

# The TalkMoves Dataset: K-12 Mathematics Lesson Transcripts

## Annotated for Teacher and Student Discursive Moves

Abhijit Suresh, Jennifer Jacobs, Charis Harty, Margaret Perkoff, James H. Martin, & Tamara Sumner

Institute of Cognitive Science and Department of Computer Science, University of Colorado Boulder

### Motivation

The Common Core State Standards for Mathematical Practice place a strong emphasis on communication in math classes. Teachers can encourage communication by using "talk moves" that prompt students to engage in productive discussions around rigorous content. In addition, talk moves can be used to foster an inclusive classroom community and promote student learning.

### Project Goal

To curate a human transcribed and annotated dataset to model teachers' and students' classroom discussion strategies at scale

### Teacher and Student Talk Moves

#### Accountability to the Learning Community

1. Keeping everyone together
2. Getting students to relate to each other's ideas
3. Restating

#### Purposeful, Coherent, & Productive Discussion

4. Pressing for accuracy
3. Making a claim

#### Accountability to Rigorous Thinking

5. Revoicing
6. Pressing for reasoning
4. Providing Evidence/Reasoning

### Sample Classroom Transcript

TimeStamp	Turn	Speaker	Sentence	Teacher Tag	Student Tag	DialogAct
00:13:37	33	T	Let's erase.	1 - none		Statement-non-opinion
00:13:37	33	T	Remember, the school-- What is the school's order here?	8 - press for accuracy		Statement-non-opinion
00:14:01	34	S	1, 1.		4 - making a claim	Acknowledge (Backchannel)
00:14:02	35	SS	0, 0.	7 - context	2 - relating to another student	Acknowledge (Backchannel)
00:14:04	36	T	Zero, zero, so that is where you have to start.	5 - revoicing		Statement-non-opinion
00:14:04	36	T	How many blocks was that?	8 - press for accuracy		Statement-non-opinion
00:14:50	37	Bruce	11	7 - context	4 - making a claim	Acknowledge (Backchannel)
00:14:18	38	T	There's one and that's 11.	5 - revoicing		Statement-non-opinion
00:14:18	38	T	Did anybody else have that one?	3 - getting students to relate		Statement-non-opinion
00:14:18	38	T	Another idea?	3 - getting students to relate		Statement-non-opinion
00:14:18	38	T	Sammie?	2 - keeping everyone together		Statement-non-opinion

### Data Sources

DATA SOURCE	NUMBER OF TRANSCRIPTS
Inside Mathematics - <a href="https://www.insidemathematics.org">https://www.insidemathematics.org</a>	27
Third International Mathematics and Science Study (TIMSS) - <a href="http://www.timssvideo.com">http://www.timssvideo.com</a>	28
Video Mosaic <a href="https://videomosaic.org">https://videomosaic.org</a>	137
Transcripts collected through TalkBack application (talkmoves.com)	375
<b>TOTAL</b>	<b>567</b>

### Annotation

- We have a detailed annotation protocol
- The inter-annotator agreement is greater than 88% for each talk move
- TalkMoves dataset is also coded with computationally derived dialogue acts (DAs) adopted from the Switchboard Dialog Act Corpus (SWBD- DAMSL) framework, which is composed of 42 DA labels (Jurafsky, 1997)

### TalkMoves Dataset

Number of Transcripts	<b>567</b>
Total utterances	234,060
Total number of teacher utterances	174,186
Total number of student utterances	59,874
Number of words	1.8 million (15,830 unique)

### Benchmarking the dataset

Teacher Model - Transformer architecture	
Input	Student - Teacher Sentence pair
Output	Probability (Softmax) over 6 Teacher Talk Moves and "None"

Student Model - Transformer architecture	
Input	Student - Student Sentence pair
Output	Probability (Softmax) over 5 Teacher Talk Moves and "None"

