MODELING SECOND LANGUAGE LEARNERS’ INTERLANGUAGE AND ITS VARIABILITY

A dynamic assessment approach to distinguishing between errors and mistakes
• what does the literature report about interlanguage and its variability?
• how to represent the learner’s knowledge
• operationalising the error/mistake distinction: tools’ architecture
• overview of the data collected and analysis
• results and discussion
INTERLANGUAGE: COMPETENCE OR PERFORMANCE

• some definitions

• “a separate linguistic system” (Selinker, 1974, p.35)

• “a grammar, which underlies the use of language” (White, 2003, p.1)

• “the language produced by a nonnative speaker of a language (i.e., a learner’s output)” (Gass and Selinker, 2001, p.455)

• linguistic competence is “what researchers are talking about when [referring] to ‘interlanguage’” (Ellis, 2008, p.17)
INTERLANGUAGE: VARIABLE OR STABLE

• approaches in interlanguage variability (Ellis, 1994, 2008)

  • the **generative** perspective sees competence as a stable feature and ignores variability
    (=> performance vs. competence: yes)

  • **psycholinguistic** researchers are concerned with the identification of internal mechanisms that are responsible for variable performance
    (=> performance vs. competence: yes and no)

  • **sociolinguistic** approaches are concerned with the study of language use and variability influenced by societal and cultural factors
    (=> performance vs. competence: no)
INTERLANGUAGE: VARIABLE OR STABLE

• other approaches?

• **dynamic theory** does not consider variations as “noise”, but rather “as an inherent property of changing system” (De Bot, Lowie and Verspoor, 2007, p.14) 
  (=> performance vs. competence: no)

• **sociocultural theory** does not see interlanguage development as a smooth linear, but rather cyclic process (Lantolf and Aljaafreh, 1995) 
  (=> performance vs. competence: no)
RESEARCH QUESTIONS

• **Question 1.** Can the learners’ zone of proximal development, i.e., their actual and potential development, and the distance in-between, be represented and observed so that errors and mistakes can be distinguished?

• **Question 2.** Is interlanguage competence variable across students, time, and text types?

• **Question 3.** Does the modeling of the learners’ zone of proximal development provide further insight into their interlanguage development?
• “usually taken for granted that linguistic errors are caused solely by a lack of linguistic competence” (Amaral and Meurers, 2008, p.328)

• the quality of a learner model is determined by considering how “performance-related errors, that is, mistakes or lapses, as opposed to genuine competence-dependent errors” are handled (Heift and Schultze, 2007, p.176)
MISTAKES OR ERRORS

“we must make a distinction between those errors which are the product of chance circumstances and those which reveal the learner’s underlying knowledge of the language to date”, i.e., mistakes and errors, respectively (Corder, 1981, p. 10).
“unworkable in practice”  
(Ellis, 1985, p. 68)

“The distinction between an ‘error’ and a ‘mistake’ is nothing like as clear-cut as Corder made out. The gravity of an error is to a very considerable extent a matter of personal opinion” (Ellis, 2009, p.6).
ERRORS VERSUS MISTAKES

- existing methods
  - ratio of incorrect to correct forms
  - systematic versus unsystematic (Corder, 1981)
  - learner’s structural intentions (Taylor, 1986)
  - learner’s self-editing (James, 1998)
• learner’s self-editing

• distance between what a learner can do with and without assistance
  => James’s (1998) distinction between errors and mistakes

• distance between what a learner can do with and without assistance
  => Vygotsky’s (1978) concept of the zone of proximal development

• actualising learners' zone of proximal development
  => dynamic assessment (Lantolf and Poehner, 2009, p.150)
Dynamic Assessment (Lantolf and Poehner, 2004)

- Integrates both teaching and assessment activities
- Focuses on emergent abilities
- Allows feedback during the assessment process
- Dispenses implicit to explicit feedback

<table>
<thead>
<tr>
<th>Interventionist</th>
<th>Interactionist</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Quantitative analysis: psychometrical measures.</td>
<td>• Qualitative analysis: ZPD.</td>
</tr>
<tr>
<td>• Computer-based application: assessment conducted with large numbers of individuals simultaneously (multiple choice questions).</td>
<td>• Face-to-face: small numbers of students.</td>
</tr>
<tr>
<td>• Written and spoken language.</td>
<td>• Spoken language.</td>
</tr>
<tr>
<td>• Mediation between learners and teachers established in advance;</td>
<td>• Mediation between learners and teachers negotiated;</td>
</tr>
<tr>
<td>• Assistance not tailored to learners’ responsivity;</td>
<td>• Mediation tailored to learners’ responsivity.</td>
</tr>
<tr>
<td>• Hints ranging from implicit to explicit</td>
<td></td>
</tr>
<tr>
<td>• Standardised mediation.</td>
<td></td>
</tr>
<tr>
<td>• Individual or group settings.</td>
<td>• Individual.</td>
</tr>
</tbody>
</table>
• the zone of proximal development is “a window into the person’s future mental growth” (Lantolf and Aljaafreh, 1995, p.619)

