A realist framework investigating the effectiveness of Data-driven Learning for Secondary School EFL students in Southern China

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EFL learners from a low-income family in a rural area, however able, are least likely to succeed in second-language acquisition.

(Xinhua Journal, 2016; Li & Yuan, 2013)
My research focus:

Secondary school EFL learners

In Need of innovative pedagogy

In need of new knowledge gain

Data-driven learning

Critical Realism

In Need of innovative pedagogy
Paper-based DDL

Data-Driven Learning (DDL)
- Corpus linguistic
- Linguistic data (Johns, 1991)
- Paper-based DDL (Boulton, 2010)
- Inductive instruction
This point is especially important when technical literature is having a great time. Providing those soldiers who commit to family and serve our country will encourage them to rely.

1. In the absence of a policeman, the female field-worker was (reply) upon for comfort by female members of the public.

2. Proving that wolves who commit to family and serve our country will encourage them to rely.

3. She should be more (consider) of her mother and yet the work must be done or there would be no income.

4. 1901: The (origin) design has been changed since then.
1. To what extent can paper-based DDL materials impact learner’s language gain?
ESL learners in China

In Need of innovative pedagogy

Data-driven learning

In need of new knowledge gain

Critical Realism

Offer an new approach to evaluate and interpret
• Realist Ontology, Constructivist Epistemology

• stratified reality

• CMO:
  • Regularity/outcome = mechanism + context (Pawson & Tilley, 1997)

(Fletcher, 2017)
## Context + Mechanism = Outcome

<table>
<thead>
<tr>
<th>Context</th>
<th>New mechanism</th>
<th>Outcome pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small isolated area, with local burglars</td>
<td>Familiarization with new measures and recognition of unchanged risks</td>
<td>Gradual return to previous burglary rates</td>
</tr>
<tr>
<td>Small isolated area, with local burglars</td>
<td>Refreshment of perceptions of scheme efficacy via publicity</td>
<td>Renewed fall in burglary rate</td>
</tr>
</tbody>
</table>

Context + ??? = outcome
1. To what extent can paper-based DDL materials impact learner’s language gain?

2. How do the underlying mechanisms in using paper-based DDL materials give rise to such language gain?
Site and participants

A classroom of 58 students
18-19 years old
Han ethnicity
in their final year
secondary school in Hunan Province, China
22 female, 36 male
L₁ Mandarin
Study English for 8-9 years
Low-level EFL learners
## Research Question

**DDL’s impact on Language gain (Empirical Level)**

<table>
<thead>
<tr>
<th>Data collection Method</th>
<th>N.</th>
<th>analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student achievement data: pre-test, post-test and delayed post-test</td>
<td>40</td>
<td>Two-way ANOVA</td>
</tr>
<tr>
<td>Improved Language sensitivity Pattern noticing</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Student interview</td>
<td>12</td>
<td>Tape-recorded and transcribe; coding</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mechanism (Real level)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Student interview</td>
<td>After three rounds of intervention</td>
</tr>
<tr>
<td>During 4 lessons, unstructured</td>
<td>4</td>
</tr>
<tr>
<td>After three rounds of intervention</td>
<td>12</td>
</tr>
</tbody>
</table>
Data Collection Timeline

- TAs
- Intervention 1
- Intervention 2
- Intervention 3
Quantitative Data

1. Histogram: **Normality Assumption** met
2. Levene’s test: assumption of sphericity/homogeneity of variance is not violated, the P value is smaller that 0.05 (all variance are equal)
3. **Two-way ANOVA** with interaction
4. **Post hoc** test: to see where the significance lie
Two-way ANOVA 1
Two-way ANOVA 2
Two-way ANOVA 3
**Post hoc test**

