

Coding Manual for ELK Conversations

In order to evaluate the quality of conversations, more specifically the quality of teachers' questioning strategies, we use the ELK coding manual to categorize the moves of teacher messages.

For every "teacher" message in a conversation, it needs to be assigned one or multiple "code(s)". The first step of coding is to decide whether this message has substantive meaning. In the following cases, the message is considered as NA (no substantive meaning), which means we do not need to further assign a questioning move to it.

NA

The category indicates that a message does not have any substantive meaning. There are several example cases where a message can be assigned an NA code.

- Language markers; content-irrelevant messages.
 - You're a disgrace
 - Fail
 - Bye
- Repetition of the previous line, correcting a typo in the previous line; one whole sentence is broken up into two separate lines
 - [First line: How about the equation $a(x)+s+10$; Second line: $a(x)+s = 10$]
 - [First line: What happens when the equation is changed to $a(x)=10$? ; Second line: What could be the values of a and x ?]
 - Conversation:
 - Teacher: "it usually has a letter and an equal sign in it" (Telling)
 - Student: "great!"
 - Teacher: "Do you understand?" (NA)

If a message is not an NA, it will then be assigned one or more question move code(s). Each message can have any number of codes attached to it.

Priming

These are meta-messages set the context for the conversation. They might appear at the beginning of the conversation or later to bring the conversation back to the topic/goal. Although useful, *Priming* messages should be used in moderation.

- **Greetings, set the context for conversation at the beginning of the conversation; greetings or check-in messages in the middle of conversations**
 - Hi. Is it okay if I ask you a few questions about circles?
 - Excellent Kaitlin! See? You knew more about equations than you thought! So let's try something a little harder. How would you solve $x+p=q$ for x ?
(Priming+ Eliciting+Evaluating)
- **Meta-messages to explain teacher intention**
 - [after a student asks, "Is that right?"] I will tell you all about that during class today, but for now I just want to understand your ideas.
 - [after evaluating] That is not quite what it is in here but during our lesson i will help to show you how to do it properly
 - I will explain that later, but for now I want to understand what you understand about the material.
- **Meta-messages about teacher plans, next steps, set norms**
 - Wonderful! Let's do a fun one:)
 - Yeah, we will be using the order of operations in our time in algebra. Have you ever solved any math problems with letters along with numbers?
(Priming+Eliciting)
 - Conversation
 - Teacher: "Do you have background knowledge in solving $x+p=q$?"
(Eliciting)
 - Student: "No, I don't";
 - Teacher: "okay not a problem" (Priming)
 - But that being able to substitute numbers into the variables is a good lesson to learn in algebra (Priming + Telling)

- Messages that are hints, or remind students to pay attention to something
 - Conversation:
 - Teacher: “Could you give me an example of a simple equation?” (Eliciting)
 - Teacher: “Feel free to use variables in your answer.” (Priming)

Eliciting

These are questions that introduce a new topic or broaden the discussion (as opposed to follow-up questions that go deeper). For example, if the teacher is asking the student about circles, initial questions about the area or circumference would be *Eliciting* messages.

- Ask students what they know about a topic (prior knowledge)
 - What do you know about the area of a circle?
 - Tell me what you remember about sentence structure.
 - What do you already know about variables?
- Ask students to solve a specific problem
 - If I gave you an equation like $2x=4$, how would you go about solving that?
- Ask a similar question again, did not go deeper
 - Conversation
 - Teacher: “If I were to give you $x+p=q$, would you know how to solve?” (Eliciting)
 - Student: “yes”
 - Teacher: “How do you do it?” (Eliciting)
 - Conversation
 - Teacher: “What can you tell me about how variables function?” (Eliciting)
 - Student: “I don’t know anything about variables besides you stick em’ next to numbers”
 - Teacher: “Do you know what they represent?” (Eliciting)
 - Conversation
 - Teacher: “That’s right! So if I asked you to solve $2a-4=4$, what do you think a would stand for?” (Eliciting)

- Student: "1"
 - Teacher: [Telling messages]
 - Teacher: "How do you think we could solve for a?" (Eliciting)
- Ask a second question about the same topic, though on a different skill
 - Conversation
 - Teacher: "How well do you know about rational numbers?" (Eliciting)
 - Student: "I know a little about rational numbers"
 - Teacher: "Well do you know how to add and multiply numbers?" (Eliciting)
 - Conversation
 - Teacher: "ok! Here's an equation. What is $2*3=?$ " (Eliciting)
 - Student: "6"
 - Teacher: "That's right, here's a harder one. What is $5*7+9?$ " (Evaluating+Eliciting)

Probing

These are follow-up questions that go deeper into what the student thinks. It is often impossible to tell the difference between *Eliciting* and *Probing* messages without context.

