims, evidence, and reasoning, as well as less productive strategies in which they were too leading or provided too much information.

Table 2

ELK Chat Transcript Coding System

Coding formatting	Teacher prompts, questions, or statements in which the PST:
Highlight in green	Elicited and/or probed student thinking effectively using open-ended questions.
Highlight in yellow	Elicited and/or probed student thinking but did so using closed-ended questions.
Highlight in blue	Focused on right/wrong answers or evaluating ideas or provided an answer.
Change to <i>italics</i>	Encouraged students to share a claim about whether matter was conserved or support the claim with evidence,

In addition to this coding, PSTs were asked to provide explanations for their coding and to answer reflective questions. For Lottero-Perdue, these questions examined the PSTs' growth between their first and second chats, asking them to reflect on changes in their use of open- and closed-ended questions, prompts to elicit thinking without telling, and prompts to encourage students to share claims, evidence, and reasoning. Rillero, who asked PSTs to code their second chat as a teacher, asked each PST to identify their most effective prompt to elicit student understanding, as well as their most effective prompt to encourage students to share claims, evidence, or reasoning. Rillero also asked them to explain why these were effective prompts, and to respond to the following questions. Where did you see an opportunity where you could have done better? What would you specifically have done differently? Why? Most PSTs were able to identify ways in which their questioning strategies improved from their first to their second attempts in the role of teacher as well as how they could improve regarding those strategies.

One of the mathematics TEs, Goldberg, not only had the PSTs code their transcripts for the prompts they used as a teacher but also asked the PSTs to code their responses in their role as a student. Reflective questions included whether participating as a student in Chat 1 helped PSTs ask more effective questions when they were positioned as the teacher in Chat 2. Overall, their responses suggested that playing the role of the student first was indeed helpful.

Small-group and whole-class reflective discussions enabled PSTs to discuss answers to their reflective questions with one another and share experiences. For example, in one breakout room in Rillero's class, PST comments included that it was harder than they thought to facilitate the chat and that, in retrospect, they should have written down the questions they wanted to ask in advance. Whole-class discussions pulled out key learnings from small-group discussions with brief clarifications from the TEs. For example, Rillero responded to a

group who shared their frustration in not moving Charlie's thinking forward, saying that the purpose of the ELK chat was "not to move student thinking but rather find out what they were thinking."

Benefits of Chat-Based Role-Play for PSTs

There are three advantages of chat-based role-play for PSTs that encourage us to continue to use this approximation of practice in our methods courses: (1) how it helps PSTs to see the importance of careful (and planned) questioning, (2) its immediate generation of a transcript, and (3) its brevity and repeatability.

Engaging in chat-based role-play as the teacher helped most of our PSTs to recognize that facilitating this short discussion to elicit students' initial arguments was not a simple task. It was a challenge for many to construct questions that were clear but not too leading. They also realized that it is not easy to think of questions in the moment—thus motivating them to prepare questions in advance for future discussions to elicit ideas from students. This also reinforces for us that it is essential to address the basics of questioning with our PSTs and give them space to practice those questioning skills.

The text-based nature of the chats generates a transcript that can be copied and saved for later analysis. Our PSTs used their transcripts to reflect on their questions, identify what was effective, and consider what they would do differently. This kind of transcript analysis is also possible when approximations of practice are video or audio recorded, but the process of recording and subsequent transcription is often logistically challenging and time consuming. The transcripts also allowed us to peruse each discussion and identify examples to be shared for collective, whole-class analysis.

Another benefit is that once the PSTs understood the technical logistics and had facilitated their first chat, subsequent chats were straightforward and not too time intensive. The first chat took about 30 minutes of instructional time, but subsequent chats took about 15 minutes (not including time to reflect). This is short compared to longer peer-teaching experiences, which have their own benefits. Being able to try again shortly after an initial attempt and reflection enables PSTs to benefit from a rapid learning cycle—for example, asking questions the second time around that they had not asked the first time, pulling back on the use of leading questions, and adding more encouragement for students to explicate their reasoning. This cycle of practice—evaluation against criteria for high-quality performance followed by more practice—is similar to the routines of "deliberate practice" described by Ericsson et al. (1993).

Not only was Lottero-Perdue able to have each PST in her class engage in role-play twice as a teacher (and as a student) early in the semester when the idea of facilitating student discussions in science was new, but she also created an opportunity for the PSTs to try again during the last week of the semester after experiencing other approximations of practice.

After these final role-plays, PSTs, who shared their thoughts in a reflective discussion, offered that they felt more comfortable facilitating the discussions and had a better sense of how to ask questions. Some PSTs commented on how they “got it” this time: They were supposed to elicit ideas rather than pushing students—or funneling them (Hagenah et al., 2018)—to the right answer.

Key Learnings From Related Research

We are fortunate to be a part of the larger OPS project. A study by Thompson et al. (2022) as a part of this project provides insight into research-based findings related to ELK. That study included 57 PSTs who were consenting research participants in eight methods courses across six universities, which included two in elementary science, two in elementary mathematics, two in secondary science, and two in secondary mathematics; all of these courses were taught in 2021. One of these eight courses was Lottero-Perdue’s elementary science methods course. (Participants in courses of the three other TEs in the present work—Rillero, Liebars, and Goldberg—were not included since their courses were taught in 2022.) There were four different scenarios used in the courses in the Thompson et al. (2022) study: the one described in this article for elementary science, another for elementary math, another for middle school science, and another for middle school math.

