digital creativity labs

Gaming Grammar: Developing a digital game for foreign language grammar learning

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Outline

- Motivation for the project
- Games and practice

- The design of the game

- The evaluation

- Analysing the online play data: Results and conclusions

DESIGN **PRODUCE** **EVALUATE**

a digital game for foreign language grammar learning

Motivation

"understand basic grammar appropriate to the language being studied"

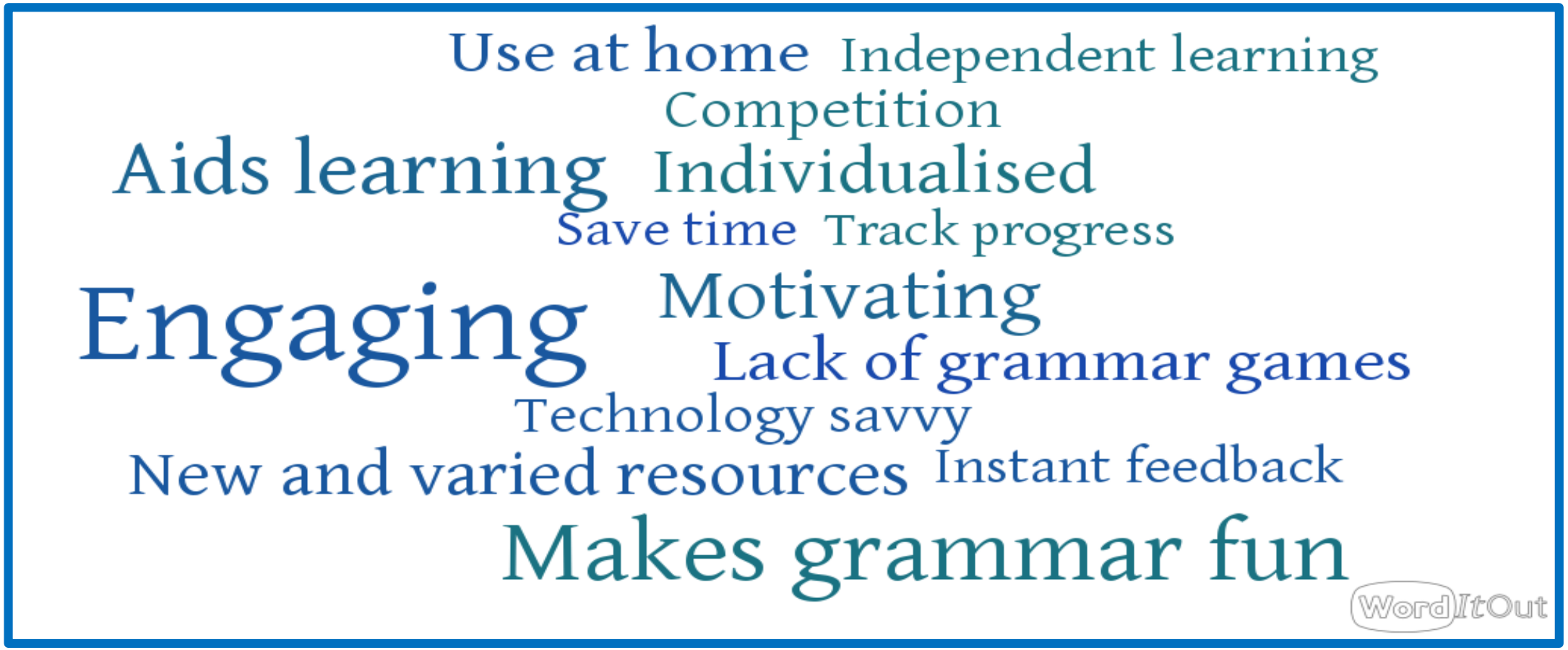
(DfE, 2013)

Teacher survey

Would you be interested in using a digital game for teaching FL grammar?

90% Yes; 10% Maybe

(*N* = 140)



Online digital gamed-based tools

Importance of **meaningful practice** to facilitate language development e.g. grammatical knowledge

Set within a communicative context
attention to meaning as well as form
(Cornillie et al., 2017; DeKeyser, 2007; Ortega, 2007; VanPatten, 2004)

Embed practice in wider context

Repetition without becoming **repetitious** (DeKeyser, 2007; Lynch & Maclean, 2001)

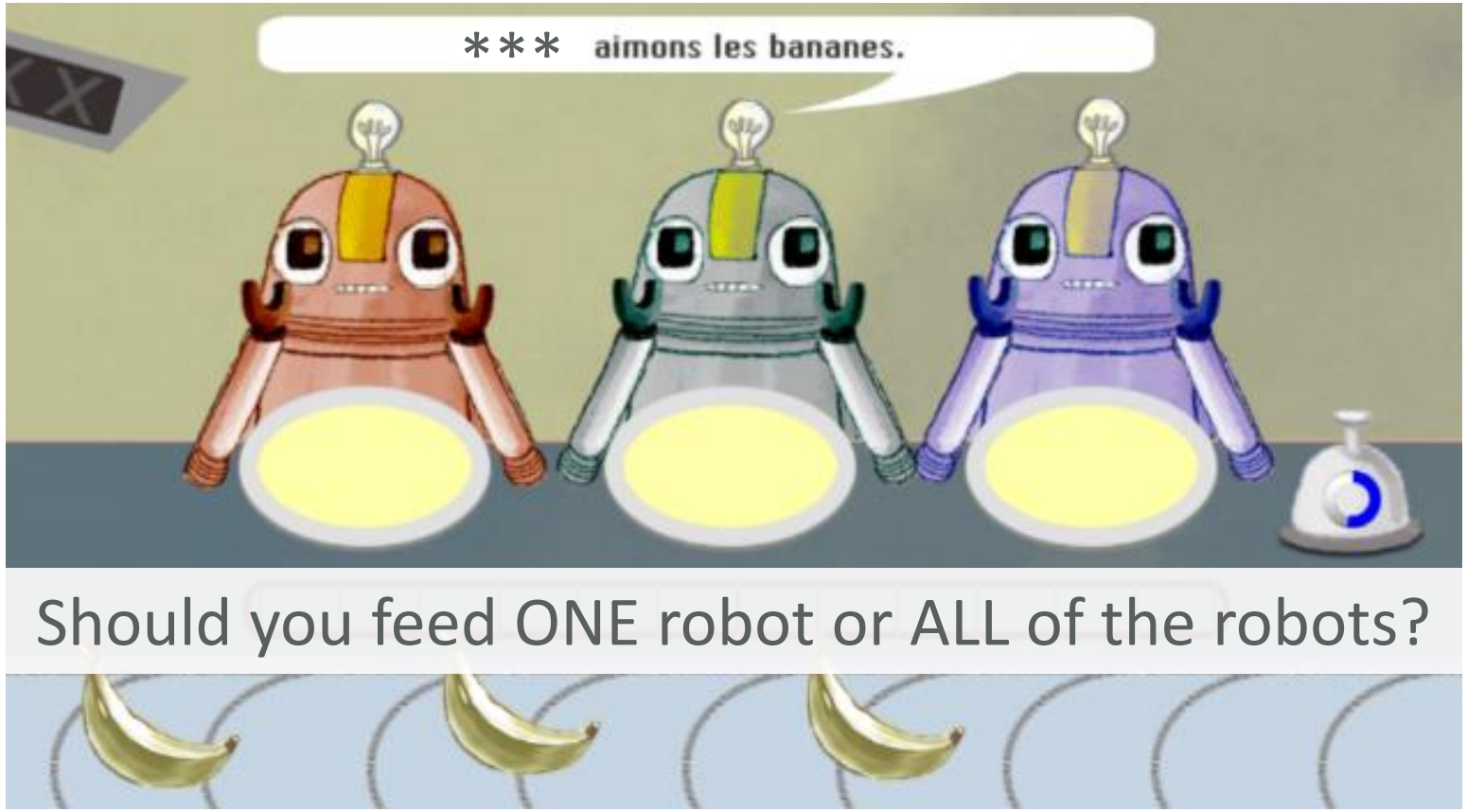
Key characteristics of a game: Goals, Interaction, Context, Feedback (Sykes & Reinhardt, 2012)

