Formative Self-Assessment for Customizable Database Visualizations: Checkpoints for Learning

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Checkpoints

- **Formative Self-Assessment:** students reflect on the state of their learning
- **Questions (20):** customized to the application domain (Multiple-choice and True/False)
- **Randomized:** questions as well as choices
- **Feedback:** on both correct and incorrect answers
- **Repetition:** until question answered correctly
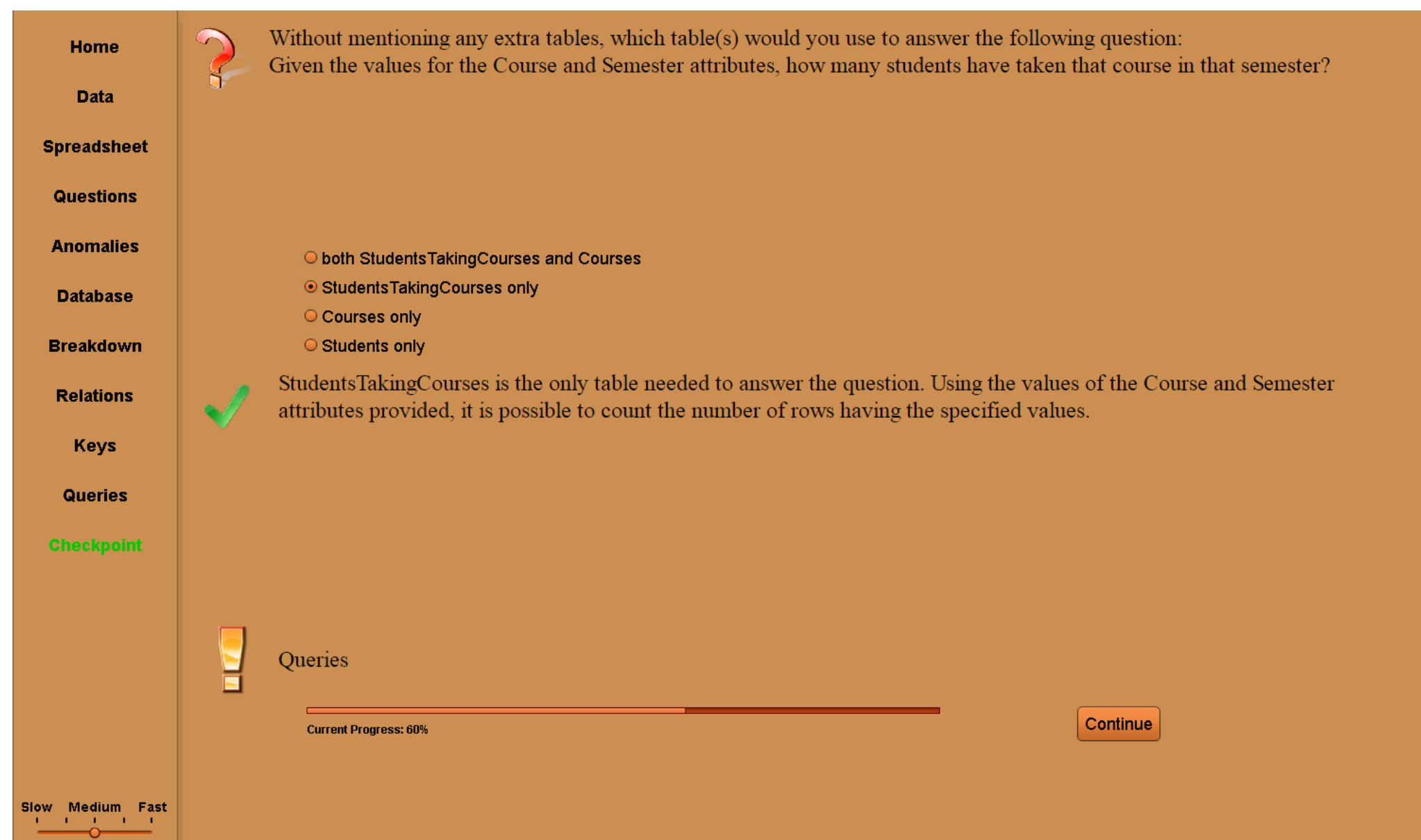
Multiple-Choice Question Answered Correctly
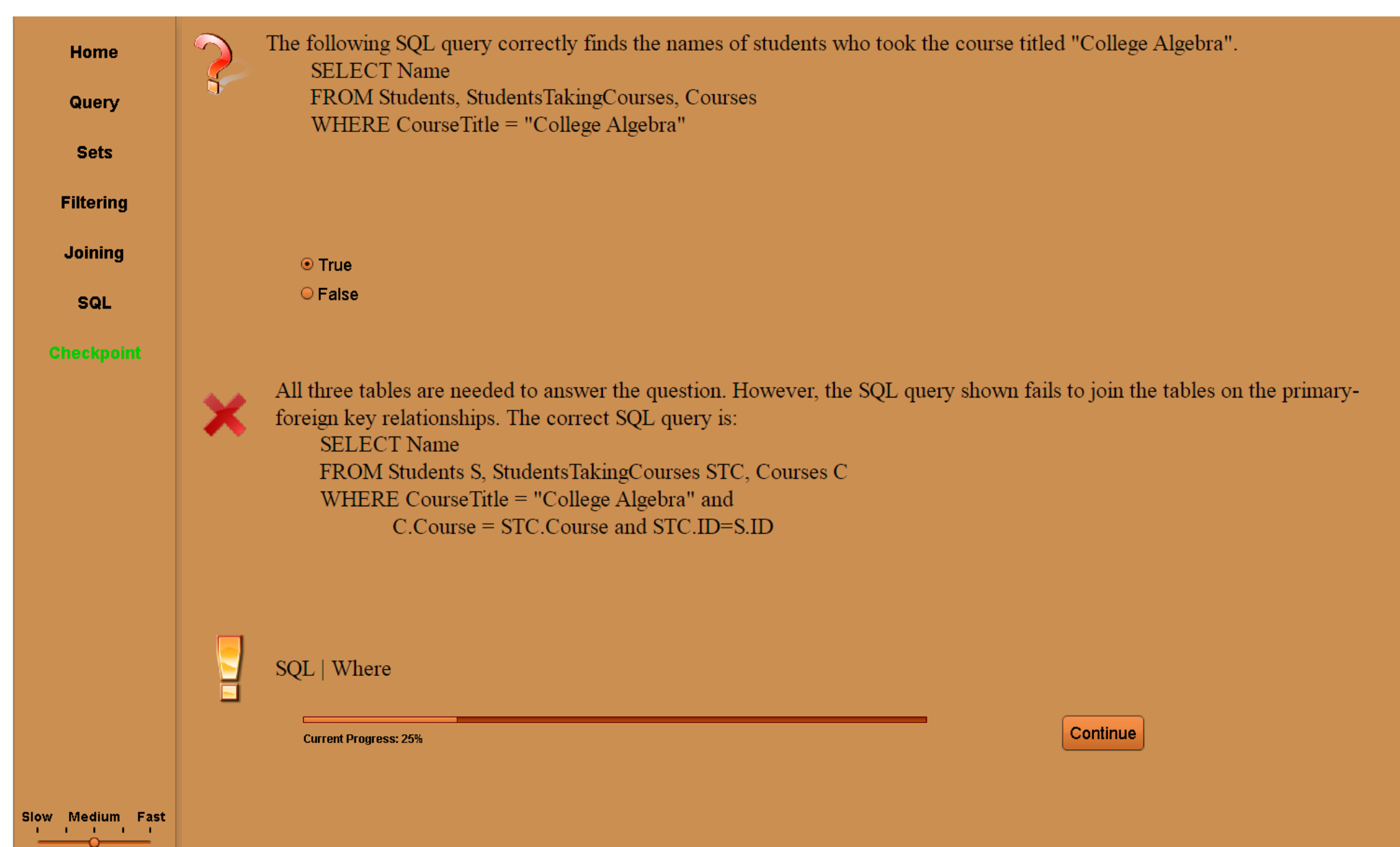
True/False Question Answered Incorrectly

