



# Which interactivity matters in TSSL? Agency, engagement and negotiation in Conversational AI

**Serge Bibauw**

UCLouvain • Universidad Central del Ecuador

TSSL 2023 Conference  
Iowa State University  
October 20, 2023

 **UCLouvain**

**KU LEUVEN**





# Interactivity in Conversational AI

**Interactivity** in SLA, CALL/TSL

**Methods:** dialogue sys. +/- interactive

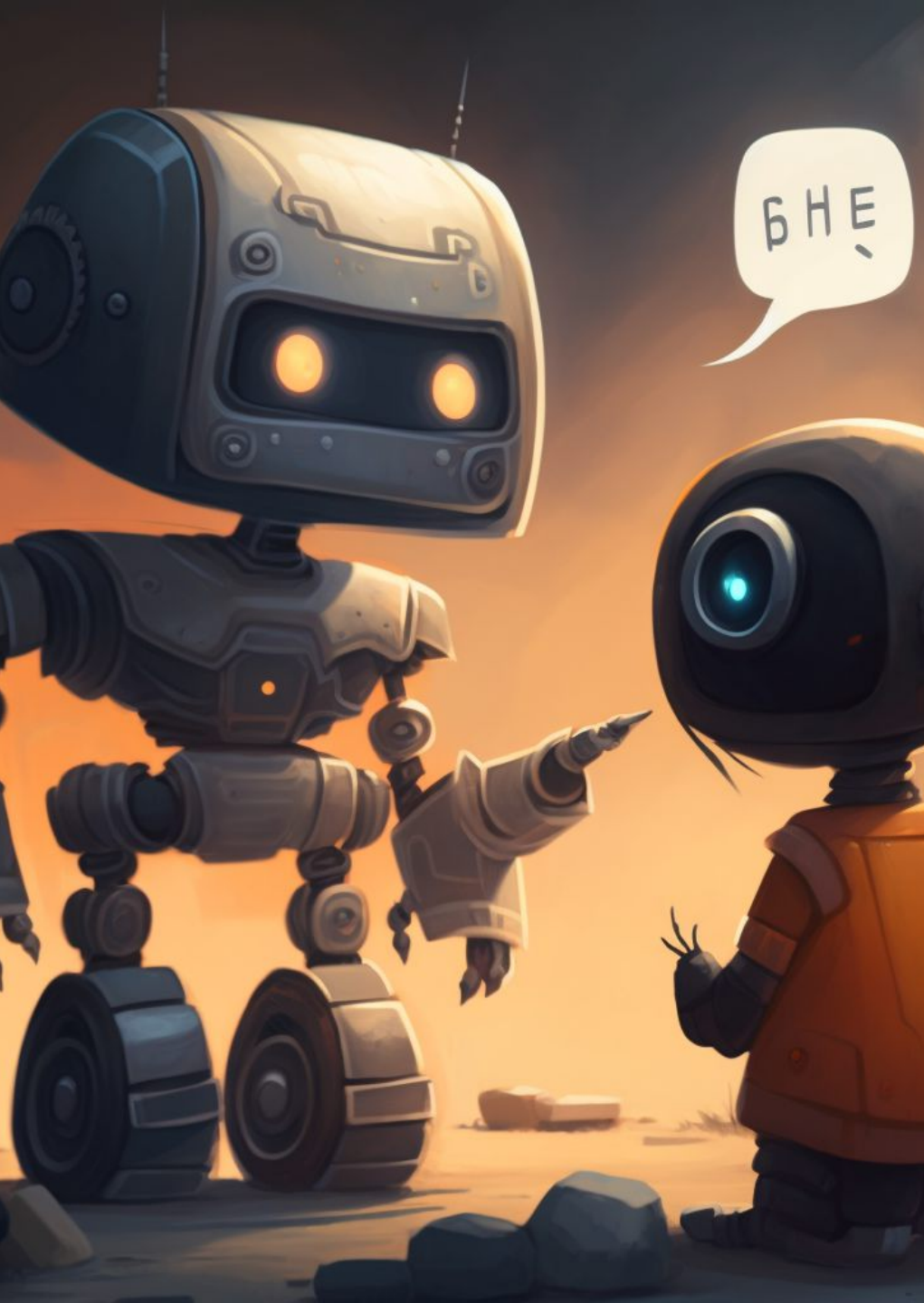
**Results**

Perceptions

Engagement

**Discussion**

Which interactivity matters?



# Interactivity in Conversational AI

## Interactivity in SLA, CALL/TSL

**Methods:** dialogue sys. +/- interactive

### **Results**

Perceptions

Engagement

### **Discussion**

Which interactivity matters?

# Interactivity in SLA and CALL/TSL

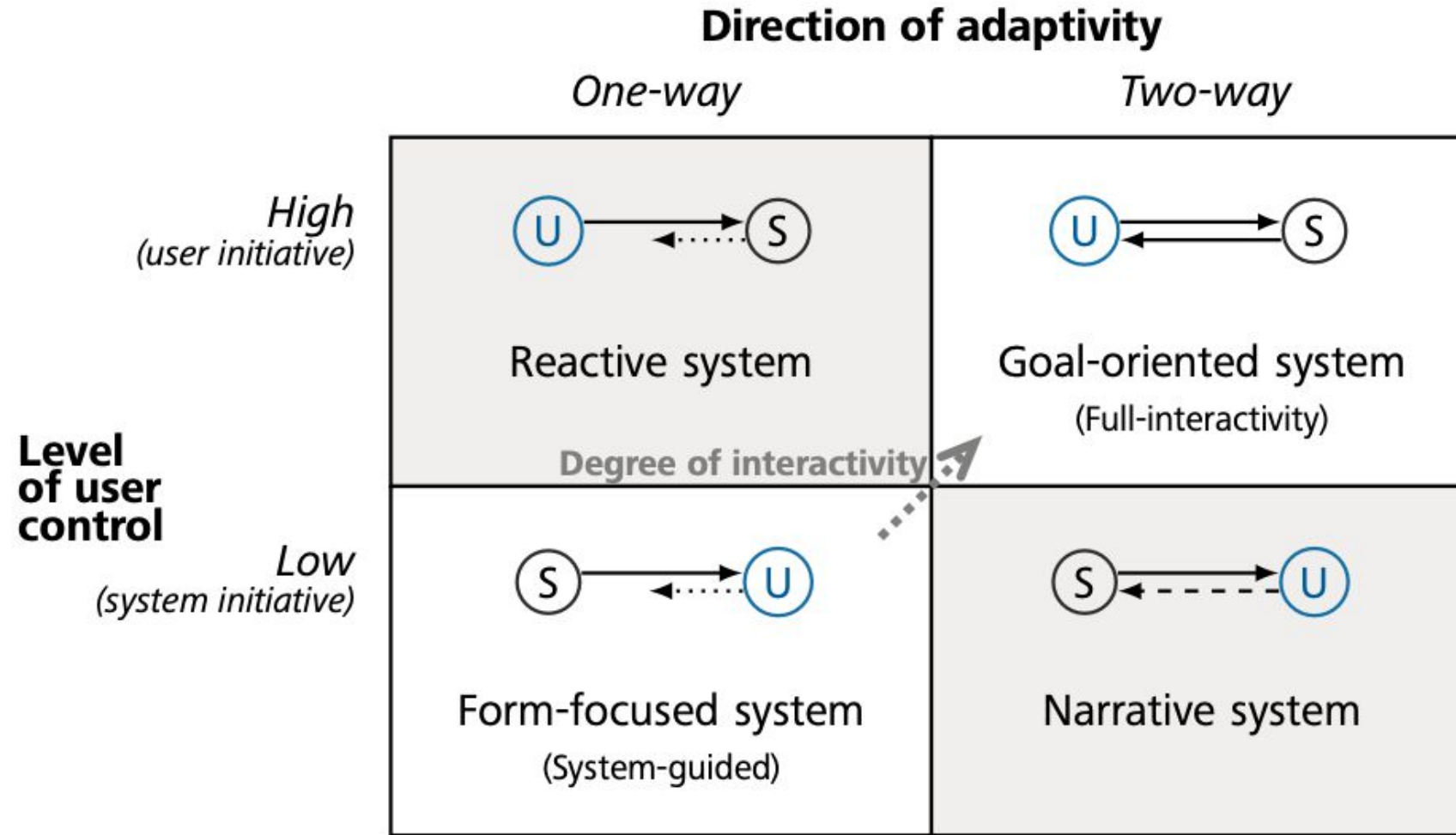
- Interactivity = intuitive, but underdefined concept (Rafaeli, 1988)
- SLA/AL research:
  - Interaction as **negotiation of meaning** (Long, 1981; Swain, 1995)
  - Interactivity as **dialogic** communicative activities (“two-way exchange of information”) (Ellis et al., 1994)
- CALL/TSL research:
  - *Interactiveness* linked to **authenticity, engagement** and “ability to express and interpret meaning” for the learners (Chapelle, 2001, p. 164)
- Game design:
  - **User agency and control** (Salen & Zimmerman, 2004)

# Conversational AI / Dialogue-based CALL

- Chatbots, dialogue systems, conversational agents, talking robots, smart speakers...  
(Bibauw et al, 2019)
- Large potential: meaningful spontaneous practice (spoken/written)
- Low-anxiety, fully controllable environment



# Model of interactivity in dialogue-based CALL (Bibauw, 2022)



S = system, U = user, → = intervention influencing the interlocutor's turn,  
..... → = intervention having no/limited influence on interlocutor

