EVIDENCE IN PRACTICE

Teacher Candidate in Mathematics Education: Example of a Self-Observation Report

Context: This self-report and reflection stem from a lesson taught by a future Mathematics teacher at the end of a semester of clinical experience in a middle school science classroom. This report uses data collected and analyzed by SMT to identify strengths and areas for improvement in future teachers' teaching methods and behaviors. This report focuses on the types of questions posed, student engagement, teacher responses, misbehaviors, teacher-student event ratios, interaction patterns, and, lastly, a summary of the wait time in the lesson.

Contents of This Report:

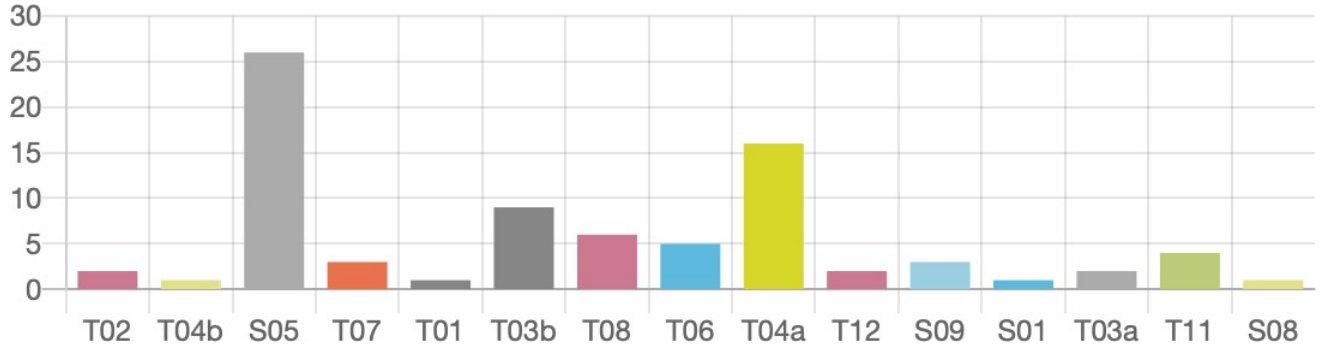
Future Teacher: Q. B. **Class: 7th Grade Math**
Topic: Solving Inequalities with a single variable
Time: 27 minutes (Not the whole lesson)
The focus of Data Collection: All T, M, and S codes using the seating chart and WT

Lesson Goals and Evidence

Goals for the Lesson: Solving Inequalities with a single variable - The goal of the lesson is for students to be able to decontextualize a real-world situation into terms and operations to construct an inequality. Additionally, students should also understand the difference between inequalities and equations and solve for the unknown variable.

Data, Analyses, and Indicators: The following tables, timelines, seating charts, or pics were taken directly from the lesson observation and quantitative analysis screens. The narrative is based on the evidence in the tables and graphics that indicate teacher actions, teacher-student interactions, student actions, and student engagement during the lesson.

Code Summary



OBSERVATION EVIDENCE

Code Summary

Code	Description	Events	Event %	Duration	Duration %
T01	Teacher presents information	1	1.22%	00:00:10	0.85%
T03a	Teacher asks a question in yes/no format	2	2.44%	00:00:22	1.20%
T03b	Teacher asks a question in short-answer format	9	10.98%	00:02:05	10.68%
S05	Student answers teacher's question	26	31.71%	00:02:54	14.87%
T08	Teacher repeats student answer	6	7.32%	00:00:25	2.14%
T07	Teacher confirms student answer	3	3.66%	00:00:14	1.20%
T11	Teacher asks student to clarify their answer	3	2.97%	00:00:10	0.67%
S09	Choral response to a teacher question	3	3.66%	00:00:28	2.39%
S08	Student asked question, think, pair, share	1	1.22%	00:00:39	3.33%
T05	Teacher rejects student answer	0	0.00%	00:00:00	0.00%
T06	Teacher acknowledges student answer	5	6.10%	00:00:14	1.20%
T04a	Teacher ask questions requiring speculation	16	19.51%	00:09:58	51.11%
T04b	Question requiring speculation + justification	1	1.22%	00:01:20	6.84%
S03	Student comments to the teacher	0	0.00%	00:00:00	0.00%
T02	Teacher is giving directions	2	2.44%	00:00:05	0.43%
T12	Teacher using student answer	2	2.44%	00:00:18	1.54%
M10	Student misbehavior	0	0.00%	00:00:00	0.00%
M11	Teacher addresses misbehavior – student directed	0	0.00%	00:00:00	0.00%
S01	Student asks teacher a question	1	0.99%	00:01:33	6.23%
	Overall T Codes	51	62.20%	00:15:19	78.655%
	Overall S Codes	31	37.80%	00:04:11	21.45%
	Overall M Codes	0	0.00%	00:00:00	0.00%
	Overall U Codes	0	0.00%	00:00:00	0.00%
	Overall Codes	82	100.00%	00:19:30	100.00%

