Emotional Responses to AI Tutors in Young Learners: A Sociocultural Perspective on Trust, Motivation, and Frustration

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Context








Where is the line between real benefits and technological hype?

iPotty by CTA Digital

Eric *Italian Journal of Pediatrics* (2021) 47:223
https://doi.org/10.1186/s13052-021-01174-6

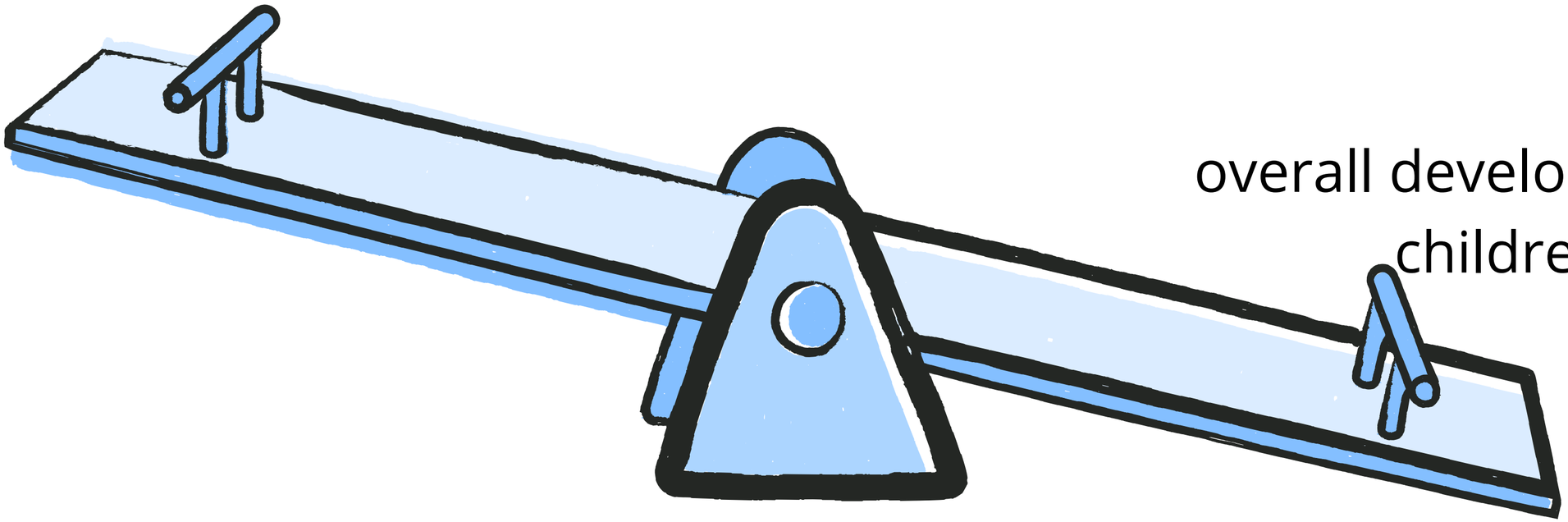
Italian Journal of Pediatrics

REVIEW Open Access

The negative effects of new screens on the cognitive functions of young children require new recommendations

Osika Eric

knowledge



overall development of children

Bot

A general term for any software that performs **automated t**asks.

Chatbot

“A computer program **designed to simulate conversation with human users**, especially over the Internet”

AI tutor

Advanced chatbot used in education in order to teach, guide learning, and improve understanding

AI tutor: a tool or quasi-social agent?

What makes AI-tutor a quasi-social agent?

- Simulates social interaction, without being truly social
- Uses human-like behaviors
- Elicits social responses from users

These features lead children to interact with AI tutors as if they were social beings!

They :

- They tend to assign a certain identity to tutors
- Say “thank you” to the AI
- Form bonds, trust them, feel motivated or frustrated by them

Why it matters

Understanding AI tutors as quasi-social agents helps us:

- Design better human-AI interactions to enhance learning
- Anticipate their cognitive and emotional impact on learners
- Teach students to critically engage with AI without over-trusting it

