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Interactive Learning for Database Principles

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Start Now

Group:
JHYRZ

Member:
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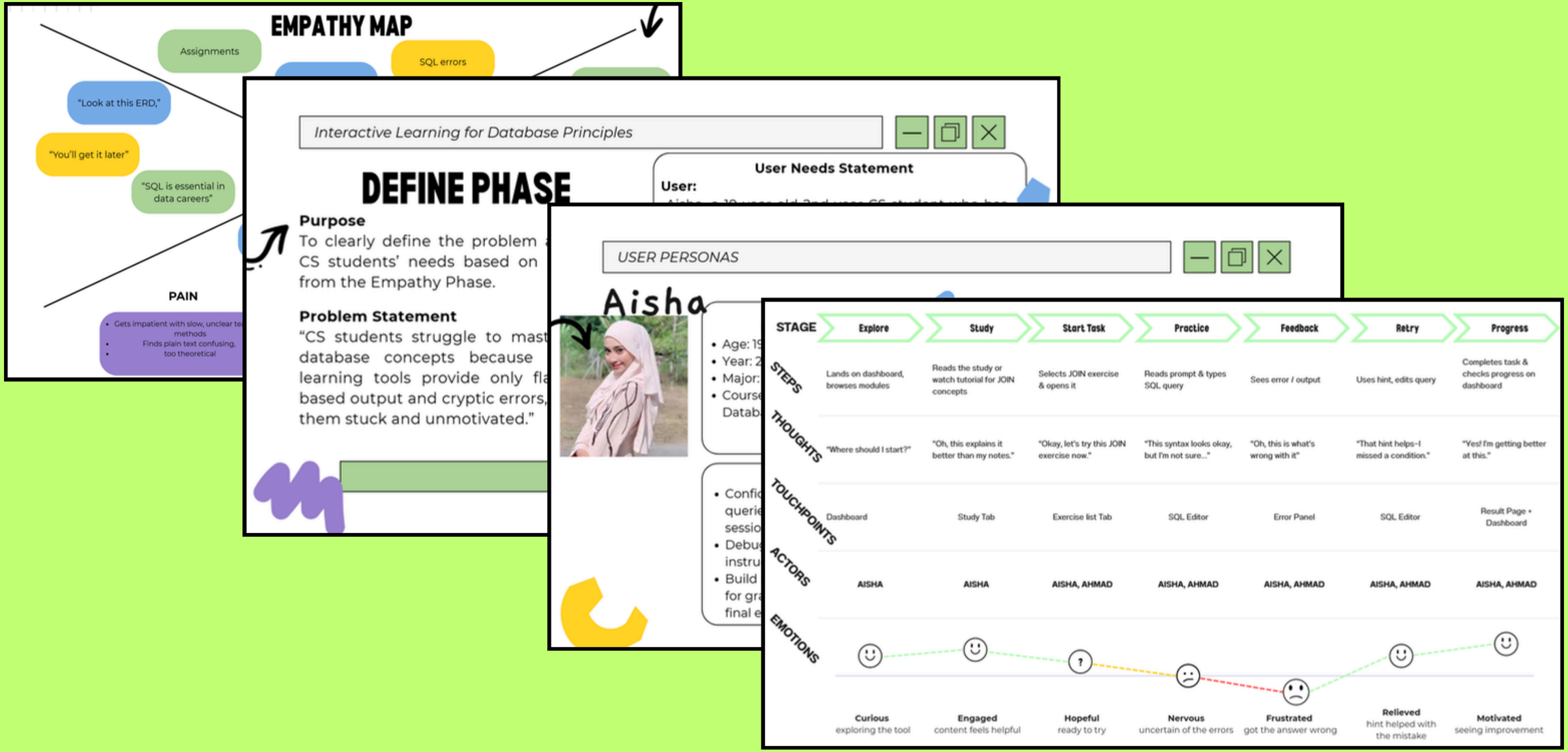
RECAP

Reintroducing our Design Thinking Activities



EMPATHY MAP

SEE

Assignments

sample tables

SQL errors

HEAR

"Look at this ERD,"

"You'll get it later"

"SQL is essential in data careers"

SAY & DO

uses online tutorials

skips hard exercise

Chooses video tutorials

THINK & FEEL

"I need to see how it works,"

"This should be easier if they explained it better."

