Intelligent Tutors Can Open New Pathways to Digital Economy Jobs

Explosive Labor Demand

- The **information technology job sector is growing fast**, especially in novel areas like cloud computing.
- **Cloud computing** related jobs have been growing by more than **200% annually** (Eide, 2020).

Community Colleges Can Close the Gap

- Because labor demand has outpaced the supply of workers, employers are considering **workers without a four-year university degree,** as long as they have the right skills.
- Community colleges are uniquely **positioned to capitalize** on this, which is why we are collaborating with CCAC.

The Two Sigma Problem

- The “two sigma problem” refers to how students receiving **one-to-one tutoring perform** up to **two standard deviations better than classroom-instructed students** (Bloom, 1984).
- Community college faculty are notoriously **time and resource constrained** and unable to provide this kind of personalized learning support.

Intelligent Tutors Can be as Effective

- The effectiveness of human tutors can be attributed to **immediate feedback** and **scaffolding**.
- Step-based Intelligent Tutoring Systems (ITS) provide an **interaction granularity** similar enough to human tutoring that the feedback and scaffolding can be almost as effective.
- This comes with a major **cost advantage**, especially when used in frequently offered, large classes (VanLehn, 2011).

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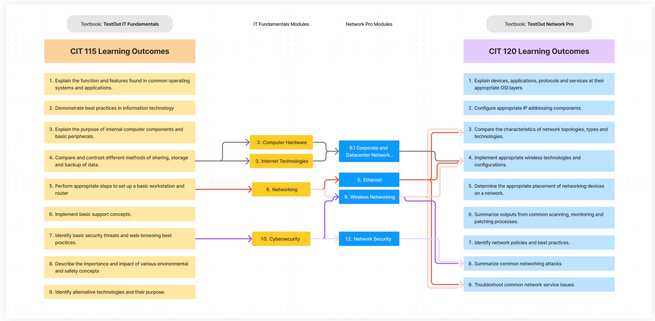
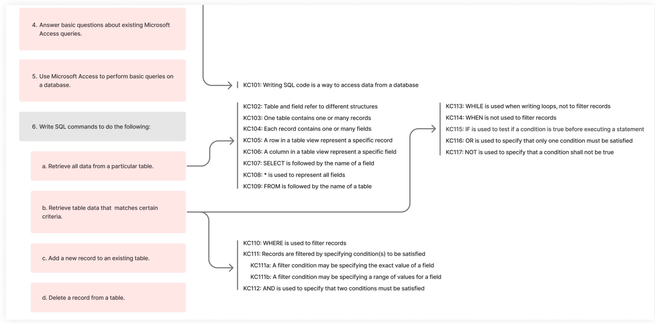
1 Curriculum Mapping



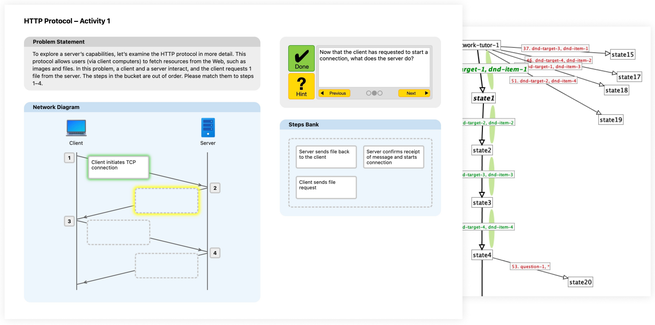
- To find **skills to target** in introductory IT courses we employed curriculum mapping.
- Identifying **pathways of transferable skills** ensures a **high impact** on students’ success **throughout the program**.
- A **paper**, led by Dr. McLaren, on this has been submitted to **AERA 2024**.

2 Identifying Knowledge Components



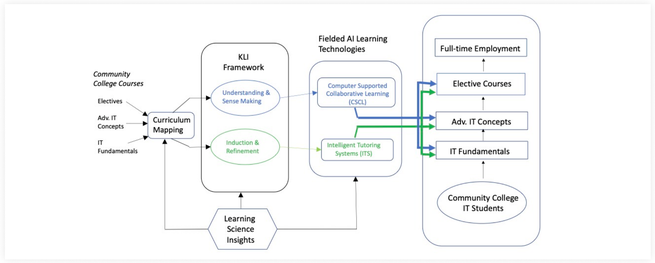
- Crucial to developing intelligent tutors is **breaking down learning outcomes** into their smallest unit — knowledge components.
- This allows the tutor to keep track of students’ knowledge and provide **individualized, just-in-time feedback**.

3 Developing and Testing Tutors



- We developed intelligent tutors covering **database** and **networking** units.
- This was done using HTML, CSS, JS, and the **Cognitive Tutor Authoring Tools**.
- The tutors were then tested for usability and educational effect using the **think-aloud** protocol.

4 Next Steps



- In addition to ITS, **computer-supported collaborative learning** (CSCL) will be deployed in a local community college.
- ITS learning, CSCL learning, and the standard curriculum will be **compared in randomized controlled trials**.

Eide, Naomi., (2020). “Supply, Demand, and Talent Constraints in the Cloud Workforce,” CIODive. • Bloom, B. S. (1984). The 2 Sigma Problem: The Search for Methods of Group Instruction as Effective as One-to-One Tutoring. Educational Researcher, 13(6), 4–16. • VanLehn, K. (2011). The relative effectiveness of human tutoring, intelligent tutoring systems, and other tutoring systems. Educational Psychologist, 46(4), 197–221.

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