• predicting the learners’ future knowledge: past-to-present and present-to-future models (Valsiner, 2001)

• predicting the learners’ present knowledge: an expanded model (Thouësny, 2011)
ERRORS VERSUS MISTAKES
AN EXPANDED MODEL

• phase 1/2

independent performance with errors and mistakes

self-editing task with or without assistance
ERRORS VERSUS MISTAKES
AN EXPANDED MODEL

• phase 2/2

Low in ZPD: error
High in ZPD: mistake

amount
of assistance
ERRORS VERSUS MISTAKES
AN EXPANDED MODEL
WHERE ARE WE?

- what does the literature report about interlanguage and its variability?
- how to represent the learner’s knowledge
- operationalising the error/mistake distinction: tools’ architecture
- overview of the data collected and analysis
- results and discussion
• **tools’ architecture and external resources**
  
  • WAN and LAN servers  
  
  • PHP  
  
  • MySQL  
  
  • Debian  
  
  • TreeTagger  
  
  • TinyMCE
STUDENTS’ TOOLS

• Levels of assistance
  (Based on Aljaafreh and Lantolf’s (1994) regulatory scale)

  • **Level 1.** The incorrect form is highlighted.

  • **Level 2.** The error type is provided for each incorrect form.

  • **Level 3.** Detailed explanations about the nature of the incorrect form is given to the learner.

  • **Level 4.** The correct form is provided.
STUDENTS’ TOOLS

• level 4

• a suggestion is provided to the learner

• each learner’s replacement is marked as correct or incorrect

<table>
<thead>
<tr>
<th>incorrect form</th>
<th>feedback</th>
<th>my correction</th>
<th>teacher’s correction</th>
<th>Alternative validated?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[âpres]</td>
<td>-</td>
<td>après</td>
<td>après</td>
<td>✗</td>
</tr>
<tr>
<td>[ans]</td>
<td>-</td>
<td>année</td>
<td>années</td>
<td>✗</td>
</tr>
<tr>
<td>[dans un]</td>
<td>-</td>
<td>au</td>
<td>de travail</td>
<td>✓</td>
</tr>
<tr>
<td>[l'Université]</td>
<td>-</td>
<td>Université</td>
<td>étudiante à l'université de DOL / étudiante à</td>
<td>✓</td>
</tr>
</tbody>
</table>
RESEARCHER’S TOOLS

• pre-processing the learners’ texts
• computer-aided error editor
• correcting learners’ replacements
• monitoring the learners’ actions when self-editing their texts
• positioning the incorrect form in the ZPD
• part-of-speech tagging learners’ texts
• determining learners’ language accuracy and complexity
PRE-PROCESSING LEARNERS’ TEXTS

Enter New Participant’s Text in Database

<table>
<thead>
<tr>
<th>date of student's submission</th>
<th>new file: pick a date!</th>
</tr>
</thead>
<tbody>
<tr>
<td>text file:</td>
<td>Browse...</td>
</tr>
<tr>
<td>student:</td>
<td></td>
</tr>
<tr>
<td>text type:</td>
<td></td>
</tr>
</tbody>
</table>

Log

<table>
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<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>student_id</td>
<td>2</td>
</tr>
<tr>
<td>type_id</td>
<td>1</td>
</tr>
<tr>
<td>submissionDate</td>
<td>2008-10-30</td>
</tr>
</tbody>
</table>

Bonjour, tout le monde. Nous sommes... Maintenant je vous dirai de renseignement de yoga. Le yoga est un mélange de théorie et pratique. Le mot vient de Sanskrit, une langue Indienne et il a tant de significations telles qu'unir. Le but ultime de yoga est pour on d'attend la harmonie du corps et de l'esprit. A notre avis le yoga est polyvalent parce qu'il a beaucoup de bienfaits pour la santé ; surtout c'est accessible à tout sans considération d'âge et tout le monde peut le faire... Tout 'abord avant que commence le vous aurez besoin d'porter des vêtements confortables aussi bien que tapis de sol et une bouteille d'eau. Maintenant nous vous montrez des démonstrations de yoga qu'on fera ensemble sauf un exemple. Je vous présente... et il va faire le premier exercice. Car il n'y pas d'espace assez ici et moi ferons cet exercice ensemble. Nous espérons qui vous vous soyez bien amuse de voir notre démonstration a propos du yoga. Merci pour votre temps. A bientot mes camarades.
COMPUTER-AIDED ERROR EDITOR

