Linguistics puzzles in the university curriculum

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Outline

1. Linguistics puzzles: an introduction
2. Problem-based learning: the approach
3. Puzzles as problem-based learning
4. The Edinburgh experience

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Linguistics puzzles

A short history

- Self-contained linguistics problems described by Zaliznyak (1963) as an alternative to classic reinforcing ‘exercises’
- Original motivation: separating learners’ understanding of concepts from their knowledge of the language of instruction, by giving them data they are not, and cannot be expected to be, familiar with
- Quickly gained popularity as outreach tool: Linguistics Olympiads
  - Moscow 1965–
  - Bulgaria 1982–
  - International Olympiad 2003–
  - UKLO 2009–, AILO 2009–, Isle of Man LO 2012–

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An example: Avestan numerals

Examine the words for various numerals in Avestan, the language of the scriptures of Zoroastrianism, the religion of ancient Iran. Some are given in Latin transliteration and some in the original script

Numeral	Avestan
6	xšvaš
8	ašta
17	haptadasa
7	𐬵𐬀𐬞𐬙𐬀
16	𐬑𐬱𐬬𐬀𐬲𐬛𐬀𐬯𐬀

What is the Avestan for 18? Write both the transliteration and the Avestan script.

Credit: Mikhail Gelfand [Moscow Linguistics Olympiad, 1981]

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Problem-based learning

What is it?

> *[f]ocused, experiential learning organized around the investigation, explanation, and resolution of meaningful problems (Hmelo-Silver 2004:236)*

- The PBL cycle
  - Problem scenario
  - Identification of the facts
  - Generation of hypotheses
  - Identification of knowledge deficiencies relative to the problem, via self-directed learning
  - Application of new knowledge
- Followed by abstraction → evaluation/reflection
- Solving a puzzle follows the same cycle

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The educational goals of PBL

Problem-based learning helps students to

1. construct an extensive and flexible knowledge base;
2. develop effective problem-solving skills;
3. develop self-directed, lifelong learning skills;
4. become efficient collaborators;
5. become intrinsically motivated to learn

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Puzzles aren't quite PBL, but close enough

- PBL problems are usually open-ended, highly complex and lacking a coherent structure (Hmelo-Silver 2004; Savery 2015)
- Some key differences
  - Puzzles do have a single 'right' answer (not open-ended)
  - We build an explicit progression from simple to complex
  - For pedagogical purposes, we can identify several types (structures), such as
    - 'Scramble' puzzles (matching of translations)
    - 'Rosetta' puzzles (translation to and from the target language)
    - 'Grid' puzzles (identification of internal structure)

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The Edinburgh experience

UG curriculum structure

- Pre-Honours (Year 1 & 2)
  - 1st year: 40 credits of Linguistics and English Language 1AB + 80 credits 'outside courses'
    - Diverse student body
    - Wide range of previous exposure
    - Wide range of motivations, from linguistics geeks to students taking a punt on a subject they'd never heard about
  - 2nd year: 40–80 credits of LEL2
- Honours (Year 3 & 4)
  - In-depth specialist courses
  - No obligatory curriculum, choice driven by motivation

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Puzzles in LEL1A

- ‘Circus’ course covering a range of mostly structural topics
- ‘Puzzle component’ running alongside the lecture cycle
- Puzzles released weekly, solutions provided with a lag
- No explicit tracking of the lecture content
- Big chunk of final assessment

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Why LEL1A?

- Self-contained problems: suitable for beginners
- Wide range of off-the-shelf puzzles at many levels of difficulty
- Lever to introduce a wider range of linguistic and cultural diversity early on
- Clear ‘transferable skills’, ‘problem-solving’ pitch

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LEL1A puzzles: challenges

- Low metalinguistic awareness: even the simplest puzzles benefit from a knowledge of basic notions like ‘tense’, ‘subject’, which not all (especially UK) students have
- Lack of confidence, anxiety around assessment
- Students expect ‘recipes’, ‘how to solve puzzles’
  - Clash with PBL ethos, expectations of ‘productive failure’
  - Practical challenges in delivery
- Lack of obvious link to curriculum