Adapted from McMillan, 2002



# Interactivity in Conversational AI

Interactivity in SLA, CALL/TSSL

Methods: dialogue sys. +/-interactive

**Results**

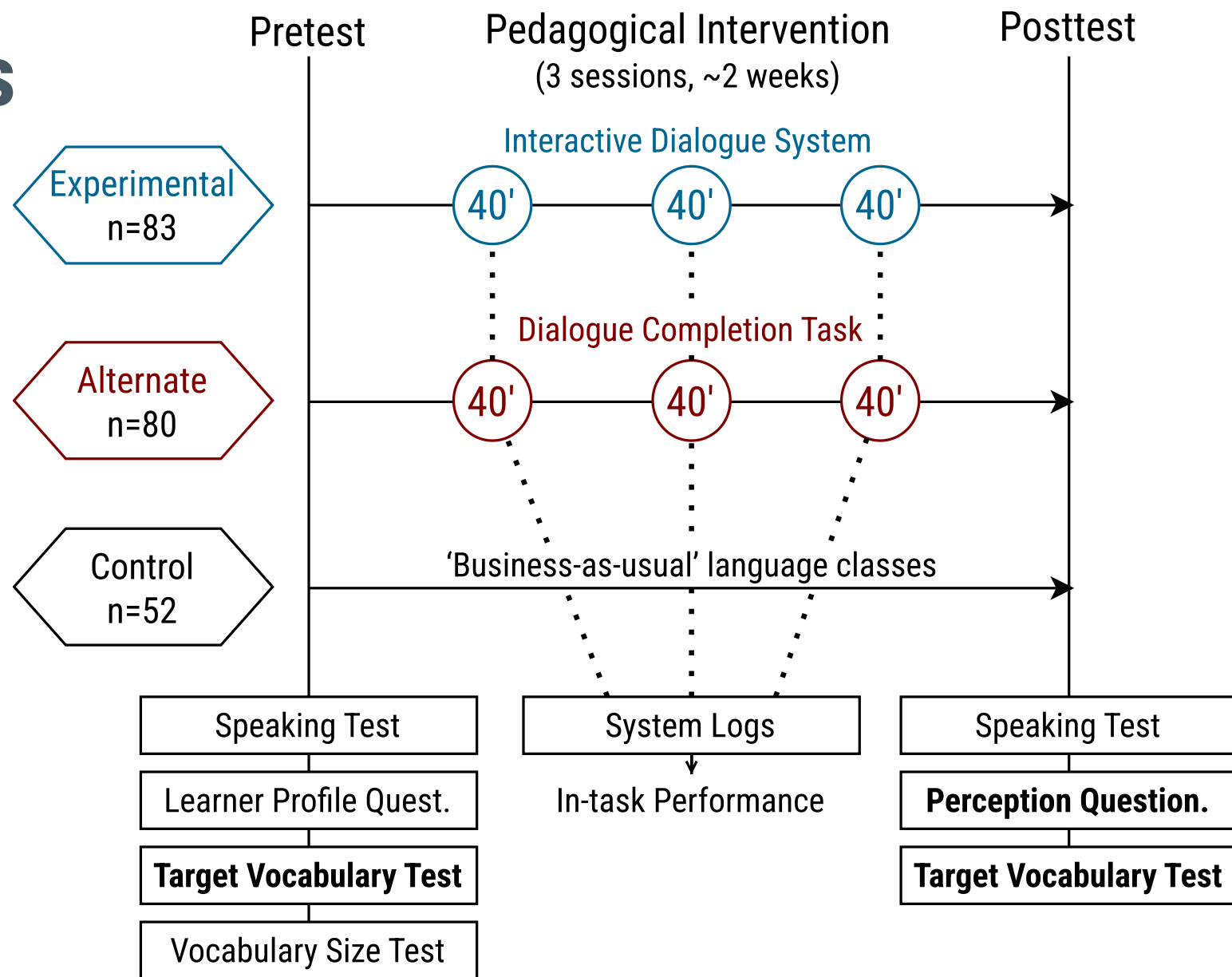
Perceptions

Engagement

**Discussion**

Which interactivity matters?

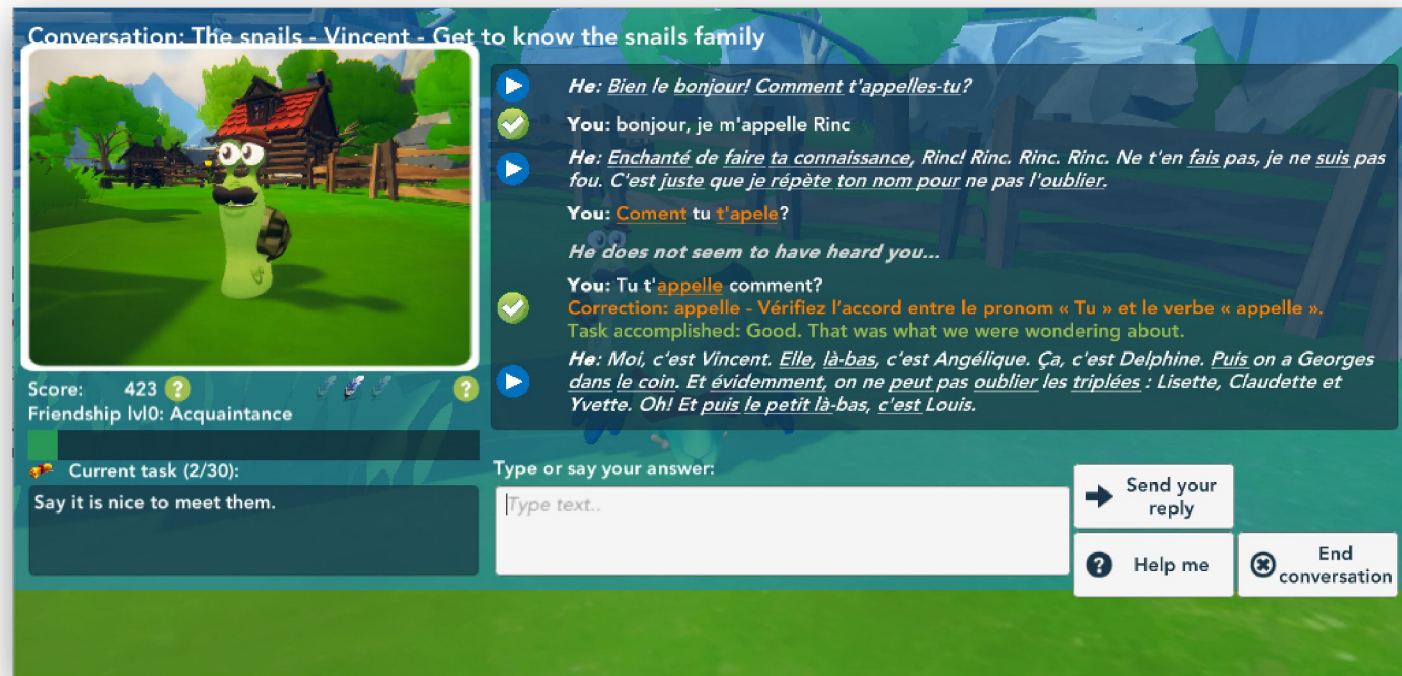
# Methods





# Intervention: Dialogue-based CALL game

- Interactive practice of L2 **French** with a dialogue system
  - *LanguageHero*, dialogue-based game for young learners : [www.languagehero.app](http://www.languagehero.app)
  - spontaneous written interaction (chat) + multimodal input
  - guided by microtask prompts



The screenshot displays a conversation window titled "Conversation: The snails - Vincent - Get to know the snails family". On the left, there is a 3D illustration of a green snail character in a rural setting with a wooden cabin and trees. Below the illustration, the user's score is 423 and their friendship level is "Acquaintance".

