UNIVERSITY OF CAMBRIDGE
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CEDiR
Cambridge Educational Dialogue Research Group

DEVELOPING AND ADAPTING CODING SCHEMES FOR EDUCATIONAL DIALOGUE

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Outline

- Educational dialogue
- Systematic coding
- SEDA scheme and its repurposing into other schemes: CDAS, T-SEDA, Tech-SEDA
- Conclusions

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PART I

Dialogue, coding and a foundational scheme

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Educational dialogue takes place between teachers and students of all ages, in peer groups, face-to-face and online

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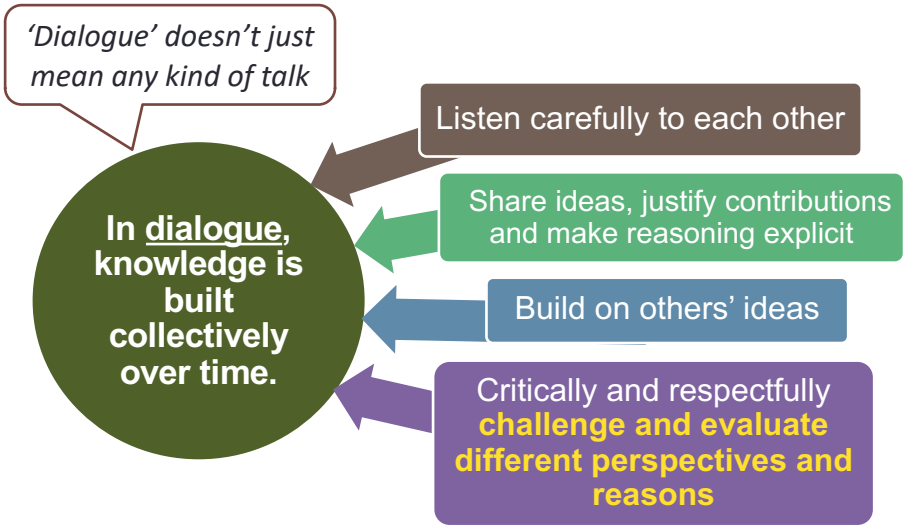
What is the form of classroom dialogue?



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How do we identify high quality dialogue?
Coding dialogue

Systematically applying pre-defined categories, using a variety of techniques:

Forms of coding:
- Rating scales
- Counting systems

Coding methods:
- Live observation
- Audio recordings
- Video recordings
- Transcript

Levels of coding:
- Turn by turn
- Sequence
- Lesson / session
- Series of sessions

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Coding decisions

Hennessy, Howe, Mercer & Vrikki, LCSI, 2020

- Categorise dialogic interaction only? (leaves gaps)
- Categorise teacher and/or student dialogue? (tools may differ)
- Group into clusters to reduce coding time & increase reliability?
- Granularity? micro-level (*clause, sentence, utterance, turn);* meso-level (*exchange/ sequence/ topic/ communicative event/ episode)*; macro-level (*lesson/session* or *lesson sequence*)

Ethnography of communication
(Hymes, 1972; Saville-Troike, 2003)

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Systematic coding schemes: **pros**

- increase **generalisability**
- rapidly reduce and process **large quantities of data**: coding is sometimes the *only* feasible method
- search dataset efficiently and see how specific acts manifest themselves; see turn-taking & other **patterns**
- **chart change** over time
- **comparing** forms of dialogue **across contexts** (e.g. across activities/subjects, groups, classrooms, schools/institutions, countries)

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Systematic coding schemes: **cons**

- temporal development of meanings is lost *(Mercer, 2004);* ignoring how codes work in combination has its limitations
- pre-determined categories can limit researcher's sensitivity to what happens
- dealing with ambiguity of meanings; utterances with same surface form can have different functions
- likewise, multiple meanings or purposes can be communicated by identical words

We can use **complementary methods** to strengthen the approach; our work includes sociocultural discourse analysis (qual. + concordance) *(Mercer, 2004).*

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Dialogue coding frameworks

SEDA – Scheme for Educational Dialogue Analysis (33 categories): Rojas-Drummond; Higham, García Carron, Howe, Hofmann, Kershner, Maine, Mercer, Warwick (UK); Torreblanca, Velez, Pedraza, Vega, Mazón, Fernández, Ríos, Márquez, Estrada, Hernández, Guzmán, Alarcón, Barrera, Trigo, Hernández, López (Mexico)