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Puzzles in LEL2D

- Second-year course: *Cross-Linguistic Variation: Limits and Theories*
- Covid-19: flipped pedagogy
- Pre-Covid ‘lecture’ → Covid-era asynchronous ‘block’ of puzzle followed by explainer video
    - Classic PBL structure
    - Technical content maintained unchanged, only the methods flipped

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Progression and curriculum integration

- The simplest puzzles do not require too much technical knowledge
- In 2D, we start from simpler puzzles like Manx {at the end of the handout), which are not much different, but do benefit from bringing some technical knowledge to bear
- They are on a continuum with fairly advanced puzzles (Alyutor at the end of the handout) that are not just complex but clearly build on the course content

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LEL2D puzzles: challenges... and successes

- Negative feedback on workload, but hard to disentangle from Covid
  - In 2020/2021 we kept the basic model but made only one puzzle a week obligatory
  - This mostly resolved the workload complaints with no obvious downside
- Otherwise...
  - Good mastery of learning outcomes
  - Clear link to assessment
  - Positive feedback on curriculum structure

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Long-term outcomes

- What we really want to know is if the puzzles have had a longer-term impact
- Survey sent out to five cohorts of LEL1A (≈ 1,500 students), although the earliest cohort was poorly represented
- 204 responses, all quantitative, some qualitative

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Overall impressions

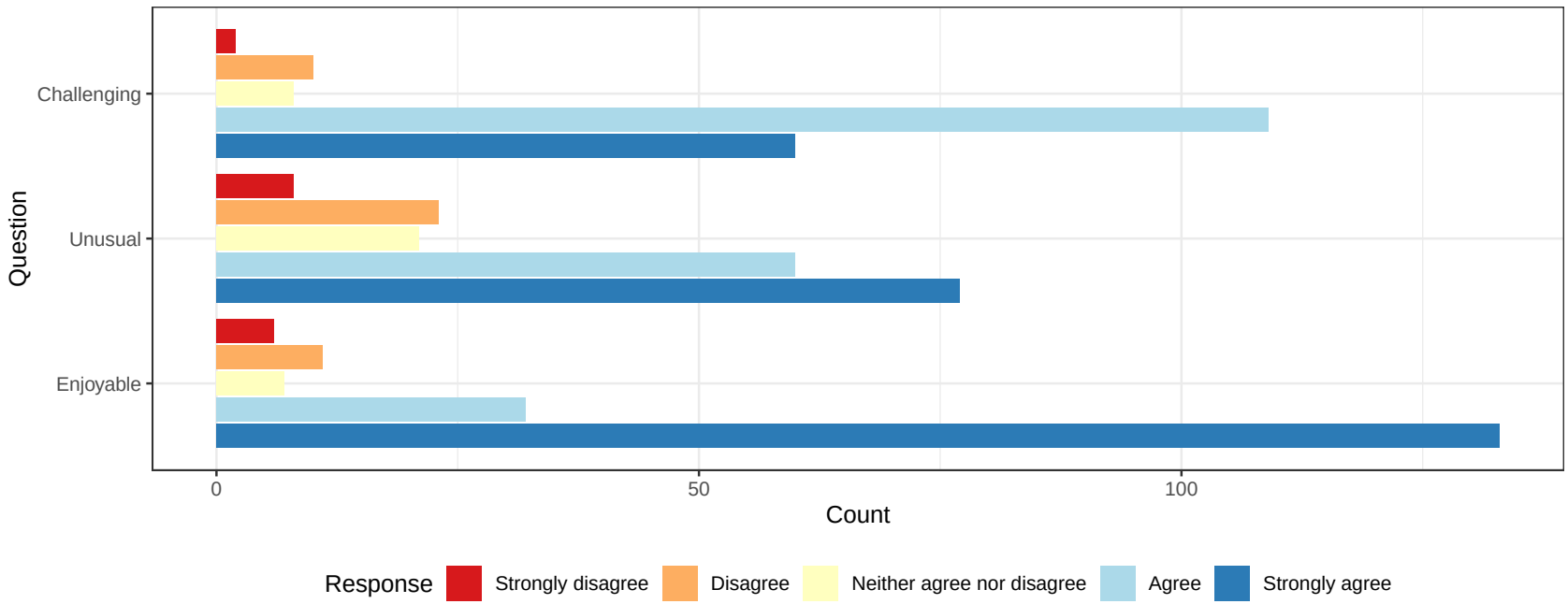

Figure 1: Responses to overall impression questions

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Local and longer-term effects

