

Artificial Intelligence (AI) and Data Science for Education

Lesson Study 2.0

How to to boost students written mathematical argumentation?

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Artificial Intelligence (AI) and Data Science for Education

Masami Isoda

Developing innovative methods of analysis
Developing innovative teaching approaches
Developing innovative environments



Students written mathematical argumentation

We analyzed 16,618 written answers to **open**-ended
questions by 464 fourth-graders from 24 schools



Article

**Do Written Responses to Open-Ended Questions on
Fourth-Grade Online Formative Assessments in Mathematics
Help Predict Scores on End-of-Year Standardized Tests?**

Felipe Urrutia ^{*,†} and Roberto Araya ^{*,†}

<https://doi.org/10.3390/jintelligence10040082>

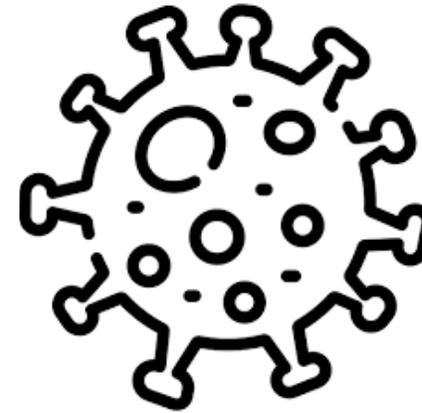


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Educational Malnutrition

We need an efficient recovery plan

Peer-review and Inner Speech



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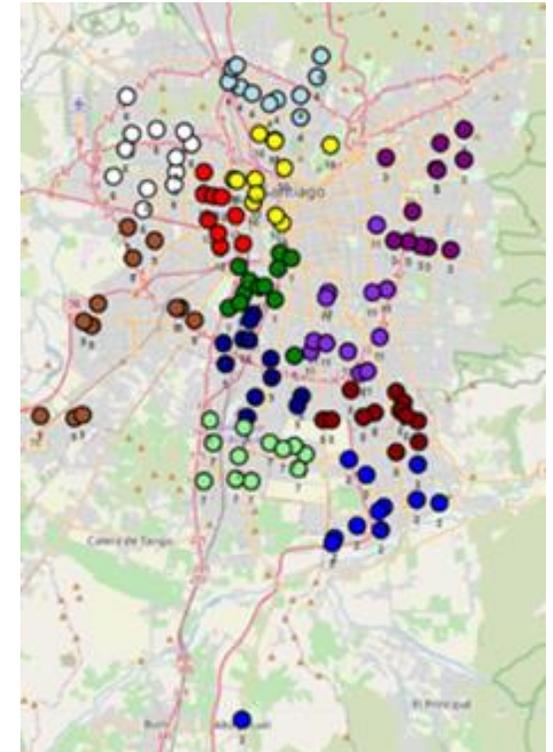
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Student's written argumentation Peer-review and Inner Speech

Now we are collecting written answers to **open**-ended questions of **5,000** students from 137 schools





Students written answers and **peer review**

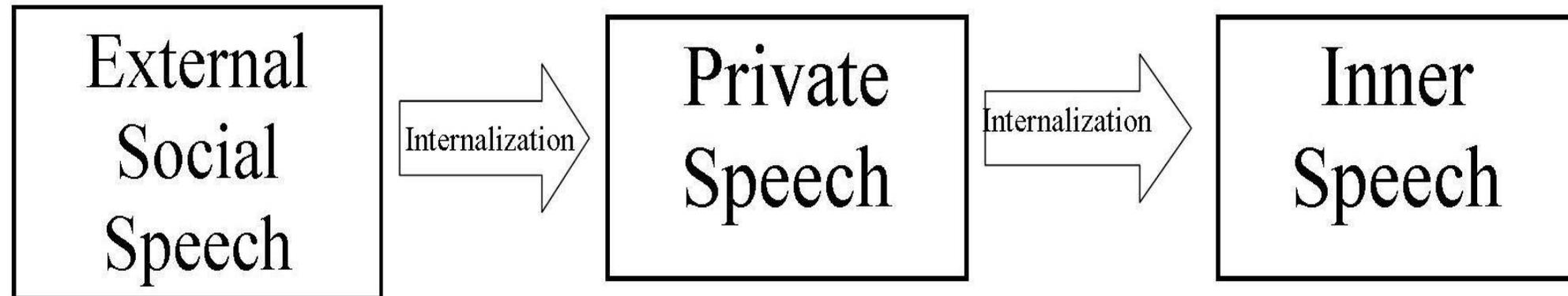
Respuestas de los alumnos

Número de estudiantes que respondieron: 33. de 0 estudiantes conectados, 40 en sesión.

Hora (HH:MM:SS)	Nombre	RUT	Nota	Núm. eval.	Acción	Respuesta	Comentario	Acción
09:13:58	 Tillería S, Sofia	25995005-6	-	0	Evaluar	Herrera D, Amalia dijo: esta mal por que encada canasta tiene que ir 6	esta mal porque no dividió bien y por eso el dio 6 y 7	5 banderas
09:14:10	 Ríos C, Belén	24447098-9	-	0	Evaluar	Herrera D, Amalia dijo: esta mal por que encada canasta tiene que ir 6	esta mal porque en cada canasta caen 7 frutas	Premiar con 5 banderas
09:14:15	 Rocha V, Pía	24997688-6	-	0	Evaluar	Herrera D, Amalia dijo: esta mal por que encada canasta tiene que ir 6	yo opino q la respuesta del compañero esta bien por q es verdad	Premiar con 5 banderas



Vigotsky's internalization



Individual or monological reasoning is a parasite of dialogical reasoning

- Tomasello (2014)

Hand **Puppets** scaffolding inner speech development



Artificial Intelligence (AI) and Data Science for Education

Natural Language Processing

Effect of **peer review** on coherence of
written answers to open-ended questions

Effect of **hand puppet** on coherence of
written answers to open-ended questions