CDAS (12): Howe, Mercer, Vrikki, Wheatley

T-SEDA (10): Kershner, Calcagni, Ahmed, Trigo Clapes, Vrikki, Brugha, Twiner…

Tech-SEDA (13): Torreblanca, Alarcón (Mexico); Major, Liu, Gomez, others… (UK); Chan, Tong, van Aalst (Hong Kong);

See Tao & Chen's 2023 (LCSI vol. 39) systematic review of coding schemes for dialogic teaching
&
Bouton & Asterhan's distillation of dialogue elements from 7 popular schemes (LCSI vol. 40)

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SEDA (Cam-UNAM **S**cheme for **E**ducational **D**ialogue **A**nalysis)

- Produced by a 3-year UK-Mexico collaboration *(Hennessy, Rojas-Drummond et al., 2016: LCSI 2016)*
- Based on comprehensive literature review, mapping onto key coding schemes, extensive piloting: captures what key **theorists consider optimal features/forms of dialogue**
- 33 categories for systematic coding of **utterances/turns**
- grouped into 8 **clusters**
- + 16 (draft – unpublished) broader categories for representing interaction **sequences**, e.g. 'monitor participation in dialogue', 'debate different opinions/ideas'

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SEDA

- Reliably measures dialogicality
- Applies across cultures, subjects, ages, whole class & peer groups...
- Can be adapted widely
- No distinction between teacher and student moves

Cam-UNAM SEDA Condensed version ©2016: Cluster and Code Summary

	I – Invite elaboration or reasoning		R – Make reasoning explicit
I1	Ask for explanation or justification of another's contribution	R1	Explain or justify another's contribution
I2	Invite building on / elaboration / (dis)agreement / evaluation of another's contribution or view	R2	Explain or justify own contribution
I3	Invite possibility thinking based on another's contribution	R3	Speculate or predict on the basis of another's contribution
I4	Ask for explanation or justification	R4	Speculate or predict
I5	Invite possibility thinking or prediction		
I6	Ask for elaboration or clarification		B – Build on ideas
		B1	Build on /clarify others' contributions
	P – Positioning and Coordination	B2	Clarify/elaborate own contribution
P1	Synthesise ideas		
P2	Evaluate alternative views		C – Connect
P3	Propose resolution	C1	Refer back
P4	Acknowledge shift of position	C2	Make learning trajectory explicit
P5	Challenge viewpoint	C3	Link learning to wider contexts
P6	State (dis)agreement/ position	C4	Invite inquiry beyond the lesson
	RD – Reflect on dialogue or activity		G – Guide direction of dialogue or activity
RD1	Talk about talk	G1	Encourage student-student dialogue
RD2	Reflect on learning process/ purpose/ value/ outcome	G2	Propose action or inquiry activity
RD3	Invite reflection about process/ purpose/ value/ outcome of learning	G3	Introduce authoritative perspective
		G4	Provide informative feedback
	E – Express or invite ideas	G5	Focusing
E1	Invite opinions/beliefs/ ideas	G6	Allow thinking time *[optional when not verbally explicit]*
E2	Make other relevant contribution		

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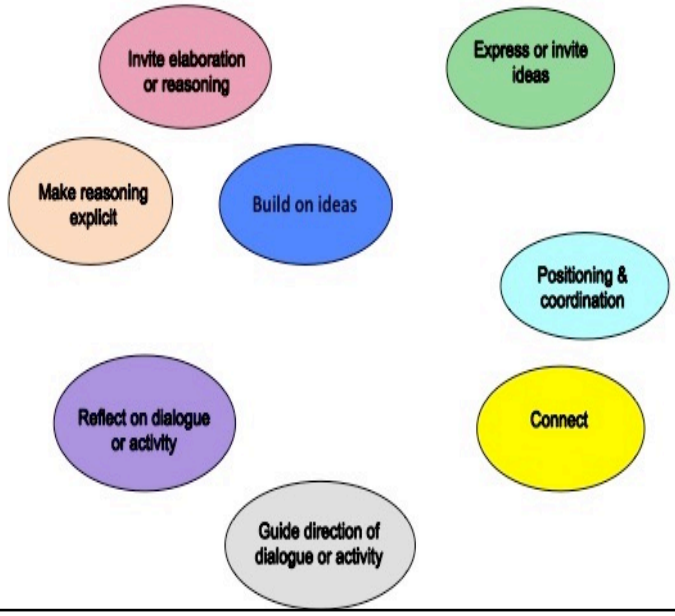
SEDA Clusters