"This will be useful at work"

PAIN

- Gets impatient with slow, unclear teaching methods
- Finds plain text confusing,
- too theoretical

GAINS

- Wants step-by-step help and real-time
- Thrives with table previews, feedback panels, and highlightable syntax
- prefers real-world tasks over just theory

DEFINE PHASE

Purpose

To clearly define the problem and our CS students' needs based on insights from the Empathy Phase.

Problem Statement

"CS students struggle to master core database concepts because existing learning tools provide only flat, text-based output and cryptic errors, leaving them stuck and unmotivated."

User Needs Statement

User:

Aisha, a 19-year-old 2nd-year CS student who has taken ER modeling, normalization, and basic SQL courses.

Needs:

- Needs immediate, contextual visual feedback on query results so she can verify her logic.
- Needs guided hints that explain syntax errors without giving away the full solution.
- Needs bite-sized interactive challenges to practice one concept at a time.

Goal:

To write correct JOIN queries and understand their results confidently before heading to lab sessions.

USER PERSONAS

Aisha

Demographics

- Age: 19
- Year: 2nd-year CS student
- Major: Computer Science, UPM
- Courses: ER Modeling, Database Systems

Key Challenges

- Gets stuck on cryptic error messages like “column not found” without context
- Finds flat, text-only outputs confusing—can't visualize table relationships
- Trial-and-error debugging is slow, frustrating, and demotivating

Goals

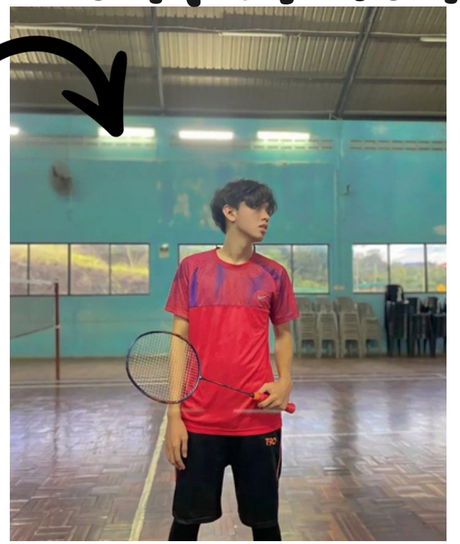
- Confidently master JOIN queries before weekly lab sessions
- Debug SQL without relying on instructors or friends
- Build independence in learning for graded assignments and final exams

Behaviour

- Practices SQL regularly via campus labs and online tools
- Prefers step-by-step challenges over passive theory
- Values immediate, visual feedback (like diagrams or table previews) to understand query flow

USER PERSONAS

AHMAD



Demographics:

- Age: 22
- Education: Computer Science student (Intermediate/Advanced level)
- Learning Stage: Currently enrolled in database-related courses
- Location: FSKTM UPM

Key Challenges

- Difficulty interpreting raw query results without visual context
- Struggles with abstract theoretical concepts like ER diagrams and ACID
- No guidance when stuck, especially after query failure

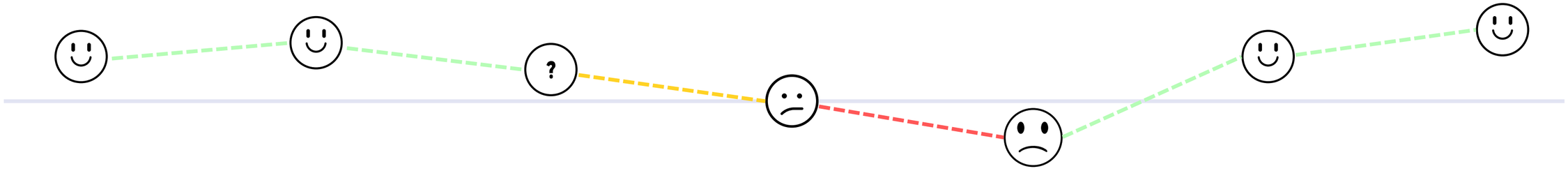
Goals:

- Strengthen SQL and normalization skills for real-world job readiness
- Develop problem-solving confidence in database tasks
- Transition from academic theory to practical application

Behavior:

- Focuses on career-aligned learning, not just passing the course
- Needs platforms that blend hands-on practice with light theory
- Looks for visual aids and sandbox environments to try things out safely

STAGE	Explore	Study	Start Task	Practice	Feedback	Retry	Progress
STEPS	Lands on dashboard, browses modules	Reads the study or watch tutorial for JOIN concepts	Selects JOIN exercise & opens it	Reads prompt & types SQL query	Sees error / output	Uses hint, edits query	Completes task & checks progress on dashboard
THOUGHTS	“Where should I start?”	“Oh, this explains it better than my notes.”	“Okay, let’s try this JOIN exercise now.”	“This syntax looks okay, but I’m not sure...”	“Oh, this is what’s wrong with it”	“That hint helps–I missed a condition.”	“Yes! I’m getting better at this.”
TOUCHPOINTS	Dashboard	Study Tab	Exercise list Tab	SQL Editor	Error Panel	SQL Editor	Result Page + Dashboard
ACTORS	**AISHA**	**AISHA**	**AISHA, AHMAD**	**AISHA, AHMAD**	**AISHA, AHMAD**	**AISHA, AHMAD**	**AISHA, AHMAD**
EMOTIONS	**Curious** exploring the tool	**Engaged** content feels helpful	**Hopeful** ready to try	**Nervous** uncertain of the errors	**Frustrated** got the answer wrong	**Relieved** hint helped with the mistake	**Motivated** seeing improvement



IDEATION

Brainstorming

- Review ideas gained from Aisha & Ahmad’s pain points
- Review suggestions from last presentation
- What makes our system different
- Focus back on the user personas
- Focused on problem statements and **How Might We (HMW)** questions
  - How might we make errors easier to understand?
  - How might we keep students engaged during practice?
  - How might we support learners when they're stuck?
- Build on each other’s ideas

IDEATION

Hard to Implement

Easy to Implement

HOW?

- Recommendation System
- Notifications for Activities

NOW

✅ Visual Update

- Clean layout
- Consistent UI
- Improved color use

WOW!

⭐ Forum (Discussion Tab)

⭐ Achievement System

⭐ Improved Error Messages with Visual Feedback

Normal Ideas

Original Ideas

IMPROVEMENTS

Changes we've made since our last presentation

VISUAL UPDATE	Major update to visuals
NEW FEATURE	Recommendation system, Forum (Discussion), Notifications for activities, Achievement System
ERROR MESSAGE AND FEEDBACK	More detailed and helpful error messages for learning, added visual feedback