- **process to correct learners’ texts:**
  - (1) highlighting the incorrect word or groups of words;
  - (2) applying the corresponding error type;
  - (3) writing a personalised feedback or (5) choosing a meta-linguistic feedback in the drop down list;
  - (4) entering an appropriate replacement to the learner’s incorrect form.

- **error encoding**
  - *incorrect form*[errorType] {index@meta-linguistic feedback@correct form}
- **error classification based on:**
  - Mackey, Gass and McDonough (2000)
  - L’Haire (2007)
  - Granger (2003)

<table>
<thead>
<tr>
<th>Error category</th>
<th>Error sub-category</th>
<th>Error type</th>
</tr>
</thead>
<tbody>
<tr>
<td>[se] selection</td>
<td>[vo] vocabulary</td>
<td>[mu] nonstandard word or expression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[lw] inappropriate choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[re] inappropriate register</td>
</tr>
<tr>
<td></td>
<td>[gr] grammar</td>
<td>[sn] not understandable</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[cw] inappropriate connection word choice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[rv] reflexive verb</td>
</tr>
<tr>
<td></td>
<td>syntactic</td>
<td>[ar] incorrect article type</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pr] incorrect preposition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[mo] incorrect mood</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[te] incorrect tense</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[vo] incorrect voice</td>
</tr>
<tr>
<td>[mo] morphosyntactic</td>
<td>[ag] agreement</td>
<td>[cl] incorrect word class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[dn] determinant noun agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[ge] gender agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[na] noun adjective agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pa] pronoun antecedent agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pp] past participle agreement</td>
</tr>
<tr>
<td></td>
<td>[fo] form</td>
<td>[sv] subject verb agreement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[pl] incorrect plural form</td>
</tr>
<tr>
<td>[sp] spelling</td>
<td></td>
<td>[co] incorrect conjugation form</td>
</tr>
<tr>
<td></td>
<td>[hy] hyphen</td>
<td>[wf] incorrect word formation</td>
</tr>
<tr>
<td></td>
<td>[ms] misspelling</td>
<td></td>
</tr>
<tr>
<td>[ty] typography</td>
<td></td>
<td>[ca] capitalisation</td>
</tr>
<tr>
<td></td>
<td>[ab] abbreviation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[mp] missing punctuation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[wp] inappropriate punctuation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[es] missing or inappropriate space</td>
<td></td>
</tr>
</tbody>
</table>
CORRECTING LEARNERS’ REPLACEMENTS

- **Criterion 1.**
  From the students’ perspective. Marked as appropriate, only if the replacements suggested were perfectly well-formed.

- **Criterion 2.**
  From the research perspective. Marked as appropriate, if error types are resolved, even if learners produced other error types when proposing their replacements.
MONITORING LEARNERS’ ACCESS TO FEEDBACK

- **Procedure:**
  - (a) recording the time at which any feedback pop up was opened and closed;
  - (b) computing the difference between both records;
  - (c) calculating the time required to read the feedback;
  - (d) evaluating whether the access was sufficiently long for the feedback to be read.

<table>
<thead>
<tr>
<th>Incorrect Form</th>
<th>Feedback</th>
<th>My Correction</th>
<th>Teacher’s Correction</th>
<th>Alternative Validated?</th>
<th>Feedback Read? How many times? Average time?</th>
</tr>
</thead>
<tbody>
<tr>
<td>[français]</td>
<td>misspelling</td>
<td>français</td>
<td>français</td>
<td>✓</td>
<td>1.46 seconds (1 time)</td>
</tr>
<tr>
<td>[les grammaires]</td>
<td>inappropriate word choice</td>
<td>la grammaire</td>
<td>les exercices de grammaire</td>
<td>✗</td>
<td>1.53 seconds (1 time)</td>
</tr>
<tr>
<td>[étais]</td>
<td>subject verb agreement</td>
<td>-</td>
<td>étaient</td>
<td>✗</td>
<td>3.86 seconds (1 time)</td>
</tr>
<tr>
<td>[rencontrerai]</td>
<td>misspelling</td>
<td>rencontrerai</td>
<td>rencontrerai</td>
<td>✗</td>
<td>1.35 seconds (3 times)</td>
</tr>
<tr>
<td>[après]</td>
<td>incorrect or missing accent</td>
<td>après</td>
<td>après</td>
<td>✓</td>
<td>Not read!</td>
</tr>
<tr>
<td>[heures!]</td>
<td>missing or inappropriate space</td>
<td>heures !</td>
<td>heures !</td>
<td>✓</td>
<td>2.64 seconds (1 time)</td>
</tr>
<tr>
<td>[bientôt]</td>
<td>incorrect or missing accent</td>
<td>bientôt</td>
<td>bientôt !</td>
<td>✗</td>
<td>Not read!</td>
</tr>
</tbody>
</table>