Evaluation

Context:
- Introductory database course
- Review for second database course

Data:
- Students self-reported score with required threshold of 70% for participation credit
- Survey: Likert Scale and Open-Ended

Databases for Many Majors

Customizable visualizations that introduce fundamental data concepts to students of many majors

- 3 animations: IntroDB, QueryDB, DesignDB
- Customization Tool: CreateDB
- STEM Customizations: Astronomy, Computational Molecular Biology, Environmental Science, Forensics, Geographic Information Systems, Statistics
- Cooperative Learning Exercises

IntroDB: Introduction to Databases
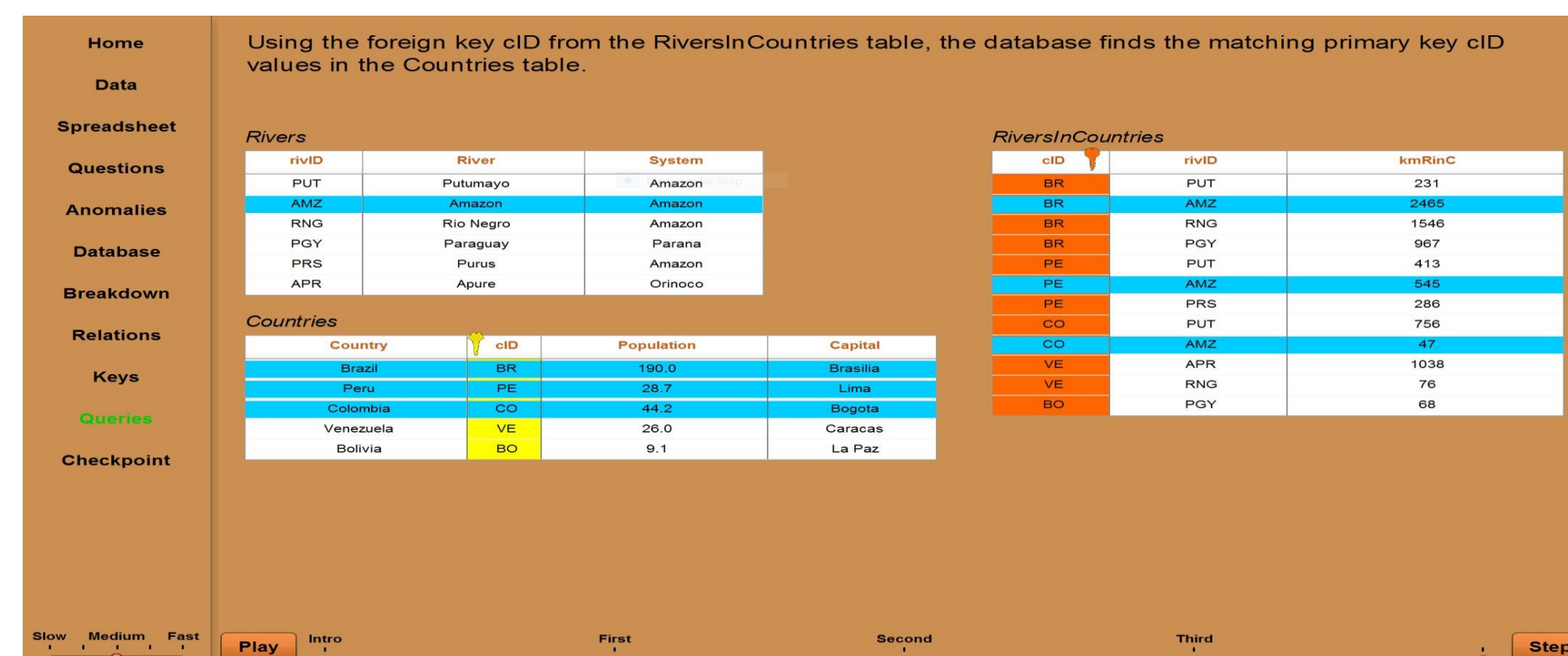
Using primary/foreign keys in a query (GIS Customization)

Databases provide a powerful tool to ask questions, or queries, of that data without changing the data.