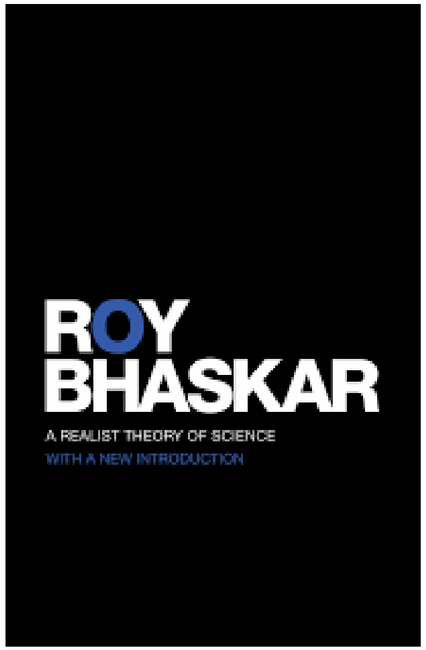
Research questions

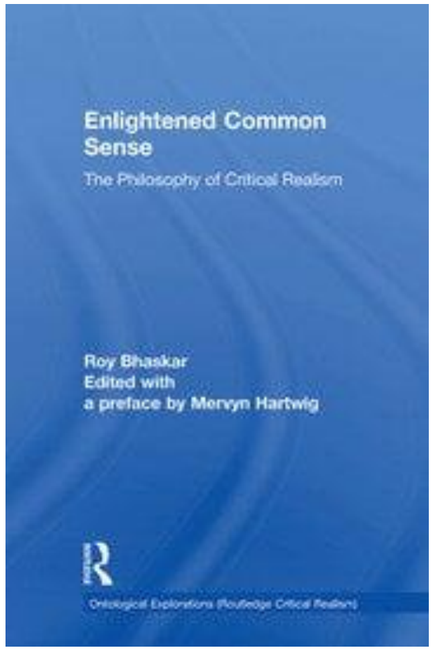
- How do young learners emotionally respond to AI tutors?
- What do these responses reveal about AI’s role in scaffolding within the Zone of Proximal Development (ZPD)?
- Which deeper causal mechanisms are revealed by the students’ emotional responses?

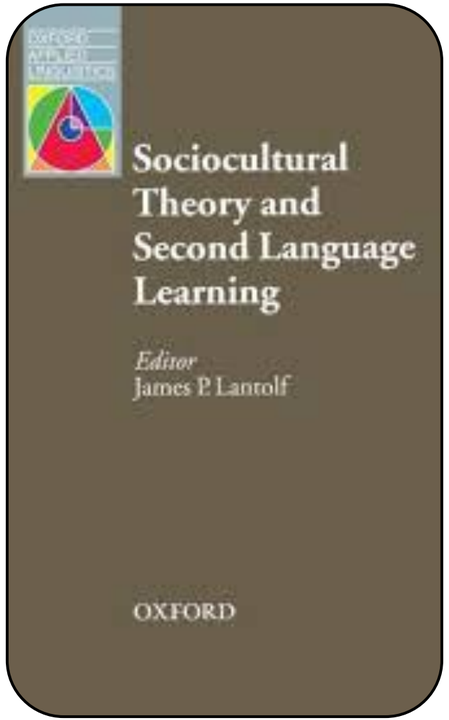
Theoretical framework

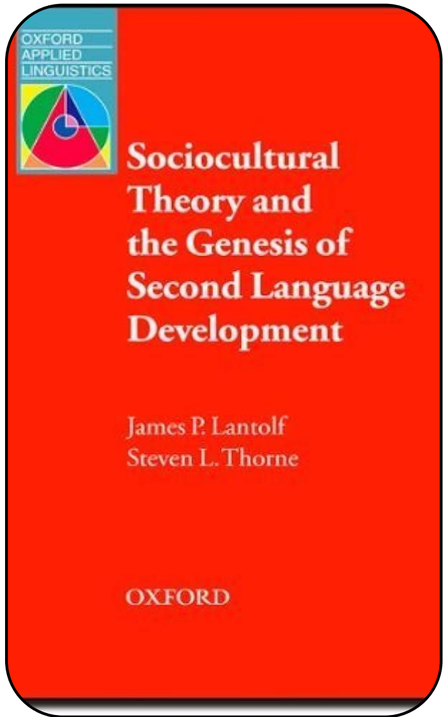
Vygotsky's Sociocultural Theory

and its application in L2 development









Key Concept: Perezhivanie

- Vygotskian concept often translated as "emotional experience"
- Represents unified emotional-cognitive interpretation of situations
- Posits dialectical relationship between individual and environment
- Development determined not by environment itself but by how it's experienced
- In AI-mediated learning: how students emotionally interpret interactions with AI
- Effectiveness of AI tutors must consider emotional experience, not just learning outcomes

(Vygotsky, 1994)

Stratified Reality in AI-Mediated Learning

Ontological level	Description	Application in AI Learning	Learner–AI interaction scenario
Empirical	observed events / experiences	Learner's experience of AI system	The student shows signs of frustration, which are detected by the AI tutor (e.g., through response latency, error patterns, or selected emotional indicators).
Actual	events that occur, even if not observed	Hidden algorithmic operations	In response, the AI adjusts the difficulty level of the task, simplifies instructions, or provides additional scaffolding.
Real	underlying mechanisms / structures	perezhivanie	Underlying these observable interactions are deeper mechanisms such as the learner's emotional-cognitive integration, capacity for self-regulation, and the cultural or experiential framing of the task (perezhivanie).