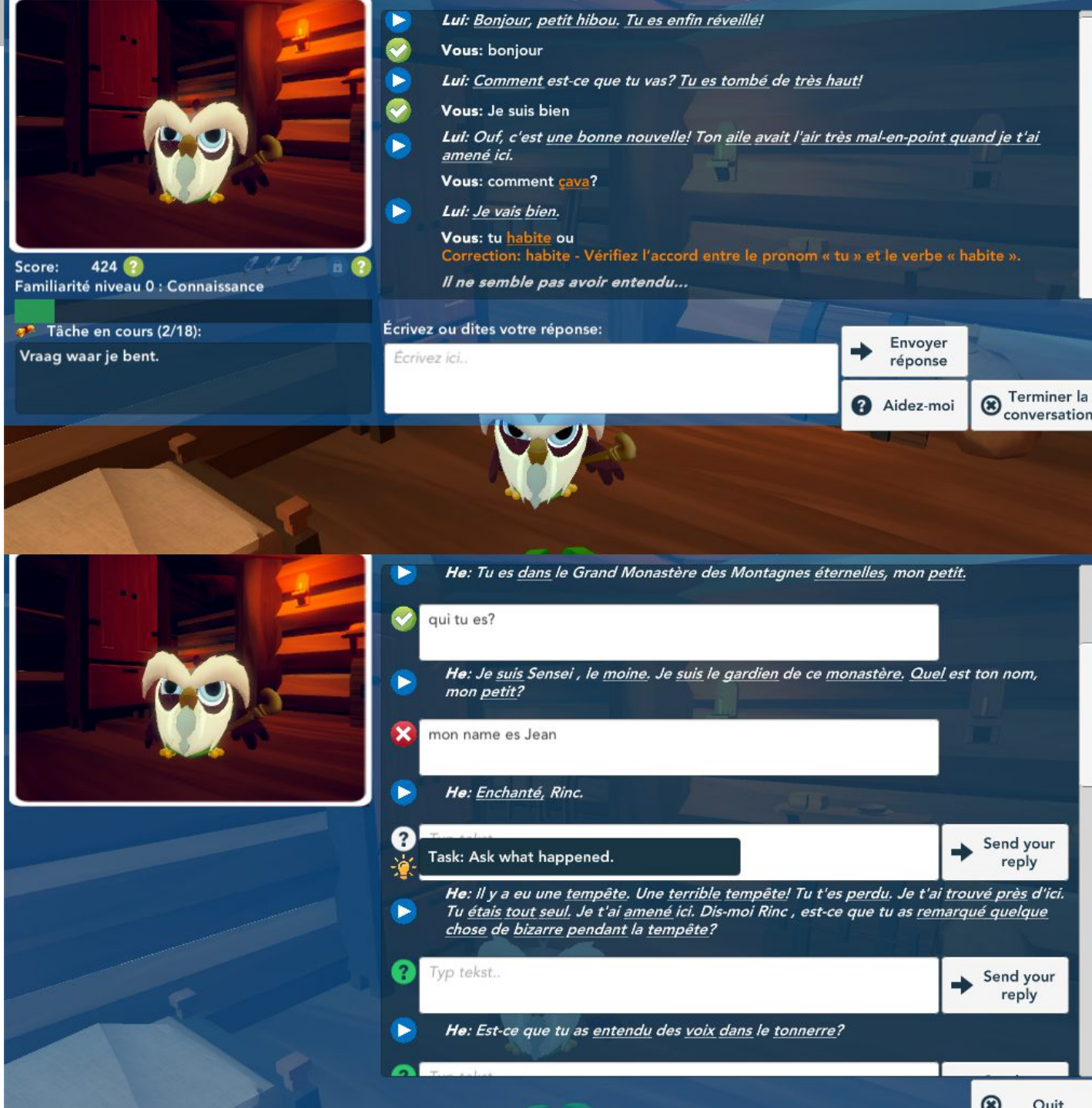
The main dialogue area shows the following exchange:

- He:** *Bien le bonjour! Comment t'appelles-tu?*
- You:** *bonjour, je m'appelle Rinc*
- He:** *Enchanté de faire ta connaissance, Rinc! Rinc. Rinc. Rinc. Ne t'en fais pas, je ne suis pas fou. C'est juste que je répète ton nom pour ne pas l'oublier.*
- You:** *Comment tu t'apele?*
- He:** *He does not seem to have heard you...*
- You:** *Tu t'appelle comment?*
- Correction:** *appelle - Vérifiez l'accord entre le pronom « Tu » et le verbe « appelle ».*
- Task accomplished:** *Good. That was what we were wondering about.*
- He:** *Moi, c'est Vincent. Elle, là-bas, c'est Angélique. Ça, c'est Delphine. Puis on a Georges dans le coin. Et évidemment, on ne peut pas oublier les triplées : Lisette, Claudette et Yvette. Oh! Et puis le petit là-bas, c'est Louis.*

At the bottom of the interface, there is a text input field labeled "Type or say your answer:" with a placeholder "Type text..". To the right of the input field are three buttons: "Send your reply", "Help me", and "End conversation".

# Intervention: Dialogue system

- *LanguageHero*, dialogue-based game for young learners : [www.languagehero.app](http://www.languagehero.app)
- Developed in 4 BC (before ChatGPT)
- Spontaneous written interaction (chat) + multimodal input
- Guided by microtask prompts
- Full logging of all messages read/written (577 494 words)
- Alternate condition: Static dialogue completion task



The screenshot displays the LanguageHero interface with an owl character on the left. The chat history shows the following exchange:

- Lui:** *Bonjour, petit hibou. Tu es enfin réveillé!*
- Vous:** *bonjour*
- Lui:** *Comment est-ce que tu vas? Tu es tombé de très haut!*
- Vous:** *Je suis bien*
- Lui:** *Ouf, c'est une bonne nouvelle! Ton aile avait l'air très mal-en-point quand je t'ai amené ici.*
- Vous:** *comment cava?*
- Lui:** *Je vais bien.*
- Vous:** *tu habite ou*
- Correction:** *habite - Vérifiez l'accord entre le pronom « tu » et le verbe « habite ». Il ne semble pas avoir entendu...*

Below the chat, there is a task prompt: "Tâche en cours (2/18): Vraag waar je bent." and a text input field with the placeholder "Écrivez ici..". Buttons for "Envoyer réponse", "Aidez-moi", and "Terminer la conversation" are visible.

The second part of the screenshot shows a different conversation:

- He:** *Tu es dans le Grand Monastère des Montagnes éternelles, mon petit.*
- qui tu es?** (input field)
- He:** *Je suis Sensei, le moine. Je suis le gardien de ce monastère. Quel est ton nom, mon petit?*
- mon name es Jean** (input field)
- He:** *Enchanté, Rinc.*
- Task:** *Ask what happened.*
- He:** *Il y a eu une tempête. Une terrible tempête! Tu t'es perdu. Je t'ai trouvé près d'ici. Tu étais tout seul. Je t'ai amené ici. Dis-moi Rinc, est-ce que tu as remarqué quelque chose de bizarre pendant la tempête?*
- Typ tekst..** (input field)
- He:** *Est-ce que tu as entendu des voix dans le tonnerre?*

Buttons for "Send your reply" and "Quit" are also present.



Conversation: Na de storm - Ontmoet Sensei, zoek uit wat er gebeurd is en waar je bent.



Repeat audio input



Lui: *Bonjour, petit hibou. Tu es enfin réveillé!*



Vous: *bonjour*



Lui: *Comment est-ce que tu vas? Tu es tombé de très haut!*



Vous: *Je suis bien*



Lui: *Ouf, c'est une bonne nouvelle! Ton aile a en-point quand je t'ai amené ici.*

Vous: *comment cava?*



Lui: *Je vais bien.*

Vous: *tu habite ou*

*Correction: habite - Ve entre le pronom « tu » et le verbe « habite ».*

*Il ne semble pas avoir entendu...*

Corrective feedback

Glossing

Conversation history

Score: 424 ?

Familiarité niveau 0 : Connais

Gamification elements

Tâche en cours (2/18):

Vraag waar je bent.

Microtask prompt

Écrivez ou dites votre réponse:

Écrivez ici..

Free written production

Help options

Envoyer réponse

Aidez-moi

Terminer la conversation

# Participants

- **Multisite:** 4 Flemish schools, with 2-3 classes each
  - $N = 215$      $N_{\text{classes}} = 11$
  - Focus on active conditions:  $n_{\text{ds}} = 83 + n_{\text{dc}} = 80$
- Teenagers: 12-13 y.o. (2<sup>nd</sup> grade of sec. school, ~8<sup>th</sup> grade)
- **L1** = 95% Dutch
- **L2** = French (first L2 learned at school)  
M = 3.1 years of French instruction  
Mostly at A1 level (beginners)
- In “classroom” (school computer lab)



# Instrument: Perceptions questionnaire (post)

Construct	Subdimensions	Items	$\alpha$	Source/Theoretical framework
Perceived ease-of-use	Corrective feedback, Comprehensibility, Interface, Tasks	5 (7)	.67	Technology Acceptance Model (Davis 1989), partially from Cornillie et al (2013)'s translation (adapted)
Perceived usefulness	General usefulness, Corrective feedback, Hints, Tasks	11	.89	
Perceived interactivity	Immediacy, Control, Mutuality	11 (13)	.79	New scale developed
Perceived authenticity	General Academic Personal	6 (7)	.84	Perceived Authenticity of Writing Scale (Behizadeh & Engelhard 2014) (adapted)

e.g., PERCEIVED INTERACTIVITY: "Through my answers, I could really have an impact on the game."

PERCEIVED USEFULNESS: "I am less afraid to speak French now than I was before playing the game."

# Instrument: Full in-game logging

- Full logging of all messages read and written in the system
  - 48 353 messages  
577 494 words
- Keylogging (keystrokes + timestamps)

# Instrument: Target vocabulary test

- Target words: selected because of (expected) occurrence, but no focus of instruction  
→ **Incidental learning** only
- At pre- & posttest, randomized, identical tests
- **50 target items**

## 1. Receptive part: meaning recognition

25 isolated words *potager*

## 2. Productive part: form recall

25 'formulaic sequences' in gap-filling  
*beaucoup d'imagination*

le membre

lid

vlies

gebouw

hetzelfde

Ik weet het niet.