### Multiple Comparisons TRADITIONAL

**Dependent Variable:** vocabscore  
**Bonferroni**

<table>
<thead>
<tr>
<th>(I) test</th>
<th>(J) test</th>
<th>Mean Difference (I-J)</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>pretest</td>
<td>posttest</td>
<td>-27.25000 *</td>
<td>5.16346</td>
<td>.000</td>
<td>-39.7915 -14.7085</td>
</tr>
<tr>
<td></td>
<td>delayedtest</td>
<td>-16.50000 *</td>
<td>5.16346</td>
<td>.005</td>
<td>-29.0415 -3.9585</td>
</tr>
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<td>posttest</td>
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<td>14.7085 39.7915</td>
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<tr>
<td></td>
<td>delayedtest</td>
<td>10.75000</td>
<td>5.16346</td>
<td>.119</td>
<td>-1.7915 23.2915</td>
</tr>
<tr>
<td>delayedtest</td>
<td>pretest</td>
<td>16.50000 *</td>
<td>5.16346</td>
<td>.005</td>
<td>3.9585 29.0415</td>
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<td></td>
<td>posttest</td>
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<td>.119</td>
<td>-23.2915 1.7915</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.
## Post hoc test

### Multiple Comparisons INTERVENTION 1

**Dependent Variable:** vocabscore  
**Correction Method:** Bonferroni

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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Lower Bound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Upper Bound</td>
</tr>
</tbody>
</table>

| delayedtest | pretest  | -8.00000     | 4.24214    | .185 | -18.3037 2.3037                 |
|          | posttest | 19.50000 *   | 4.24214    | .000 | 9.1963 29.8037                  |
|          | delayedtest | 11.50000 * | 4.24214    | .023 | 1.1963 21.8037                  |
| delayedtest | pretest  | 8.00000      | 4.24214    | .185 | -2.3037 18.3037                 |
|          | posttest | -11.50000 *  | 4.24214    | .023 | -21.8037 -1.1963                |

* The mean difference is significant at the 0.05 level.
Context + Mechanism = Outcome

Not at work?

Compared to TAs
1: significantly lower
2: no significance
3: no significance

Within Intervention:
Always positively significant result btw Pre- and Post-test; progress
Qualitative

Observation Notes

Interview Transcripts
XX: How long did teacher usually spend on teaching vocabulary?
ZS: It’s longer when we were first year students, but it is only around 10-20 minutes now.
XX: Wow, can you comment on its comparison to DDL, which takes 1-2 lessons to cover half the vocabulary in one unit?
ZS: DDL session takes longer, but worth spending the time as we can learn it better. It is one thing to memorise the spelling and Chinese translation of a word, it is another thing to know whether it is a noun or verb and understand its daily usage. Now I realize that it is important to do the latter and incorporate that into learning vocabulary, but not yet reached the stage of fluently applying it.

ZS: It is easy to do exam question when you not knowing this, so that you do it according to ‘how you feel’. I hesitated more now as I haven’t fully understood its usage and application. I know that adverb goes with verb, but I have difficulty identifying the adverb or verb in the exam paper.
XX: Why is that?
ZS: Because when we learn vocabulary, we do not pay attention to that. It would be much better if we can be exposed to DDL earlier, like in our first year in secondary school.
**Context + Mechanism = Outcome**

**Fixed curriculum goals** (Smith, 2014)—time constraint; 58 students VS 1 English teacher—scaffolding and facilitation; Exam-oriented; explicit rule-based language teaching and learning

Increased linguistics sensitivity; pattern noticing and induction ability
Fixed curriculum goals (Smith, 2014)—time constraint; 58 students VS 1 English teacher—scaffolding and facilitation; Exam-oriented; explicit rule-based language teaching and learning; DDL lesson last shorter

**Pre-existing:**
Culture and expectation of Language teaching and learning

**Qualitative Data:**
Increased linguistics sensitivity; pattern noticing and induction ability

**Quantitative Data**
Compared to TAs
1: significantly lower
2: no significance
3: no significance

**Within Intervention:**
Always positively significant result btw Pre- and Post- test; progress
Discussion

Deny DDL?
Or just the learning curve?