INTERPRETATION

Data Highlighted on the Chart

Questions Posed

Questions Posed – 17 out of the 28 questions posed were higher-order thinking questions. Two questions were posed as yes/no questions.

> **Recommendation:** The lesson lacked T4b (speculation with explanation) questions. I can modify most of the T4a questions into T4b questions, since there were sixteen. As for the recall and yes/no questions, I could change them into higher-order thinking questions. The yes/no questions would be easy to change, but the recall questions used in the lesson are more challenging to change. Most were posted after students were working independently, so changing them is less obvious. One way to change the questioning is to have a student explain one of their classmates' work instead of their own. This will allow students to think critically about how others solve problems.

Student Engagement

Student Engagement—Of the 31 student engagement events, students answered 26 questions, made no comments to the teacher, and asked the teacher 1 question. Notably, one think-pair-share event allowed students to interact with one another and ask questions about each other's thinking. However, students made no comments to one another outside the think-pair-shares.

> **Recommendation:** Increase the number of think-pair-shares students engage in during the lessons. This will increase student-student communication and get students more used to commenting on other students' answers. After implementing this, take it a step further and encourage students to comment on other students' work unprompted.

Teacher Responses

Teacher Responses – The most common teacher response after a student's answer was repeating the student's response (T08) at 6 events and acknowledging the response (T06) at 5 events. After this, both clarifying and using a student's answer tied for the third most common teacher response at 3 events. Though these responses are not negative for this type of lesson, one would also expect to see the same amount or more of T11 codes. This is because students are just learning these new mathematical concepts, so having them clarify their thinking would help you understand their current understanding of like and unlike terms.

> **Recommendation:** T08 is often used to acknowledge a student's response or mirror it back to them, anticipating that the student might explain or clarify their answer further. This might work for some students; however, the students in this classroom are well-known for a lack of verbal participation. Therefore, the instructor might simply acknowledge the student's response (T06) and then follow it up by asking the student to clarify or expand on their answer (T11).

Misbehaviors

Misbehaviors – I did not need to address any individual student misbehaviors and noted zero group misbehaviors (M12). Therefore, I did not use class time to address student misbehaviors.

> **Recommendation:** None

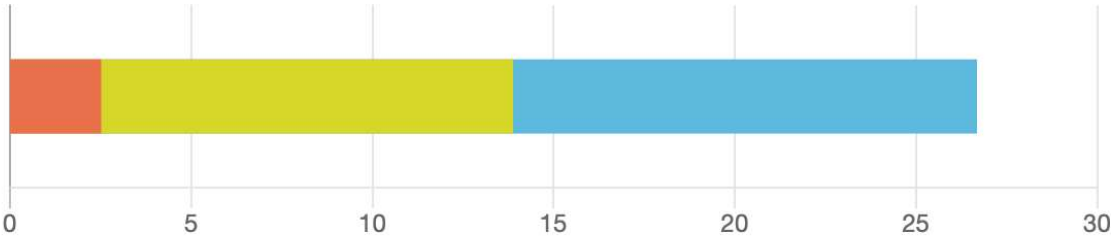
Teacher Student Events Ratio

Teacher-Student Events Ratio – The Overall T Codes vs. Overall S Codes (Percentage of Time) indicate teacher actions occupied 78.55% of the lesson time, while student actions occupied 21.45%. Classroom management occupied 0.00% of the time. The closer the T/S ratio is to 50%/50%, the more student-centered this lesson becomes. However, there were two points in the lesson where students worked independently and with a partner, which I believe would increase the percentage of students' actions to closer to 30%-35%.

