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# Supporting individual practice with immediate feedback

Motivation, design, and evaluation of an interactive workbook  
for English language learners

**Detmar Meurers, Kordula De Kuthy**  
with Florian Nuxoll, Björn Rudzewitz, Ramon Ziai

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# Digital Tools for Foreign Language Teaching

- Schools going digital is a common topic in the current discourse, though typically with a focus on buying hardware.
  - But digitization is not a value in itself – it is essential to consider, what is supposed to be supported by it.
1. Where can computers contribute to real-life language teaching and learning, on the basis of which learning principles?
  2. FeedBook as a concrete example
    - Intelligent Tutoring System supporting interactive English homework
    - Randomized Field Trial establishing effectiveness in regular schools



# I. Computers can transport information

- increase motivation to learn through **multimedia material**
  - authentic language material from the target language context (websites, audios, videos, texts)
  - curated language learning material (corpora, e.g., <http://uni-tuebingen.de/telos>)
- support **communication** with native speakers:
  - direct contact with native speakers (where alive ;-)  
(asynchronous: Email, synchronous: Skype)



## II. Computers can analyze language for

- **Interactivity**
    - provide feedback, stepwise leading to successful task completion
  - **Adaptivity**
    - obtain materials at the learner's level of complexity
  - **Input Enrichment and Enhancement**
    - offer content rich in developmentally relevant forms
- ⇒ Supporting individual learners makes it possible for them to participate better in class (“Binnendifferenzierung”).
- Digitisation can only be successful where it is based on established mechanisms of foreign language learning.



## Key factors: **Input**

- **Input Hypothesis** (Krashen 1985)

- access to comprehensible input at  $i+1$  is essential
- input one level more complex than the interlanguage of the learner

⇒ Digitization can help us search for interesting  $i+1$  input

- SyB: Syntactic Benchmark (<http://complexity.schule>, Chen & Meurers 2019)



## Key Factors: **Focus-on-Form**

- Input alone only results in **Basic Varieties** (Klein & Perdue 1997).
- Foreign language learners need a **Focus-on-Form**, to overcome partial or missing competencies (Long 1991; Lightbown 1998).
- attention to forms crucial: **Noticing Hypothesis** (Schmidt 1995)
  - **Input enhancement** (Sharwood Smith 1993) increasing salience
- ⇒ Digitization can support input enhancement and enrichment:
  - ⇒ Visual Input Enhancement of the Web (Meurers et al. 2010)
    - Alternative: Functional Input Enhancement (Chinkina & Meurers 2017)  
Generation of questions on sentences with relevant forms
  - ⇒ Search engines supporting retrieval of texts rich in forms to be focused
    - FLAIR (<http://flair.schule>, Chinkina & Meurers 2016)
    - KANSAS (<http://kansas-suche.de>, Weiss et al. 2018)



## Key Factors: **Practice, Output, Interaction, Feedback**

- **Skill Acquisition Theory** (DeKeyser 2005)
  - Teaching leads to declarative knowledge; then **practice** is needed for fluent, automated, procedural ability that does not bind attention.
- **Output hypothesis** (Swain 2005)
  - language production essential, since it requires full specification (understanding can rely on “good enough” processing)
- **Interaction** is central for language development (Vygotsky 1986)
  - Learning results from interacting with a learner in their **Zone of Proximal Development (ZPD)** (Lantoff & Appel 1994)
  - Partner **scaffolds** learner development.
- **Feedback** is one of the most effective factors (Hattie & Timperley 2007).



## Can digitization help address real challenges?

- How can students **interact** and receive **feedback** on **output**?
    - limited time with teachers
  - How can students **practice** at home, at their **individual level** and pace, then work as a class on a better common basis?
    - without interaction and scaffolded feedback, little can be tackled
    - reliance on parental involvement bad for educational equity
- ⇒ Computer-Assisted Language Learning Systems could in principle support such individual practice.
- computer-based exercises widely available, e.g., on the web
  - but these tools are limited
    - closed exercise types (multiple-choice, fill-in-the-blank)
    - no incremental, specific feedback scaffolding learner (only true/false)



## Our starting point: current school homework practice

- Student completes homework without feedback on whether (s)he understands what the exercise is about or masters the form.

 **Grammar check: Problems**

Everyone has got problems. What could these people do differently?

0. Gillian is sad. Her mother never has any time for her.

*If Mrs Collins had more time for Gillian, Gillian wouldn't be so sad.*

---

1. Mrs Collins feels bad. She should listen more to Gillian.

*If ~~she~~ she listens more to Gillian, she feels better*

---

2. Gwynn is very disappointed. Gillian doesn't like Wildings School as much as his sister did.

*If Gillian like Wilding School as much a Ross would*

- In discussion of homework in class
  - the teacher often cannot address individual misconceptions, and
  - student is no longer engaged with the exercise.



## Making foreign language practice interactive

- Let's replace the workbook of the established "CamdenTown" book for 7th grade with an interactive system, the FeedBook.

### CYP2 Grammar check: Problems

Everyone has got problems. What could these people do differently? Use conditional clauses in your answers.

0. Gillian is sad. Her mother never has any time for her.

*If Mrs. Collins had more time for Gillian, Gillian wouldn't be so sad.*



1. Mrs Collins feels bad. She should listen more to Gillian.

*If she listens more to Gillian, she feels better.*

2. Gwynn is very disappointed. Gillian doesn't like Wilding

3. George and Rajiv feel bad because they don't have a pres

Feedback für "If she listens more to Gillian, she..."