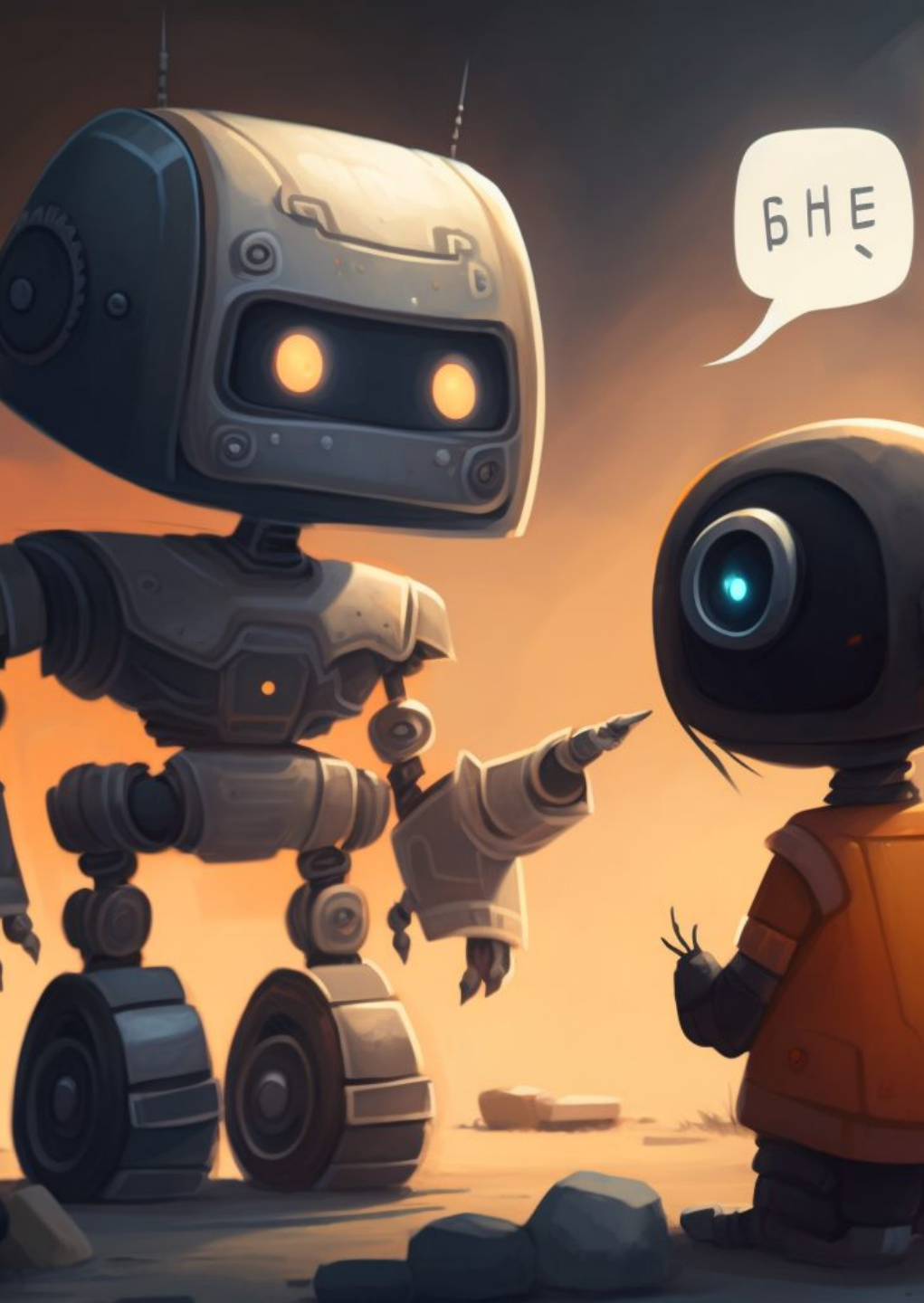


Allô ? Jean ? Il est 22h00 et tu n'es toujours pas à la maison. J'es\_\_\_\_\_ que tout va bien...

espère







# Interactivity in Conversational AI

**Interactivity** in SLA, CALL/TSL

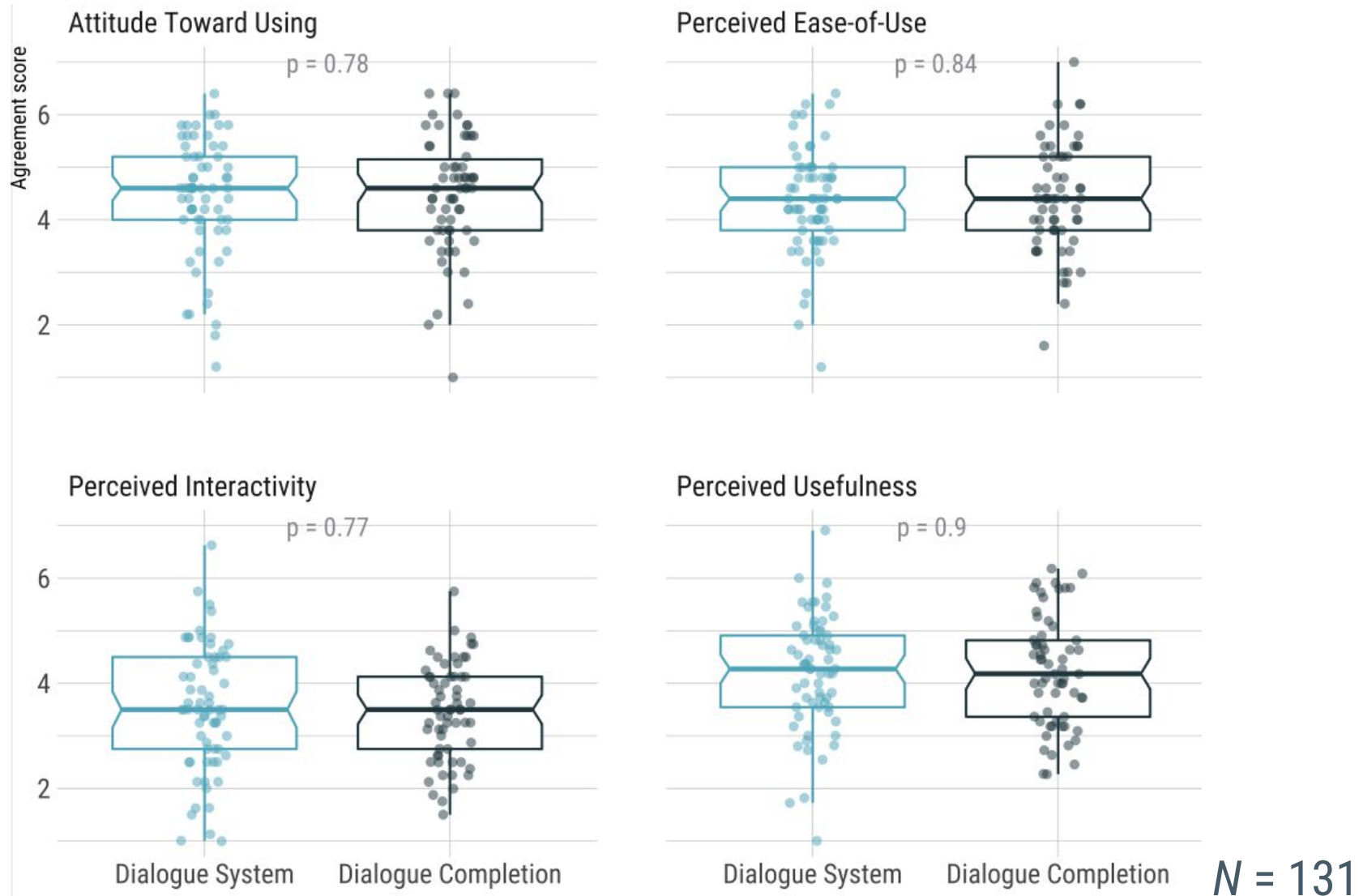
**Methods:** dialogue sys. +/-interactive