- Limitation of spreadsheets
- Breakdown of spreadsheets into smaller tables to avoid redundancies and anomalies
- Introduction to primary and foreign keys and how a database uses keys to identify and relate information
- Brief introduction to asking questions over a database

QueryDB: Introduction to Querying
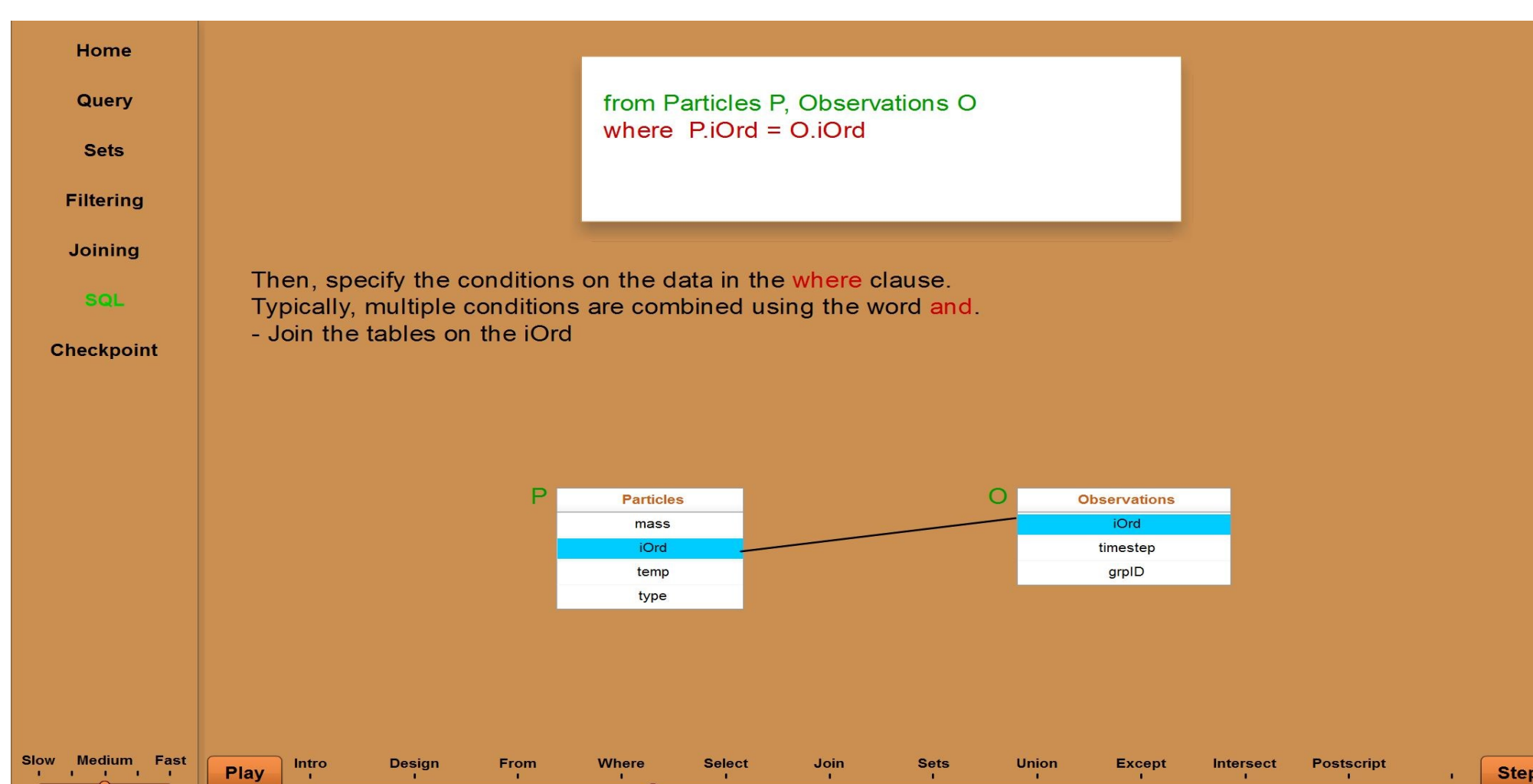
SQL visualization (Astronomy Customization)

Querying provides a powerful tool for asking questions over one copy of the data.