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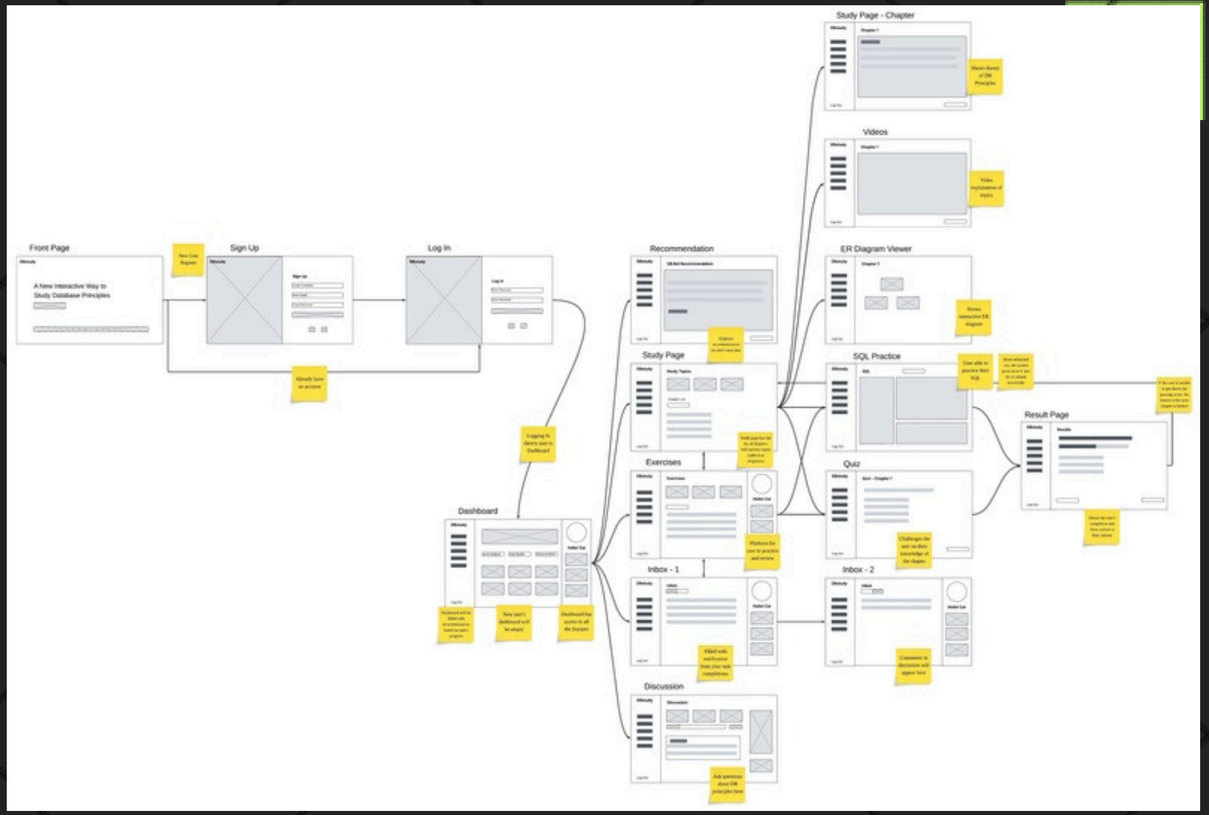
WIREFRAME



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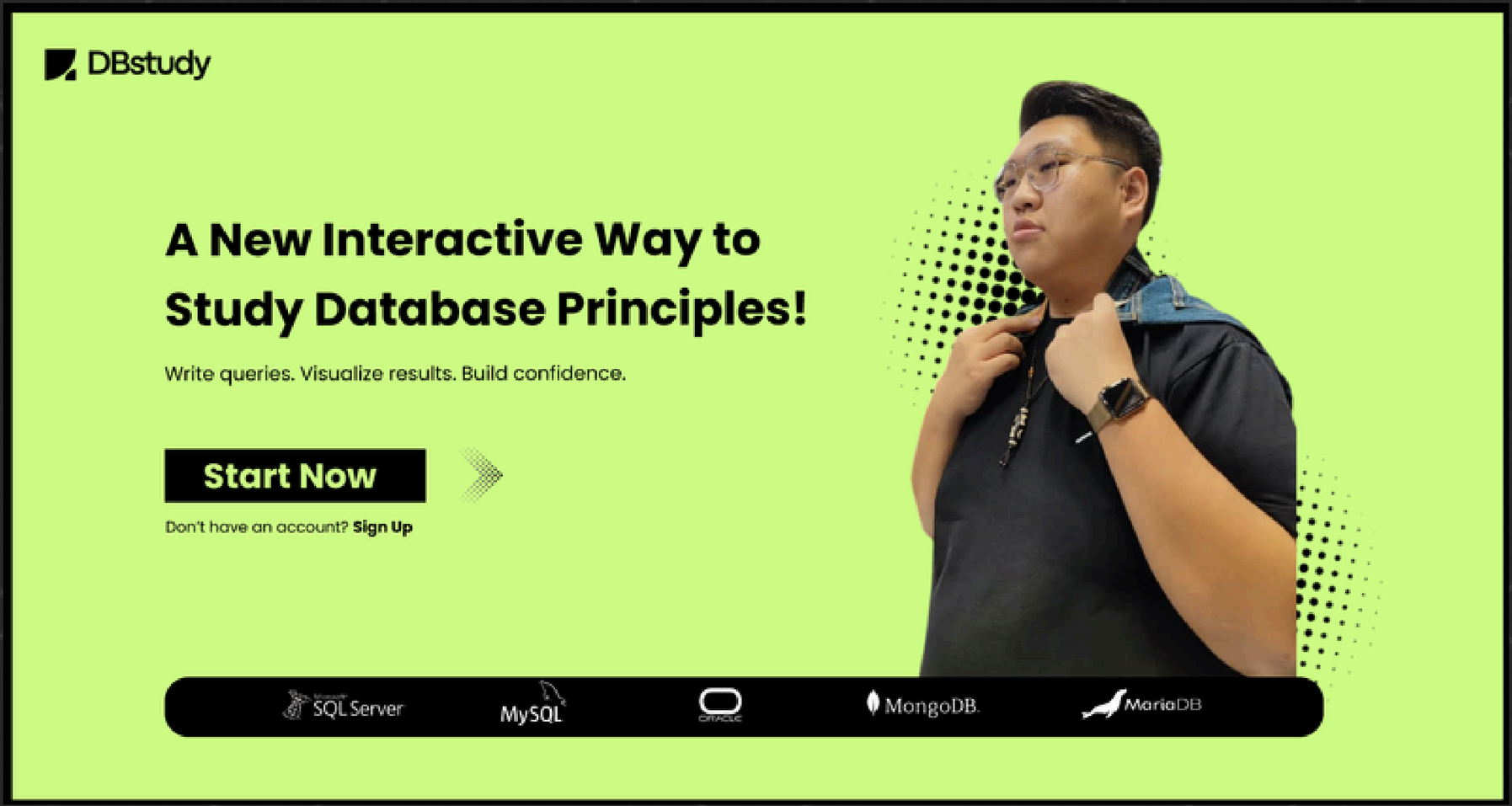
HIGH FIDELITY PROTOTYPE

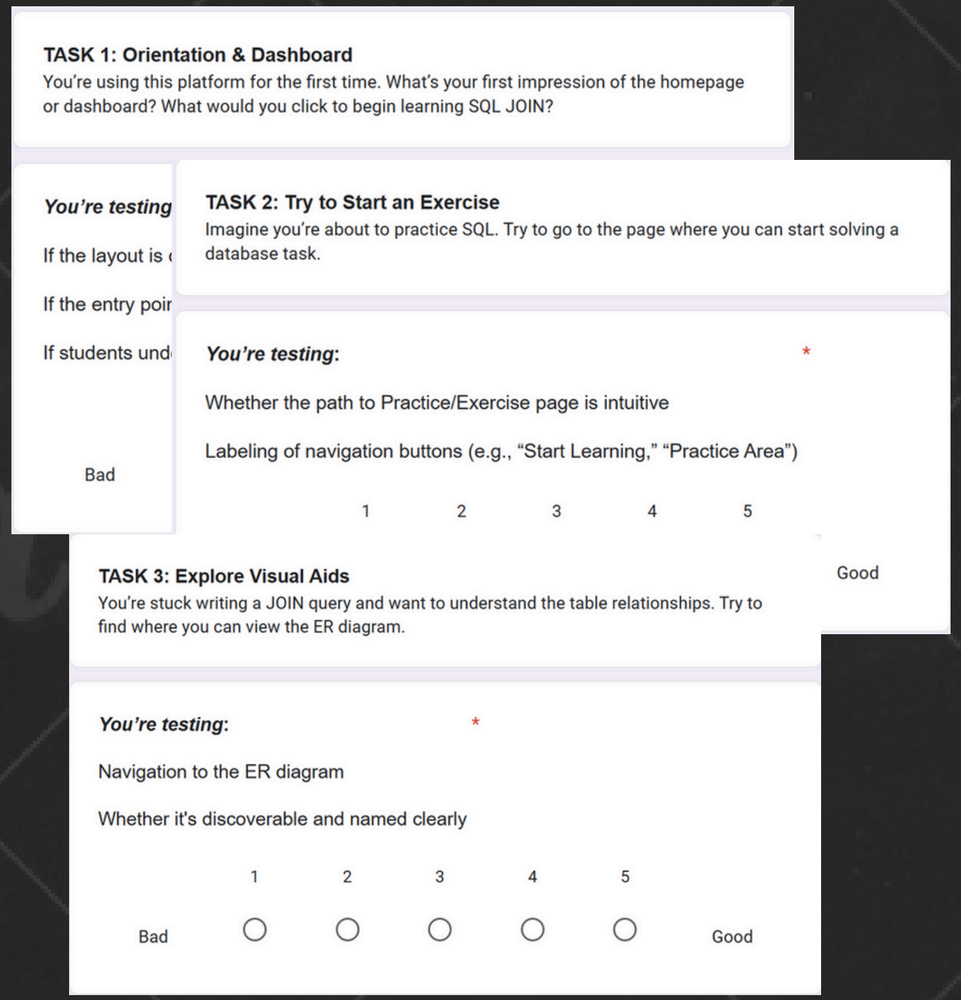


USABILITY TESTING

- We designed a Google Form with 5 usability tasks based on real user journeys in DBStudy.
- Each task focused on a specific part of the system (e.g., navigation, error feedback, visual aids).
- Users rated each task on a scale of 1 (Bad) to 5 (Good).
- Example task:

"You're stuck writing a JOIN query and want to understand the table relationships. Try to find where you can view the ER diagram."

- A total of 8 Computer Science students completed the form after trying our prototype.



USABILITY TESTING

Task	Focus Area	Avg. Score
1	Layout clarity & homepage purpose	4.75
2	Navigation to Practice/Exercise	4.50
3	Discoverability of ER diagram	3.25
4	Error/hint feedback clarity	4.62
5	Visibility of progress tracking	5.00

Common Feedback Highlights:

- “Clear dashboard, very easy to follow”
- “Error messages are helpful and appear quickly”
- “ER diagram needs to be more prominent or easier to find”
- “Would like more examples or rewards for progress”

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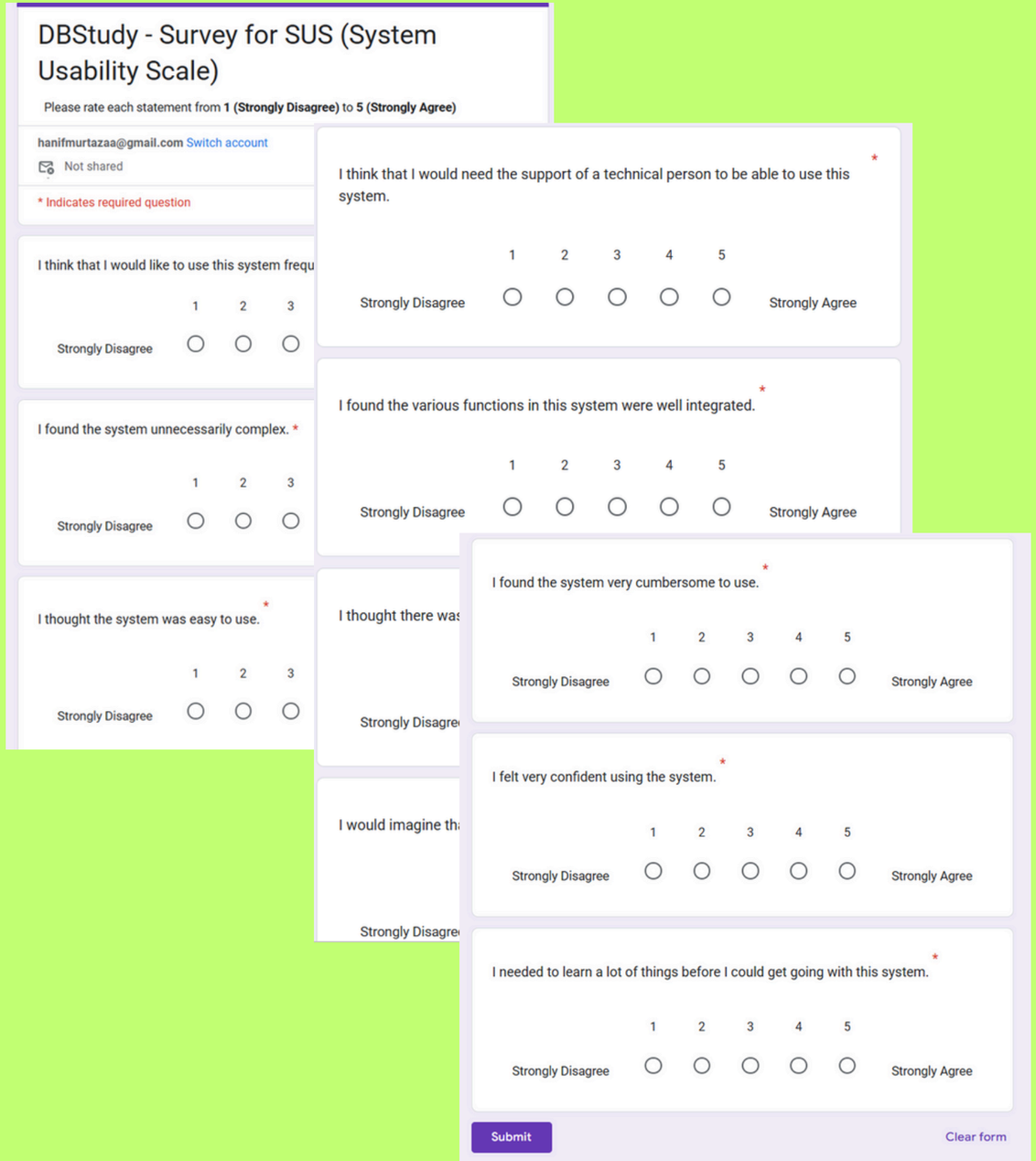
SUS (SYSTEM USABILITY SCALE)

- Collected via Google Form using the standard **10 SUS questions**
- Each question rated on a **1 (Strongly Disagree)** to **5 (Strongly Agree)** scale
- **8 respondents** tested the DBStudy prototype
- Participants explored features like the **dashboard, tasks, and overall system**
- **Responses** were used to calculate individual **SUS scores** and the **final average usability score**



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SUS (SYSTEM USABILITY SCALE)

Respondent	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total	SUS Score
R1	4	3	4	3	3	3	3	2	4	3	**32**	**80**
R2	3	3	3	3	4	4	3	3	4	3	**33**	**82.5**
R3	3	4	4	3	4	4	3	3	3	4	**35**	**87.5**
R4	3	4	4	4	3	3	4	3	4	4	**36**	**90**
R5	4	4	3	3	3	4	4	3	4	4	**36**	**90**
R6	3	4	3	4	3	4	4	3	4	4	**35**	**87.5**
R7	2	3	4	3	3	4	3	3	4	4	**36**	**90**
R8	2	4	4	4	4	4	4	3	4	4	**36**	**90**

- **Q1, Q3, Q5, Q7, Q9 = Positive questions → Score = Response - 1**
- **Q2, Q4, Q6, Q8, Q10 = Negative questions → Score = 5 - Response**
- **Final Score = Total × 2.5**