> **Recommendation:** Another strategy for fostering student-student interactions is to ask the class to engage in a think-pair-share after hearing a student response. This refers to another way to implement think-pair-share in the classroom that differs from the problem-centered form used multiple times already. For the new method, use think-pair-share to generate a reaction to the student response, which engages all students for a few seconds and expands thinking and communication time for everyone, instead of the instructor always responding to student answers. Additionally, changing the question types used from T4a (16 events) to T4b (1 event) will grant students much more action time because they will be justifying their responses.

LESSON EVIDENCE

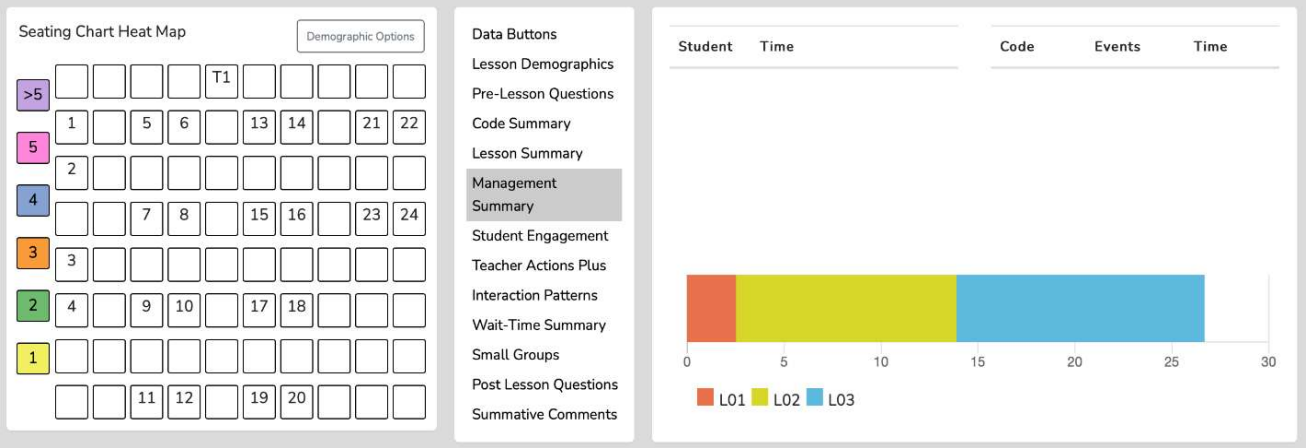
Lesson Summary



Code	Description	Event Start Time	Event End Time
L01	Administrative	00:00	02:31
L02	Lecture/notes	02:31	13:53
L03	Demonstration	13:53	26:41

This analysis used a portion of the full lesson. The administrative part of the lesson was removed, leaving two different Lecture/notes sections and two different demonstration/try it yourself sections.

Management Summary



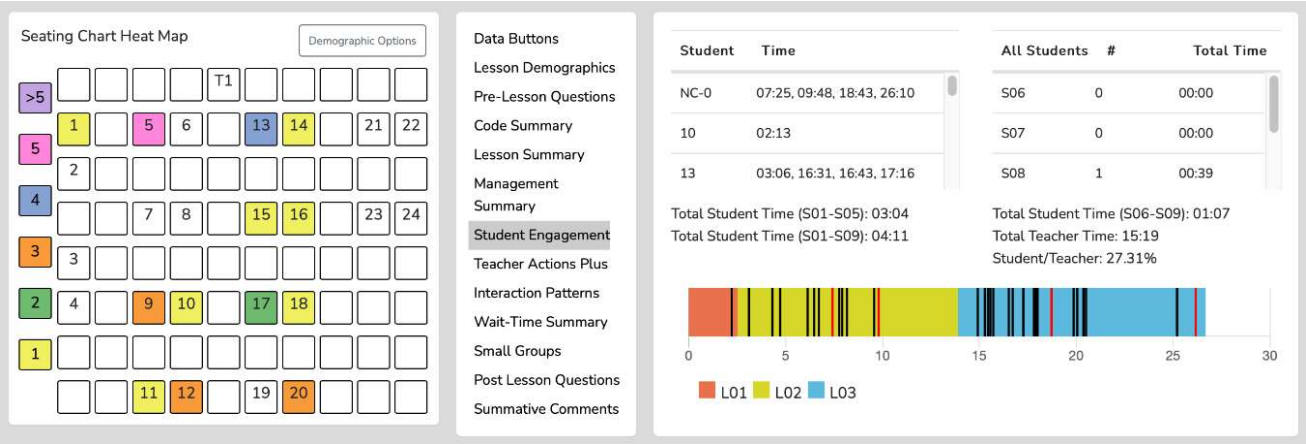
I did not need to address any individual student misbehaviors, and no group misbehaviors were noted (M12). Therefore, I did not spend any class time addressing student misbehaviors.