The underpinning learning theory

Form-Meaning Mapping practice (Input-based)

- Short grammar explanation PLUS
- Repeated practice via meaningful L+R activities

Push learners to focus on:
FORM + MEANING



Numerous studies conducted with **young** and **adult** learners, a **range of languages** and **grammar features**

Marsden (2006):

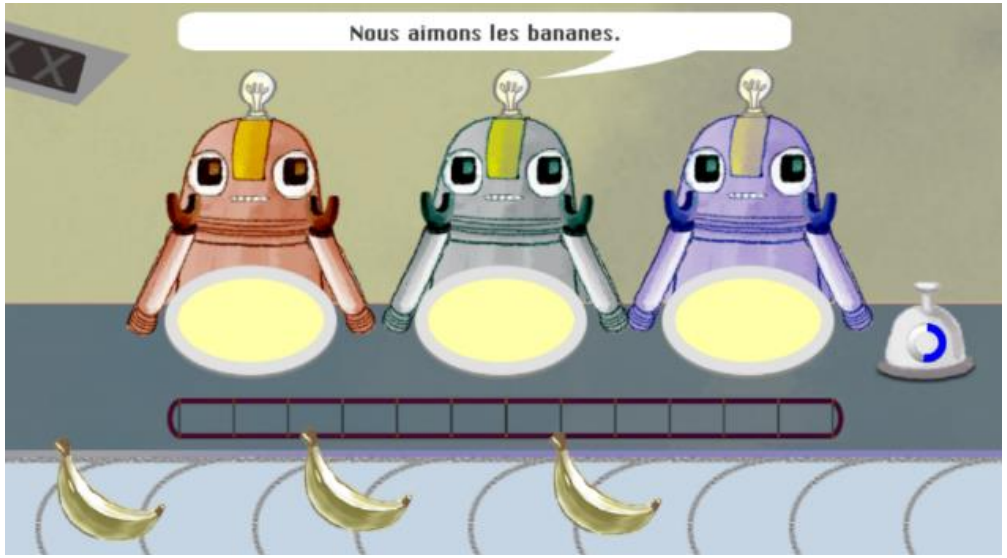
- 13-14 year olds
- L2 French verb conjugation
- FMM activities > Enriched Input

Gaming Grammar: The Game

Series of mini-games

L2 French verb conjugation

	Number	Tense (+avoir)
1st person	-e *vs.* -ons	je *vs.* j'ai
3rd person	-e *vs.* -ent	il / elle *vs.* il / elle a

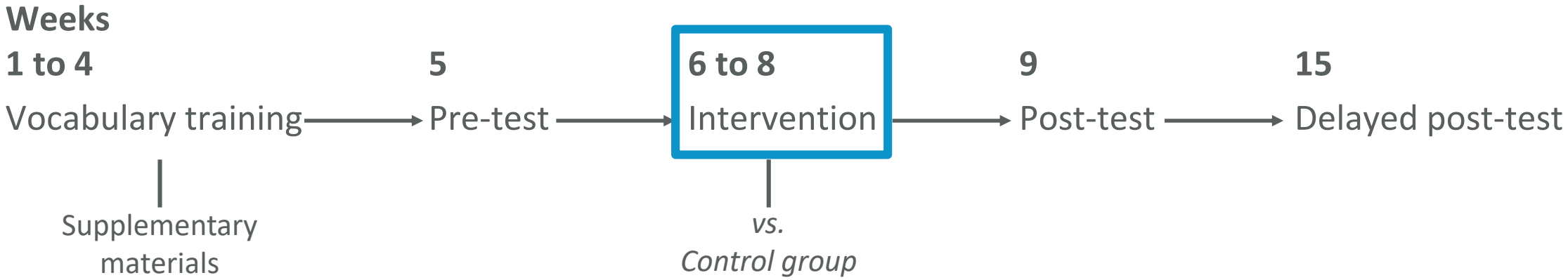


Evaluation: Research Questions

Does meaningful, game-based, grammar practice lead to learning?

Experimental, classroom-based study

- 6 primary school classes, 150 children (aged 8 to 11)
- L1 English, L2 French (beginners)



Evaluation: Research Questions

Frequency of play

How much practice and how often?