With conditional clauses (type 2), we use the simple past in the if-clause, not the simple present.

Hilfreich?

Ja  Nein

OK



## FeedBook: a web-based workbook for English

- Starting point: printed **Camden Town Gymnasium 3** Workbook
  - approved for 7th grade English classes in German secondary schools
  - existing workbook, already integrated into real-life formal education
- Our FeedBook system provides a web-based implementation of the traditional print workbook enabling
  - students to complete activities online
  - teachers to give formative and summative feedback
- Purpose of the system:
  - to provide individualized, immediate scaffolding feedback to learners
  - to guide them towards solutions for a number of different activities.
- Current state: automatic feedback on
  - 7th grade grammar topics (form-oriented)
  - reading/listening exercises (meaning-oriented)



## B 2 Gillian's point of view

Complete this version of the story from Gillian's point of view. Use the following verbs and put them in the simple past.

• LiF1Rc: Simple past

*begin · come · feel · get · give · go · lie · make · not be · not listen · put · say · sit · suggest · try*



Support ●●●●●

Irregular verbs:

Textbook p. 255



Mum's boyfriend was coming to meet me so of course I got ✓ ⊕ up in a bad mood. But Mum gave ✓ ⊕ me a great big smile. She made ✓ ⊕ me my favourite pancakes with maple syrup for breakfast but I wasn't ✓ ⊕ hungry. She tryed ⊕ to cheer me up and \_\_\_\_\_ ⊕ that we go shopping. That usually puts me in a good mood but not today. So I \_\_\_\_\_ ⊕ something about homework and \_\_\_\_\_ ⊕ into my room. I \_\_\_\_\_ ⊕ down on my bed and \_\_\_\_\_ ⊕ really sorry for myself. Just then Mum \_\_\_\_\_ ⊕ in. She



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Irregular verbs:

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Mum's boyfriend was coming to meet me so of course I got ✓ up in a bad mood. But Mum gave ✓ me a great big smile. She made ✓ me my favourite pancakes with fruit ✓. I was ✓ hungry. She tried ✗ to go shopping. That usually puts me in a good mood. I was ✓ sitting at my desk doing homework and fell ✓ into my room. I lay ✓ down on my bed and was ✓ really sorry for myself. Just then Mum came ✓ in. She

Feedback für "tried"

When an infinitive ends in 'consonant + y', we change the 'y' to 'i' in the simple past.



Hilfreich?

Ja  Nein

OK





## B2 Family histories: The Batsons

Read this short text about Charlie's family and fill in the right form of the verbs in the simple past or past perfect.

- LiF1Rc: Simple past
- LiF13: Past perfect



Support ●●●●●●●●●●  
Before you start, look for the signal words for the simple past and past perfect.  
●●●●●●●●●●

Feedback für "had followed"

We only use the past perfect if one action in the past took place before another action in the past. If not, we use the simple past.

Hilfreich?  
 Ja  Nein

Lee Batson, \_\_\_\_\_ (arrive) in London in 1955 from Barbados. After he \_\_\_\_\_ *had found* ✓ (find) a job in Notting Hill, his wife \_\_\_\_\_ *had followed* ✗ (follow) him to England. They both \_\_\_\_\_ (work) very, very hard and by the time Charlie's father \_\_\_\_\_ (be) born\*, they \_\_\_\_\_ (buy) a small terraced house\* in Notting Hill. They soon



## B 1 Off to Greece again

Mr Lambraki is checking flights to Greece. Read the information he has found on the two airlines and use the adjectives below to compare them.

• LiFBR: Comparison of adjectives

*expensive (ticket) · early (departure) · attractive (shopping on board) · good (choice of food offered on board) · healthy (food and drinks) · suitable (airport) · cheap (tickets for shuttle bus) · friendly (service on board) · easy (online booking)*

Midair	Air-Con
<ul style="list-style-type: none"> <li>• London – Athens from 39 pounds</li> <li>• departure 7.00 am</li> <li>• non-stop</li> <li>• small choice of duty free articles for shopping on board</li> <li>• low-calorie and vegetarian food available<sup>1</sup></li> <li>• from Gatwick only 28 miles from London</li> <li>• tickets for shuttle bus are 10 euros</li> </ul>	<ul style="list-style-type: none"> <li>• London – Athens from 57 pounds</li> <li>• departure 12.15 pm</li> <li>• via Berlin</li> <li>• all international brands for shopping on board</li> <li>• snacks: crisps and chocolate bars</li> <li>• from Stansted only 40 miles from London</li> <li>• tickets for shuttle bus are 10 euros</li> </ul>

1.

*The tickets at Air-Con are expensiver than at Midair.*



2.





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Feedback für "The tickets at Air-Con are expensiv..."

When an adjective has three or more syllables, we form the comparative with 'more' and the superlative with 'most'.



Hilfreich?

Ja  Nein

OK



1.

*The tickets at Air-Con are expensiver than at Midair.*

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## B1 Off to Greece again

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Feedback für "The tickets at Air-Con are expensiv..."

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The tickets at Air-Con are **expensiver** than at Midair.



Hilfreich?

Ja

Nein

OK

1.

*The tickets at Air-Con are **expensiver** than at Midair.*

2.

3.





## CYP 3 Reading check: How kayaking changed my life

James is a student at St David's College. Read his report and answer the questions below.

A long, long time ago, I arrived at St David's College ... this is my story...

I wasn't very confident when I first arrived. But I soon found myself in a kayak on the Llangollen canal (...). That was the day kayaking became my life: something I enjoyed, an activity I knew would build my confidence.