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Adapting codes for different learners

	Younger students: you might hear simpler language:	**Older students:** you might hear more formal language:
Build on Ideas (clarify / add something new)	'And…'; 'So then…'; 'Oh yeah…' 'The mouse was brave' 'Yes, the mouse was brave, and sneaky'	'I agree that…'; 'That's a good point'; 'We started off thinking…, and then…' 'Sanjay's contribution made me think about the article we read last term where…'
Challenge/ query/ disagree	'No!'; 'But…'; 'It can't be…'; 'No, I'm not scared of the skeletons, they look friendly'	'I disagree that…'; That doesn't seem right '; ' That isn't possible, because…'; 'That's partially true, but not when the force is larger…'
Reason / explain / justify / predict	'Because…' 'I think if I made a giant jam sandwich the bread would get too squishy'	'Therefore', 'Thus,' 'In order to' 'The ice caps melting by 10% supports the global warming theory.'

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Dialogic teaching strategies for engaging learners on the autistic spectrum in class discussion

(B) When 'building' ideas in a class discussion	• Represent visually and physically how ideas are being combined to 'build' a collective idea • Allow adding ideas to a conversation that has finished in written form
(CH) When questioning & challenging ideas	• Probe the students' understanding of the class activity or discussion
(RB) Refer back to rules and steps	• Break down discussions into steps and refer to them • Refer to rules for talking • Refer to the timetable of the day
(RD) When reflecting on dialogue	• Dedicate a moment to talk about the steps and components of a discussion • Monitor negative thoughts or feelings during class discussions
(G) Guide the students' participation	• Assign students specific roles in a discussion • Suggest and model alternative forms of communication to speech

Ana Laura Trigo Clapés, 2022

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Coding challenges

- Distinguishing some codes reliably, eg P5 (challenge viewpoint) and P6 (state [dis]agreement/position). Explicitness. (Reliability = 0.54-0.88/cluster, mean = 0.74
- Coding at cluster level increases reliability but looking closely at communicative acts allowed for richer interpretation of data
- Multiple code use and segmentation of communicative acts in extended turns: tension between frequency counts and assessing quality of dialogue

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PART II

Example of multilayered analysis

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"Classroom dialogue: Does it really make a difference for student learning?"

http://tinyurl.com/ESRCdialogue

- ESRC-funded, 27-month project:
  Christine Howe, Sara Hennessy, Neil Mercer, Maria Vrikki, Lisa Wheatley (*Journal of the Learning Sciences 2019: 28)*
- **Main question:**

  Does the quality of teacher-student dialogue (whole-class, group, 1:1) influence student outcomes?
- 2 lesson videos from different subjects recorded and analysed in each of 72 classrooms in England: children aged 10-11 (n=144 lessons)

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Repurposing SEDA

Why?

- Fewer than 33 codes are desirable to apply reliably and readily: wanted something at a medium level of granularity for this research project
- Codes needed to be mutually exclusive for frequency counting & statistical analyses
- A few codes relating to specific turns, e.g. 'talk about talk', can also characterise interaction sequences (e.g. co-constructing ground rules for discussion)

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Analyses

Identified 'dialogicality' levels using

1. Coding scheme: Systematically coding 12 'dialogic moves' at the turn level using CDAS (Vrikki et al, 2018), adapted from the 33-code SEDA (Hennessy, Rojas-Drummond et al, 2016)

2. Rating scales: student participation vs teacher direction in activities across whole lesson

THEN **Multilevel modelling** related naturally occurring variation in dialogue to student outcome measures

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Cambridge Dialogue Analysis Scheme (CDAS)

- **Many codes (Building on/Elaboration, Reasoning, Refer Back) preserved or slightly collapsed**
- **Some categories modified / expanded:**
  - Tightened definitions of speculation/prediction categories to require justification
  - Introduced several "coordination of ideas" codes, where bringing in additional info is key
  - Agreement and Querying include simple (explicit) statements of (dis)agreement
  - SEDA contained an (optional) cluster Expression of ideas (E); in CDAS invitations for E were coded as Other Invitations (OI), propositions were incorporated in Student Participation dimension