- Native speakers’ speed rate: usually acknowledged as 250 words per minute (wpm)
- Reading on a computer screen: 180 words per minute (Ziefle, 1998) => time in milliseconds to read one word = 60/180x1000 = 333.33ms
POSITIONING THE INCORRECT FORM IN THE ZPD

- incorrect forms for which learners did not require assistance to correct themselves: high in the ZPD => mistakes (1)

- incorrect forms for which learners required assistance to correct themselves: between high and low in the ZPD => errors with a potential development (0)

- incorrect forms for which learners could/would/did not provide any replacement even with assistance: low in the ZPD => errors with no potential development (-1)
PART-OF-SPEECH TAGGING

- TreeTagger (University of Stuttgart) tagging accuracy => 96.34% (Schmid, 1994)

- **tagging accuracy on texts written by learners of French**
  precision => 78.43%; recall => 77.67%

- **improvements:**
  - identification of unknown lemmas => lowercase conversion
  - reduction of incorrect tags consistently applied => additional rules
  - elimination of incorrect tags randomly applied => cross-reference between pos-tagged and error-annotated corpora

- **tagging accuracy after improvements**
  precision => 97.21%; recall => 96.01%; Cohen’s kappa => 97.60%
LANGUAGE COMPLEXITY

• balanced complexity measure
  (Schulze, Wood and Pokorny, forthcoming)

  • Lexical complexity/diversity: text-length adjusted type token ratio
  • Lexical sophistication: mean length of a word
  • Syntactic sophistication: mean period unit length
  • Syntactic complexity/diversity: unique bigram ratio
LANGUAGE ACCURACY

- counting correct as well as incorrect forms:
  “obligatory occasion analysis” (Brown, 1973; Ellis, 1994, p.74)

  - (a) my sister **visited** us yesterday => past tense -ed (one correct occasion)
  - (b) my father **arrived** yesterday => past tense -ed (one missing occasion)

- ratio of incorrect to correct forms => IncF:CorF
LANGUAGE ACCURACY

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  “obligatory occasion analysis” (Brown, 1973; Ellis, 1994, p.74)

  • (a) my sister **visited** us yesterday => past tense -ed (one correct occasion)
  • (b) my father **arrive** yesterday => past tense -ed (one missing occasion)

• ratio of incorrect to correct forms => IncF:CorF

• **Example:**
  4 noun-adjective agreement error types
  6 ADJ pos-tags => (2 correct - 4 incorrect)
  IncF:CorF => 4:2

  **percentage of success** in noun-adjective agreement =>(2/2+4)X100=33.33%

[...]

Il y n'a pas beaucoup des parlent, mais ce n'est pas nécessaire parce-que les choses malheureux qui passer est drôle et les plus important. J'aime cet film parce-que il est surréaliste. Il n'est pas trop longue mais il y a beaucoup des choses passer. J'aime aussi le fin de le film, parce-que on n'attendre pas le fin, quand le homme as coincé dans le four. [..]
- language accuracy in performance (P) and knowledge (K)

\[
P = \left( \frac{CorF}{CorF + IncF} \right) \times 100
\]

\[
K = \left( \frac{CorF + M}{CorF + IncF} \right) \times 100
\]
OVERVIEW OF THE DATA

- 14 participants
- 77 texts
  average per participant: 2 texts
  except student #2: 50 texts
- 19,870 tokens
- 17,752 words
  average per participant: 806 words
  except student #2: 7,264 words
- 2,579 error types (14.53%)
- 3,689 incorrect words (20.78%)
- text types
  most students: bilan, wiki
  student #2: bilan, wiki, essay, email, forum
- timeline submission
  most students: Dec 2008
  student #2: Dec 2008 - Apr 2009

=> synchronic inter-learner analysis
=> diachronic intra-learner analysis
SYNCHRONIC INTER-LEARNER ANALYSIS

• 1 text type written by 14 participants in Dec 2008
  =>wiki/bilan grouped together: no significant differences in terms of language complexity; learners performed at a similar level of lexical and syntactical complexity.

