SLD in CALL Tasks

A complexity-scientific analysis

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It’s all about understanding the learner to provide instructional guidance …

- language learning as a **complex** and dynamic system
- the construct of **proficiency**, its operationalization, and its indicators in text
- the **study**
  - data
  - methods
  - results
- **pre-emptive feedback** on proficiency development in online writing
language learning

- complex dynamic system
  - sensitivity to initial conditions
  - multivariate, interacting (conglomerate) variables
  - nonlinear, nonperiodic, nonhomogeneous
  - fractal

- prior learning outcomes are the best predictor of future learning success

- prediction of immediately adjacent events as the basis for contingent and contextualized preemptive feedback
proficiency

- conglomerate dynamic variable

- operationalized as textual complexity, accuracy, fluency - CAF
  - less predictable constructions indicate higher **complexity**
  - more recognizable constructions indicate higher **accuracy**
  - more connected constructions over time indicate higher **fluency**

- balanced **complexity**
  - indicators of sophistication and diversity
  - lexis and grammar

- probable **accuracy**
  - indicators of actuality and compatibility
  - lexis and grammar

- written **fluency**
  - text length per task
  - cohesion and coherence to be considered
text production task outcomes from elementary and intermediate German hybrid courses (E-Tutor)

3 consecutive semester courses over 16 months: 8 small essays

selected 8 students with a complete text set (from 5000 students who used the system over the years)

calculated complexity, accuracy, fluency, and proficiency for each text:
8 × 8 × 4 = 256 data points over 16 months
methods

- computing of complexity and fluency based on surface indicators
- error annotation (syntactic)
- interaction analysis of CAF
- cluster analysis to identify comparable student trajectories
- pairwise comparison of phase space diagrams

Time series depicts temporal development; phase space depicts change.
results (CAF interaction)

Pairwise scatterplots with LOWESS lines

• expected interactions of CAF in the group
• trade-off effects between accuracy and complexity
• complexity and fluency correlate with proficiency; accuracy does not
results (cluster analysis)

- some students are more similar than others

... and that makes the comparison of squiggly little graphs much easier
results (pairwise analysis: example 1)

- attractor in quadrant D (below group average)
- deterioration of 3 of 4 scores at the end of both semesters
- trade-off effects of complexity and accuracy not pronounced

- provide encouragement towards the end of the semester to boost motivation
- encourage students to write longer texts and employ a wider range of constructions
results (pairwise analysis: example 2)

- large, D-quadrant attractor basin
- high variability over time
- low complexity and low accuracy often have a compounding effect on the developing proficiency

- encourage students to meet the required text length consistently
- direct focus onto thorough proof-reading
pre-emptive feedback

- When embarking on the next text production task, the complex goal of improving their proficiency can be broken down for them and an individualized focus can be recommended: concentrate on range of vocabulary, write a longer or shorter text, leave time for proof-reading, ...

- These recommendations can be specified in the context of the task’s genre, topic, and instructions.

- Timely, contextualized, and contingent pre-emptive feedback is only feasible after a computational analysis.
a look back and forward

- methods work: conglomerate variables need to be analyzed over time and in context
- (individualized pre-emptive feedback is valuable)
- longitudinal data is essential, but the data density needs to be increased
- complexity and fluency computation is robust, but can be improved
- error annotation needs to be replaced by accuracy computation
- larger data sets will be beneficial for additional cross-sectional analysis
- further mathematical analysis of phase space diagrams will be the basis for automatic pre-emptive feedback
Thank you

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