- Using database schema to design query
- Common set operators
- Operations to horizontally and vertically filter data
- Combining tables using joins
- Introduction to querying using SQL

DesignDB: Conceptual Database Design
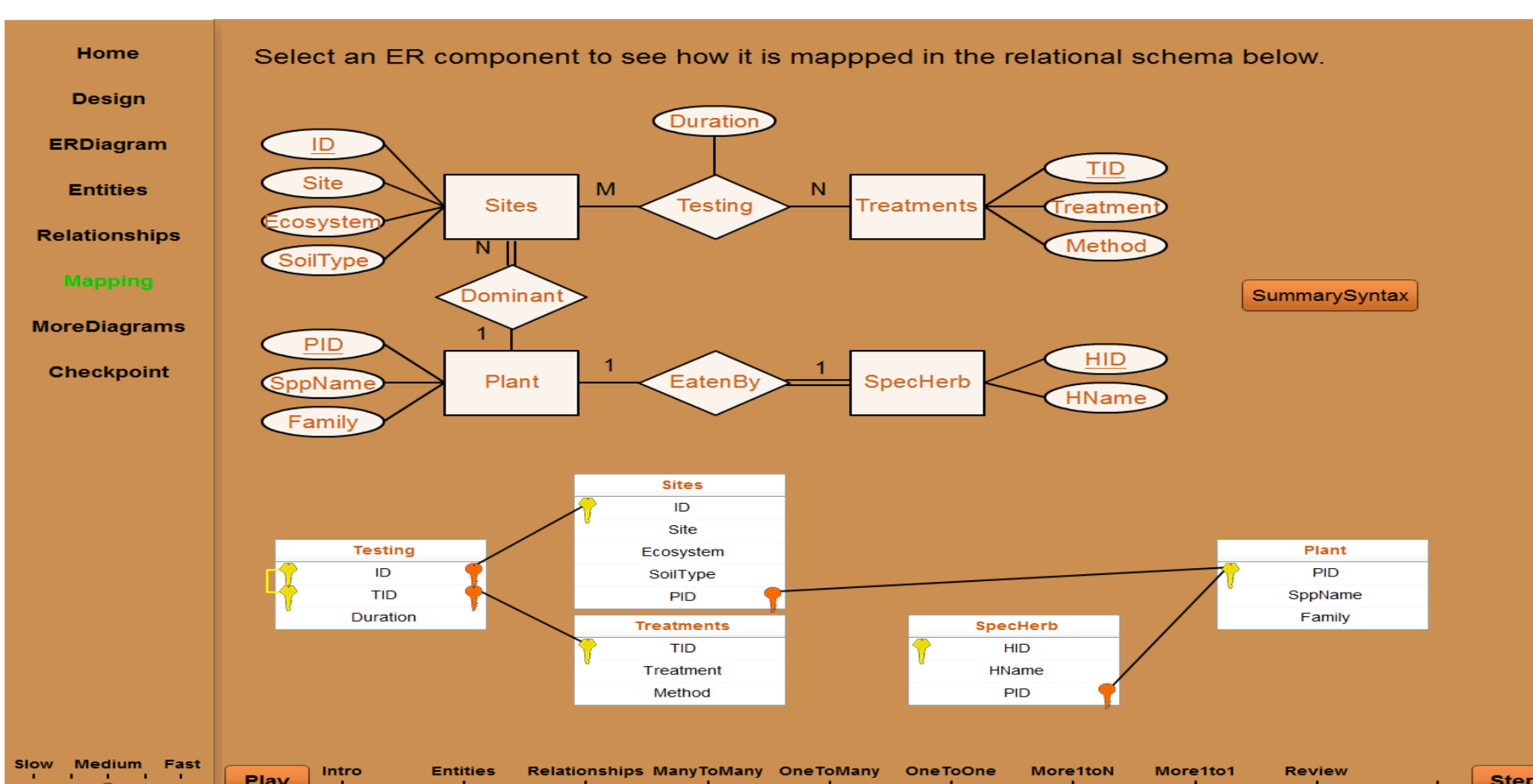
ER Diagram Mapping (Environmental Science Customization)

How to design the database based on the concepts and relationships between the data.

- What is conceptual design?
- What concepts are stored in a database and how are they related?
- Overview of Entity Relationship Diagrams (ER Diagrams) and how they are mapped to tables
- Alternative approaches to ER Diagrams

http://databasesmanymajors.faculty.asu.edu

Results

"The checkpoints in the animations are an important learning component of the animations."
- *Strongly Agree: 10*
- *Agree: 11*
- *Neutral: 4*
- *Disagree: 0*
- *Strongly Disagree: 0*

Qualitative Content Analysis

Helpful (#26):
- Understanding/Learning
- Good Review
- Feedback Useful
- Grabs Attention