I started going to kayaking sessions at weekends and every Wednesday; I loved every minute! I also tried other activities like climbing, mountain biking and sailing. I also tried hill walking but that was rubbish!!!! I started to get really good at kayaking and the outdoor ed teachers<sup>1</sup> helped me develop<sup>2</sup> lots of new skills<sup>3</sup>.

I have been lucky enough to go on many expeditions; my first one was in year 10, when I went to Sweden. We sea-kayaked around Tjorn Island (...), and it was an amazing experience which I will never forget.

The same year I went on the Alaska trip (...). The expedition was cold but I still had a really good time. I caught my first fish. Afterwards we ate it, yum<sup>4</sup>!!! We kayaked past glaciers<sup>5</sup> and saw bears<sup>6</sup> and other animals. My kayaking skills and strength<sup>7</sup> were improving, as well as my confidence.

In year 11 I went to Scotland to try white water<sup>8</sup> kayaking, (...) and went down some fantastic rivers. During the expedition I did my first river Eskimo roll<sup>9</sup>. (...) This was a very big moment for me as it greatly helped my confidence in the



kayak and after that I got really good.

At the end of year 11 Ian Lloyd Jones suggested that I could do this as a career<sup>10</sup>. From that moment I knew it was all I wanted to do.

In the lower 6th I signed up<sup>11</sup> for (...) an outdoor apprenticeship<sup>12</sup>. (...) I got the opportunity to work with all the year groups on their outdoor ed days and join<sup>13</sup> them on some expeditions; this has been life changing and great fun.

(...)

I also did a very wet year 6 Snowdonia expedition, which was fun until my tent got flooded!<sup>14</sup> There was so much water in my tent, I'm sure I could have kayaked in it!!! (...) I'm now a qualified kayaking instructor myself, which is great!!! (...) I am leaving St David's College early to go and work with *Acorn Adventure* in France, teaching kids to canoe<sup>15</sup>. This is what I have wanted for a long time and is the start of my own outdoor ed career.

Thank you St David's for changing my life.

James Oram

<sup>1</sup> outdoor ed teachers – Sportlehrer für Aktivitäten im Freien (z.B. Kajakfahren etc.)

<sup>2</sup> develop – erarbeiten

<sup>3</sup> skills – Fertigkeiten

<sup>4</sup> yum – lecker

<sup>5</sup> glacier – Gletscher

<sup>6</sup> bear – Bär

<sup>7</sup> strength – Stärke

<sup>8</sup> white water – Wildwasser

<sup>9</sup> Eskimo roll – Eskimorolle (man dreht sich mit dem Kajak so, dass man zeitweise ganz unter Wasser ist)

<sup>10</sup> career – Beruf

<sup>11</sup> sign up – zu etw anmelden

<sup>12</sup> apprenticeship – Ausbildung

<sup>13</sup> join – begleiten

<sup>14</sup> flooded – überflutet

<sup>15</sup> canoe – Kanufahren

1. How did James feel when he first came to St David's?

*James was a student.*





## CYP3 Reading check: How kayaking changed my life

James is a student at St David's College. Read his report and answer the questions below.

A long, long time ago, I arrived at St David's College ... this is my story...

I wasn't very confident when I first arrived. But I soon found myself in a kayak on the Llangollen canal (...). That was the day kayaking became my life: something I enjoyed, an activity I knew would build my confidence.

I started going to kayaking sessions at weekends and every Wednesday; I loved every minute! I also tried other activities like climbing, mountain biking and sailing. I also tried hill walking

but that was rubbish!!!! I started to get really good at kayaking and the outdoor ed teachers<sup>2</sup> helped me develop<sup>2</sup> lots of new skills<sup>2</sup>.

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Thank you St David's for changing my life.  
James Oram

Feedback für "James was a student."

There seems to be important information missing in your answer. Please have a look at the highlighted passage in the text.



Hilfreich?

Ja  Nein

OK

1. How did James feel when he first came to St David's?

*James was a student.*









## FeedBook characteristics

- FeedBook offers immediate, scaffolding feedback guiding the learner to an understanding of the concepts to be learned.
- Analysis of thousands of well-formed and ill-formed variants automatically generated (not manually encoded for the exercise).
  - Coverage of all grammar topics in the official 7th grade curriculum
  - 188 different types of feedback on tenses, comparatives, relative & reflexive pronouns, gerunds, passive, conditionals, (in)direct speech
- The FeedBook also includes explicit
  - learner models, informing student & suggesting next exercise to tackle
  - task models, supporting identification of (in)effective tasks



# Learner model: What do I know & what should I work on?

## Lernermodell betrachten

Hier werden Statistiken zum Lernverhalten angezeigt. Bitte unten auf eine Kategorie klicken um mehr zu erfahren.