> **Recommendation:** None

STUDENT EVIDENCE

Student Engagement Summary

(Seats 8, 21, and 22 were not filled with students for this lesson)

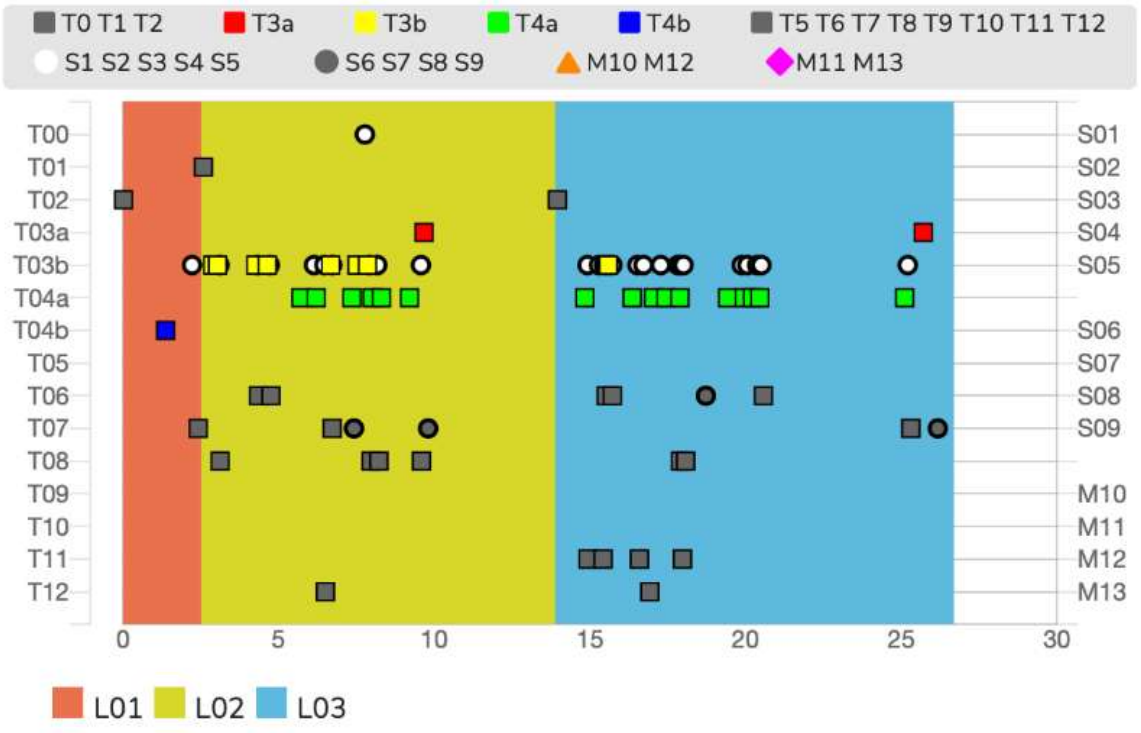


First, the Seating Chart Heat Map indicates that a little over half of the students present in the class got the chance to participate in the lesson. Second, the timeline shows that student engagement was mostly distributed throughout the lesson rather than clumped together, except when students worked independently and with a partner to solve a problem or when they were quietly thinking about a question. The Seating Chart Heat Map and the Student/Time column show that students numbered 5, 13, 9, 12, and 20 were most active when responding to questions. However, just under half of those events were voluntary, while the rest occurred because I asked students to answer. In short, student engagement was consistent throughout the lesson, but I could have spread the questions out to engage all students present.

