

Assignment 2

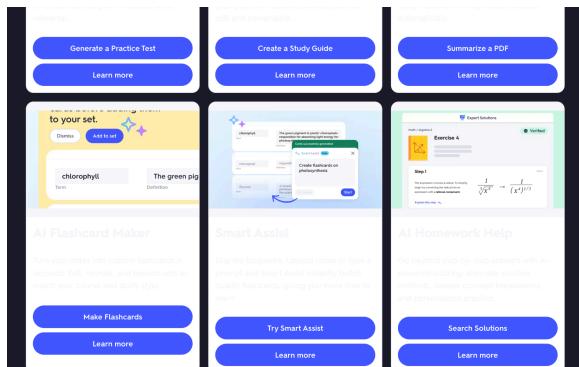
Task 1

1.1

Question: Provide screenshots and explanations to illustrate how well each guideline is followed in the MS HAI [guidelines](#). If you cannot accurately evaluate some guideline(s), provide concrete reasons. [15]

Microsoft Guidelines

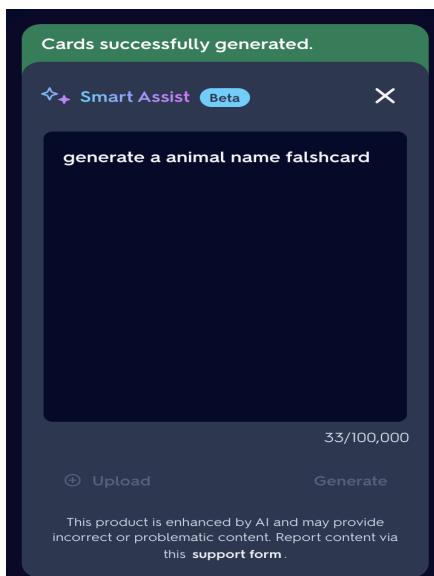
G1 – Make clear what the system can do



Follows well

Quizlet clearly displays core AI-assisted features such as study with Flashcards, generate practice tests, and summarize PDFs. Each study mode shows expected outputs. The new AI Learn Mode previews how it adapts difficulty and allows users to know what task the AI is going to help them with, such as generating flashcards

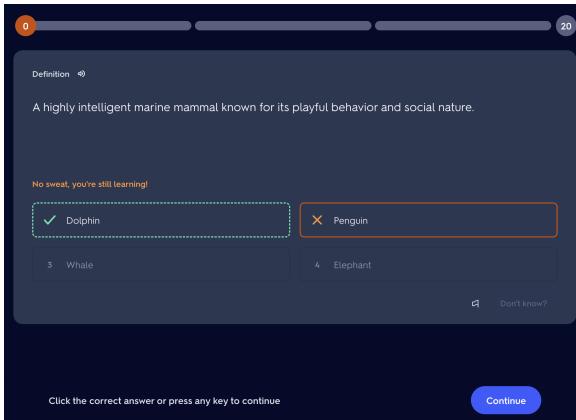
G2 – Make clear how well the system can do it



Follows partially

Quizlet has informed the user that its features are enhanced by AI and may provide incorrect or problematic content when users are inputting prompts to the chatbox. It also provides users with the option to report if a mistake occurs. However, it doesn't give information about exactly how often the AI may make mistakes

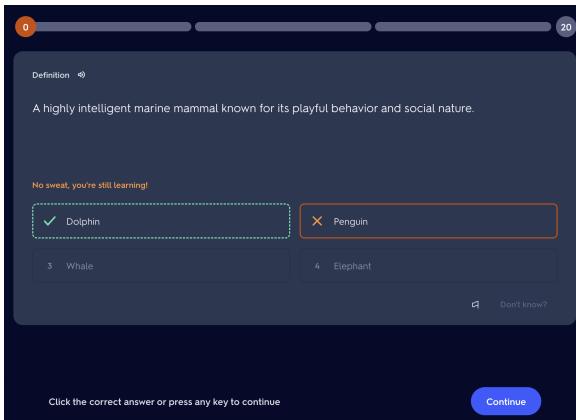
G3 – Time services based on context



Follows well

Quizlet's Flashcard learning responds in real time to how the learner is performing. In this screenshot, the system identifies that the student has chosen the wrong answer and immediately provides feedback and gives advice: "No sweat, you're still learning!" The feedback occurs right after the selection, which is the exact moment when the learner is most likely to benefit from clarification

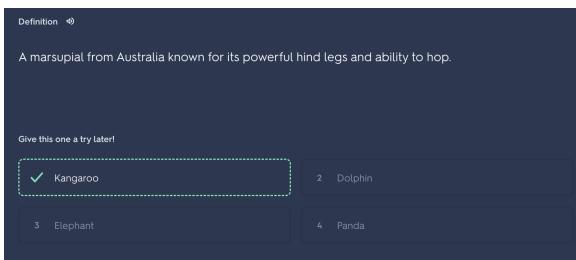
G4 – Show contextually relevant information



Follows well

Quizlet gives users information on which tasks they are going to do before starting the task, such as flashcards. When doing the task, such as the screenshot, it shows which step the user is on and guides the user to the next step.