- From abstract to specific, exemplification of a concept.
 - Conversation:
 - Teacher: What do you know about the circumference of a circle? (Eliciting)
 - Student: The circumference of a circle is $2\pi r$.
 - Teacher: What's the circumference of a circle with diameter 6? (Probing)
- Ask follow-up question(s) about the student's thought process, e.g., why did you xxx, how did you xxx.
 - Conversation:
 - Teacher: If I gave you the equation $x+3=5$ and asked you to solve for x what would you do to solve it
 - Student: $2+3=5$
 - Teacher: Not quite. How did you get that answer?

- Conversation:
 - Teacher: "Hello class! Today we will be talking about variables! What do you already know about variables?" (Eliciting)
 - Student: "They are in equations and we solve for the unknown letter."
 - Teacher: "That's a great start. Why do we solve for the letter?" (Probing)
- Synthesize skills/questions that have been tested/asked before. E.g., ask one question that combines two knowledge components discussed before.
 - Conversation:
 - Teacher: "How would you go about solving $2+x=4$?" (Eliciting)
 - Student: "subtract the 2 from both sides.. Then it gives you $x=2$ "
 - Teacher: "Good! Now for a more difficult question... how would you solve $4x=12$?" (Eliciting, because it's asking a different skill compared to the first question)
 - Student: "you would divide the 12 by 4 giving you $x=3$ "
 - Teacher: "Great! Now let's put it all together. Can you tell me what x equals in $4x+2=14$?" (Probing)
 - Ask follow-up question(s) that go deeper into the same topic (skill)
 - Conversation:
 - Teacher: What do you know about word order? (Eliciting)
 - Student: The noun comes before the verb.
 - Teacher: Is this always true? Or are there ever nouns after verbs in a sentence? (Probing)
 - Conversation:
 - Teacher: "What is an example of a variable you are familiar with?" (Probing, because it's an follow-up of the previous question)
 - Student: "x is a common variable in math for an unknown number."
 - Teacher: "Do you know any other variables common in math?" (Probing)
 - Conversation:
 - Teacher: "What can you tell me about equations?" (Eliciting)
 - Student: "that there is an equal sign separating the two parts of the equations."

- Teacher: "Okay... could an equation look like this though? $4+9=x$?" (Probing)
- Student: "yes, you just have to read it backwards instead of $x = 4+9$ "
- Teacher: "What if I gave you an equation that looks like this: $2x=6$? Could you tell me how you would get the x on one side, by itself like the equation above?" (Probing)
- Student: "you would take the number that is attached to the variable and divide it on the other side since the 2 and the x are being multiplied you divide to undo it."
- Teacher: "And if we had an equation like this: $2x+6=12$? How would you get the x by itself this time?" (Probing)
- Conversation:
 - Teacher: "What do you know about equations?"
 - Student: "they help you find out what X is"
 - Teacher: "What does X stand for?" (Probing)

Evaluating

These messages tell the student if they were right or wrong, either explicitly or implicitly. They often lead to *Telling* messages and distract the student from the goal of figuring out their preconceptions.

- Simple evaluation a student's response
 - Nice!
 - Not quite.
 - That's right.
- Both evaluate and tell. Usually it's evaluating the student's answer through telling them what the correct answer is.
 - You're confusing the radius with the diameter.
 - If it were 1, that would make the equation $2(1)-4$, which would be $2-4$, which would then be -2 . (Evaluating+Telling)

Telling

These are messages in which the teacher explains what's true. While important during instruction, they are distracting if the goal is to figure out what the student already knew or believed.

- **Tell student the answer**
 - The circumference of a circle is $2\pi r$.
- **Tell student high-level knowledge**
 - But that being able to substitute numbers into the variables is a good lesson to learn in algebra ([Priming + Telling](#))
- **Evaluate + Tell**
 - You're confusing the radius with the diameter. ([Evaluating + Telling](#))
 - You are correct about the letter representing a number, however you aren't quite getting how they work. ([Evaluating + Telling](#))