> **Recommendation:** First, I can track students who have already participated and make sure to call on others before calling on those who have already participated. Additionally, I can call on students who are not raising their hands to engage all the students. This strategy also allows me to assess quiet students. Another option is to implement group responses using digital devices, dry-erase response boards, or think-pair-share to foster more student-student interaction.

LESSON TIMELINE

Teacher Actions Plus

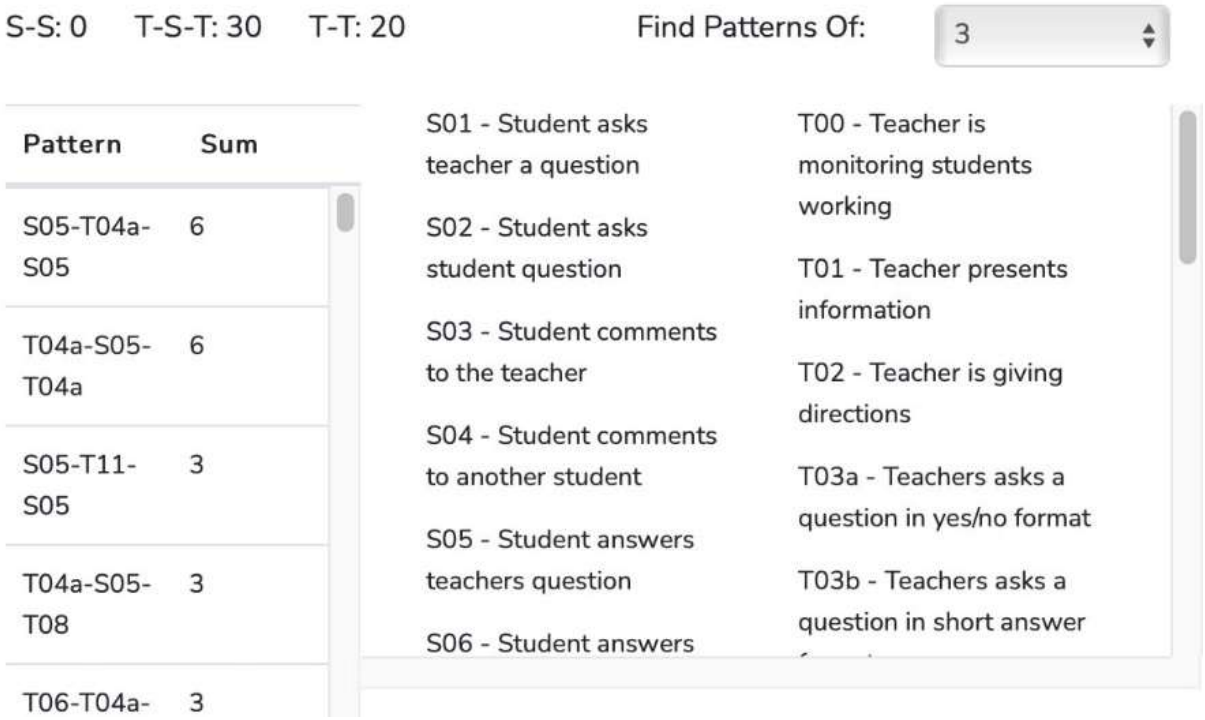


Teacher actions plus provide a digital visual story of the whole lesson, merging all teacher and student actions in one timeline from beginning to end. First, the misbehavior and teacher reactions, as indicated by the triangles and diamonds, show that zero misbehavior occurred during the lesson. Second, the white dots represent student actions, indicating that many students answered questions throughout the lesson, as noted by S05. However, it also shows zero S03 events, meaning students did not ask any questions during the lesson. The chart also shows that the answers were fairly distributed throughout the lesson, except when students were quietly thinking about and working on problems individually or with a partner. The grey dots representing teacher actions indicate that I switched between multiple different response types throughout the whole lesson. Next, the colored squares show that I asked mostly higher-level questions (T4a & T4b) and a few recall and yes/no questions (T3b & T3a). The most common teacher responses after a student's answer were repeating the student's response (T08) and acknowledging it (T06), with 6 events and 5 events, respectively. I asked the student to clarify their answer only three times (actions consistent with an inquiry lesson), spread across the entire lesson.

Recommendation: Some of the T4a questions could have been modified to be T4b questions. The recall and yes/no questions could be modified into higher-order thinking questions. The yes/no questions would be easy to change, but the recall questions used in the lesson are a little harder to adapt. One way to change the questioning is to have a student explain the work of a classmate instead of their own. This lets students think critically about how others solve problems. Next, T08 is often used to acknowledge a student's response or mirror it back to them, anticipating that the student might explain or clarify their answer further. This might work for some students. However, students in this classroom are well known for their lack of verbal participation. Therefore, the instructor might simply acknowledge the student's response (T06) and then follow it up by asking the student to clarify or expand on their answer (T11). Lastly, the ratio between T4a and T4b is huge and can be easily fixed by simply asking students to justify their reasoning when they answer a question.

INTERACTION EVIDENCE

Interaction Patterns – 3 Codes in Sequence



This graphic shows predominant patterns of three codes in sequence. There are several data points in this table worth mentioning. First, two code chains tied as the most common. These two chains are S5-T4a-S5 and T4a-S5-T4a. This shows that a common pattern I used in this lesson was to ask a T4a question, get a student's response, ask another T4a question, and get another student's response. After this, there are three code chains, each with three occurrences. One of these (S5-T11-S5) is very similar to the two most common code chains; it replaces the T4a question with a request for the student to clarify their answer. Therefore, each common code chain shares something in common: I ask a question, a student answers, and I respond. This tie most likely comes from using an equal number of higher-order questions and about the same number of teacher responses.

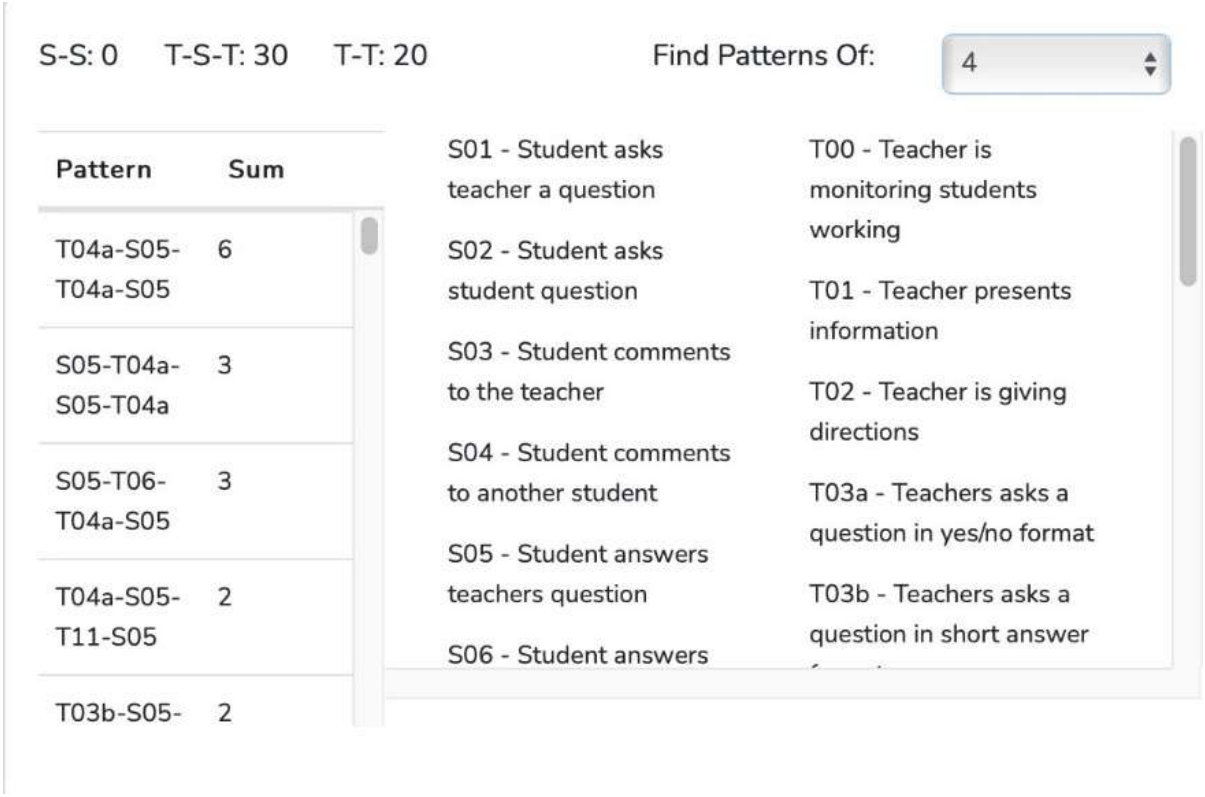
Another important indicator in this data table is that the S-S number is zero. This means that during the lesson, an S code never followed another S code. This strongly indicates that the lesson did not include enough student-student interaction. However, there was a think-pair-share event where students interacted with one another and asked questions about each other's thinking. Additionally, there were two points in the lesson where students worked in pairs, sharing ideas and thoughts to solve an inequality problem. Both were fantastic examples of student-student interaction that the codes and code chains do not fully capture.