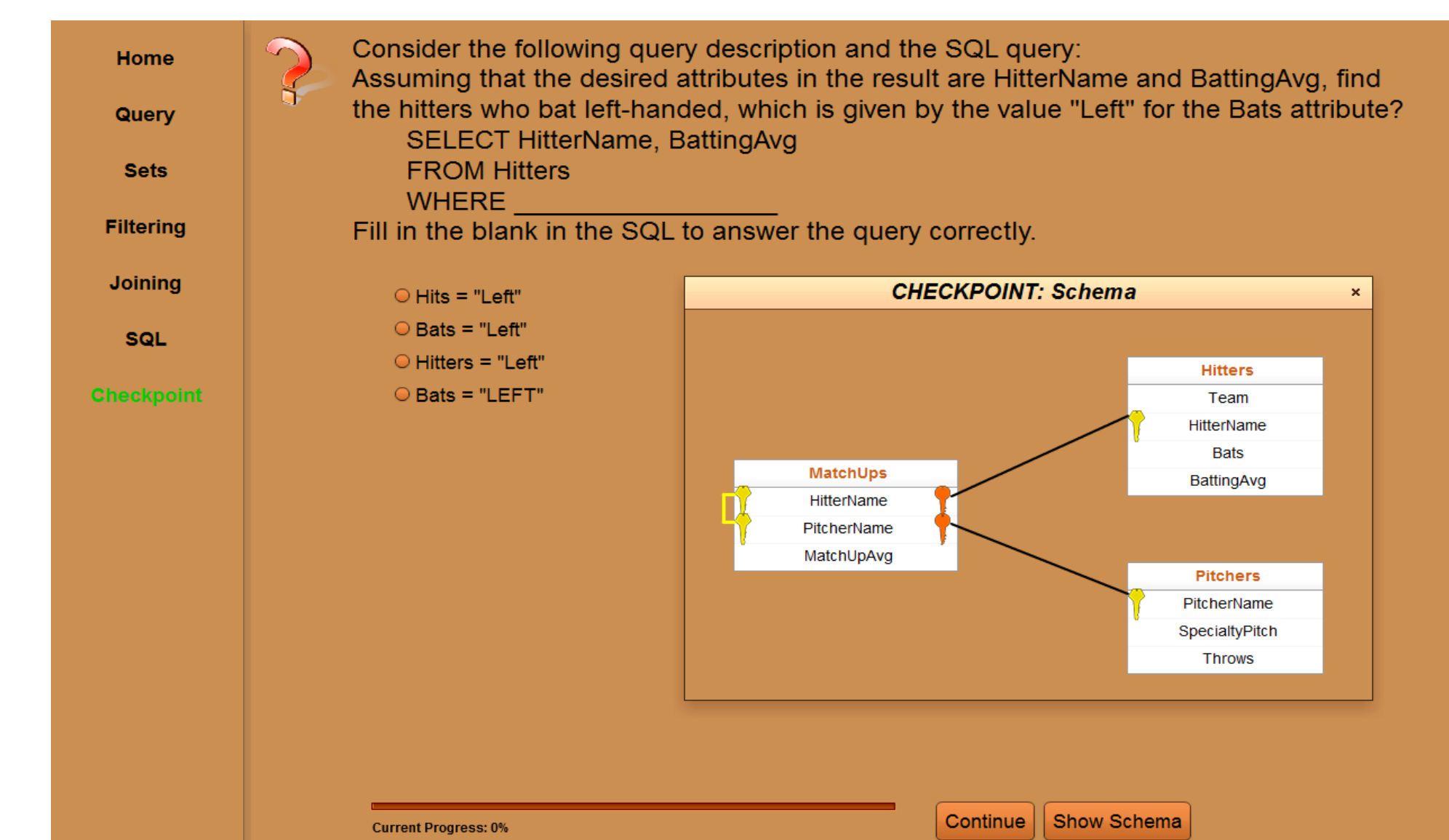*Needs Improvement (#6):*
- Need visual schema for checkpoints

Not too Helpful (#3):
- Not my style of learning

Improvements

For each animation, a SHOW button has been added to remind the student of the database structure.
- IntroDB: Show Tables
- QueryDB: Show Schema
- DesignDB: Show ERD (ER Diagram)

Show Schema (Statistics Customization)

Acknowledgments