G5 – Match relevant social norms



Follows well

Tone is friendly and academic. It assumes the user is in a studying environment, which is similar for people coming from different cultures and social norms. For example, it uses a very supportive and encouraging tone like a teacher ("give this one a try later") when the user selects the don't know the answer.

G6 – Mitigate social biases

The screenshot shows two AI-generated flashcards. The first card has 'Racism' as the term and a definition: 'Prejudice, discrimination, or antagonism directed against individuals of a different race based on the belief that one's own race is superior'. The second card has 'Xenophobia' as the term and a definition: 'Fear or hatred of that which is perceived to be foreign or strange, often manifesting as discrimination against people from other countries'. There are 'Dismiss' and 'Add to set' buttons at the top right.

Follows partially

It has a safeguard in the AI system to not generate content that is related to undesirable and unfair stereotypes and biases. However, no visible safeguards are communicated to the user on whether the system is actually biased and how they mitigate it.

G7 – Support efficient invocation

The screenshot shows the home screen of the application. On the left, there is a sidebar with 'Home', 'Your Library', 'Notifications', 'Your Folders', 'New Folder', 'Start here', 'Flashcards', and 'Study Guides'. The main area says 'Generate a flashcard set' and 'Put your notes here. We'll do the rest.' with an 'Upload file' button. At the bottom, there are ads for 'Canva Pro' and 'Fresh New Coffee Flavors'.

Follows well

AI-powered modes are one click away from any set. There are large visual text boxes on the home screen that clearly indicate it is the place to input prompts and use AI to help with different tasks.

G8 – Support efficient dismissal

The screenshot shows two AI-generated flashcards. The first card has 'Mammal' as the term and a definition: 'A warm-blooded vertebrate characterized by the presence of mammary glands, hair or fur, and typically giving live birth.' The second card has 'Reptile' as the term and a definition: 'A cold-blooded vertebrate that has scales, lays eggs, and breathes air, including snakes, lizards, and turtles.' There are 'Dismiss' and 'Add to set' buttons at the top right.

Follows well

Users can immediately dismiss undesired output from AI and ask it to generate again. In the screenshot, after the AI helped create a set of flashcards, there is an option to dismiss, which deletes everything the AI has generated.

G9 – Support efficient correction

The screenshot shows two AI-generated flashcards. The first card has 'Mammal' as the term and a definition: 'A warm-blooded vertebrate characterized by the presence of mammary glands, hair or fur, and typically giving live birth.' The second card has 'Reptile' as the term and a definition: 'A cold-blooded vertebrate that has scales, lays eggs, and breathes air, including snakes, lizards, and turtles.' There are 'Dismiss' and 'Add to set' buttons at the top right.

Needs improvement

Users can add the AI generated flashcards to the set or dismiss it, but AI doesn't let you correct the actual card content directly inside Learn/Test mode. Users must switch to Edit mode separately which can be very inconvenient.

G10 – Scope services when in doubt

The screenshot shows the Quizlet interface. On the left, there's a list of generated flashcards for terms like 'Racism' and 'Xenophobia'. Each card has a term on the left and a definition on the right. On the right, a modal window titled 'Smart Assist' says 'create some card with racist words' and shows a progress bar at 56/100,000. A note at the bottom of the modal says 'This product is enhanced by AI and may provide...'. At the top right of the main screen, there are buttons for 'Dismiss' and 'Add to set'.

Needs Improvement

Quizlet does not clarify uncertainty. When the user inputs a prompt, it will not ask for clarification even if the prompt is vague. It will simply generate stuff based on what the user inputs, which can generate stuff that the user doesn't want.

G11 – Make clear why it did what it did

This screenshot is identical to the one above, showing the Quizlet interface with generated flashcards and the 'Smart Assist' modal. The modal again says 'create some card with racist words' and shows a progress bar at 56/100,000. The note at the bottom of the modal also includes 'This product is enhanced by AI and may provide...'.

Needs Improvement

When AI prioritizes terms or generates certain flashcard contents, no explanations are provided. In Quizlet, the AI only outputs content without giving any context to the user about why the AI system behaved as it did.

G12 – Remember recent interactions

The screenshot shows the 'Your library' section of Quizlet. It displays a timeline of recent activities. At the top, there's a 'Recent' button and a search bar. Below that, under 'IN PROGRESS', there's a '(Draft)' entry. Under 'A FEW SECONDS AGO', there's an entry for 'Biology: Animal Classification, Adaptations, and Ecosystems'. