

Multiparty Co-Learning and Transdisciplinary Collaboration

*Cultivating Critical AI Literacy in the Development of Automated
Speaking Assessment for high-stakes examinations*

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"Global Englishes AI-assisted Virtual Reality Interactive System"

About

Today's presentation

1. The background of the “GAVIS” project - funded by QEF eLAFP
 - a. What is HKDSE
 - b. The project overview
2. Three stories about GAVIS
 - a. Narrative inquiry + action research
 - b. Stories of the three developmental stages
3. Multiparty co-learning and trans-disciplinary collaboration

PART I: The “GAVIS” project

A government-funded research-informed EduTech project
Quality Education Fund e-Learning Ancillary Facilities Programme
by the Hong Kong Education Bureau

WHAT

does the **HKDSE*** English speaking assessment look like?

(Hong Kong Diploma of Secondary Education Examination)

狂爭第一

2023 DSE

98% 5**

HKDSE Speaking Assessment Context

The Assessment:

- 40,000+ annual candidates
- Group discussion format
 - 4 candidates, 8 minutes
- Four assessment criteria (band 1-7):
 - Pronunciation & Delivery
 - Communication Strategies
 - Vocabulary & Language Patterns
 - Ideas & Organisation

HKDSE English Language Paper 4 Speaking

ASSESSMENT GUIDELINES

	I. Pronunciation & delivery	II. Communication strategies	III. Vocabulary & language patterns	IV. Ideas & organization
7	Projects the voice appropriately. Pronounces all sounds/sound clusters and words clearly and accurately. Speaks fluently and naturally, with very little hesitation using intonation with some sophistication to enhance communication.	Uses appropriate body language to display and encourage interest. Uses a full range of strategies skilfully to initiate and maintain interaction and to respond to others.	Makes accurate use of an impressive range of vocabulary. Uses varied and highly accurate language patterns. Rephrases skilfully when necessary.	Expresses an impressive range of well-developed complex ideas clearly and fluently. Expands and elaborates with impressive detail. Consistently responds effectively to others, sustaining and extending conversational exchanges effortlessly.
6	Projects the voice appropriately. Pronounces all sounds/sound clusters and words clearly and accurately. Speaks fluently and naturally, with only occasional hesitation using suitable intonation to enhance communication.	Uses appropriate body language to display and encourage interest. Uses a full range of strategies effectively to initiate and maintain interaction and to respond to others.	Makes accurate use of a wide range of vocabulary. Uses varied and accurate language patterns; only minor slips made, which do not impede communication. Rephrases effectively when necessary.	Expresses a wide range of well-developed relevant ideas clearly and fluently. Expands and elaborates in detail. Consistently responds effectively to others, sustaining and extending conversational exchanges.
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4	Usually projects the voice satisfactorily. Pronounces most sounds/sound clusters and words clearly and accurately; less common words usually comprehensible. Speaks reasonably fluently although with some hesitation in longer utterances. Uses intonation sufficiently to convey meaning.	Uses some features of body language to support communication. Uses a range of appropriate strategies to initiate and maintain interaction and to respond to others.	Makes generally appropriate use of vocabulary. Makes use of generally accurate language patterns. Errors do not generally impede communication. Self corrects when concentrating carefully or when asked to do so.	Expresses some relevant ideas clearly. Most ideas are developed and linked. Elaborates on most contributions appropriately. Generally responds appropriately to others. Sustains most and may extend some conversational exchanges.

MANAGING STUDENTS AND CLASSES WITH SEAMLESS LMS INTEGRATION – SIMPLE & TIME-SAVING

- Evaluate students' learning effectiveness on an individual, class and form basis
- Minimize administrators' workload in class management, while maximizing teachers' efforts in teaching

Learning Management system with learners' analytics - Supports HKedCity

AI-assisted speech training laboratory

Blended learning

ASSISTIVE TECHNOLOGY – INSTANT & EFFORTLESS

- Assess speaking performances and provide real-time feedback using Artificial intelligence
- Provide interventions during practice in the VR and/ or 2D mode

AI instant Feedback

VR & 2D mode

On-demand interventions

SELF-DIRECTED LEARNING – ANYTIME ANYWHERE

- Play to learn, at own pace and time
- Reflect to improve, through meaningful learning experience

Experiential learning

Gamification

Personalization

← *Today's focus*

Schools and teachers

Students



Project Overview:

Funded by the Quality Education Fund e-Learning Ancillary Facilities Programme, Education Bureau HKSAR (amounted funded \$30,365,700) in June 2023, this project aims to develop a self-directed English speaking programme with AI assisted feedback for secondary and tertiary students in Hong Kong.

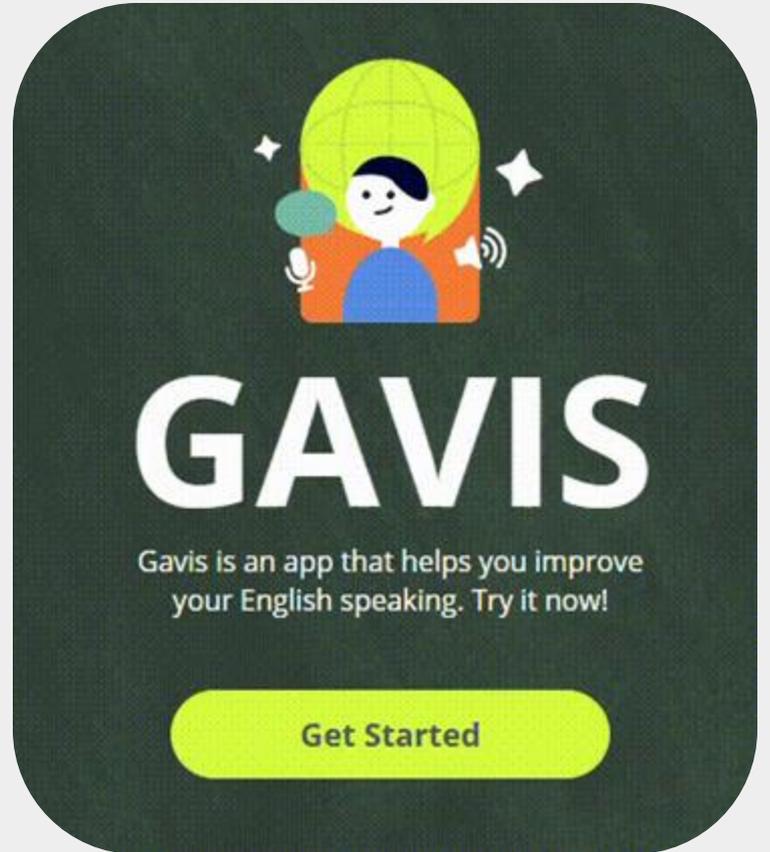
An avatar initiates the discussion with natural behaviors (eye contact and hand gestures)



GAVIS

"Global Englishes AI-assisted Virtual Reality Interactive System"

A one-minute demonstration
on [Gavis](#)



PART II:

The three stories of GAVIS

Researching Multiparty Co-Learning and the development of Critical AI Literacy

When researching AI-enabled EdTech tools...

The Challenges

- AI-enabled EdTech tools proliferating rapidly in education
- Published accounts rarely explain HOW practitioners, technologists, and researchers co-produce these tools
- Need for systematic documentation of collaborative development processes

Research Questions

Central Questions:

1. How do practitioners, technologists, and researchers collaboratively develop AI-enabled assessment tools?
2. How does multiparty co-learning facilitate innovation in EdTech?
3. How is critical AI literacy developed through collaborative processes?

Theoretical Framework

Multiparty Co-Learning

Origins: Computer science → Educational application
(Brantmeier, 2020)

Core Characteristics:

- All knowledge is valued
- Reciprocal knowledge sharing
- Care for each other as co-learners
- Shared power among co-learners

Beyond Traditional Researcher-Practitioner Partnership:
Fluid role shifting through ***transpositioning***

Transpositioning

Definition (Li Wei & Lee, 2024):

- Processual and iterative shifting of identity positions
- Perspectives remain in constant "flow-and-flux"
- Transcending fixed roles
- Fostering empathy through adaptive practices

In Our Project:

- Teachers → Learning Facilitators & Reflection Enhancers
- Technologists → Scaffolders & Meaning Makers
- Researchers → Empowered Explorers & Knowledge Constructors

Theoretical Framework

Critical AI Literacy

Beyond Basic AI Competency:

- Not just "what AI does" but "what AI does to us and through us"
- Self-reflexive examination of AI relationships
- Critical positionality (Wang & Wang, 2025)
- EDIA principles: Equality, Diversity, Inclusion, Accessibility

Foundation: Self-reflective mindsets (Open University, 2025)

Pedagogy of Vulnerability

Brantmeier's Framework (2020):

- Willingness to admit limitations
- Take risks
- Engage in unlearning
- Essential for rapid technological change

In AI Development:

- Technologists acknowledge AI uncertainties
- Teachers question established assessment practices
- Researchers challenge theoretical assumptions

Theoretical Framework

From multi-disciplinary, inter-disciplinary, to trans-disciplinary collaboration

Multi-Disciplinary (Additive):

- Disciplines work side-by-side separately
- Minimal integration

Inter-Disciplinary (Interactive):

- Synthesis and integration of knowledge
- Collaborative knowledge construction

Trans-Disciplinary (Holistic):

- Transcending boundaries
- Creating unified frameworks beyond any single discipline

METHODOLOGY OVERVIEW

Hybrid narrative inquiry (Connelly & Clandinin, 1990) + action research (Lewin, 1946; Kemmis & McTaggart, 2007)

examining multiparty collaboration through three commonplaces: temporality, sociality, place (Clandinin & Caine, 2013) across iterative planning-acting-observing-reflecting cycles

Participants

20+ team members across three stakeholder groups :

- Experienced Teachers (8-15 years): HKDSE assessment standards, student learning processes
- Educational Technologists: ML specialists, NLP experts, LLM fine-tuning, deep learning
- Applied Linguists: Speaking proficiency frameworks, assessment validation methodologies

Structure: Non-hierarchical horizontal collaboration with distributed decision-making authority

Analytical Framework

Combined narrative analysis + statistical analysis examining three co-learning aspects (Pushor & Clandinin, 2009; Toledano & Anderson, 2017)

Data Collection

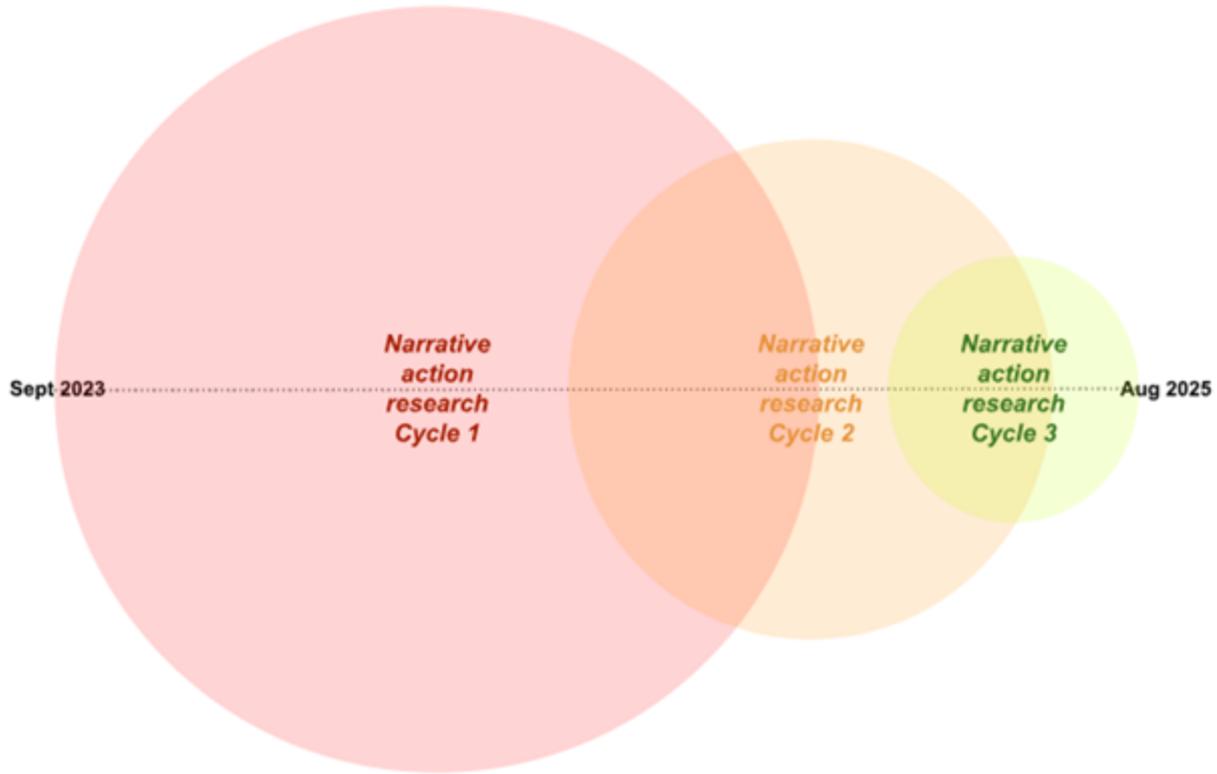
1. Collaborative Documentation: 165 meeting minutes over 24 months + project design documents + internal correspondence capturing real-time discussions, vulnerability instances, adaptive learning