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Turn-level Analysis: Cambridge Dialogue Analysis Scheme (CDAS)

Codes		Examples
ELI	Elaboration invitation	'Have you noticed anything else that the poet uses?'
EL	Elaboration	A: 'It's sort of describing how you do it B: 'Yes, it's got a good emphasis and good use of vocabulary'
REI	Reasoning invitation	'Why do you think the bottle floats?'
RE	Reasoning	'He came back because he made a promise.'
IC	Co-ordination invitation	'Would anyone like to summarize the ideas we've been hearing?'
SC	Simple co-ordination	'Some of you are talking about weight and some about size; both matter – things float when they're light for their size'.
RC	Reasoned co-ordination	'We've been arguing about how much of personality is inherited; twin studies show conclusively it's 50%'.
A	Agreement	'Brilliant'; 'I agree with James'
Q	Querying/challenge	'I don't think that's quite right.' 'I disagree with Mary'
RB	Reference back	'Can anyone remember which of the animals we saw at the zoo are nocturnal?'
RW	Reference to wider context	'It's like in Macbeth where the storm builds into it'.
OI	Other Invitations	'Do you want to go first?' 'What do you know about magnets?'

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Assessing validity of coding strategy

Independent evaluations from experts

- 5 sample transcripts of different levels of dialogicality were identified using our coding
- Transcripts sent to 6 international scholars (and their teams) from diverse theoretical perspectives: asked to evaluate and rank order them for dialogicality **using their own criteria**
- **Significant degree of consensus** (especially at extreme ends) **but also some dissension!** Specific criteria for 'educationally productive' dialogue and worthwhile learning outcomes need agreement

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Rating Scales

Student participation: Do multiple students express ideas publicly, at length, actively engaging with others' ideas?

0	1	2
Not explicit/ apparent	Teacher-led	Student-led/ Negotiated

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Inter-coder reliability testing

- Team of 4 coders conducted **pilot reliability rounds** (in alternating pairs) over 5 months, establishing rules and generating examples to distinguish codes
- **Range for moves**: Cohen's *k* = 0.58-0.80 (**mean** 0.68)
- **Range for rating scales:** 75-92% agreement (**mean** 83%)

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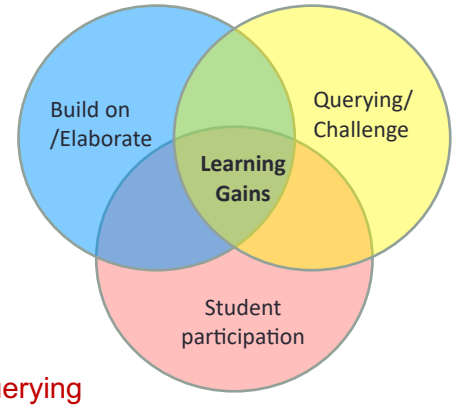
Headline findings: Student learning



High levels of Elaboration or Querying (preferably both) were very helpful for learning when combined with high levels of active Student Participation across the lesson

- Significant boosts to performance on English (spelling & grammar) and mathematics standardised tests (SATs)

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PART III

T-SEDA

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T-SEDA: Toolkit for Systematic Educational Dialogue Analysis (http://bit.ly/T-SEDA)

Coding is not just for academic researchers:
T-SEDA reflective inquiry toolkit with simple coding scheme tools and templates for teachers' own systematic observation

T-SEDA is in 9 languages and tested in 15 countries; web version and courses for practitioners coming on camtree.org

Camtree
CAMBRIDGE TEACHER RESEARCH EXCHANGE

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Contents of T-SEDA

A user's guide	• Introduction to educational dialogue • Examples and guidance for planning an inquiry; short videos
Core Resources	• **Self-assessment dialogue rating tools** for educators and students • **Reflective cycle:** steps for designing, conducting, sharing and reflecting on one's inquiry • **Coding scheme and templates for observing, coding & rating dialogue** in groups and whole class
Additional Resources	• Guidance on ethics, recording, transcribing • Case study examples of practitioner inquiries • References to research on dialogue