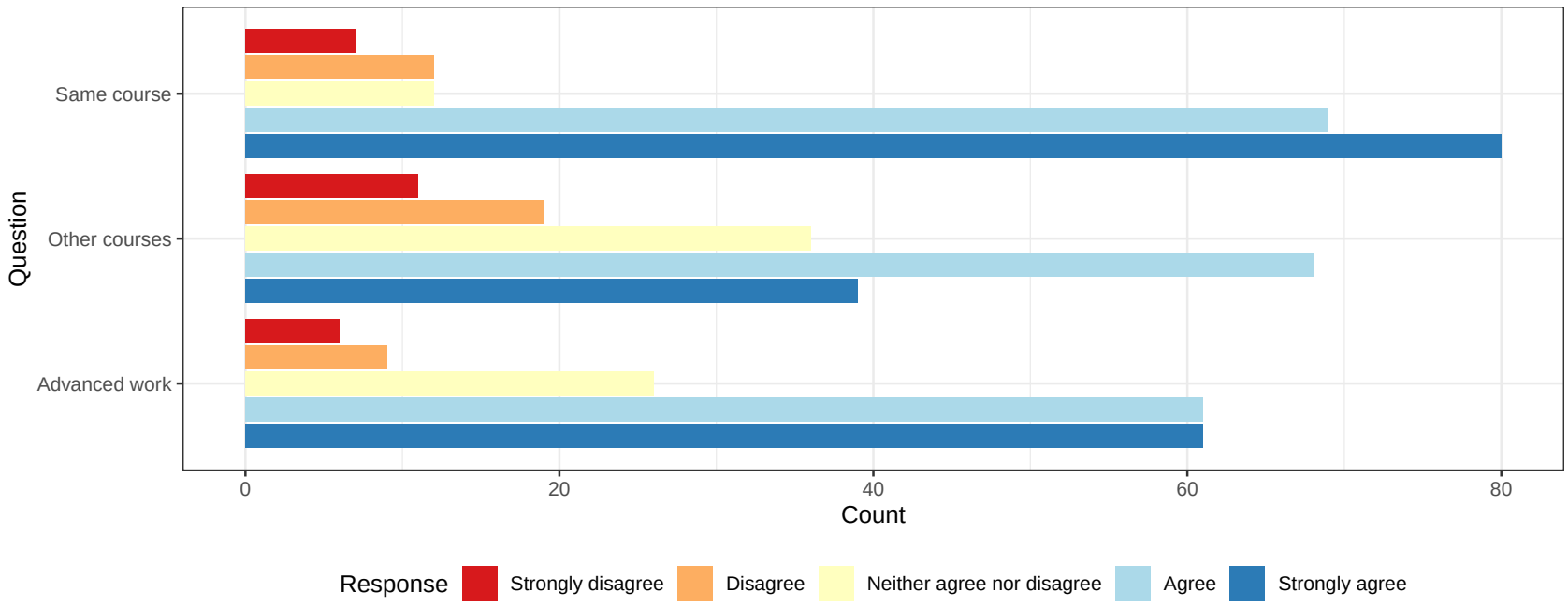

Figure 2: Responses to effectiveness questions

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Learner needs

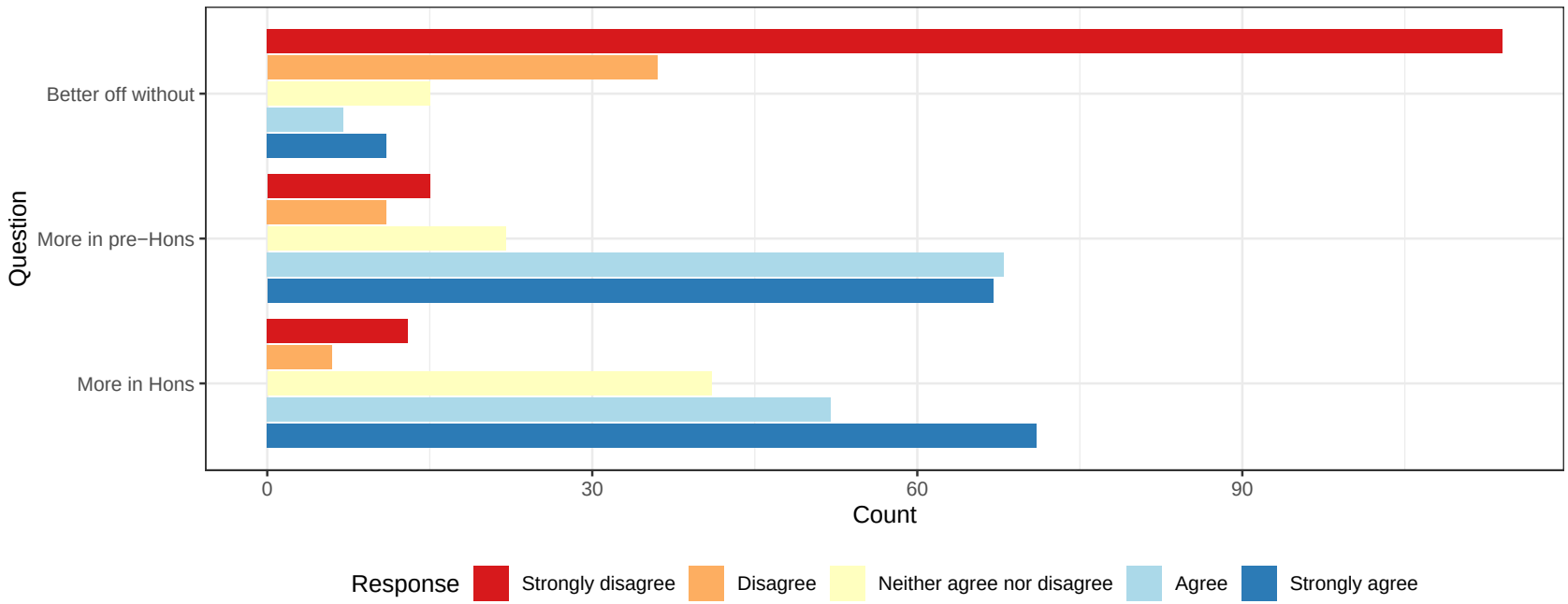

Figure 3: Responses to learner needs questions

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Qualitative feedback

- Overwhelmingly positive
  - Not all, admittedly
- Frequent references to general ‘problem-solving’ skills being useful, including from outside students

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The future: puzzles at Honours i

- As well as embedded problem-based learning in the curriculum, linguistic puzzles also allow students to practise grammatical analysis
- In 2022/23, we are introducing an Honours course in designed to develop this skill
  - LEL1A: students practise solving puzzles;
  - LEL2D: students learn to relate puzzles to theory development;
  - Methods in Theoretical Linguistics: students learn to inform theory development, by making their own puzzles
- Much theoretical linguistics research involves using small-scale pieces of grammatical analysis to inform deeper theoretical debates
- NB! This is different from the common theme of many undergraduate/MSc research projects, which are essentially descriptive.

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The future: puzzles at Honours ii

- We hope that Methods in Theoretical Linguistics can help students become adept at using the cycle of theory → prediction → empirical study → evaluation, at a relatively early career stage, building on their familiarity with the puzzles
- Watch this space...

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Overall summary

- Puzzles follow many principles of problem-based learning
- They are pedagogically effective and have a motivating effect on learners
- This makes them suitable for use at earlier stages, where we cannot assume much technical knowledge, but their relevance continues into the more advanced parts of the curriculum
- Caveats
  - Curricular integration
  - Teaching as guidance vs. teaching as recipe-giving
  - Workload

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Thank you!

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http://maths-puzz-ling.ed.ac.uk (coming soon!)

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