2. Reflective Interpretations: Systematic narrative analysis using LLTT framework (Looking, Listening, Talking, Thinking) (Li & Zhu, 2013) capturing identity transformation, social dynamics, contextual factors (Wong & García, 2025)

3. Artifact-Based Data: 61 HKDSE speaking samples (HKEAA) with dual-examiner official rubric scores (pronunciation/delivery, communication strategies, vocabulary/patterns, ideas/organization) as ground truth for MAE and correlation analysis

For understanding role shifting within participants

For validating the automated speaking assessment



Three Development Cycles (24 months, spirally connected)

Cycle 1 - Acoustic-Phonetic Model (Late 2023 - Early 2025)

Stage: Multi-Disciplinary → Inter-Disciplinary Level 1 (Synthesis)

The Challenge:

- Assess context-insensitive criteria: Pronunciation, Fluency, Vocabulary, Grammar

Initial Tension:

- Teachers & linguists wanted LLM approach (AI optimism)
- Technologists raised concerns: reliability, data privacy, stability, cost

Negotiated Solution Through Co-Learning:

- Deep learning acoustic-phonetic model
- Bottom-up assessment approach
- Nu Support Vector Regression (NuSVR) model implementation

This represents beginning of synthesis

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2	Projects the voice appropriately. Pronounces all sounds/word clusters and words clearly and accurately. Speaks fluently and naturally, with only occasional hesitation using intonation appropriately to enhance communication.	Uses appropriate body language to display self-confidence interest. Uses a full range of strategies effectively to initiate and maintain interaction and to respond to others.	Makes accurate use of a wide range of vocabulary. Uses varied and accurate language patterns, only minor slips, which do not impede communication. Rephrases effectively when necessary.	Displays a wide range of well-developed relevant ideas clearly and fluently. Points and elaborates in detail. Generally responds effectively to peers, maintaining and extending conversational exchanges.
3	Projects the voice appropriately. Pronounces almost all sounds/word clusters and words (clearly and accurately). Speaks fluently and naturally, with only occasional hesitation using intonation appropriately to enhance communication.	Uses appropriate body language to display self-confidence interest. Uses a wide range of strategies to initiate and maintain interaction and to respond to others.	Makes varied and generally appropriate use of vocabulary. Makes use of generally accurate and appropriate language patterns. Self-corrections effectively when necessary.	Displays a range of relevant ideas clearly and fluently. Most ideas are developed and linked. Points and elaborates appropriately. Speaks appropriately to others, maintaining and extending conversational exchanges.
4	Usually projects the voice satisfactorily. Pronounces most sounds/word clusters and words clearly and accurately, less common words usually comprehensible. Speaks reasonably fluently although with some hesitation in longer utterances. Uses intonation sufficiently to convey meaning.	Uses some features of body language to support communication. Uses a range of appropriate strategies to initiate and maintain interaction and to respond to others.	Makes generally appropriate use of vocabulary. Makes use of generally accurate language patterns. Errors do not generally impede communication. Self-corrections when communicating carefully or when asked to do so.	Displays some relevant ideas clearly. Most ideas are developed and linked. Devotes no more than minimal communication. Usually responds appropriately to peers. Some ideas need to be stated for conversational exchanges.