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The T-SEDA coding framework

IB – Invite to build on ideas	**CA - Coordination of ideas and agreement**
B – Build on ideas	**RD – Reflect on dialogue or on activity**
CH – Challenge	**C – Connect**
IR – Invite reasoning	**G – Guide direction of dialogue or activity**
R – Make reasoning explicit	**E – Express or invite ideas**

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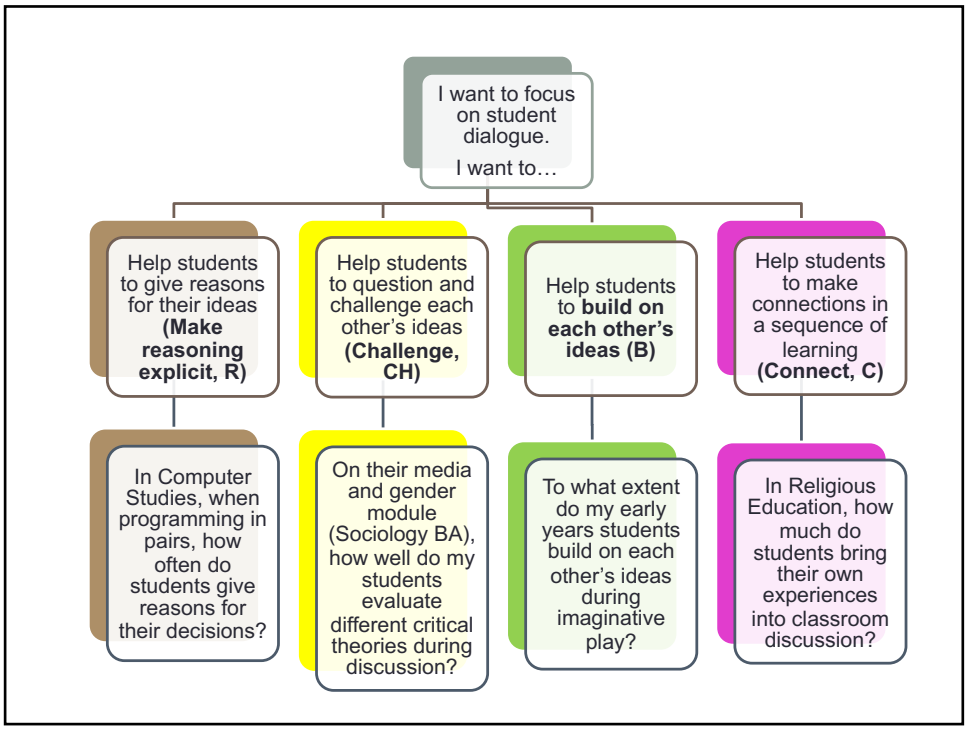
I want to focus on student dialogue.
I want to…
Help students to give reasons for their ideas **(Make reasoning explicit, R)**
Help students to question and challenge each other's ideas **(Challenge, CH)**
Help students to **build on each other's ideas (B)**
Help students to make connections in a sequence of learning **(Connect, C)**
In Computer Studies, when programming in pairs, how often do students give reasons for their decisions?
On their media and gender module (Sociology BA), how well do my students evaluate different critical theories during discussion?
To what extent do my early years students build on each other's ideas during imaginative play?
In Religious Education, how much do students bring their own experiences into classroom discussion?

