The Language of Solving First-year Physics Problems

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The Physics Perspective

The textbook opens with instruction in effective strategies for solving word problems in physics. The units then present physics problems linked to the set of physics concepts typically taught in first year — from linear motion to fluids — focusing on how students and experts solve problems in groups and report their solutions with rationale formally in writing.

By exploring the diverse competencies of students and experts in speaking and writing physics solutions, the textbook aims to help students understand and develop their own competencies.

The Language Perspective

Across the 13 units, the three main functions of language in shaping physics knowledge are illustrated, unpacked, and practiced:

- Units 2-6: Representing experience & ideas
- Units 7-9: Organizing meaning in language, figures, mathematical symbolism
- Units 10-13: Negotiating interpersonal relations in knowledge claims

For example, we explore the functional structures of English that physicists typically use when a problem requires re-interpreting the concrete, physical world in terms of abstract concepts, such as when modelling a running person (concrete) as a point mass (concept). How is such a shift in perspective realized in language?

Organization

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FAQs answered

- What are the functions of language in solving physics problems?
- How does language help us to shift perspectives between a problem’s dynamic, physical situation and the stable, theoretical concepts involved?
- What are the roles of visual figures and mathematical symbolism relative to language in solving physics problems?
- What language choices are involved in effectively solving a physics problem in group dialogue and writing?
- Can we distinguish between reporting and explaining our solution? If so, how?
- What does it mean for a solution to be effectively communicated?

Strategies for Engagement

Task-based learning

Task-based syllabus with little frontal instruction. Learning occurs as users engage with tasks. Units typically lead with tasks linked to audio/transcripts of spoken solutions by students and experts; users input their task responses, and receive feedback, which is where much of the explicit instruction occurs.

Gamification

Advancement between textbook units is gated with a learning game involving a single Rube Goldberg machine comprising of 12 phases

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Acknowledgement

We gratefully acknowledge the financial support for this project provided by UBC Vancouver via Teaching and Learning Enhancement Fund (TLEF): Small TLEF Innovation Project Grant (Year 3): ID: 2024-TLEF-SP-000030268

The Language of Solving Physics 101: The Language of Solving First-year Physics Problems

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