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

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

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

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

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

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

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 ER (ER Diagram)

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