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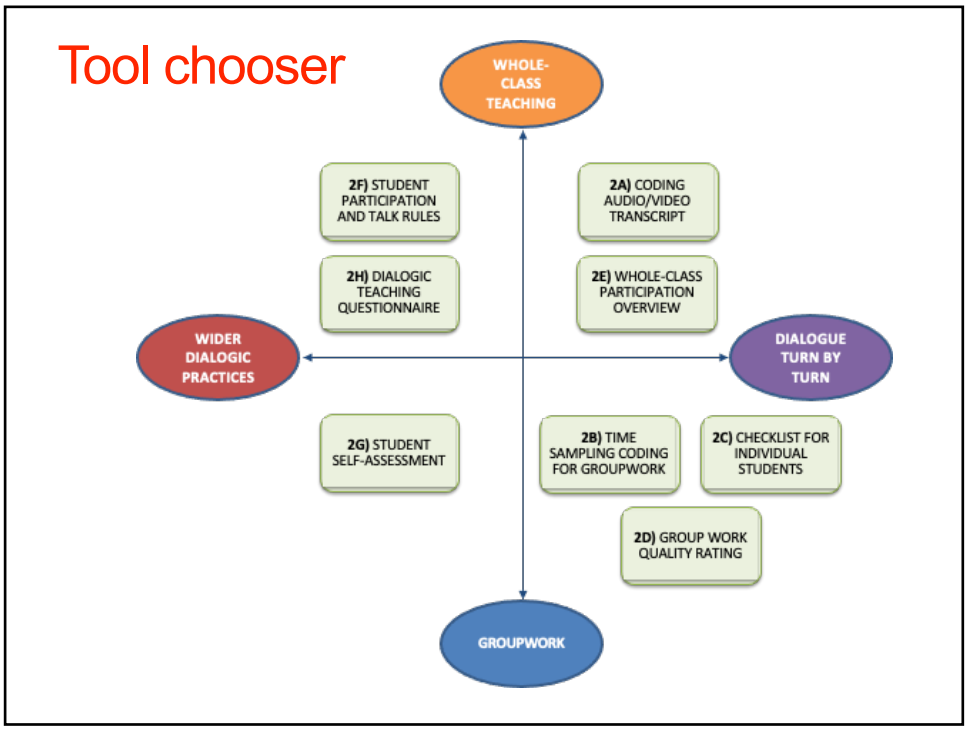
Tool chooser
WHOLE-CLASS TEACHING
2F) STUDENT PARTICIPATION AND TALK RULES
2A) CODING AUDIO/VIDEO TRANSCRIPT
2H) DIALOGIC TEACHING QUESTIONNAIRE
2E) WHOLE-CLASS PARTICIPATION OVERVIEW
WIDER DIALOGIC PRACTICES
DIALOGUE TURN BY TURN
2G) STUDENT SELF-ASSESSMENT
2B) TIME SAMPLING CODING FOR GROUPWORK
2C) CHECKLIST FOR INDIVIDUAL STUDENTS
2D) GROUP WORK QUALITY RATING
GROUPWORK

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PART IV

Multimodal analysis

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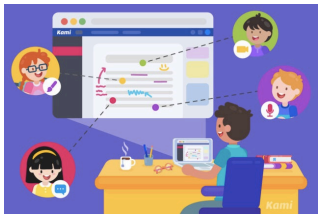
Multimodal analysis



Dialogue is not just talk:

- Interactions involve multiple, diverse but complementary modalities of meaning making (*Kress, 2010; Lemke 1999*).
- **Nonverbal interaction** (e.g. gesture, gaze, facial expression, physical movement), including with tangible or digital artefacts, in particular, can frame & support/hinder the spoken conversation
- '**Multimodal analysis** sheds light on the other ways in which [talk] is negotiated in modes beyond the linguistic' *(Cowan, 2014, p. 18)*

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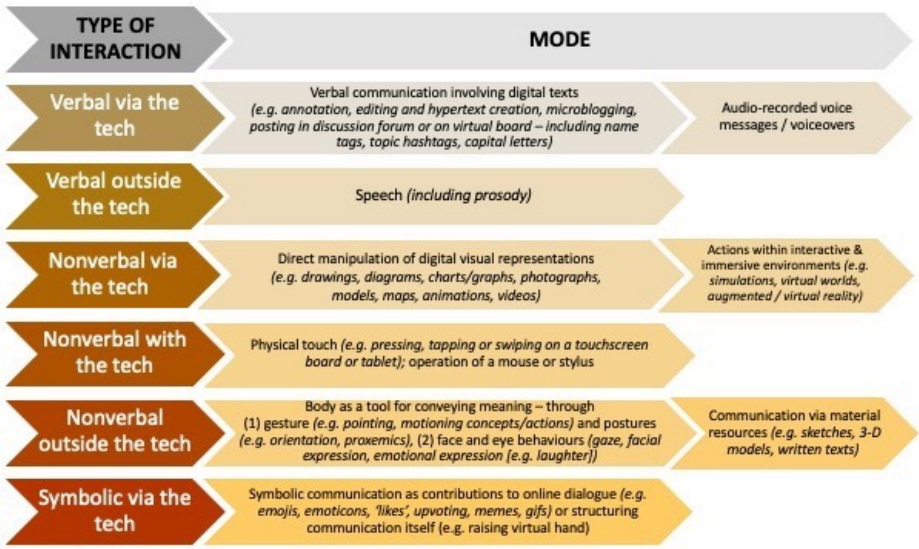
Modes of tech-mediated dialogue and spatial location