**Results:** Perceptions & Engagement

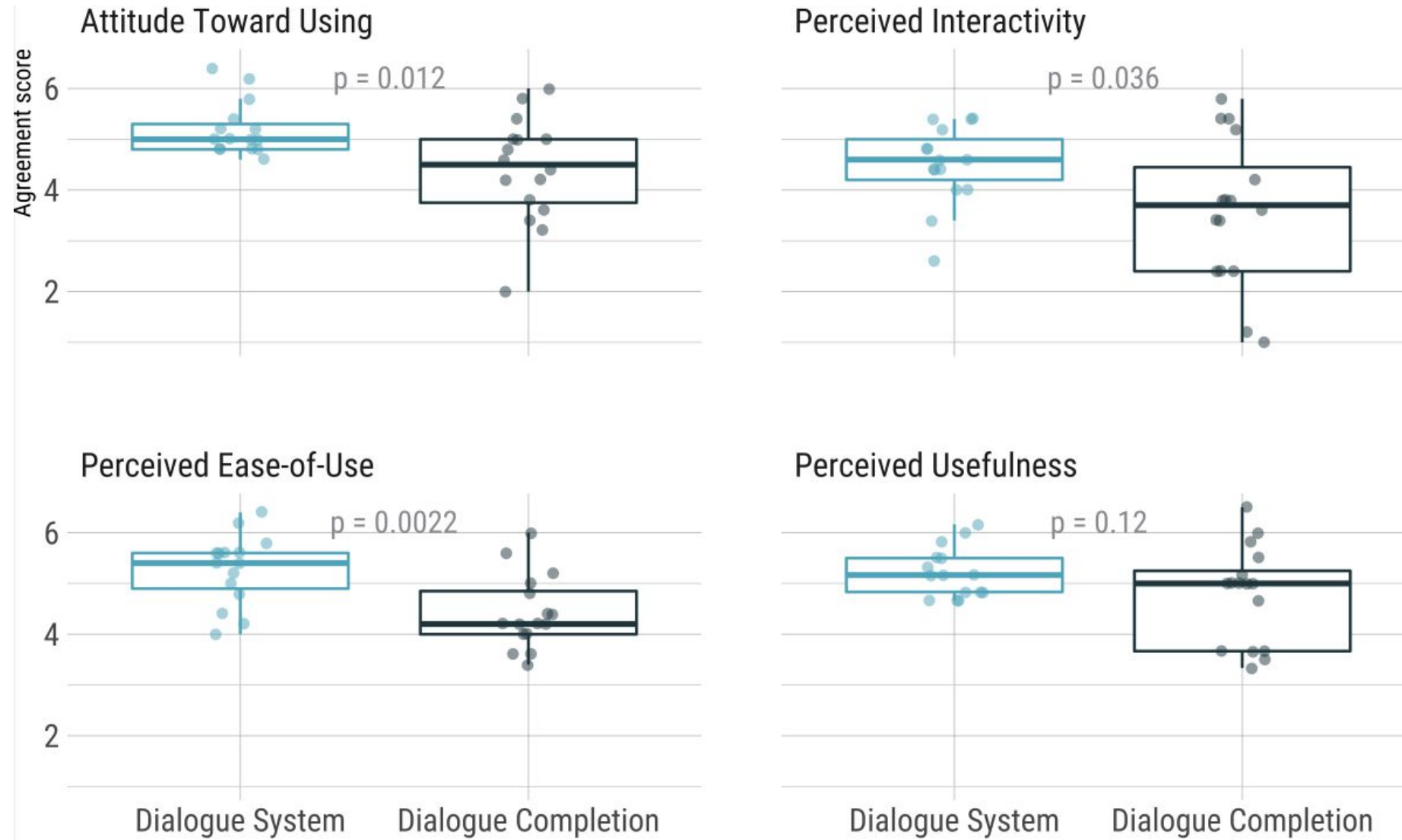
**Discussion**

Which interactivity matters?

# No difference in perceptions



# But very different perception of the pilot app



# Pilot version of the Dialogue Completion condition



- No feedback, no scaffolding (for input comprehension or help for output)
- Visible frustration among users of the Dialogue Completion condition ( $n = 16$ )



# Interactivity in Conversational AI

**Interactivity** in SLA, CALL/TSL

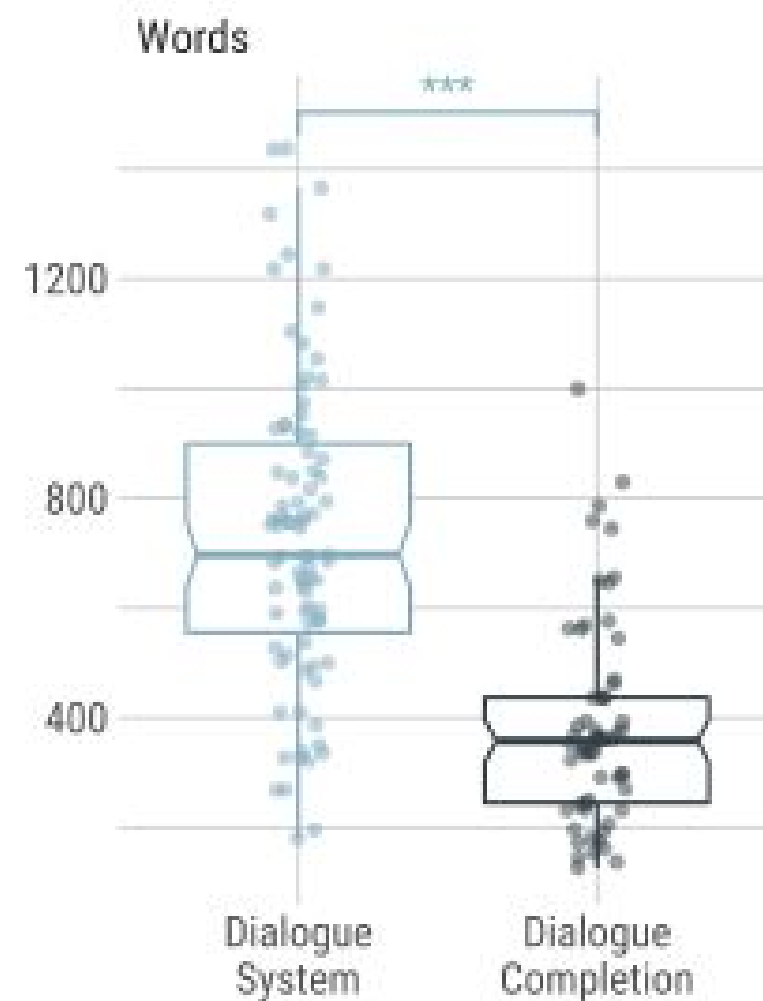
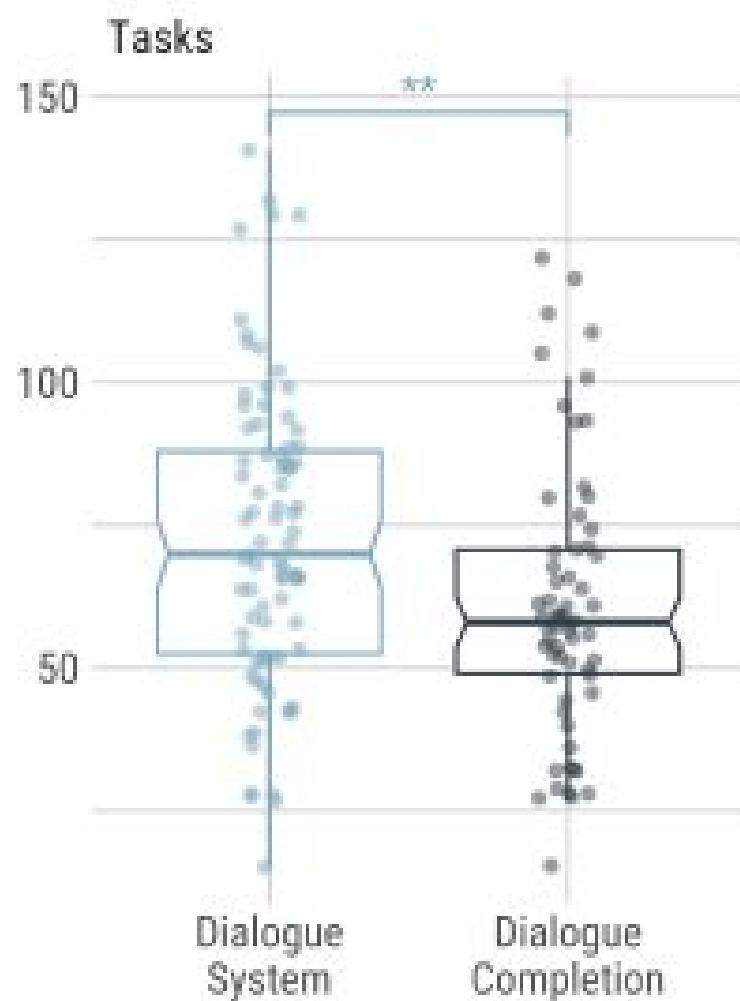
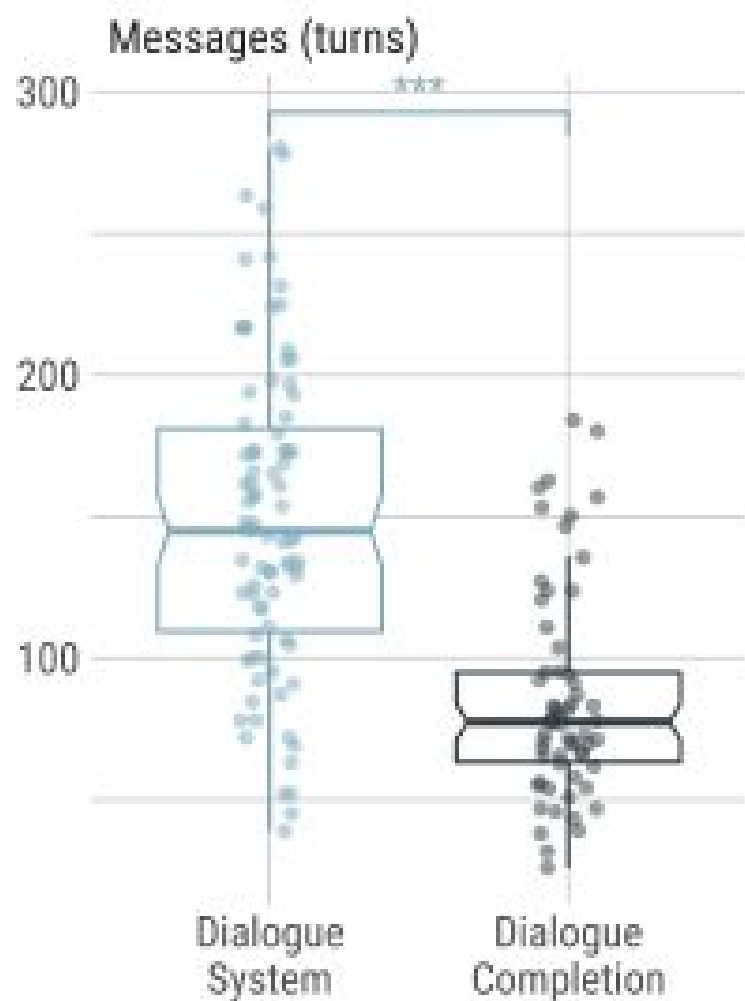
**Methods:** dialogue sys. +/--interactive