Cycle 1 - Acoustic-Phonetic Model (Late 2023 - Early 2025)

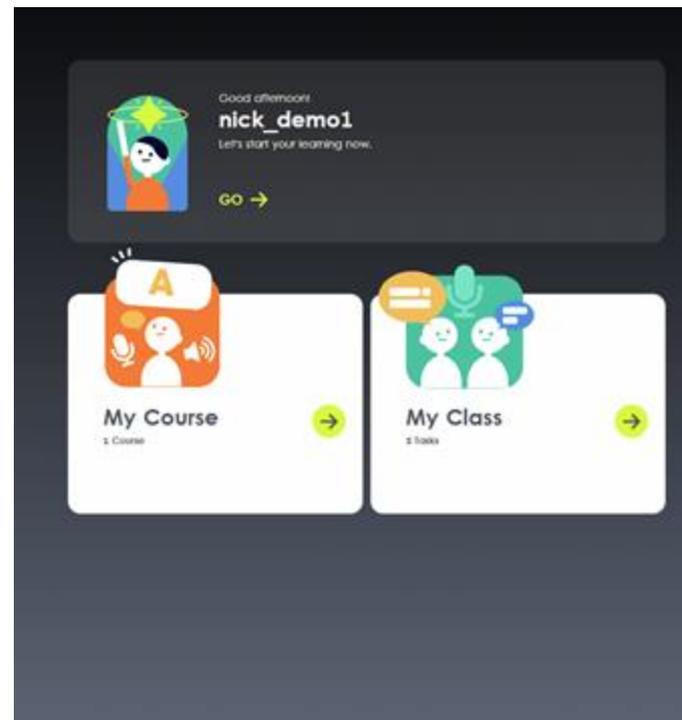
Inter-Disciplinary Synthesis Evidence (Level 1):

- Teachers contributed: Assessment standards, student error patterns, marking calibration
- Technologists contributed: Acoustic feature engineering, model architecture, training optimization
- Applied linguists contributed: Validation frameworks, scoring rubrics, reliability measures

Joint Product: Acoustic model integrating all three types of expertise

Critical AI Literacy Development:

- From AI optimism → AI realism
- "What shouldn't AI do?" becomes central question
- Technical capability ≠ sufficient justification
- Ethics and validity concerns integrated



Metrics	Overall	Pronunciation & Delivery	Vocabulary & Language Patterns
Mean Absolute Error <small>(The lower - the better)</small>	0.45	0.55	0.50
Pearson Correlation Coefficient <small>(The higher - the better)</small>	0.82	0.80	0.79

Cycle 2 - LLM Integration Attempt (Late 2024 - Early 2025)

Stage: Inter-Disciplinary Level 1 (Synthesis) → Level 2 (Perspective-Taking)

The Challenge:

- Assess context-sensitive criteria: Communication Strategies, Ideas & Organisation
- These require understanding discourse, interaction quality, coherence, logical flow

Inter-Disciplinary Synthesis Approach (Level 1):

- GPT-4o implementation
- Teachers developed "super rubric"—enhanced HKDSE descriptors with explicit tacit knowledge
- Detailed prompting combining practitioner expertise + technical optimization

Expected: Synthesis would succeed like Cycle 1

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Reality: Persistent failure despite synthesis efforts

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Cycle 2 - LLM Integration Attempt (Late 2024 - Early 2025)

Problems:

- LLM produced extreme, inconsistent scores
- Better at ranking than absolute scoring
- Diverged significantly from human judgment
- Detailed rubrics couldn't bridge gap

Why Synthesis Failed:

- Teachers' tacit knowledge "could not be easily codified into rubrics, however detailed"
- "Technical refinements could not bridge fundamental epistemological differences"

This crisis forced deeper engagement...

Table 3. Excerpt of the human marking scores vs. AI-marking scores (Ideas and organisation)

Name (pseudo)	Human marker's score	LLM model (GPT-4o)
Luo Suiyan	7	4.25
Tse Yeekwan	6.5	3.71
Ng Tsztung	6	4.33
Ho Yankiu	4.5	3.4
Lau Hoikei	4	4
Sam Zeonhei	3	3.33
Ning Gitjeoi	2	3.25

Table 3. Excerpt of the human marking scores vs. AI-marking scores (Ideas and organisation)

Cycle 2 - LLM Integration Attempt (Late 2024 - Early 2025)

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The team engaged in intense discussion:

"Is the LLM genuinely inaccurate, or is the AI marker actually more objective while human markers are inherently subjective?"

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- "Technical refinements could not bridge fundamental epistemological differences"

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The team engaged in intense discussion:

“Is the LLM genuinely inaccurate, or is the AI marker actually more objective while human markers are inherently subjective?”

This question reveals Inter-Disciplinary (Level 2) development:

Teachers thinking FROM technologist perspective:

- Recognizing assessment involves tacit, embodied knowledge
- Understanding technical limitations of encoding human judgment
- Questioning: "Maybe our subjectivity IS the problem?"