- Limited time available within the language classroom (Tinsley & Board, 2017)
- Technology offers more flexibility

Mixed findings from previous studies

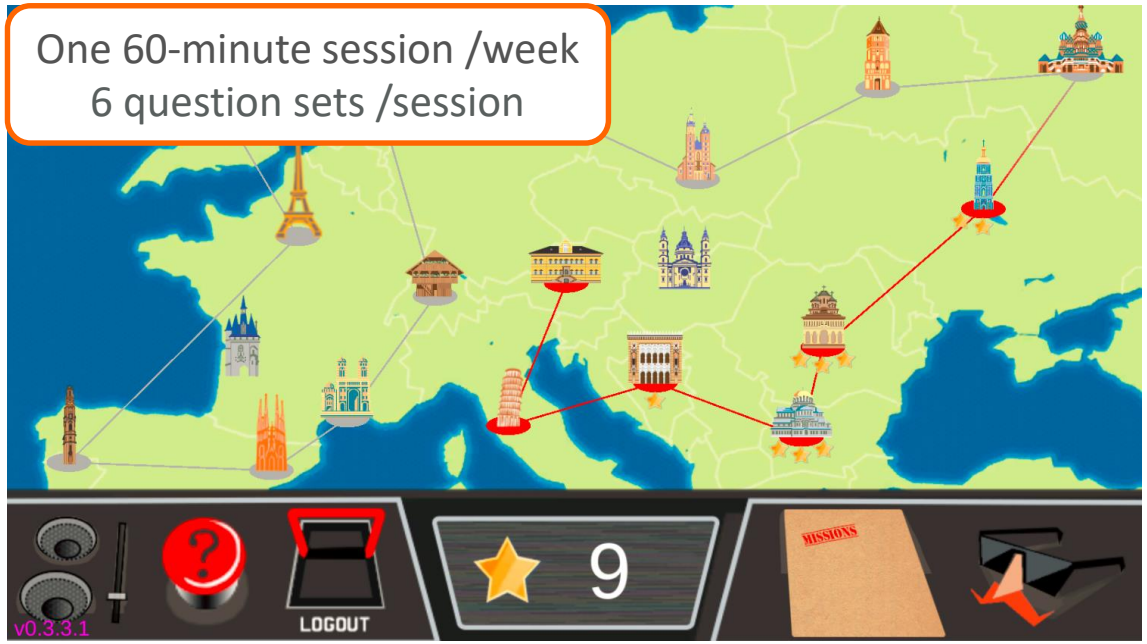
- Longer spacing > short spacing (e.g. Bird, 2010; Rogers, 2015)
- Longer spacing = < shorter spacing (e.g. Suzuki & DeKeyser, 2015; Suzuki, 2017)

Is the learning effectiveness of the game mediated by **frequency of play**?

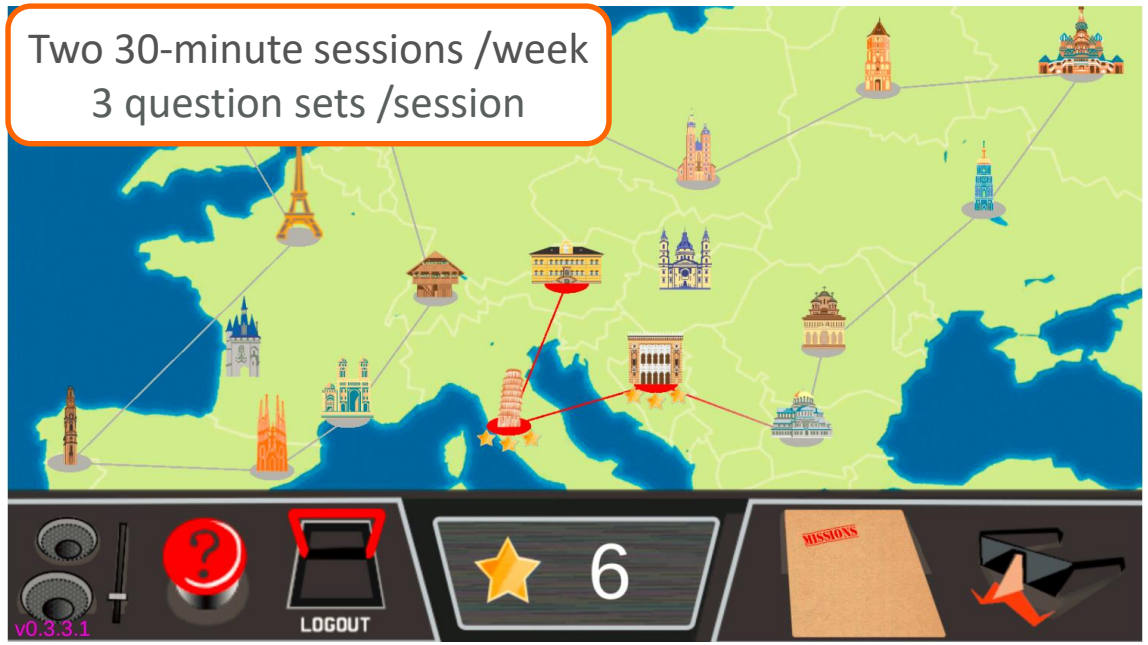
Evaluation: Implementing variables

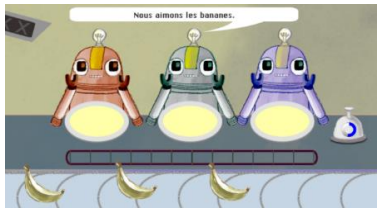
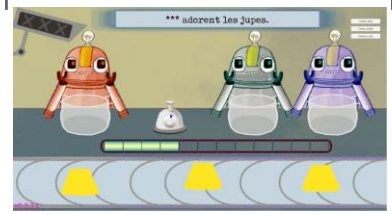
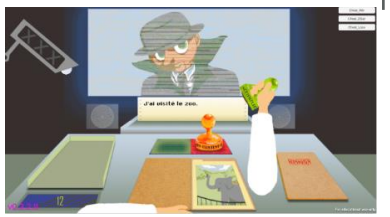
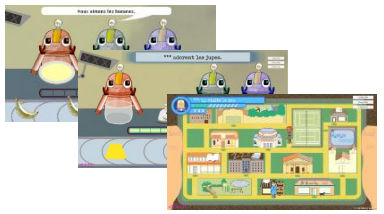
Frequency of play