**Results:** Perceptions & **Engagement**

**Discussion**

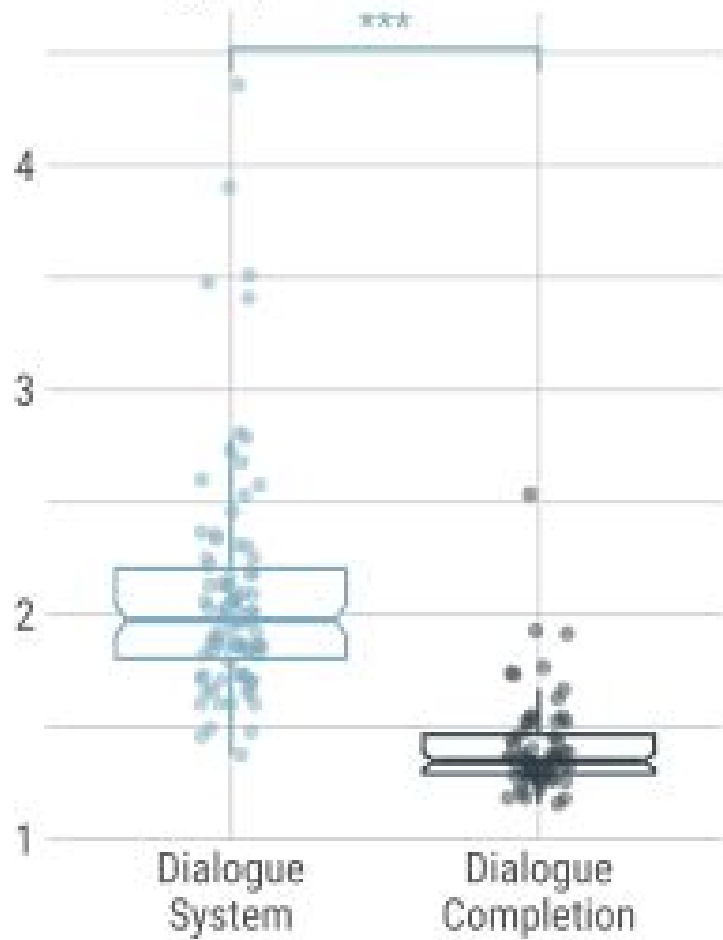
Which interactivity matters?