future tense



present tense



past tense



reported speech



conditionals



comparatives



relatives



reflexives



gerunds



passive

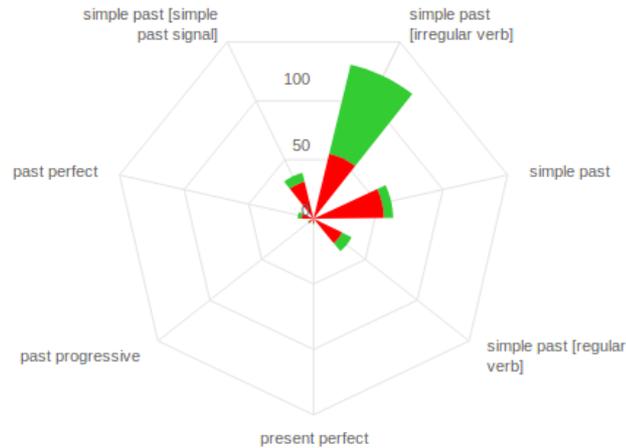




# Learner model: How about the past tense?

past tense

Richtig vs. Fehler



Highcharts.com

simple past  
irregular verb

Hervorragend. Weiter so! ★★★★★

simple past



# Learner Model: What should I work on?

simple past

Bitte üben! ★★☆☆

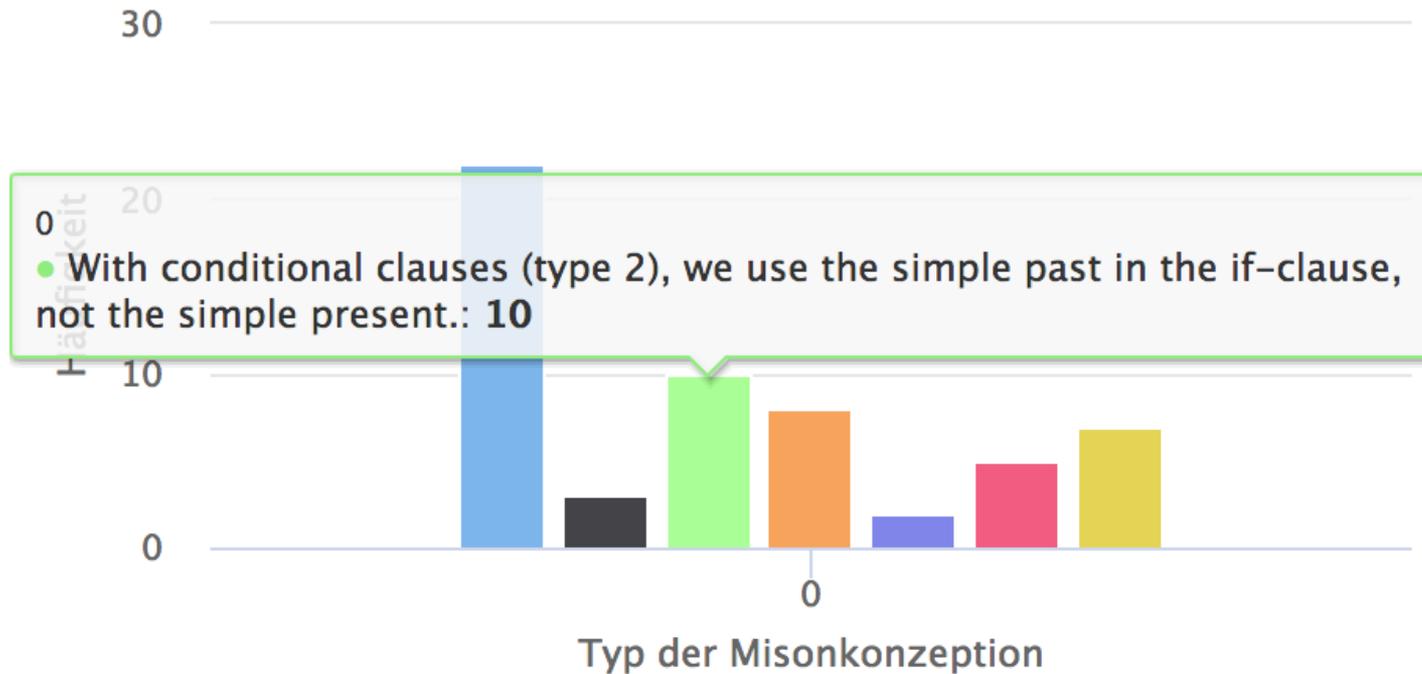
Vorschläge für Übungen

Empfohlene Übungen:

  Moving trouble 1  Theme 1 AP 18 b  S.25 	  PRESENTING FACTS 1  Theme 3 AP 11  S.89 	  NO PARTY FOR FAY 1  Theme 4 AP 8  S.118 	  AN INSTAGRAM STAR QUILTS 1  Theme 4 AP 35  S.141 
 	 	 	 



## Learner Model: What are my most common errors?





# Task model: Is this task effective for learning?

## C3 What was ... doing while Gillian was doing something else?

Write down what Gillian's friends were doing while she was running away from home. Use the past progressive in both parts of the sentence.

- LiF1Re: Past progressive



buy Arsenal tickets



feed Patch



watch TV



sit on the bus

1. buy Arsenal tickets/sit on the bus

*Charlie was buying Arsenal tickets while Gillian was sitting on the bus.*



2. feed Patch/sit on the bus

*George was feeding Patch while Gillian was sitting on the bus.*



3. watch TV/sit on the bus

|



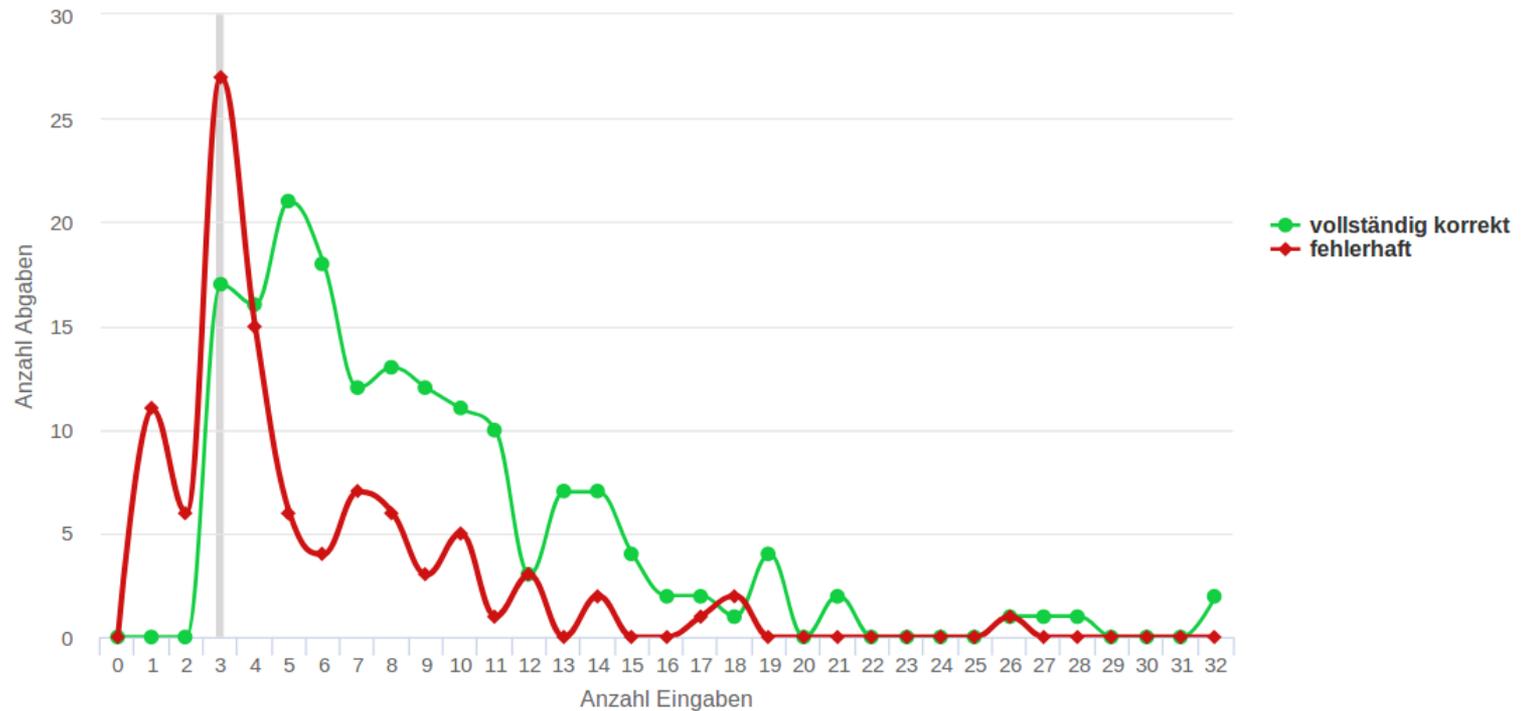


# Task model confirms exercises is effective

Theme 1 C, SubTask 3 [short answers]

anzeigen

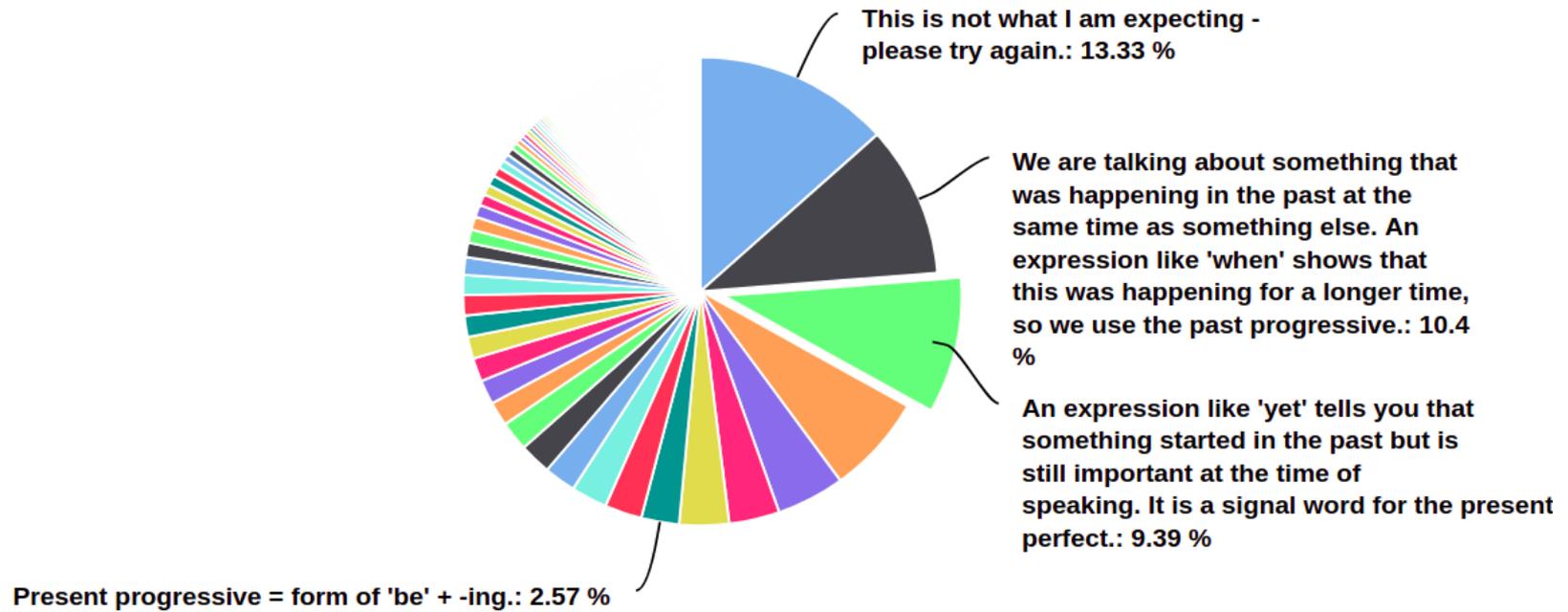
267 Abgaben (167 vollständig korrekt, 100 fehlerhaft)



Highcharts.com



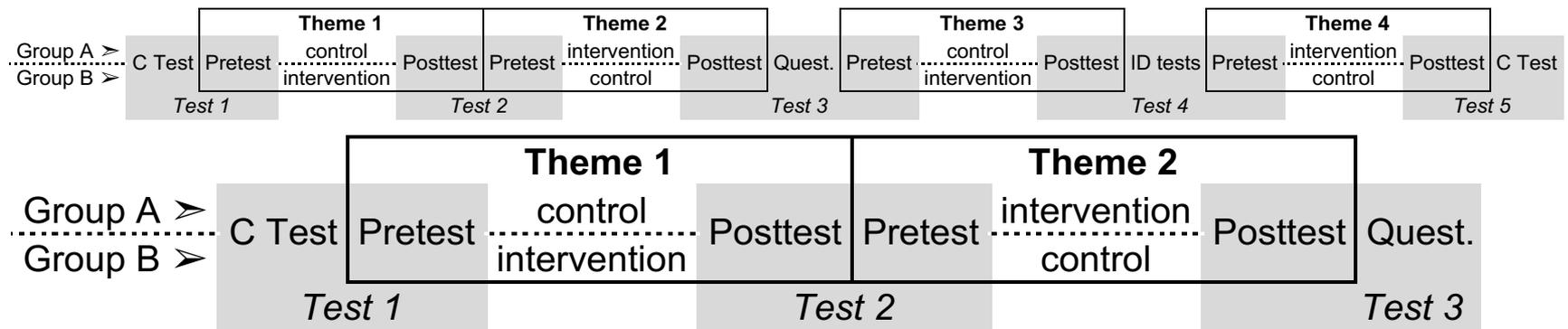
# Task model: Student misconceptions for a given task





## FeedBook as a platform for randomized field trials

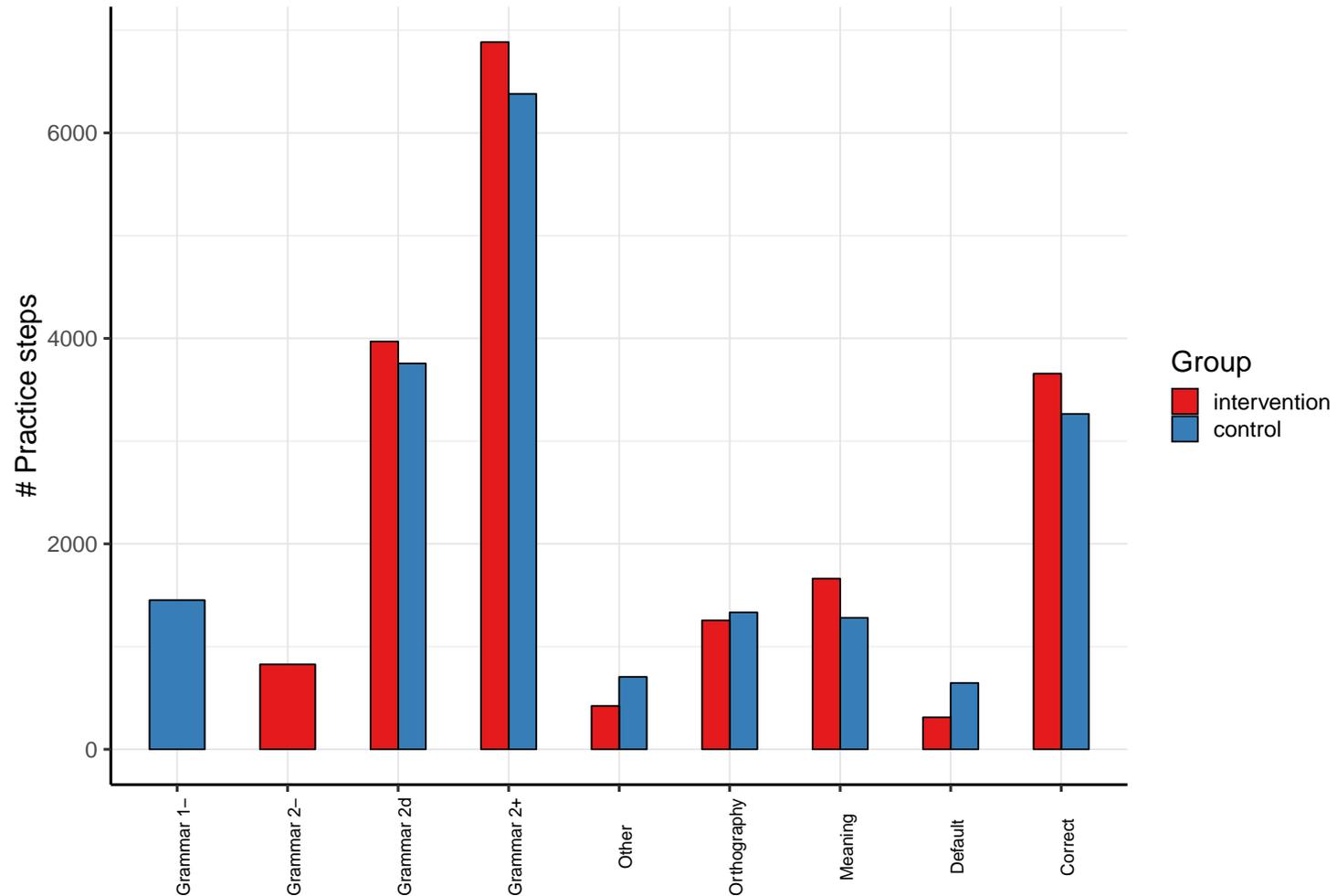
- Research question: Does immediate formative feedback on form during homework improve learning of the English grammar?
- Subjects: Ten regular English classes in 7th grade Gymnasiums.
- Regular full-year teaching, but FeedBook as workbook.
  - within-class randomization determines who sees which grammar feedback



- Pre-/Posttest targets grammar topics of each theme.
  - Theme 2: comparatives, conditional clauses, relative clauses



## Feedback types seen in Theme 2 exercises



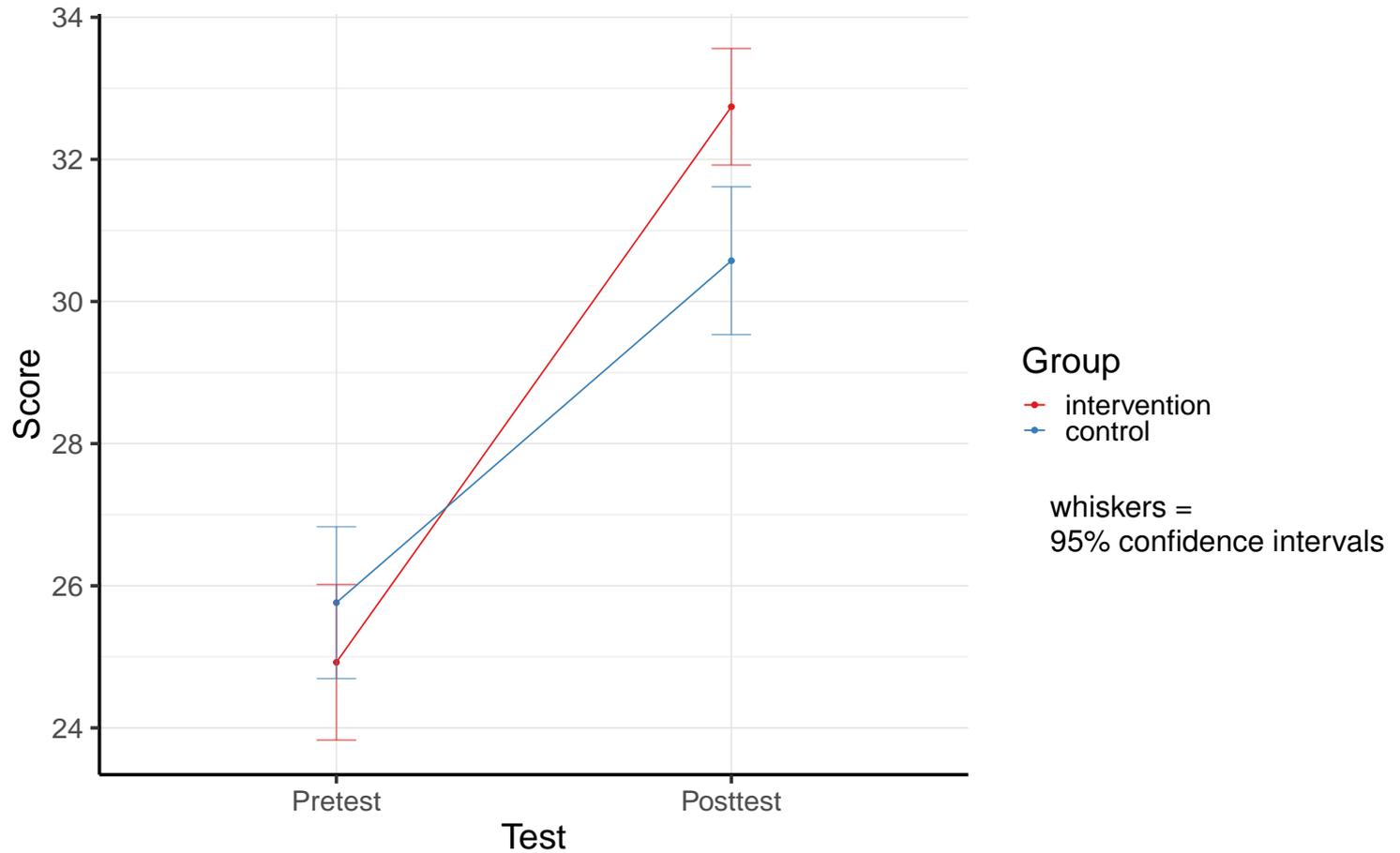


## Results

- 205 students completed pre- and posttest for Theme 2.
  - First analysis: change score = posttest – pretest
  - Second analysis: mixed effects logistic regression
- Welsh two sample t-test shows significant difference between mean change scores ( $p < 0.0001$ ):
  - 4.81 for control group
  - 7.82 for intervention group
  - intervention group learned 62% more than control group
- Effect size: Cohen's  $d = 0.56$