One 60-minute session /week
6 question sets /session

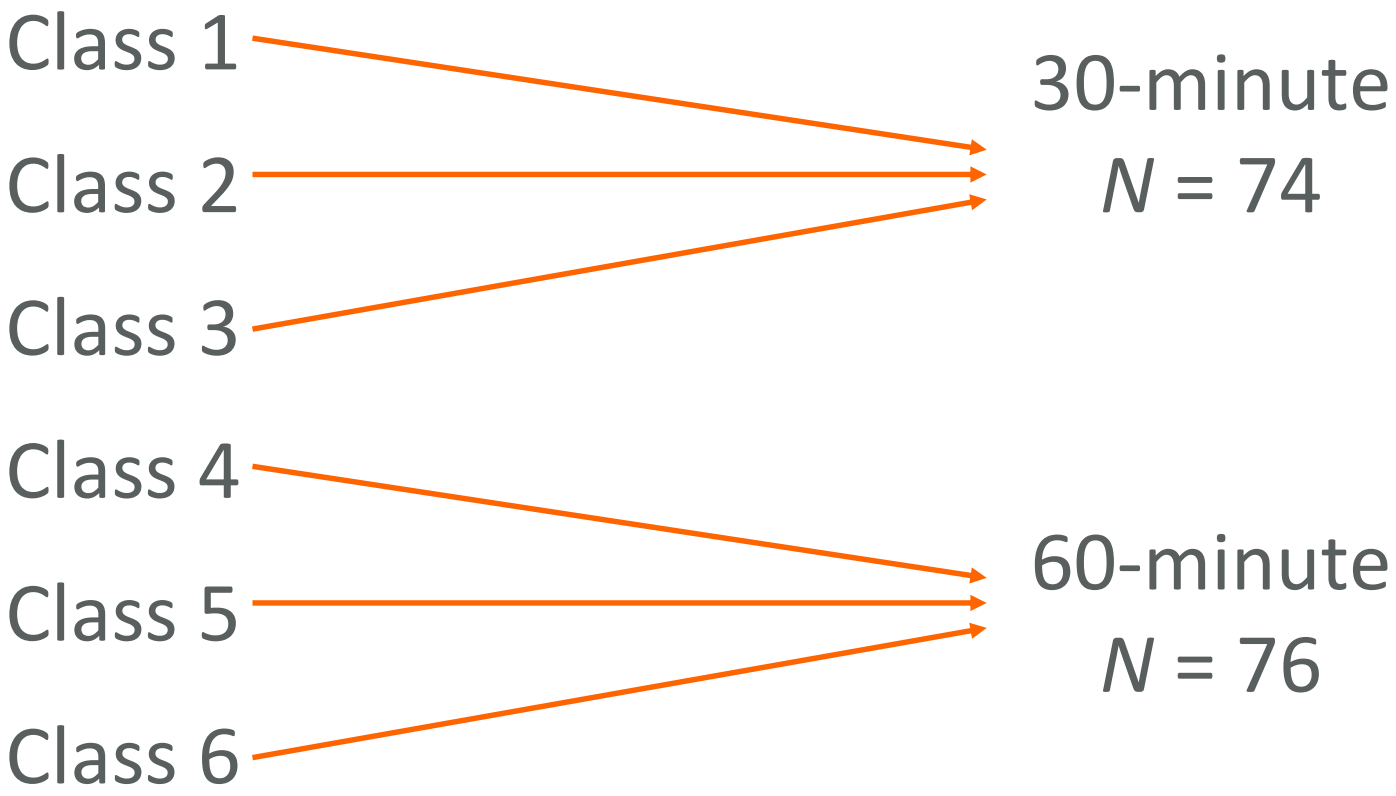


Two 30-minute sessions /week
3 question sets /session



1st person singular vs. plural *-e vs. -ons*	3rd person singular vs. plural *-e vs.* -ent	1st person present vs. past *je* vs. *j'ai*	3rd person present vs. past *il/elle* vs. *il/elle a*	1st vs. 3rd person past *j'ai* vs. *il/elle a*	Recap
					

Evaluation: Group allocation



Explicit information & Feedback

One mini-game per grammar feature

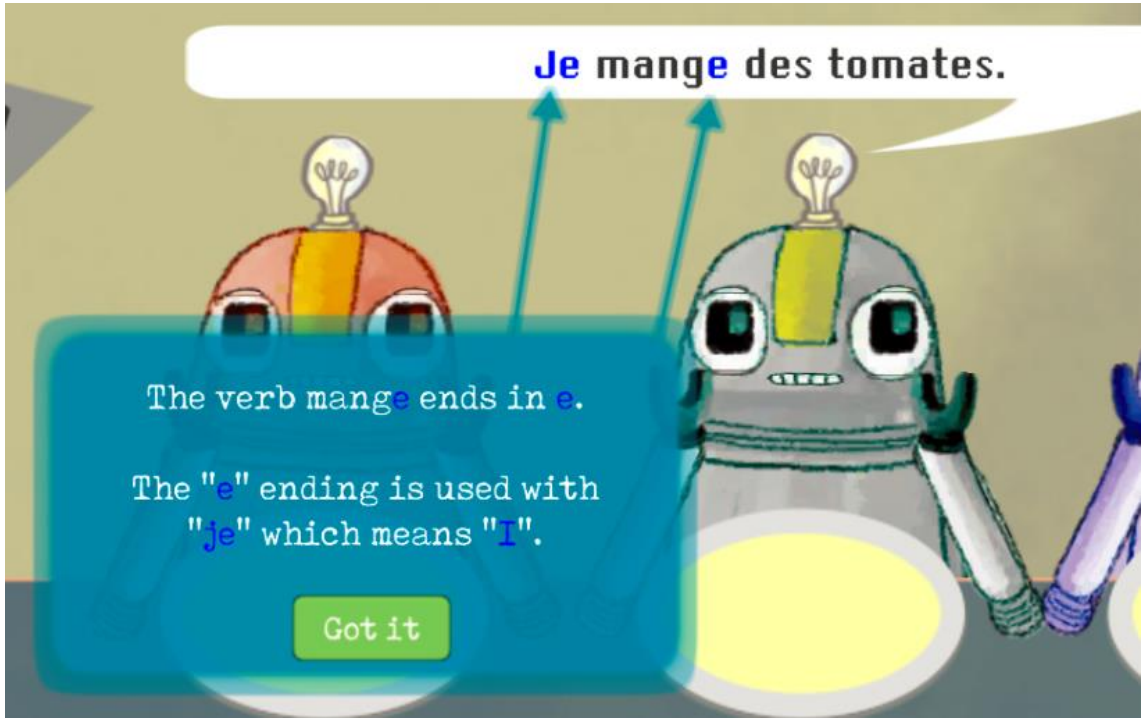
3 question sets (Reading and Listening / Reading only / Listening only)