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Tech-SEDA: Technology Scheme for Educational Dialogue Analysis

IB	**Invitation to build on ideas**	Invite elaboration, evaluation, clarifying, commenting
B	**Building on ideas**	Build on, elaborate, evaluate, clarify or comment
CH	**Challenge**	Query, doubt, disagree, challenge, reject idea
IR	**Invitation for reasoning**	Invite explanation, justification, speculation, prediction
R	**Reasoning**	Make reasoning explicit, provide explanation
IC	**Invitation for co-ordination**	Invite synthesis, comparison, evaluation, resolution
SC	**Simple co-ordination**	Synthesise, summarise, compare collective ideas
RC	**Reasoned co-ordination**	Compare, evaluate, resolve in a reasoned fashion
II	**Inquiry Invitation**	Invite problem posing; dialogic inquiry questions
RB	**Reference back**	Refer to previous common knowledge, contributions
RW	**Reference to wider context**	Link learning to experiences / resources outside the context
F	**Focusing**	Guide direction of dialogue, highlight salient ideas
RD	**Reflection on dialogue or activity**	Evaluate or reflect "metacognitively" on dialogue/activity

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1. Dialogic inquiry with Zoomabc:
Why does area of any rectangle = width x length?

Context:

- Chinese primary students (aged 9-10) in a mathematics lesson
- Zoomabc: an online, interactive learning platform on tablets

Thanks to Qian Liu for this example

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Activity: After individually making rectangles and proposing methods of calculating their areas, students screenshot and share their contributions for peer commentary

Peers browse others' ideas shared on the 'Class Circle' on Zoomabc and comment using text or voice message (IB and B: (Inviting) building on others' contributions)

Students fill in their own worksheets (SC & B: coordinating and evaluating peers' contributions, extracting key information)

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Activity: Publicly sharing individual contributions and whole-class discussion

The teacher juxtaposed four contributions on the board to compare them: *'when you view others' work, what conclusions have you found?'* (IC)

She circled two identical student conclusions (F: Focusing), probing what they meant.

She led the class to generalise the method of calculating areas of different rectangles (RC: reasoned coordination).

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2. Student-generated emojis to convey nuance when engaging in challenge

emoji	our meaning
🤔	thoughtful
😕	I don't understand
😯	I would not have thought of this myself
😊	I am saying this with a smile
😄	I am glad that you said this
⚖️	just playing Devil's advocate
😟	sorry, that wasn't how I meant it

Thanks to Lisa Hay for this example

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Methodological challenges

Entanglement of modes means selecting unit of analysis is more complex: boundaries of 'turns' in multimodal dialogue aren't obvious and may overlap, e.g. talk is commonly entwined with nonverbal action
(Jordan & Henderson 1995; Samuelsson et al. 2021; Tomasello 2003).

Level of inference in interpreting nonverbal modes. Visibly explicit verbal contributions include annotation of objects, posts to a discussion (externalizing ideas) whereas nonverbal actions and manipulation of objects lack clues to participant's intention.