Research Method: Setting and Participants

- Location: St. Philip School, bilingual Italian school in Rome
- Participants: 34 students
  - Grade 5 (n=16)
  - Grade 6 (n=18)
  - Ages 10-12
- Context: Regular curricular EFL classes and CLIL History/Art classes
- All participants had prior experience with digital tools
- Ethical approval and informed consent obtained

Research Method: Learning Tasks

- Designed to be cognitively challenging and emotionally engaging
- Aligned with current curriculum
- Primary school: Roman history (CLIL History)
- Secondary school: Leonardo da Vinci's artworks (CLIL Art) and Anglo-Saxon culture (EFL)
- Required real-time dialogic exchanges with AI tutor
- 30-minute sessions once weekly over four weeks
- Tasks mirrored teacher-led institutional practices

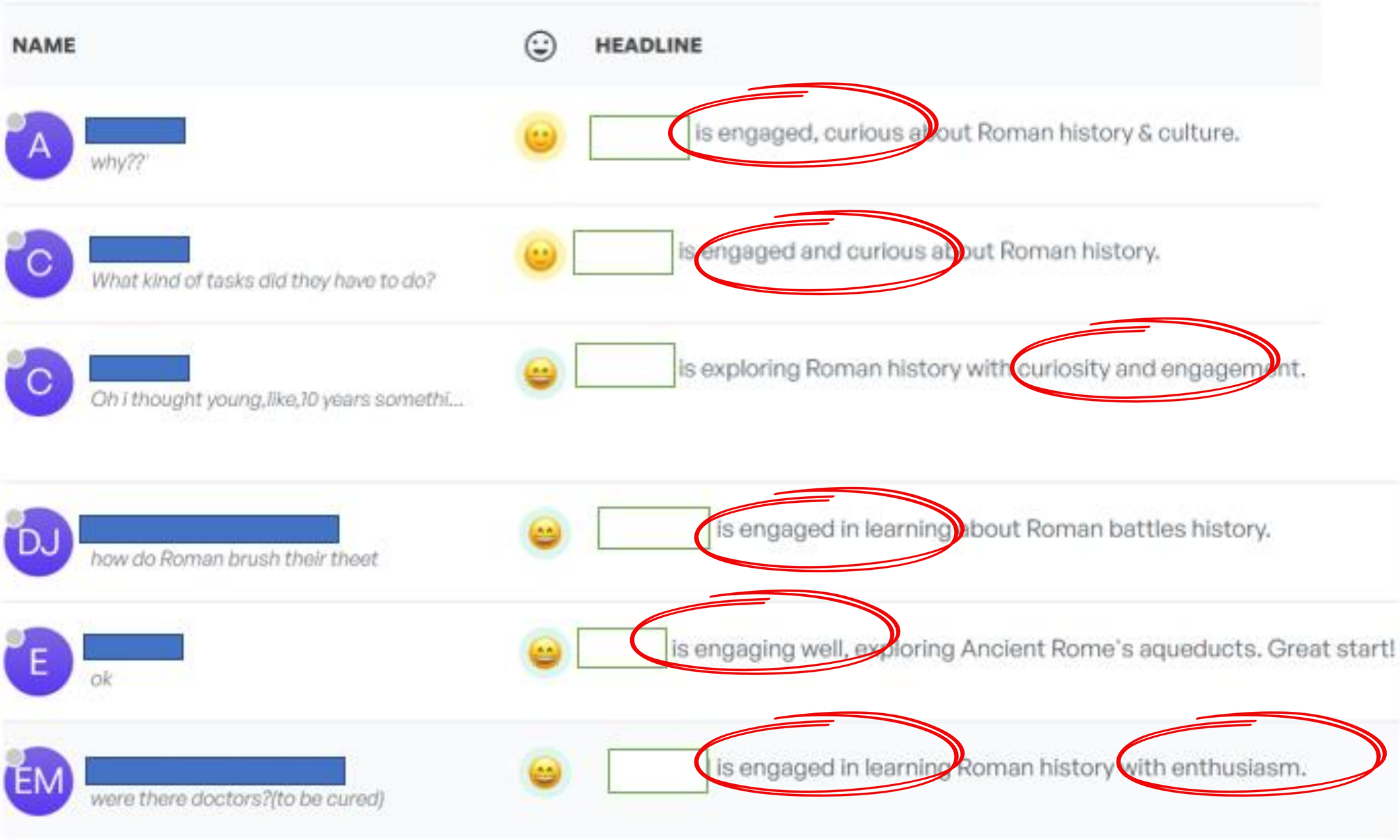
Research Method: Data Collection

- Mixed-method approach to capture emotional responses and interaction patterns
- Instruments:
  - Emotion questionnaires (5-point Likert scale + open-ended reflections)
  - Focus groups (semi-structured, post-treatment)
  - Classroom observations (documenting emotional indicators)
  - Interaction corpus (written exchanges between learners and AI tutors)
- Triangulation across data sources to enhance credibility

Data analysis

- Qualitative data analyzed using thematic analysis (Braun & Clarke, 2006)
- Coding process:
  - Deductive: drawing on key SCT constructs (scaffolding, ZPD alignment)
  - Inductive: allowing emergence of unanticipated themes
- Triangulation across data sources
- Analysis focused on how emotional responses shaped and were shaped by interactions with AI tutor

Key Findings: Positive Emotional Responses



Key Findings: Positive Emotional Responses

- Positive emotions strongly associated with well-aligned AI scaffolding
- Trust developed when AI provided supportive, attuned feedback
- Motivation highest when students encountered "challenge within reach"
- AI tutors performed key functions of successful mediators (Wood et al. 1976):
- *Recruitment*
- *Reduction in degrees of freedom*
- *Direction maintenance*
- *Marking critical features*
- *Frustration control*
- *Demonstration*

Key Findings: Frustration

The student expressed frustration and mentioned that previous inappropriate language was caused by someone else.

The student mentioned 'wo nage zhanghua', indicating potential confusion or frustration in expressing themselves in multiple languages.

Key Findings: Frustration

- 18% of students reported feeling "confused" or "annoyed" during certain tasks
- Manifestations in interaction corpus:
  - Inputting random characters (e.g. “`1234567890-=][poiuytrewqasdfghjkl;'#'/.,mnbvcxz\”)
  - Using inappropriate language
  - Resistance to AI eliciting personal responses
- Student quote: "it's a computer program. why does it care about my opinion?"
- Highlights ambivalent nature of AI's "quasi-social" dimension
- Students aware they're dealing with a computer program despite anthropomorphization

Key Findings: Topic Deviation

- Majority of interactions showed deviations from assigned topics
- Students engaged but not necessarily learning intended content
- AI tutors repeatedly attempted to redirect learners
- Frustration often emerged as reaction to redirection
- Suggests tension between AI direction maintenance and learner agency
- Learners felt deprived of ability to steer conversation in preferred direction

Key Findings: ZPD Misalignment

- Frustration pronounced in students with lower linguistic ability
- Occurred when AI introduced vocabulary/grammar beyond capability without support
- Also associated with "mid-phase of learning" (Wood et al., 1976) challenges
- Breakdowns reveal limits of current AI in sustaining intersubjective understanding
- Unlike human teachers, AI lacks capacity to:
  - Read body language
  - Know learners' background
  - Ask clarifying questions
  - Flexibly shift strategies

Theoretical Interpretation: ZPD and *perezhivanie*

- AI tutors becoming effective at approximating ZPD
- Misalignment between AI-detected emotions and student-reported emotions
- *Perezhivanie* explains why students receive same support but engage differently
- Student example: AI flagged "actively engaged" student who described praise as "fake"
- Vygotsky: environment influences development through emotional experience
- AI may scaffold tasks within ZPD but not foster positive *perezhivanie* required for development

Critical Realist Perspective (Bhaskar, 2008/1975; 2016)

- AI operates effectively at empirical and actual levels
- Varied emotional reactions exist at the "real" level
- Deeper socio-emotional and cultural factors shape learning engagement
- *Perezhivanie* as mechanism within deeper stratum explains why:
  - Some students thrive with AI support
  - Others withdraw or remain emotionally disengaged
- Calls for broader conception of adaptive learning beyond performance

Implications for AI-Mediated Education

- AI must evolve beyond functional adaptation
- Include sensitivity to learners' emotional meaning-making
- Design considerations:
  - Emotional transparency
  - Perceived authenticity
  - Responsiveness to emotional needs
- Teachers as co-mediators in AI-rich classrooms:
  - Observe emotional cues
  - Intervene when AI scaffolding breaks down
  - Help learners reflect on AI interactions
  - Support metacognitive and social learning processes

Conclusions

- Current AI systems demonstrate sophistication in modeling ZPD
- Often fall short in recognizing subjective emotional experience
- Meaningful learning requires more than cognitive adaptation
- Attention to emotional and experiential depth of learner engagement

Thank you
for your attention

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