12 items per question set

	Number	Tense (+avoir)
1st person	-e *vs.* -ons	je *vs.* j'ai
3rd person	-e *vs.* -ent	il / elle *vs.* il / elle a

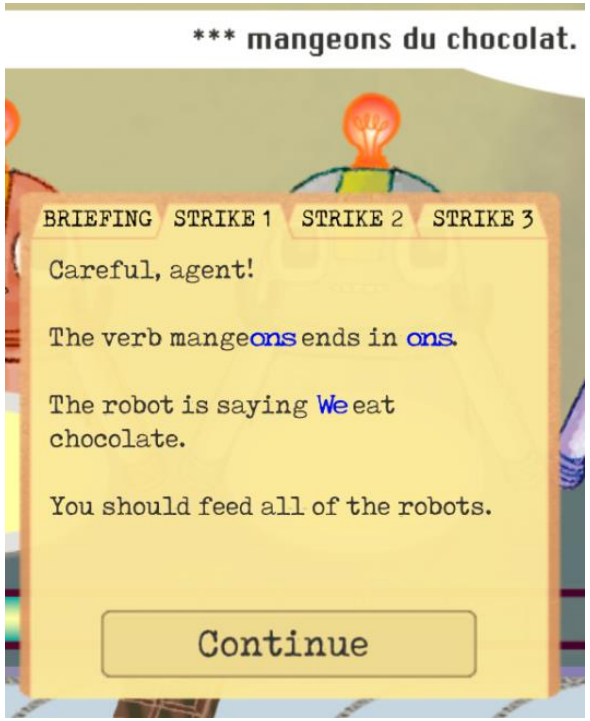
Tutorial:

R&L; Qs 1 & 2



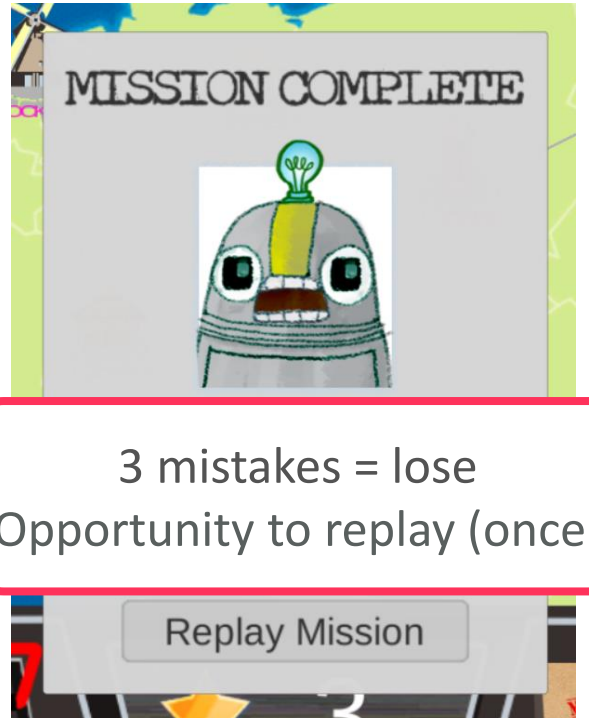
Feedback:

Reminder of grammatical rule



Reward:

Star rating



3 mistakes = lose

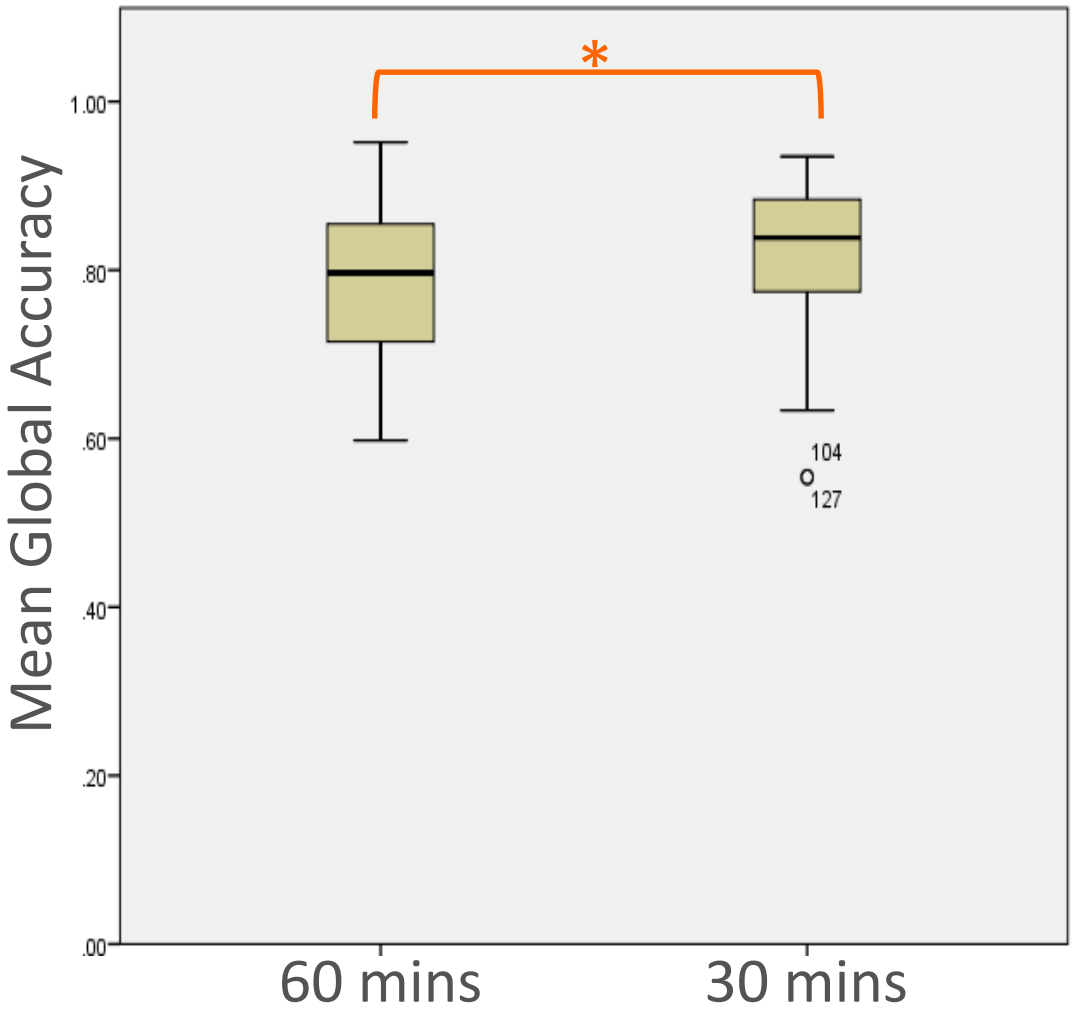
Opportunity to replay (once)