After analyzing the participants’ chats, the authors found that PSTs used a variety of productive questioning strategies in their chats, including opening the discussion with priming statements, eliciting students’ ideas about a topic, probing for elaboration after the student’s initial response, asking questions that focused on the student (e.g., Do you think that matter was conserved?) rather than the subject (e.g., Was matter conserved?), and revoicing students’ ideas. PSTs also used some of what the authors refer to as counterproductive questioning strategies, including asking closed-ended questions, evaluating students’ responses, telling students answers or information, and funneling. From assuming the role of the teacher, PSTs learned “the importance of how to elicit learner knowledge and learn[ed] that it is challenging to accomplish” (Thompson et al., 2022, p. 11). From playing the role of the student, PSTs gained empathy for students who are asked to share their ideas and learned that encouraging students to talk can be challenging, that asking good questions is important, and that students have different ways of solving problems.

Implementation Challenges and Suggestions

Each of us experienced some technical or logistical difficulties when we used the ELK platform, but most were resolved relatively quickly. In Liebars’s mathematics methods course, for example, the technical challenges were significant enough that some reflection and debrief activities were curtailed; however, these technical issues have since been resolved. There is some coordination in ELK that must take place between the PST playing the student and the PST playing the teacher (e.g., logging on to the same discussion and

starting the discussion at the same time). Some logins did not work initially and had to be recreated, and some PSTs had challenges with their wireless connections or their laptops. Having an odd number of PSTs in a class can be resolved by having the professor or a teaching assistant, if available, partner with one of the PSTs.

Collectively, we have used ELK in fully online and face-to-face modalities. In the case of the former, we suggest having the instructor available or having access to help from an ELK representative in the event of technical difficulties related to the platform or logging in. If the class typically meets through a video-conference platform such as Zoom, we suggest encouraging PSTs to keep their Zoom cameras off and stay muted during the chats. This minimizes distractions, including facial expressions, focusing the PSTs on the content of what they are typing rather than other means of communication. If all students are in the same location, we suggest having PSTs in each pair go to different rooms or at least face away from one another.

We strongly encourage TEs to play both student and teacher roles with a colleague prior to engaging their students in an ELK chat. This allows the TEs to experience the system—and the act of one-on-one, chat-based role-play—as their PSTs will.

Alternate Ways of Conducting Text-Based Chats

One of the affordances of the ELK system is that it enables all PSTs to use the same, freely accessible system to engage in chat-based role-play. It provides information that PSTs need prior to engaging in the chat, a place for the timed chat, and a chat transcript. These features can be emulated using documents that allow for real-time collaboration such as Google Docs. Alternatively, PSTs could also use their smartphones to engage in a chat-based role-play by texting or using direct messages or threads on apps such as Slack or Discord. It is beyond the scope of this article to get into the details of using and capturing text-based chats for instructional purposes on these apps; however, we do suggest finding ways to limit notifications (e.g., from incoming texts and other notifications) if PSTs are using their phones for this purpose. In this section, we address three topics for consideration if TEs are interested in implementing chat-based role-play on systems other than ELK: (1) how information related to the scenario is accessed, (2) how the timed chat occurs, and (3) PST privacy.

Accessing Information

Let's say that PST A has been assigned to play the role of Charlie. PST A can be directed to open a document (or click a link in a Learning Management System [LMS] to get to a document) that provides information about what Charlie knows. This document should not be available to PST B, who is playing the role of Charlie's teacher. However, both PST B and

PST A should have access to the document that helps the teacher prepare for the discussion because it does not reveal any information that would sway how the PST in the role of student would behave.

Participating in the Timed Chat

The TE would create one Google Doc for each pair of PSTs, sharing the link with those pairs (see the Appendix for a blank and a completed chat template). One way to disseminate this information is to create a table of links on a Google Doc or Slide where the PSTs can find their link and access their shared document. During the chat, each PST starts on a new line, adding their question or response. Each PST can use a different font color to differentiate text. There are different ways to time the chat. If all PSTs in one class will be chatting at the same time—either in an online or face-to-face environment—an announcement can be made when it is time to start the chat. Alternatively, the PST in the role of teacher can set a 7-minute timer (e.g., an online timer or a timer on their phone), starting it right before they type their first question. After the chat, PSTs can each review their transcript and add annotations to it either collaboratively or by making a copy of the transcript for each PST and working independently.

PST Privacy

A key consideration when using Google Docs or other systems is student privacy. Prior to implementation, thought should be given to who has access to seeing the chat transcripts and associated names beyond the TE and the two PSTs who are chatting. ELK enables the data collected to be seen by those three individuals only and enables usernames to be used on the platform instead of real names. Other systems may need to be set up to protect user privacy. If not, TEs should gain permission from PSTs for their chat dialogue to be publicly available or available on the system.

Conclusion

We have had the opportunity to use chat-based role-play as an approximation of practice to support our PSTs in learning how to elicit student thinking. Although it may seem like a simple task, eliciting claims, evidence, and reasoning about an investigation from a single student proved to be challenging for our PSTs. However, we also found that this task can be honed with deliberate practice, beginning with chat-based role-play. For PSTs to be meaningfully engaged in this role-play, it is essential that they are prepared to participate in and debrief about the chats. We hope that the examples we have provided are helpful models for others.

The Teacher Moments platform and ELK scenarios are free and publicly available, along with the conservation of matter scenario we described here, other scenarios we used in the project, and scenarios outside of this project (see https://tsl.mit.edu/practice_pace/eliciting-

learner-knowledge/). Further, TEs can learn about the ELK platform and design their own scenarios, or they can use other means (such as Google Docs) for PSTs to practice eliciting student ideas.

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Supplemental Files

[Lottero-Perdue_etal-Appendix-8_3.pdf](#)

[Lottero-Perdue_etal-Appendix-8_3.docx](#)

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