Technologists thinking FROM practitioner perspective:

- Realizing assessment is social practice, not just pattern recognition
- Understanding why technical sophistication ≠ pedagogical validity
- Questioning: "Maybe human judgment captures something essential?"

Applied linguists thinking FROM both simultaneously:

- Recognizing AI-human epistemological gap as fundamental
- Not technical failure but different ways of knowing

The team engaged in intense discussion:

"Is the LLM genuinely inaccurate, or is the AI marker actually more objective while human markers are inherently subjective?"

Deepening Critical AI Literacy

Key Realizations Through Perspective-Taking:

- AI assessment processes ≠ human assessment processes
- Sophisticated models (GPT-4o) ≠ better assessment outcomes
- Different epistemological approaches to judgment
- Gap is ontological, not just technical

Co-Learning Evidence (Inter Level 2):

- Team asks: "What is AI missing from human judgment?"
- Not viewing as technical failure requiring better prompts
- But understanding as different meaning-making processes
- *Vulnerability in admitting synthesis limitations*

This deep perspective-taking prepared for trans-disciplinary breakthrough.

Cycle 3 - The Trans-Disciplinary Breakthrough (Early 2025)

Stage: Trans-Disciplinary Collaboration Through Transpositioning

The Innovation:

Sequential pipeline architecture—acoustic model scores FIRST, then condition LLM processing

Where Did This Come From?

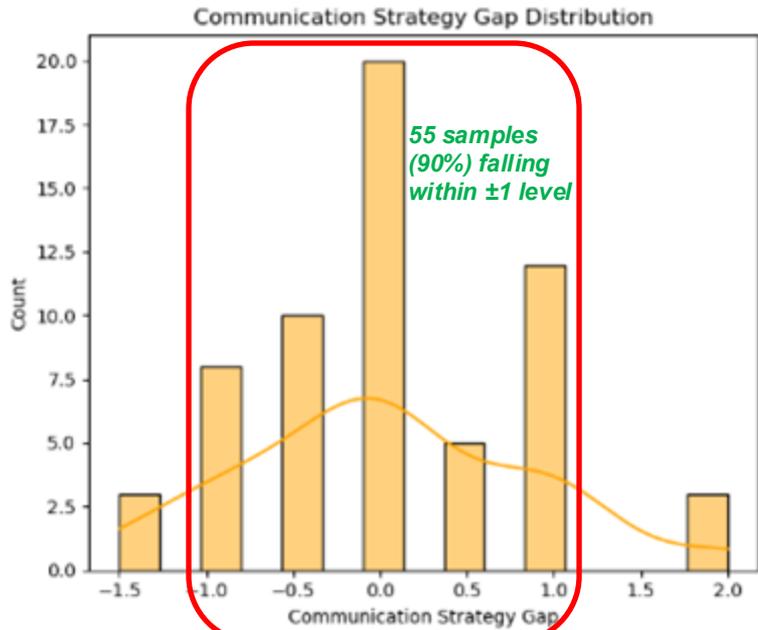
- Not from applied linguistics methodology
- Not from computer science methodology
- Not from teaching practice methodology
- From problem-focused thinking transcending all disciplines

Applied Linguist's Transpositioning:

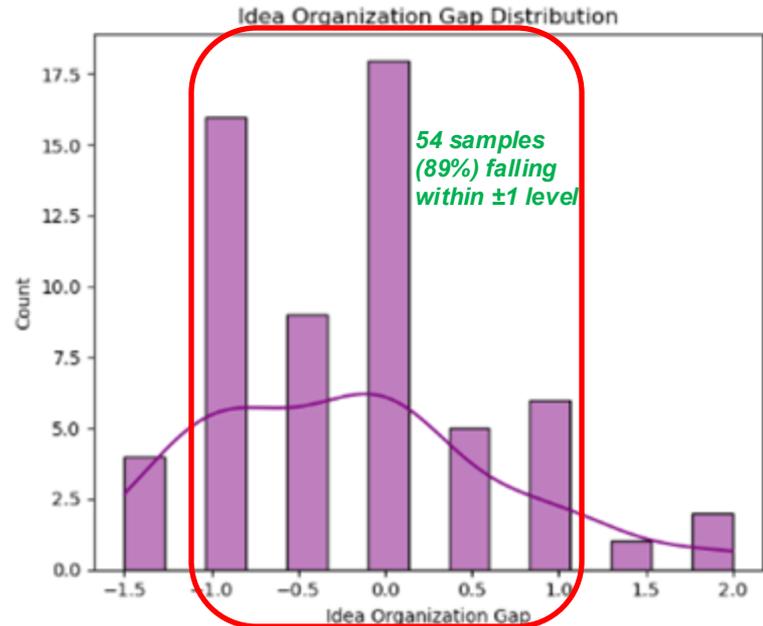
- Observed human assessment practice: pronunciation → vocabulary → content → organization (SEQUENTIAL)
- But then proposed TECHNICAL architecture: "We should design sequential AI pipeline where acoustic scores condition LLM"
- Crossing role boundary: Making technical suggestions AS IF a computer scientist