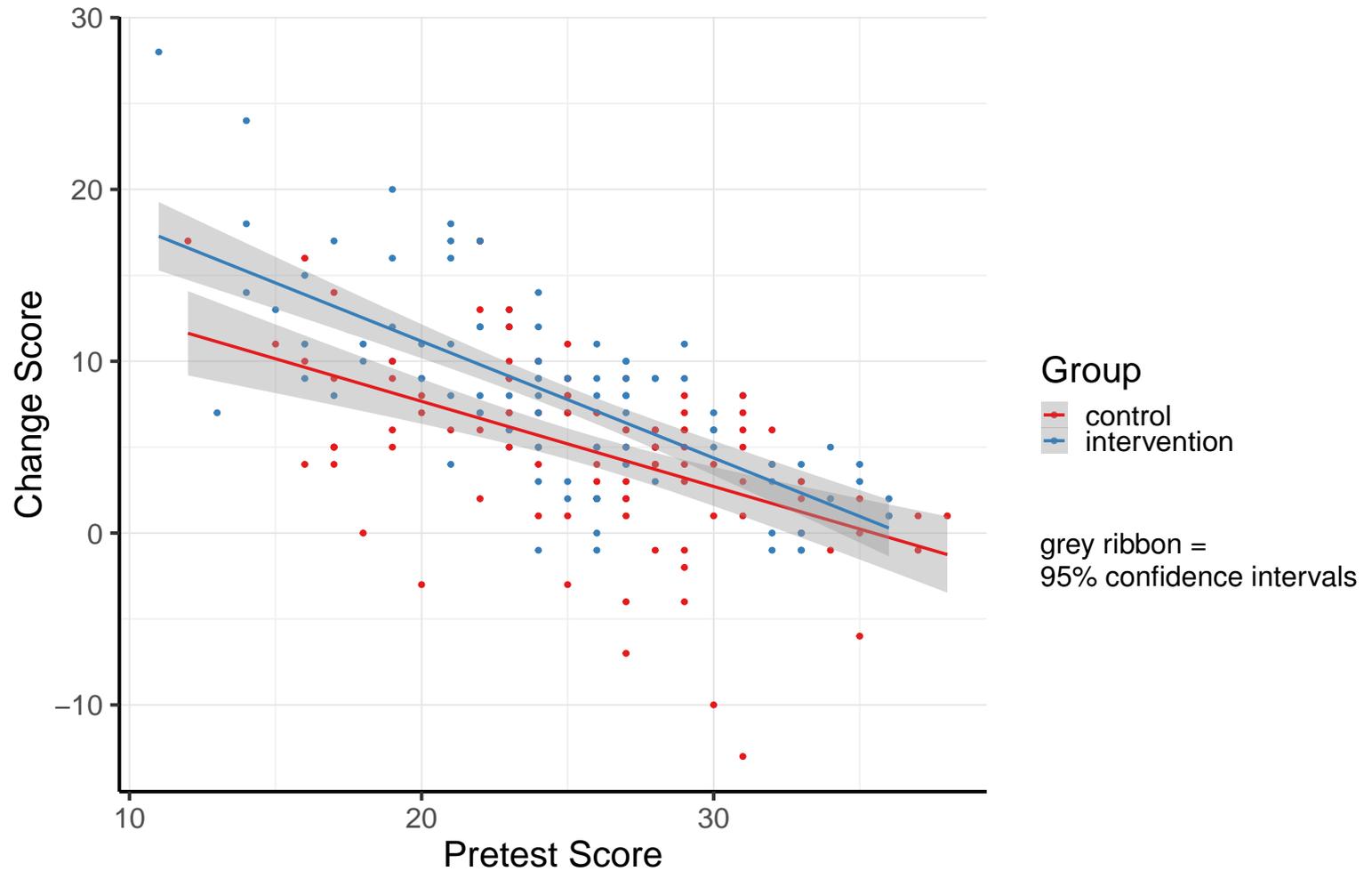


## Results: illustrating pre-/posttest means





## Results: pretest & group predicting change score





## Results: mixed effects logistic regression

- Predict log odds of the binary outcome of each gap in the tests.
  - Fixed effects: test (pre/post), group (interv./control) & their interaction
  - Random intercepts: test items, learners, teachers (=classes)

Results:	Estimate	Std. Error
(Intercept) = <i>pretest control</i>	0.73***	(0.15)
TestPosttest	0.68***	(0.05)
GroupIntervention	-0.07	(0.09)
TestPosttest:GroupIntervention	0.43***	(0.08)
Var: Learner (Intercept)	0.30	
Var: Item (Intercept)	0.52	
Var: Teacher (Intercept)	0.05	

\*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$



# A win-win situation for school practice and research

- Students
  - + can practice with effective incremental, scaffolding feedback while working on exercises at the appropriate level for them
  - + are supported independent of family characteristics
- Teachers
  - + have a reduced burden to provide written feedback
  - + are better informed about abilities of individuals and class
  - + can tackle tasks with better-prepared students in class
- Researchers
  - + in authentic, real-life school setting can test effects of
    - different types of feedback
    - different exercises and learning targets
    - individual learner differences (e.g., Ospan, MLAT-V)



## Summary

- Digital tools can support aspects of Foreign Language Teaching — if they are based on established learning mechanisms.
- A web-based workbook can provide immediate, interactive formative feedback to students.
- First results from a randomized field study in ten English classes confirms effectiveness ( $d = 0.56$ ).
- FeedBook platform fully integrated into real-life school provides an experimental sandbox in ecologically valid setting.



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