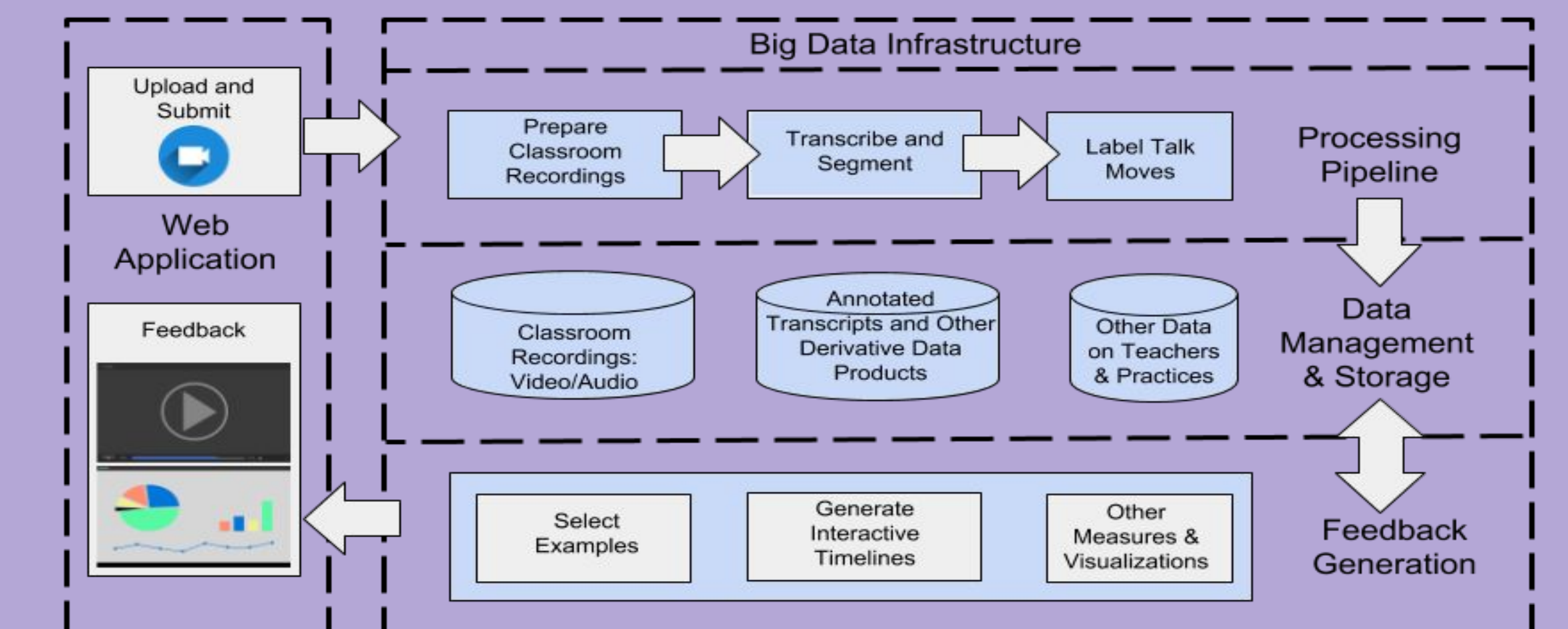
Overall performance for **teacher** talk moves (RoBERTa - Base):

F1= 76.32%  
MCC = 0.7513

Overall performance for **student** talk moves (BERT - Base):

F1= 73.12%  
MCC = 0.6716

### TalkMoves application (talkmoves.com)



### Limitations

- Data are from a tiny fraction of mathematical lessons that occur in the US
- This set of talk moves is not exhaustive (O'Connor and Michaels, 2019)
- Data is skewed towards U.S. middle school lessons (grades 6-8)
- Distribution of talk moves is non-uniform

### Significance

- Dataset is already providing numerous opportunities for researchers interested in the crossroads of Natural Language Processing and education.
  - Develop the future talk move prediction (FTMP) task (Ganesh et al., 2021)
  - To understand conversational interaction between teachers and students (Demszky et al., 2021).
  - Developing child language models for automatic speech recognition systems tailored to school environments
- Strong demand for AI based tool such as TalkMoves application based on accountable talk to provide actionable feedback to teachers

TalkMoves dataset is publicly available on Github - <https://github.com/SumnerLab/TalkMoves>

### Acknowledgements

The research team would like to thank Eddie Dombower and his team at Curve 10 for their contributions to the design and implementation of the TalkBack application. This material is based upon work supported by the National Science Foundation under Grant Numbers 1600325 and 1837986. This research was also supported by the NSF National AI Institute for Student-AI Teaming (iSAT) under grant DRL 2019805. The opinions expressed are those of the authors and do not represent views of the NSF.