Excerpt of the human marking scores vs. Human-aligned AI-marking scores (Ideas and organisation)

Name (pseudo)	Human marker's score	LLM model only	Human-marker aligned AI model
Luo Suiyan	7	4.25	6.6
Tse Yeekwan	6.5	3.71	5.2
Ng Tsztung	6	4.33	5
Ho Yankiu	4.5	3.4	4
Lau Hoiwei	4	4	4
Sam Zeonhei	3	3.33	3.2
Ning Gitjeoi	2	3.25	3



Avg: 0.049
 Variance: 0.840
 Min: -1.500
 Max: 2.000



Avg: -0.205
 Variance: 0.839
 Min: -1.500
 Max: 2.000

Out of 61 sample test results, approximately 50% were marked the same or highly similar to human markers (+/- 0.5), with **54-55 samples (~90%) falling within ± 1 level difference** for both communication strategies and ideas and organisation

PART III:

Multiparty co-learning and trans-disciplinary (TransD) collaboration

Trans-Disciplinary Collaboration

Transpositioning (Role Crossing):

- Applied linguist designed sequential architecture (technical contribution AS technologist)
- Technologists validated pedagogical logic (pedagogical contribution AS teacher)
- Teachers formalized tacit knowledge into machine-readable structures (research contribution AS linguist)

Perspective Integration (Beyond Perspective-Taking):

- Not just understanding other perspectives (cross-disciplinary)
- **Acting FROM other perspectives** in solving problem

Vulnerability in Boundary-Crossing:

- Admitting limits of own disciplinary approach
- Risk-taking in contributing outside traditional expertise
- **Unlearning disciplinary boundaries**

Critical AI Literacy Fully Developed:

- AI as complement embedding human processes
- Human judgment as foundation, not obstacle

Conceptual Contributions

1. Unpacking the Multi → Inter → Trans Trajectory:

- Multi-Disciplinary: Additive, separate contributions
- Inter-Disciplinary Level 1: Synthesis and integration
- Inter-Disciplinary Level 2: Perspective-taking and epistemological understanding
- ***Trans-Disciplinary: Transpositioning through boundary-crossing, problem-focused innovation***

2. Co-Learning as Developmental Engine:

- Multiparty co-learning DRIVES progression through stages
- Each stage requires deepening vulnerability and trust

3. Critical AI Literacy as Relational Capacity:

- Not individual skillset acquired through training
- Emerges from collaborative practice through stages
- Requires vulnerability, perspective-taking, transpositioning

Concluding remarks

Sustainable AI-enabled assessment development requires developmental progression through collaboration stages:

MultiD → InterD (Levels 1 & 2) → TransD collaboration

Enabled by:

- Multiparty co-learning as engine
- Vulnerability as foundation
- Transpositioning as mechanism
- Problem-focused thinking transcending disciplines

Our Journey Documented:

- Cycle 1: MultiD → InterD Level 1 (Synthesis)
- Cycle 2: InterD Level 1 → InterD Level 2 (Perspective-Taking through crisis)
- Cycle 3: InterD Level 2 → TransD (Transpositioning through boundary-crossing)

Critical AI Literacy:

Cultivated through collaborative practice across stages, not individual training

Educational technology innovation requires moving through collaboration stages via vulnerability, co-learning, and problem-focused thinking

- *For anyone to be able to transcend the discipline boundaries, one has to be critical and creative; in other words, trans-ing itself is being critical and creative, because one needs the critical insights to go beyond conventional thinking.*
- *TransD collaboration encourages all the parties to think about solving the problem not from any specific disciplinary perspective but by focusing on the nature of the problem that needs to be solved and design methods to solve that transcends any disciplinary boundaries - the focus is on innovation and creative thinking.*