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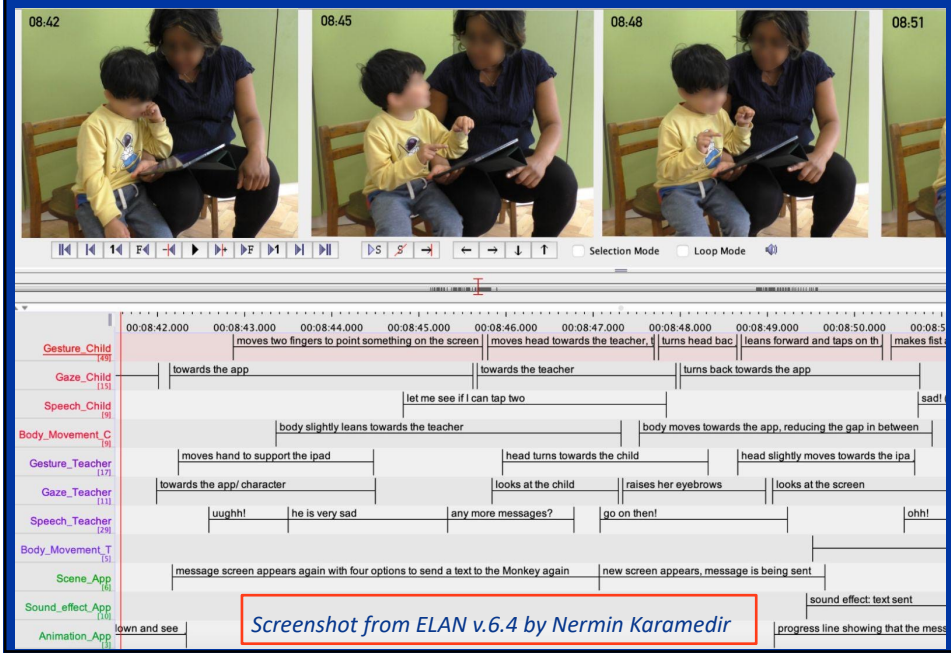
Multimodal video transcript



Screenshot from ELAN v.6.4 by Nermin Karamedir

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Conclusions

- **Reasonably reliable and valid systematic coding/rating tools** are available which have been widely applied across settings, and are open to testing in other contexts… but their value can be enhanced using **multi-level methods**
- **Multimodal analysis** can complement verbal analysis in valuable ways and show development of ideas. Methodological challenges arise – especially entanglement. Sequence/ episode unit of analysis is helpful but zooming in and out may be optimal.

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Further info

Papers by Hennessy, Howe, Mercer & Vrikki (LCSI 2020) & Hennessy, Calcagni, Leung & Mercer (Language & Education, 2021): doi.org/10.1016/j.lcsi.2020.100404; doi.org/10.1080/09500782.2021.1956943

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ESRC project tinyurl.com/ESRCdialogue

SEDA: http://tinyurl.com/BAdialogue

T-SEDA trials & materials: t-seda@educ.cam.ac.uk http://bit.ly/T-SEDA

CEDiR group tinyurl.com/cedirgroup

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Cambridge Educational Dialogue Research Group

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Mercer, N. (2008) The seeds of time: why classroom dialogue needs a temporal analysis. *Journal of the Learning Sciences*, *17*, 1, 33-59.

Trigo Clapés, A.(2022): *Dialogic teaching for students with conditions within the autism spectrum. Phd, University of Cambridge.*

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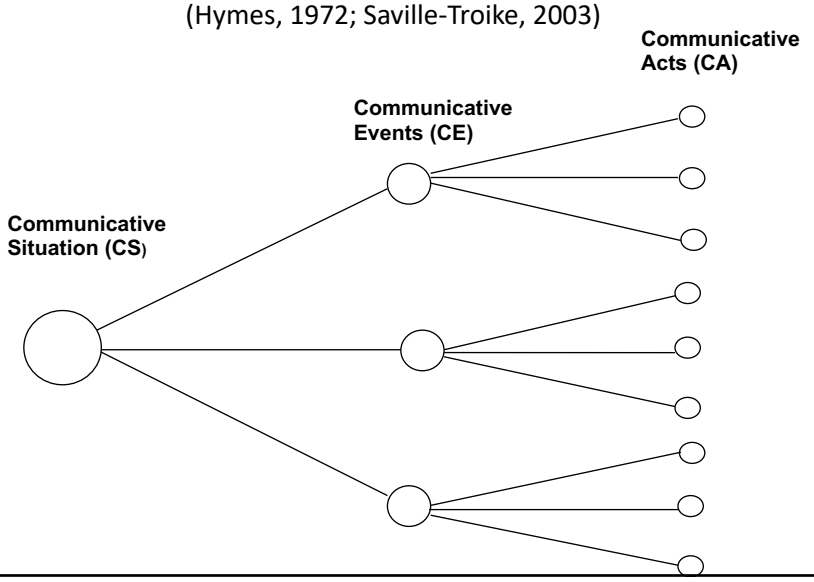
Illustration of hierarchical and nested categories from the ethnography of communication

(Hymes, 1972; Saville-Troike, 2003)



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