Class	nQuestion	nCorrect	[03]IsCor	[03]Respc	[04]IsCor	[04]Respc	[05]IsCor	[05]Respc	[06]IsCor	[06]Respc	[07]IsCor	[07]Respc	[08]IsCor	[08]Respc	[09]IsCor	[09]Respc	[10]IsCor	[10]Respc	[12]IsCor	[12]Respc	[13]IsCor	[13]Respc
Class 1A	10	10	1	5.629	1	8.42	1	4.515	1	8.214	1	7.768	1	8.052	1	4.59	1	10.003	1	10.003	1	6.055
Class 1A	11	10	1	8.075	1	7.532	1	8.47	1	7.056	1	7.564	1	10.007	1	5.171	1	8.298	0	5.208	1	6.391
Class 1A	10	10	1	7.262	1	5.065	1	3.95	1	6.735	1	4.967	1	7.535	1	2.68	1	3.435	1	7.372	1	7.547
Class 1A	12	10	1	3.017	1	6.058	1	6.4	1	5.6	1	6.802	0	7.138	1	2.583	1	2.902	0	5.238	1	8.767
Class 1A	10	10	1	5.168	1	6.412	1	4.784	1	4.995	1	5.55	1	7.567	1	3.401	1	5.748	1	3.953	1	7.147
Class 1A	11	10	1	3	0	10.018	1	2.283	1	6.782	1	6.715	1	10	1	3.465	1	5.953	1	4.523	1	8.365
Class 1A	6	3	1	7.302	0	10.016	1	5.967	0	4.401	1	10.034	0	10.017								
Class 1A	12	9	1	7.102	1	9.927	1	4.414	0	3.622	1	8.4	1	10.009	1	6.65	0	9.99	1	6.468	1	8.683
Class 1A	10	10	1	5.918	1	7.032	1	3.835	1	7.667	1	7.267	1	8.983	1	4.734	1	4.966	1	5.884	1	8.431
Class 1A	12	10	1	4.12	1	10.015	1	7.817	1	9.69	0	10.002	1	10.015	1	5.515	1	8.2	0	9.452	1	9.664
Class 1A	4	1	1	7.749	0	10.015	0	9.545	0	9.085												
Class 1A	12	10	0	10.018	1	10.018	1	10.028	1	10.005	1	10.002	1	10.013	1	10.018	1	10.013	0	10.003	1	10.017
Class 1B	11	10	1	3.52	1	5.853	1	3.365	1	4.603	1	5.435	1	6.353	1	2.115	0	7.79	1	2.883	1	4.2

34,467 data points collected through gameplay

Class 1B	12	10	1	5.503	1	5.517	1	2.535	1	5.719	1	7.813	1	8.504	0	5.333	1	10.004	0	3.303	1	6.248
Class 1B	10	10	1	3.935	1	6.002	1	4.567	1	6.45	1	7.052	1	9.05	1	3.582	1	4.116	1	6.255	1	5.615
Class 1B	12	10	1	4.77	0	10.015	1	3.85	1	8.67	0	10.02	1	9.1	1	4.783	1	6.05	1	5.947	1	8.098
Class 1B	11	10	1	4.052	1	7.845	1	2.589	1	6.52	1	5.311	1	8.1	1	3.499	1	4.609	0	3.451	1	7.764
Class 2B	3	0	0	10.011	0	3.469	0	7.837														
Class 2B	10	10	1	6.016	1	7.467	1	2.502	1	6.568	1	8.356	1	7.682	1	3.595	1	4.734	1	4.748	1	5.778
Class 2B	11	10	1	3.102	1	5.151	1	4.823	1	4.835	1	5.398	1	5.191	1	3.119	1	3.625	0	7.028	1	4.398
Class 2B	10	10	1	3.384	1	5.401	1	2.751	1	7.723	1	5.906	1	7.566	1	3.222	1	8.775	1	3.298	1	6.042
Class 2B	10	10	1	4.983	1	8.413	1	3.679	1	6.261	1	6.292	1	7.67	1	4.177	1	4.004	1	5.023	1	6.849
Class 2B	10	10	1	3.556	1	6.165	1	2.602	1	4.918	1	7.096	1	10.013	1	2.633	1	2.748	1	3.402	1	5.556
Class 2B	10	10	1	3.322	1	7.831	1	2.995	1	7.583	1	6.38	1	6.5	1	2.848	1	3.424	1	2.868	1	5.315
Class 2B	10	10	1	3.556	1	4.751	1	8.582	1	5.831	1	5.688	1	6.415	1	2.646	1	3.117	1	2.659	1	5.887
Class 2B	10	10	1	2.517	1	5.732	1	2.164	1	7.372	1	4.59	1	8.167	1	2.686	1	2.704	1	7.076	1	9.197
Class 2B	11	10	1	3.667	1	6.918	1	4.735	1	6.935	1	9.524	1	5.794	1	4.879	1	4.029	0	9.874	1	5.426
Class 2B	11	10	1	7.681	1	5.557	1	7.202	1	8.434	1	5.031	1	8.471	1	2.704	1	8.933	0	4.65	1	5.794
Class 2B	12	10	1	2.684	1	7.052	0	6.013	1	6.501	1	6.214	1	8.767	1	3.054	1	3.029	0	8.037	1	5.525
Class 2B	10	10	1	6.528	1	6.676	1	2.417	1	7.317	1	5.365	1	7.221	1	2.649	1	3.453	1	4.636	1	6.205
Class 2B	3	0	0	9.806	0	9.26	0	7.714														
Class 2A	10	10	1	5.712	1	7.891	1	3.736	1	5.777	1	6.414	1	6.697	1	3.362	1	3.993	1	2.832	1	6.866
Class 2A	11	10	0	9.174	1	8.261	1	2.402	1	6.074	1	7.078	1	6.999	1	3.389	1	3.209	1	3.489	1	6.012
Class 2A	12	9	1	8.511	1	7.657	1	4.778	1	7.794	1	6.954	1	7.902	1	4.524	1	9.175	0	7.116	1	9.401