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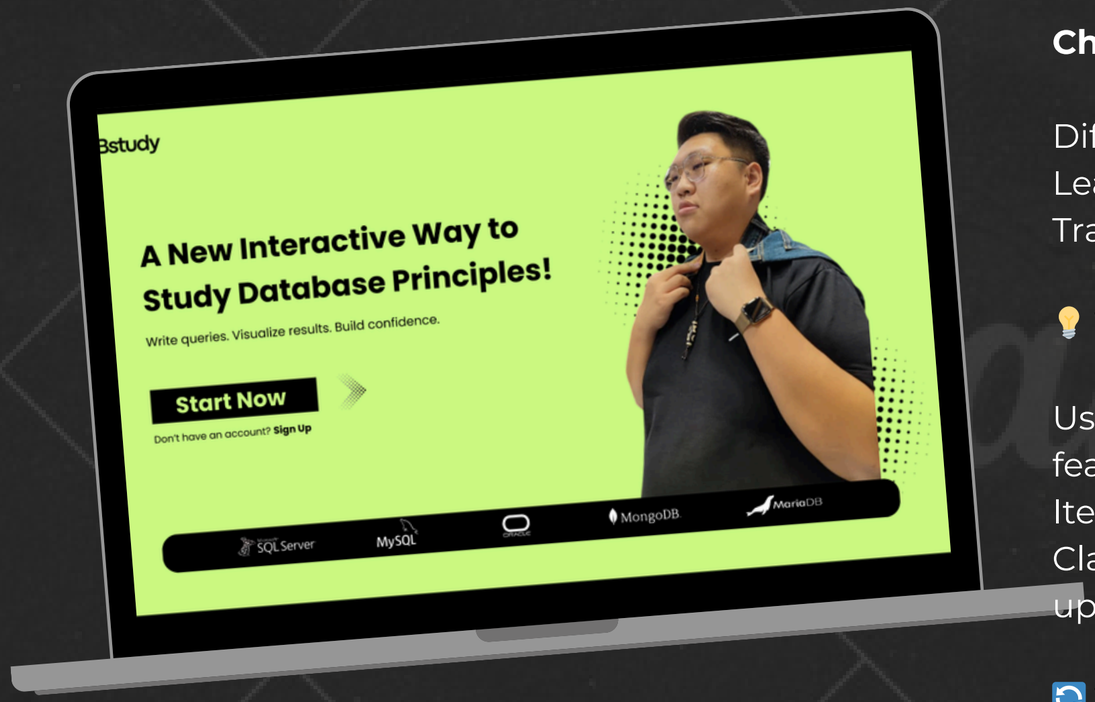
SUS (SYSTEM USABILITY SCALE)

Average SUS Score: **87.19**

Based on 8 respondents, our system achieved a score of **87.19**, which falls in the "Excellent" usability range.

This indicates that users found the interface to be:

- Clear and easy to navigate
- Visually well-structured
- Enjoyable and efficient to use



REFLECTIONS

Challenges Faced:

Difficulty recruiting users for testing
Learning Figma slowed early prototyping
Translating empathy insights into features required many iterations

💡 **What We Learned:**

User-Centered Design: Personas like Aisha & Ahmad shaped key features (e.g., visual SQL feedback)
Iterative Testing: Usability tests + SUS score of 87.19 validated our design
Clarity + Feedback: Small improvements (error hints, dashboard updates) enhanced experience

🔄 **What We'd Do Differently:**

Start user testing earlier in the process
Learn Figma components/tools at the start
Prioritize accessibility for more inclusive design

CONCLUSION

The DBStudy UX process taught us valuable real-world skills:

- How to identify user pain points through empathy
- The power of prototyping and usability testing
- The importance of continuous design improvement

While there were challenges, our team successfully built a user-friendly solution with a strong usability score.

Moving forward, we are better equipped to design systems that are not only functional, but also intuitive, inclusive, and impactful.

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THANK YOU

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