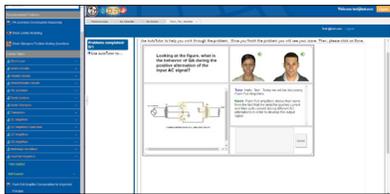


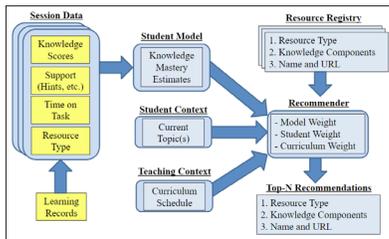


INTEGRATION OF INTELLIGENT TUTORING SYSTEMS FOR ELECTRONICS (ELECTRONIX TUTOR)

Supplementing the existing instructor-led training with advanced learning environments.



User Interface



Student Model and Recommender

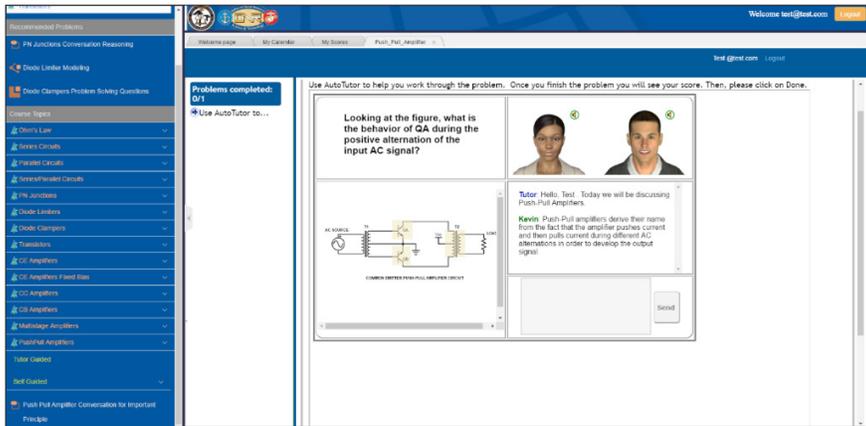
ElectronixTutor (ET) is an Intelligent Tutoring System (ITS) focusing on Navy Apprentice Technician Training courses in basic electricity and electronics. The goal of this effort is to supplement the existing instructor-led training with advanced learning environments that students can complete at their own pace (ITS and other adaptive learning technologies).

Using ET, students will be able to access selected readings from their Naval A-school curriculum, converse with their tutor (i.e., a computer agent) in natural language, engage in deep-reasoning question-answering with their tutor, answer multiple-choice questions, explore circuits in a simulation environment, construct mental models of circuits in a simulation environment, and find answers to common questions through a Point and Query facility. Data from the experience of each student is recorded in the student model, so that intelligent recommendations can be made to focus a student's attention on the knowledge components where they need additional practice and in the mode in which they need to continue their training.

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USER INTERFACE

The interface is designed to give learners access to the content in multiple ways. Students can engage with tutor-guided bundles presented as the topic of the day and managed by a calendar system that matches the syllabus for the class. For additional practice, the student can work through a self-guided selection of problems either by selecting a problem recommended for them based on their previous work, or by choosing a problem from the tree-structure list of course topics. Students are also able to see their progress, mastery levels for each topic, and full course calendar.



Learners have access to multiple learning resources within the ET environment. These include:

- **AutoTutor** (pictured), which has conversational agents to promote verbal reasoning, question answering, conceptual understanding, and natural language interaction.
- **Dragoon**, which is a simulation environment that allows learners to visualize how any change in a circuit element has potential repercussions on other elements and the circuit as a whole.
- **ASSISTments**, which is a platform for building learning technologies and assessment materials delivered on the web.
- **Learnform**, which provides problem-solving based learning activities with an in-depth multi-step solution breakdown and hints and feedback.

Taken together, these resources provide a unique learning environment which allows the learner to tackle difficult concepts through a variety of pedagogical approaches.

RESEARCH CHALLENGES AND OPPORTUNITIES

- Helping sailors learn with the latest advances in learning technologies on the web.
- Tracking the knowledge, emotions, and psychological characteristics of the individual sailor and their impacts on learning.
- Recommending the right learning resource on the right topic at the right time for an individual sailor.
- Summarizing performance of sailors and presenting results to the individuals and their instructors.
- Improving learning, retention, and transfer of training by applying principles of cognitive science, data mining, and learning analytics.

STUDENT MODEL AND RECOMMENDER

Performance measures are collected on each instructional module, such as time on task, percent correct, match scores between trainee behavior and expectations, and mastery of knowledge components associated with each topic. These performance measures will be stored in a data repository that updates the student model. An intelligent recommender system will use this data to decide which learning module and knowledge components need to be recommended to the learner for additional practice. Such decisions need to be sensitive to the student model profile of the trainee.

- 1) Session features are extracted from Learning Records.
- 2) Student mastery on Knowledge Components is estimated and resources ranked to maximize learning.
- 3) Resources reweighted to match active topics opened by student and teacher curriculum.