Results: Global game data



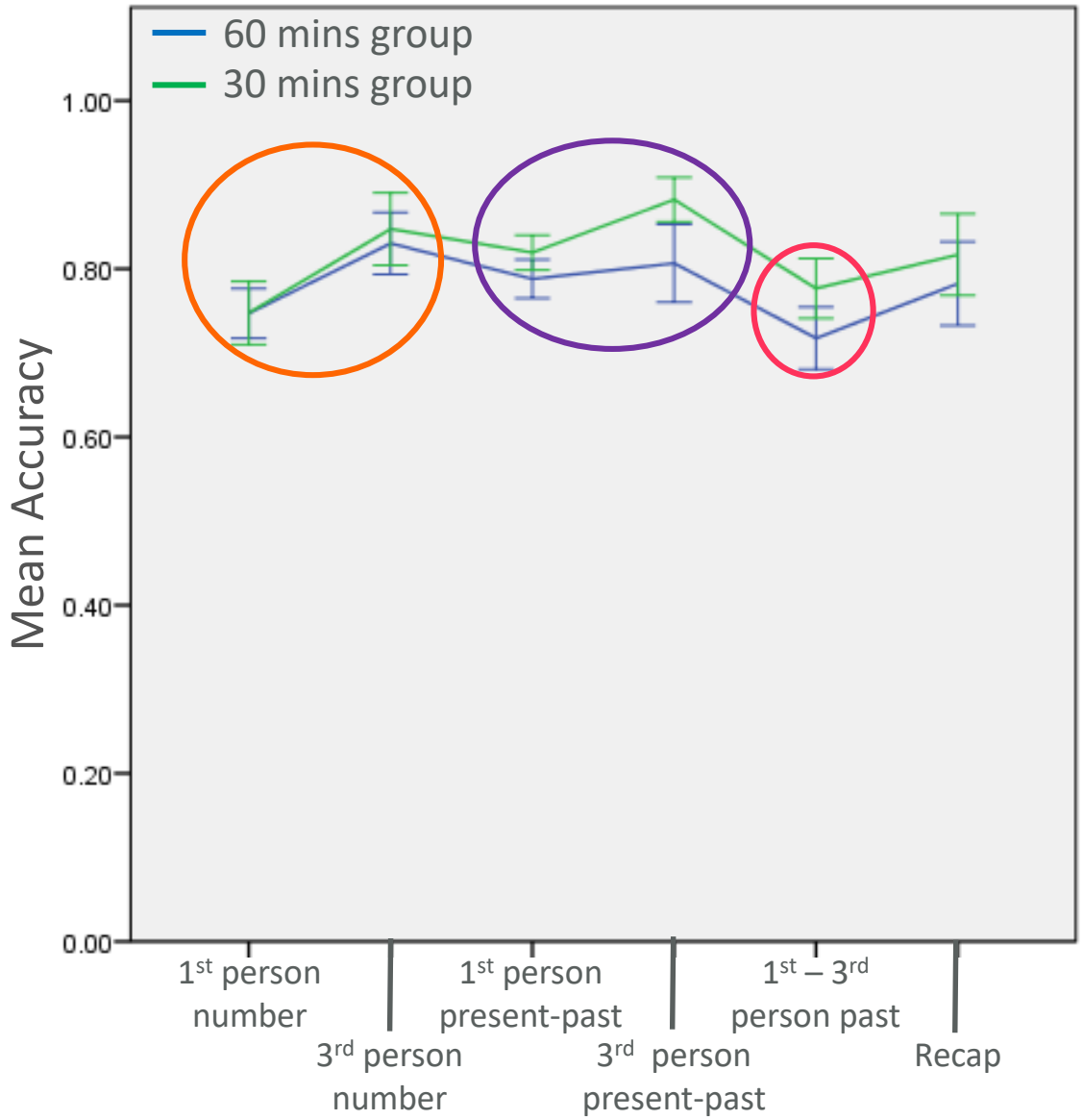
Global game accuracy
(Total questions correct / Total questions answered)

Overall accuracy was high for both groups

Higher accuracy for learners who completed two **30-minute** sessions per week
($p = 0.047$, $d = 0.39$)