## Behavioural task engagement: Quantity

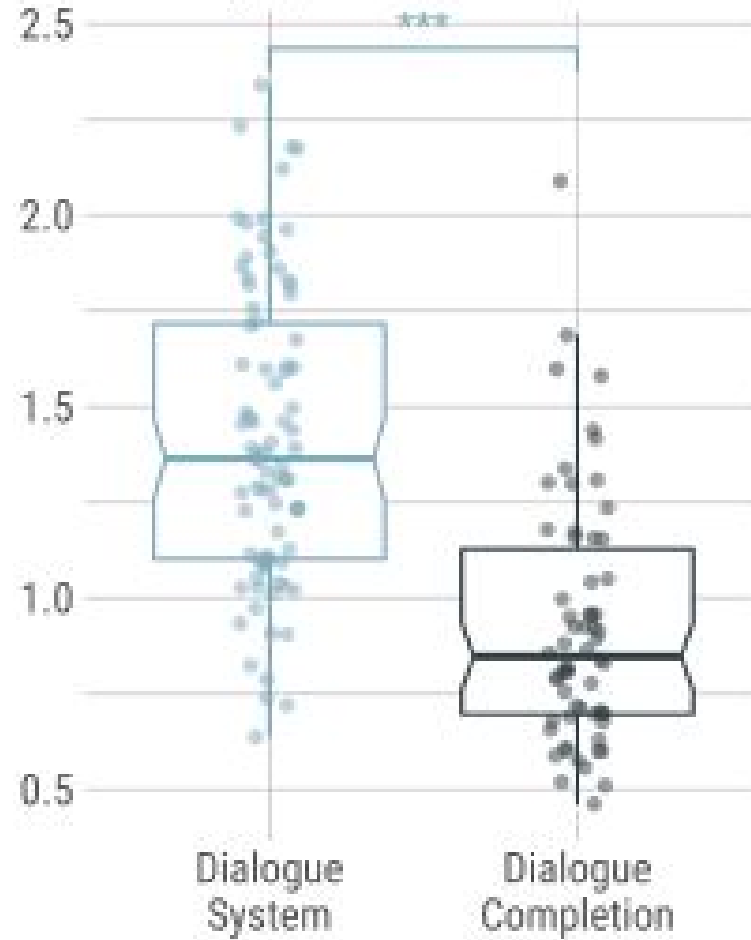


## Behavioural task engagement: Intensity

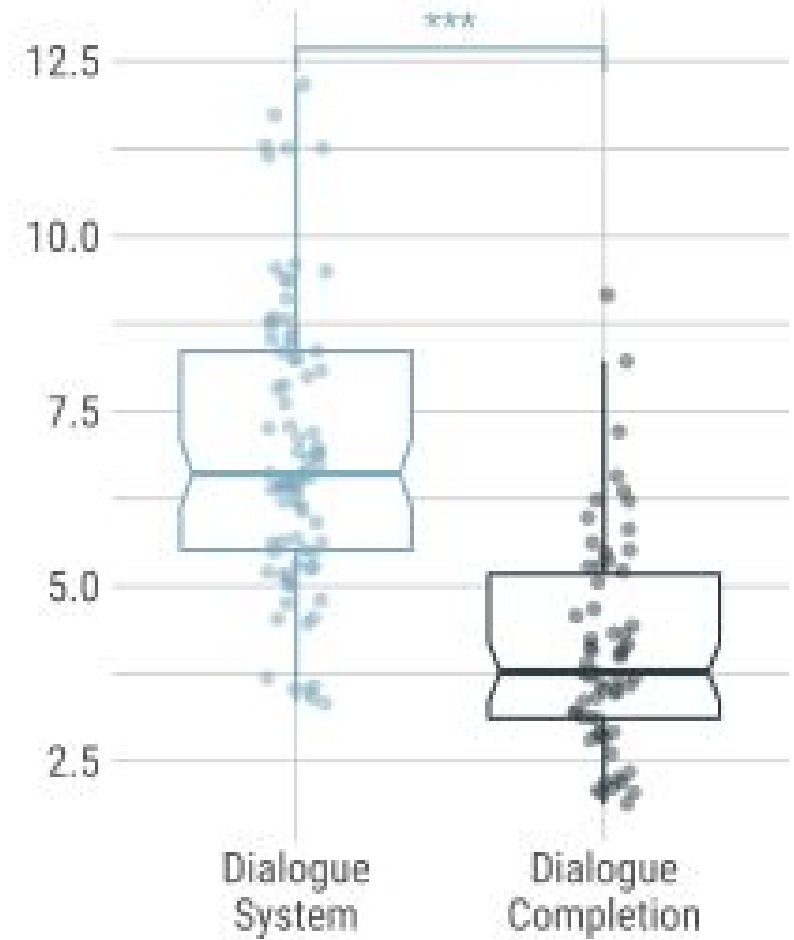
Messages per task



Messages per minute

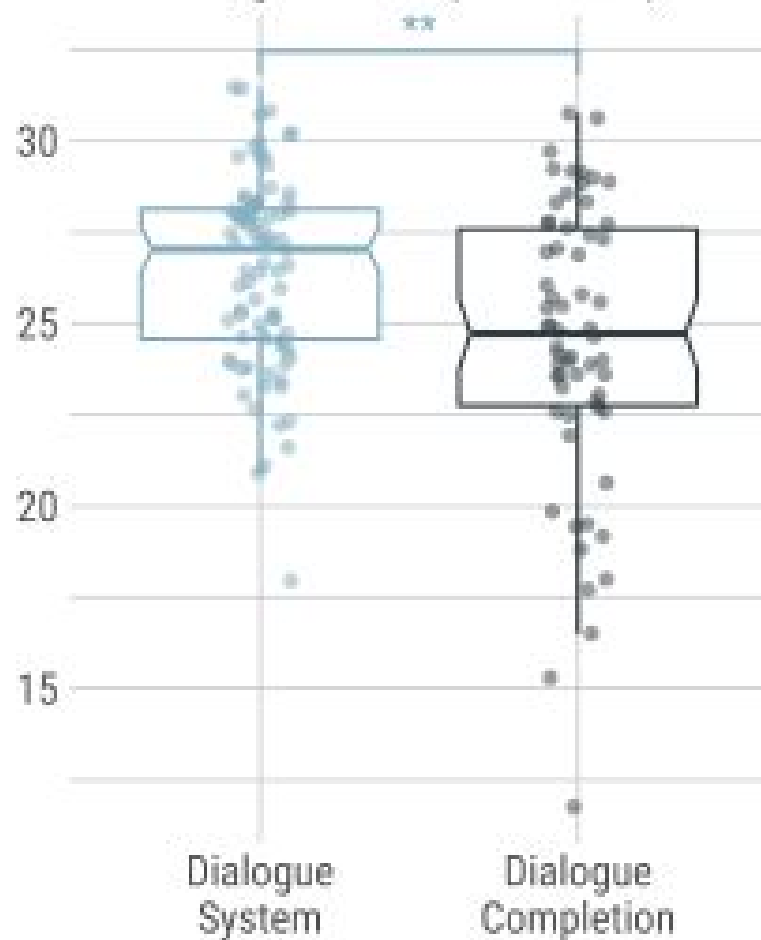


Words per minute

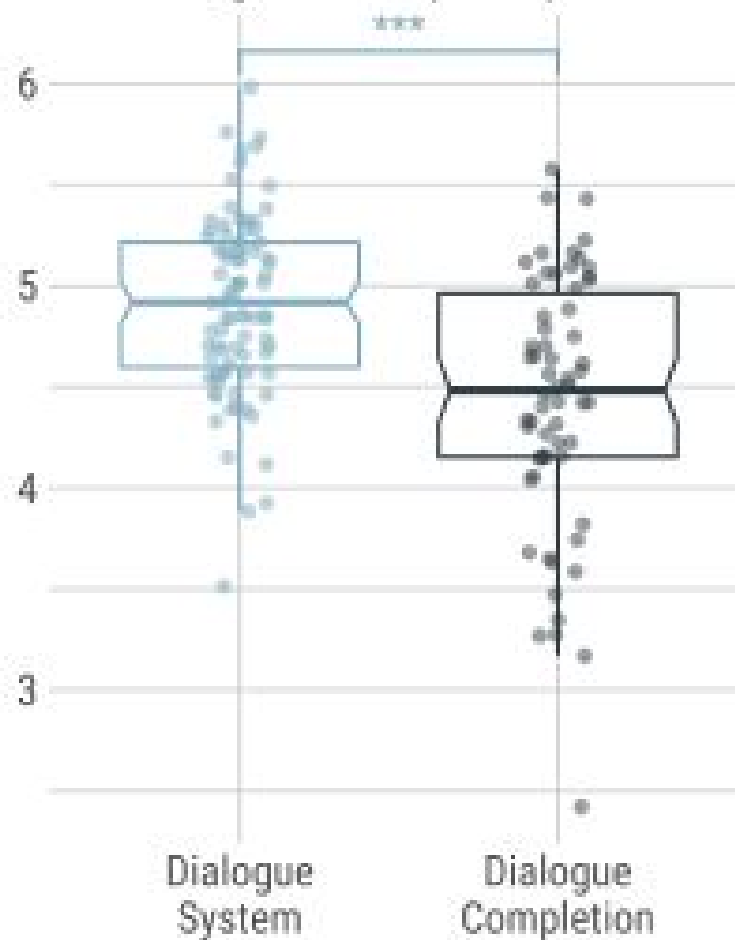


## Cognitive task engagement: Syntactic complexity

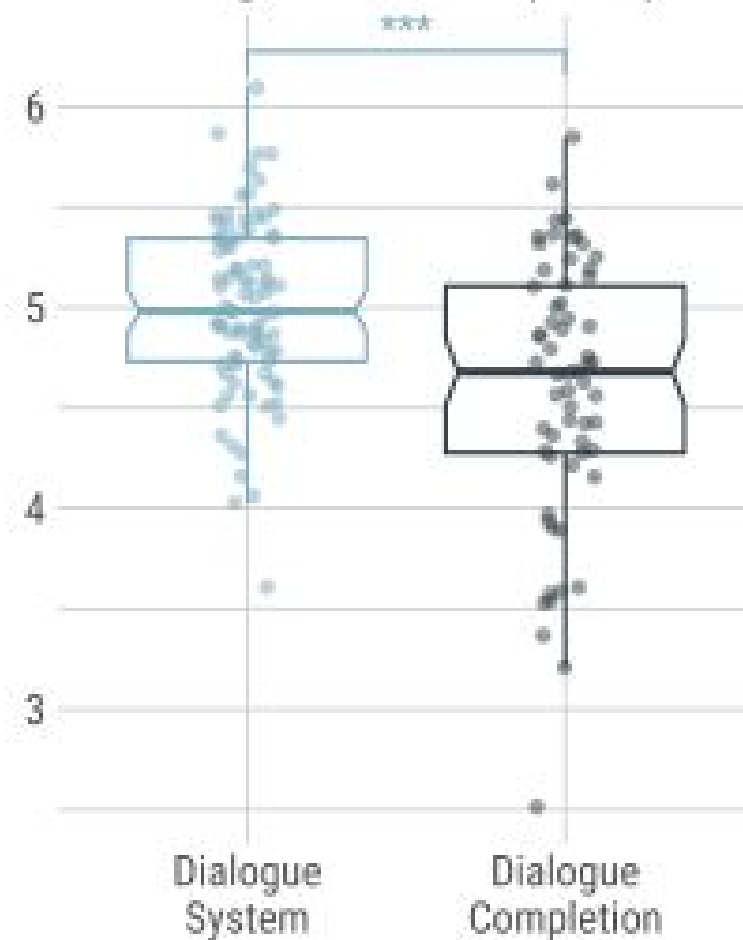
Mean length of turn (characters)



Mean length of turn (words)

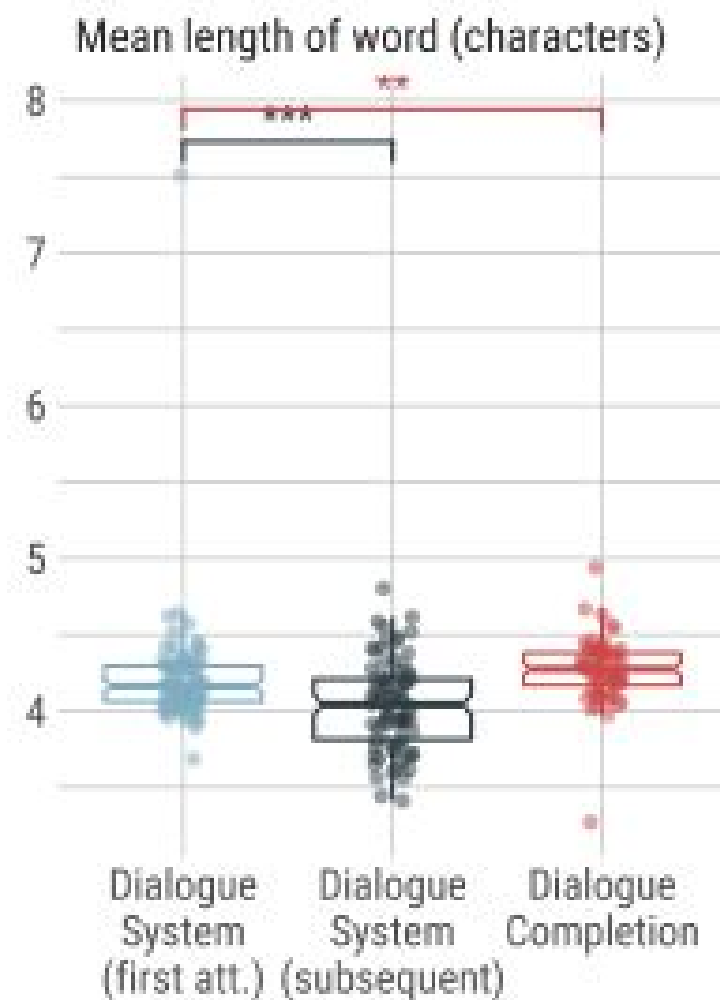
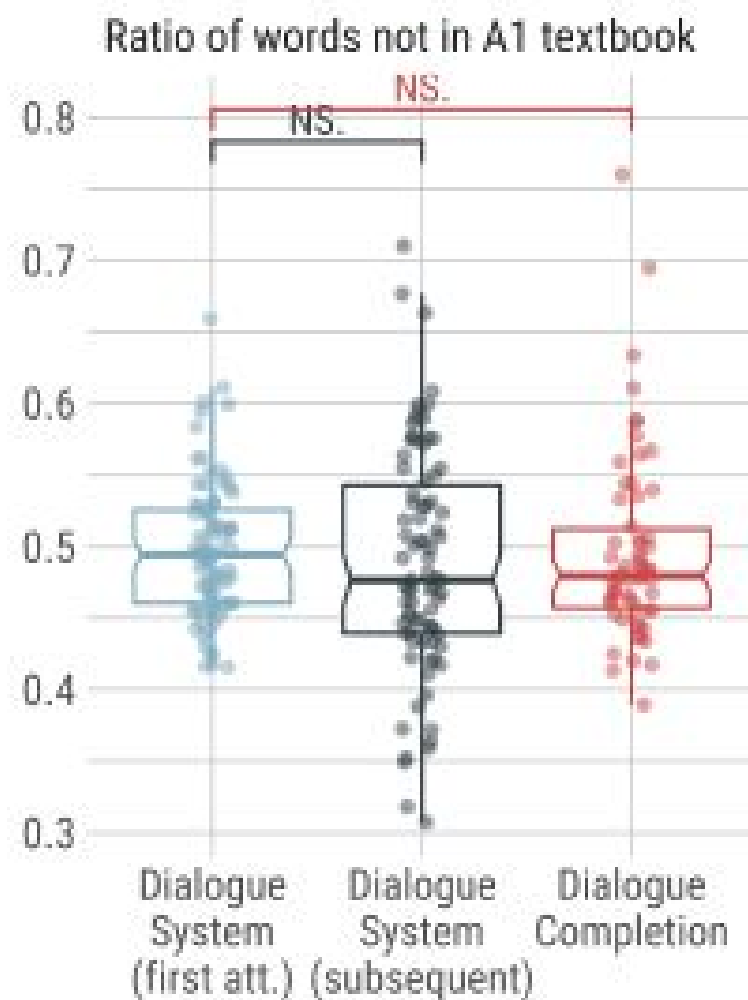
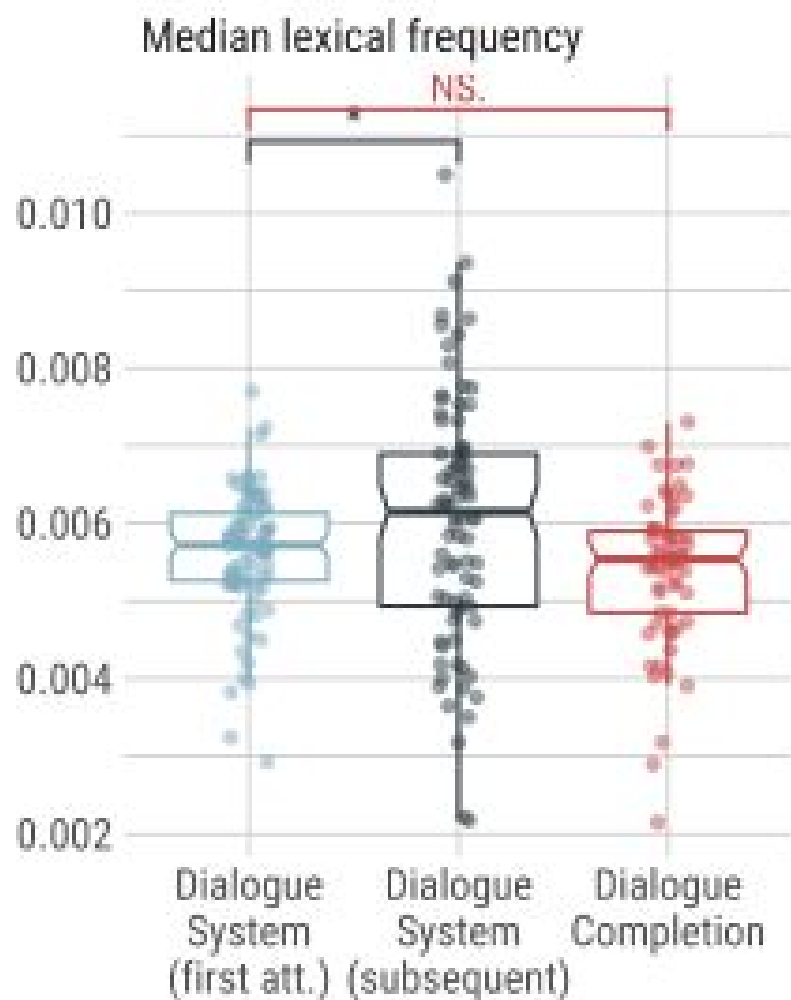