• feedback was often ignored (53%, N=1084)
  => learners did not need help, may have been more interested by the final corrections, may have felt overwhelmed, did not understand the feedback they read and decided to skip some of the incorrect forms, ...

• proposed replacements to 71.5% of their incorrect forms
  => not an issue for the error/mistake distinction
  => issue when determining what learners could do with assistance
SYNCHRONIC INTER-LEARNER ANALYSIS

![Graph showing percentage of mistakes in incorrect forms and percentage of incorrect forms in texts over different samples.](image-url)
<table>
<thead>
<tr>
<th>Students</th>
<th>Text identification</th>
<th>Number of incorrect forms</th>
<th>Number of errors</th>
<th>Number of mistakes</th>
<th>Percentage of mistakes in incorrect forms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>34</td>
<td>9</td>
<td>1</td>
<td>8</td>
<td>88.9%</td>
</tr>
<tr>
<td></td>
<td>48</td>
<td>48</td>
<td>23</td>
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<td>65</td>
<td>111</td>
<td>74</td>
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<tr>
<td></td>
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<td>98</td>
<td>70</td>
<td>41.7%</td>
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<tr>
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<td>61</td>
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<td>64</td>
<td>111</td>
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<tr>
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<tr>
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<td>39</td>
<td>101</td>
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<td>1</td>
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<tr>
<td></td>
<td>Total</td>
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<td>151</td>
<td>24</td>
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<tr>
<td>10</td>
<td>44</td>
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<td>48</td>
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<td>34.7%</td>
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<td>106</td>
<td>88</td>
<td>18</td>
<td>17.0%</td>
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<tr>
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<td>Total</td>
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<td>24.2%</td>
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<tr>
<td>17</td>
<td>55</td>
<td>110</td>
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<td>48.2%</td>
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<td>67</td>
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<td>43.2%</td>
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</tbody>
</table>
• student #2
• from Dec 2008 to Apr 2009 (T3 to T6)
• forum/email => non-graded
• wiki/bilan/essay => graded
• feedback accessed: 81.6%
• replacements provided: 81.3%
DIACHRONIC INTRA-LEARNER ANALYSIS

• variations in actual development
  
  • more mistakes in non-graded documents (forum/email) than graded documents (wiki/bilan/essay)

  • difficulties in selection, syntactic, and morphosyntactic in all documents (expected to observe less difficulties in email as she produced less complicated sentences)

  • difficulties in correcting herself in syntactic error types (like all other participants)

  • none of her results in language accuracy display regular or gradual changes over time (e.g., 93.1%, 71.4%, 85.7%, and 94.9% of success in noun adjective agreement - Dec, Feb, Mar, and April, respectively)
• variations in interlanguage development
RESULTS AND DISCUSSION

• **Question 1.** *Can the learners’ zone of proximal development, i.e., their actual and potential development, and the distance in-between, be represented and observed so that errors and mistakes can be distinguished?*

  • the learners’ actual development could be delineated on the condition that learners provided the system with a replacement each time they knew one

  • the representation of the learners’ potential development was conditioned by the learners’ behaviour with respect to feedback access
RESULTS AND DISCUSSION

• **Question 2.** *Is interlanguage competence variable across students, time, and text types?*

  • students with comparable results with regard to language accuracy in performance had indeed quite different levels of actual development

  • varying degrees of ability to perform knowledge

  • results in language accuracy showed ups and downs over time

  • new errors that never occurred before were encountered at each new point of observation in time, errors were also random

  • text types were found to have no impact on the learner’s knowledge (observation derived from the data of one single participant, cannot be used to draw any decisive conclusions)
RESULTS AND DISCUSSION

- **Question 3.** Does the modeling of the learners’ zone of proximal development provide further insight into their interlanguage development?

  - actual and potential development gives valuable information about learners’ actual strengths and weaknesses. Such information, however, did not assist much in predicting the learners’ knowledge to come.

  - the learners’ knowledge recorded at a time Tt+1 is not a mere continuation of the learners’ levels of actual and potential development as observed at a time Tt.
SOME OF THE LIMITATIONS

• the student sample with fourteen participants was too small
• learners’ ability to understand the feedback might have been over-estimated
• learners may have felt overwhelmed with the comprehensive error annotation
• learners did not use the tools in the way they were designed to (the fact that learners did not use the assistance at any time limited the access to their potential development)