Results: Mini-game data

3 question sets per grammar feature



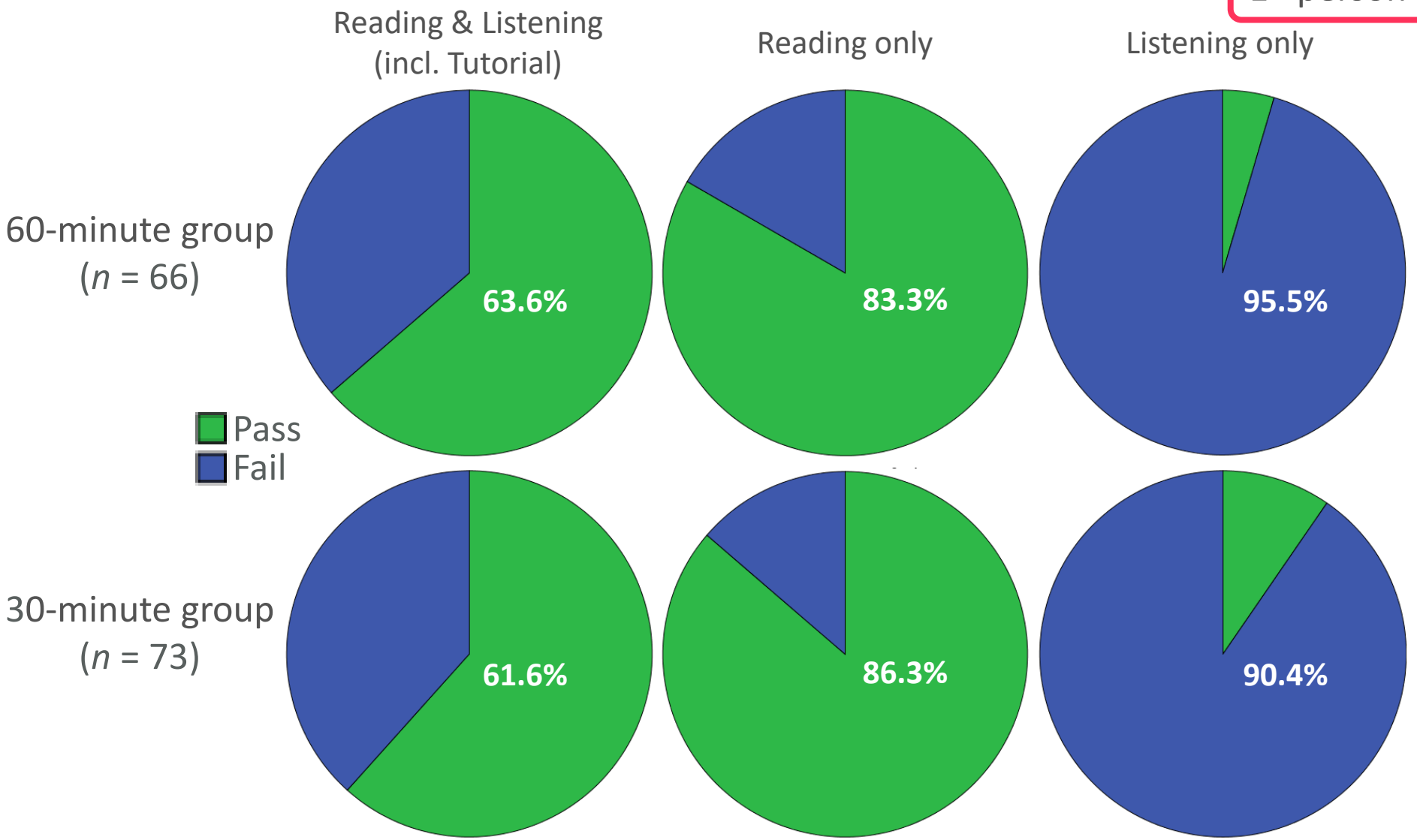
Similar trajectory across mini-games

Transfer of knowledge 1st to 3rd person for **number** and **tense**

Difficulty with **1st *vs.* 3rd** person past tense

Question set data

1st person present (*je*) *vs.* past (*j'ai*)



% learners passing 1st play through

Similar performance between groups

Majority of learners applying rule correctly

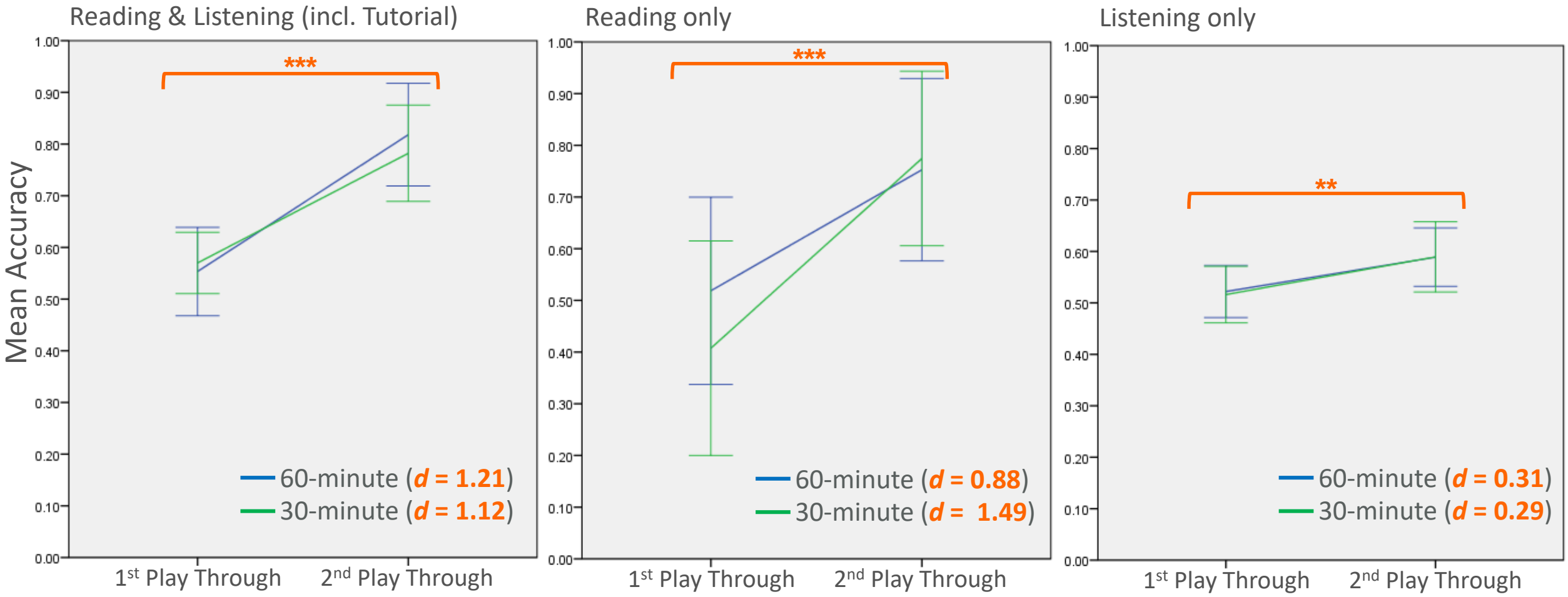
Transfer of knowledge between **R&L** and **R only** question sets

Listening problematic (*je vs. j'ai*)

Question set data

1st person present (*je*) *vs.* past (*j'ai*)

For players who lost (3 mistakes) on 1st play through → Increase in accuracy on 2nd play through



Conclusions

Meaningful, game-based, grammar practice did lead to learning

- Overall accuracy was high
- Some mini-games / grammar features more challenging than others
- Increase in accuracy over question sets (R&L → R)
    - Difficulty transferring between skills (R → L)
    - More opportunity to practice listening

Frequency of play (two 30-min sessions vs. one 60-min session per week) did not impact learning effectiveness

- Accuracy marginally higher for 30-min group
- Similar learning trajectories followed by both groups

Future directions

Variation in individual performance

- Rate and extent of knowledge development for sub-groups and individual learners
- Amount of practice needed (e.g. 1st vs. 2nd play through)

Adapt instruction to suit individual learners

- Amount and nature of explicit information
- Amount of practice

Integration of game-based practice within normal classroom practice

Pupil comments

“That’s the best score I’ve ever got!”

“I got three stars in that game!”

“I actually get it now!”

“I only got one wrong that time!”

“If it’s got –ons it means all of them.”

“I learnt when it’s j-a-i, it has already happened.”

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