Mean length of sentence (words)





## Cognitive task engagement: Lexical complexity [distinguishing attempts]





# Interactivity in Conversational AI

**Interactivity** in SLA, CALL/TSL

**Methods:** dialogue sys. +/- interactive

**Results:**

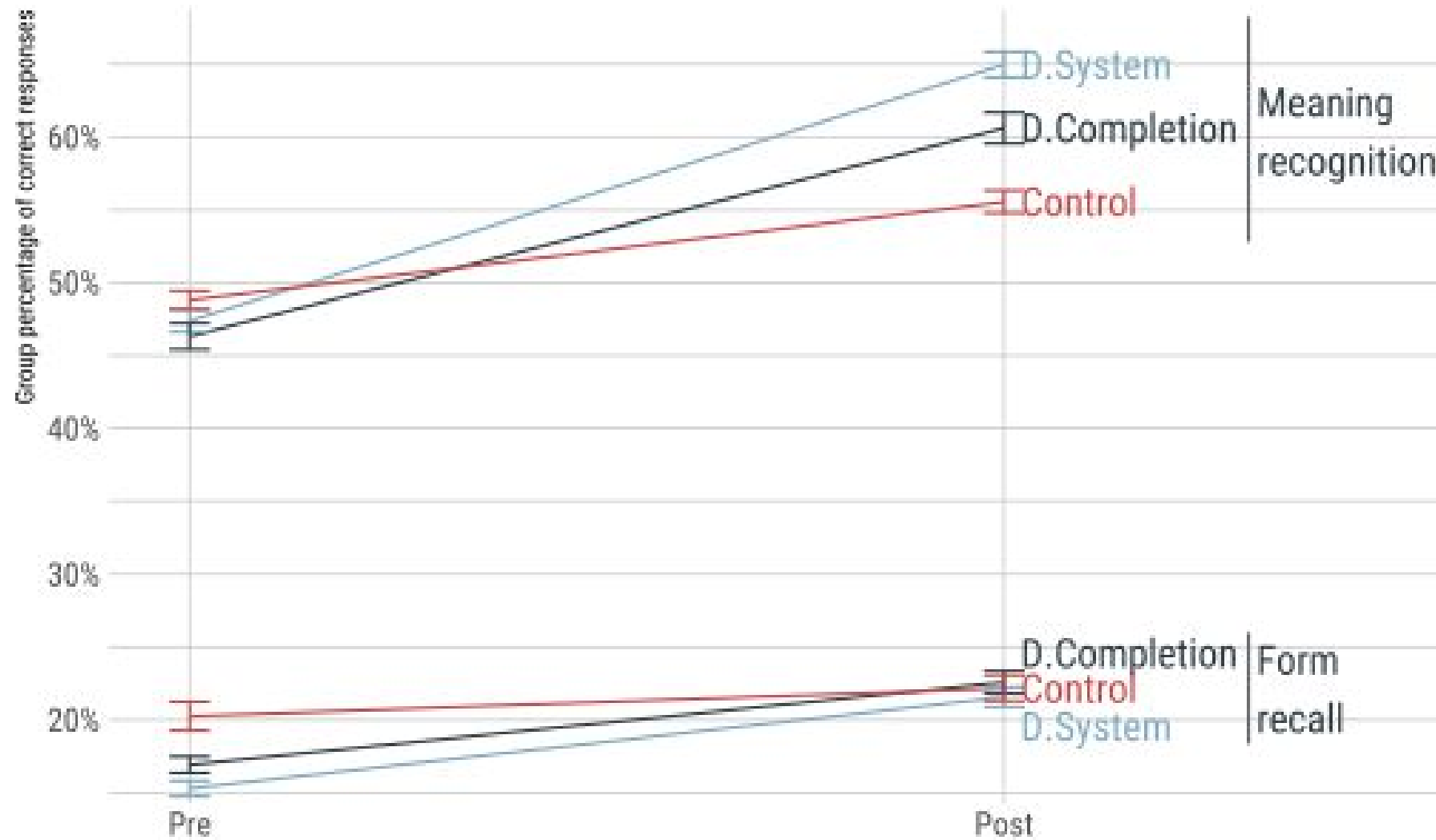
Perceptions, Engagement,

**Vocabulary learning**

**Discussion**

Which interactivity matters?

## Evolution of group means





# Interactivity in Conversational AI

**Interactivity** in SLA, CALL/TSL

**Methods:** dialogue sys. +/- interactive

**Results**

Perceptions

Engagement

**Conclusion**

Which interactivity matters?

# Limitations

**System:** story-first design

→ **explicit microtask prompts**

→ reduced user control

→ limited difference across conditions (exp. condition less interactive than foreseen)

**Instruments:**

too limited number of items for Perceived ease-of-use

excessive difficulty of target vocabulary test (form recall)

many vocabulary items with too limited/no exposure in the end



Repeat  
audio input



*Lui: Bonjour, petit hibou. Tu es enfin réveillé!*



**Vous:** bonjour



*Lui: Comment est-ce que tu vas? Tu es tombé de très haut!*



**Vous:** Je suis bien



*Lui: Ouf, c'est une bonne nouvelle! Ton aile a un point quand je t'ai amené ici.*

**Vous:** comment çava?



*Lui: Je vais bien.*

**Vous:** tu habite ou

**Correction:** habite - Ve entre le pronom « tu » et le verbe « habite ».

*Il ne semble pas avoir entendu...*

Corrective  
feedback

Conversation  
history

Glossing

Score: 424 ?

Familiarité niveau 0 : Connai

Gamification  
elements ?

Tâche en cours (2/18):

Vraag waar je bent.

Microtask  
prompt

Écrivez ou dites votre réponse:

Écrivez ici..

Free written  
production

Help  
options



Envoyer  
réponse



Aidez-moi



Terminer la  
conversation

# Conclusion: Which interactivity matters?

- Perceptions and learning more affected by **instructional interactivity** (feedback, scaffolding) than game-like user agency on the dialogue.
  - Interactivity as user agency may *not* change perceptions or technology acceptance.
  - Interactivity as **negotiation of form and meaning**: retries, self-repair...
  - ⇒ For effective dialogue-based CALL:
    - ▴ **feedback, scaffolding, adaptivity**    ▾ ability to process anything
- Interactive/Dynamic interface ⇒ **Engagement**
  - More focus on fluency and meaning
  - More output ⇒ More productive vocabulary use ⇒ Reinforced learning

Thanks! Questions & suggestions?

**Serge Bibauw**  
serge.bibauw@uclouvain.be  
Tw: @SergeBibauw