Wang, 2013: Increased vocabulary gain qualitatively, but it takes longer than TAs, which make DDL only complementary

Sweller, Ayers, & Kalyuga, 2011: pattern induction is a natural process, it reduces the cognitive load of processing

Barrett, Dunbar, & Lycett, 2002: rules are an artificial intellectual abstraction, whereas the human brain is programmed to detect patterns in the world around us (e.g.,)

Aston, 1998, : This allows the learner to proceed toward the target norm by progressive approximations DDL arguably promotes such skills, which should be transferable to new contexts and thus produce better learning outside the classroom, increasing learner autonomy and lifelong learning for them.
Limitations

- Translation issues
- Limited Intervention

- Quantitative data: Missing students; Sleepy student; Only one round of Test; Spelling mistakes; difficulty of the Vocabulary

- Qualitative data
References


Many thanks to:

Supervisor: Pascual Pérez-Paredes

I welcome questions or comments at xx802@cam.ac.uk
Thanks!
Supplementary Materials
Assumption Test

Levene's Test of Equality of Error Variances

<table>
<thead>
<tr>
<th>Dependent Variable:</th>
<th>vocabscore</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>1.096</td>
</tr>
<tr>
<td>df1</td>
<td>5</td>
</tr>
<tr>
<td>df2</td>
<td>234</td>
</tr>
<tr>
<td>Sig.</td>
<td>.363</td>
</tr>
</tbody>
</table>

Mean = 56.875
Std. Dev. = 23.37222
N = 240

Vocabscore distribution histogram.
• Intervention material
• Material design; British Academic Written English Corpus (BAWE)
• Test questions: Sketch Engine for Language Learning (https://skell.sketchengine.co.uk/run.cgi/skell)
• usage-based perspective: “frequency of exposure” and “salience of the feature”
Paper-based DDL

- intervention

Main materials:

- The following concordances all come from the same novel. Can you identify the pattern of usage in each group?

1. Harnet (typed Goldberg), does she entice him then or does he want to come? Does she entice him or does he appear by chance? Ovid wrote Harnet, it is this which excites me, this which makes me want to go on. As if my whole life, he wrote, had been spent
2. It had all become too complicated, too extreme, I did not want to know any of it until it was all over, until I had made
3. What about the right hand side? I said. That’s what I want to know. But he couldn’t help. Only kept repeating it was quite
4. He wrote, this is a message from the past. I just want to tell you. Goldberg, pushing aside pad and pen, drew the little
5. and less and less well of course, but the truth was I did not want to wake up. How the days, instead of each being distinct from each
6. story, you can have one. If not, not. If you want to walk round it, you can do so. If you want to get
7. you with it, he said. My best picture. You didn’t want to win their lousy prize, did you? I said. You did too
8. a room. And so on. Otherwise perhaps too dangerous. I don’t want anyone to get lost in it, I said. To be unable to get
9. new? I want it to be as though I had never been, I want it to be as though I had never taken that turning. But that can not
10. difficult to know if idea is really valid. Will really yield what I want it to. You can dream and dream but only what happens in this room
11. Goldberg too: Help me, I’m so unhappy. What do they want me to do? Blow their noses for them? And why me? Why
13. to stifle doubts by creating you with clever bulk, he wrote. I want my doubts to play and dance. And Goldberg, drawing his pad
14. glass to be seen, I want it placed in a morgue and I want people to come in and see it, pay money and come in and see to be done. I myself am guilty, he wrote, in that I want the glass to be seen. I want it placed in a morgue and I

want (wants plural & 3rd person present) (wanting present participle) (wanted past tense & past participle)

1 verb If you want something, you feel a desire or a need for it. I want a drink... V n
2 verb You can say that you want to say something to indicate that you are about to say it. Look, I wanted to apologize for today. I think I was a little hard on you. V to-inf

Paper-based DDL teaching materials

Traditional inductive teaching materials