Lastly, there were 20 T-T events. This is less than half as many T-T events as reported in the last video reflection. Therefore, I spent less time as the center of the lesson.

> **Recommendation:** A worthwhile goal would be to foster more student-to-student exchanges in the lesson. Continue using think-pair-shares to increase student-to-student talking, and try to encourage students to comment on the student boardwalk without being asked first. For example, I could use a think-pair-share to generate reactions to student responses, which engages all students for a few seconds and expands thinking and communication time for everyone, instead of the instructor always responding to student answers. I could also change the questioning in the lesson by having a student explain the work of one of their classmates instead of their own. This will allow students to think critically about how others solve problems and increase student discussion.

INTERACTION EVIDENCE

Interaction Patterns – 4 Codes in Sequence



This graphic shows predominant patterns of four codes in sequence. There are several data points in this table worth mentioning. First, the most prevalent four-code sequences revolve around asking a T4a question, getting a student's response, asking another T4a question, and getting another student's response. Moving on, the next two sets of common sequence patterns were the reverse of the most common chain (S5-T4a-S5-T4a) and the code chain S5-T6-T4a-S5, which is also very similar to the two other common code chains mentioned. Again, this shows that I heavily relied on moving from one T4a question to the next after getting a student's response. One final change this data shows is that T-code T11 was present in the lesson. This is an improvement from the last video reflection, which contained zero instances of T11 in the commonly used code chains.

> **Recommendation:** To learn more about how students are thinking, keep implementing more patterns involving T11, so it appears in more code chains. This will allow me to hear what their students are thinking when working on a problem instead of only monitoring and looking at their whiteboard work.

TIMING EVIDENCE

Wait-Time Summary

Wait-Time Type	Total Events	Total Time	Average
Wait Time 1 (T-S)	24	02:16	00:05
Wait Time 2 (S-T)	14	00:19	00:01
Wait Time 3 (T-T)	2	00:12	00:06

Code	Wait-Time 1	Wait-Time 2	Wait-Time 3	Wait-Time 4
T01				
T02				
T03a	3.50			

Research has shown the significant benefits of adequate wait time, generally defined as at least 3.5 seconds. First, the data above shows that the lesson captured 40 WT events, which is a good number for a lesson where students work on problems and then discuss them as a large group. However, there were still several opportunities to implement additional wait-time 2 & 3 in this 27-minute lesson.

Additionally, some wait-time events are so short that the observer does not have enough time to hit the wait-time bar before entering other codes. Looking at the average time for each wait-time, WT1 averages just above the recommendation at a solid five seconds. This wait time is very good, especially since 24 WT1 events were coded. However, WT2 was well below the recommendation, at one second per entry. Lastly, the data shows WT3 was much higher, at a good six seconds per entry. However, as mentioned before, the amount of WT3 used during a lesson should be increased. Finally, no WT4 was present in this lesson.

> **Recommendations:** I should look for opportunities to implement additional wait-time events in the lesson. Additionally, I can also work on increasing wait time after listening to a student answer a question (WT2). This matters because giving the student more time after speaking might encourage them to continue and expand on their answer or thoughts. I could count on my fingers to ensure they use the proper amount of wait time before speaking after a student's response. Additionally, implementing more WT3 would ensure the teacher does not rush the class and takes time to wait for responses before reframing a question or moving on to another problem or topic.

Small Group Summary

This lesson included no small group activities. Therefore, the Small Group Summary is irrelevant and void of data.