CHALLENGING STUDENTS' UNDERSTANDING OF THE ROLE OF THEORY IN COMPUTER SCIENCE

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PROBLEM

- Students feel like the theoretical concepts they're learning in have no real-world applications, or connections to other CS courses they've taken

GOAL

- Design an assignment to help students develop an understanding of the role and necessity of theory in Computer Science

THE ASSIGNMENT DEVELOPMENT, PHASE 1

- Find papers to assign that dealt with Theory of Computation concepts

- Decide the main learning goals
  - Exposure to the breadth of applications of and careers within Theoretical Computer Science
  - Develop an understanding of the role and necessity of theory in the field of Computer Science
  - Embrace difficulty

THE ASSIGNMENT DEVELOPMENT, PHASE 2

- How can we encourage students to engage in the activity without feeling overwhelmed?

- What is a manageable task they can submit?

- How can we assess their engagement?

THE SCAFFOLDING

- Task one: read the abstract and the introduction for each paper, and write a short reflection

- Task two: read for 30 minutes while engaging in active note taking, and write a short reflection

- Task three: write a 1-2 page reflection on the process of reading and analyzing the paper

PROBLEM

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SOME STUDENT FEEDBACK

- Overall, the paper made me more interested in the [...] and how it may have evolved since this paper's publication in [...]

SOME STUDENT FEEDBACK

- Theoretical courses often have an aura of abstraction that results in viewing the content more as historical knowledge of the field, rather than information which will widely be used by anyone not pursuing theoretical work in the future. However, post my-final in depth reading of [...], I can admit that my mindset has shifted. Though it may not have been a revolutionary adjustment [...]

SOME STUDENT FEEDBACK

- This assignment has been very challenging but has also given me the opportunity to practice reading dense academic papers, figure out new strategies to read complicated texts, and allowed me to see real-world applications of the material I have learned in class this semester. […] I wondered about the connections between all these subjects and how they have developed, especially in recent years.

OUTCOMES

Instructor perspectives

- Reflections as assignments

- Embed meta-conversations in the curriculum

- Slow down and reflect

LOOKING TOWARDS THE FUTURE

- Overall, student response was positive!

- We can challenge students in different ways

- We might find other papers that are better suited to the assignment

- We can design different goals around engaging with the paper

THANK YOU!

WHICH PAPERS WERE CHOSEN

- On the nature of the Theory of Computation, *Avi Wigderson* (2018)

- Computing Machinery and Intelligence, *Alan Turing* (1950)

- Towards a morphological transducer and orthography converter for Western Tlacolula Valley Zapotec, *Jonathan Washington, Felipe Lopez, and Brook Danielle Lillehaugen* (2021)

- The Applications of Automata in Game Theory, *Sally Almanasra, Muhammad Rafie Mohd Arshad, and Khaled Suwais* (2013)

- Automata Theory, Artificial Intelligence and Genetic Epistemology, *Mark Bickhard* (1982)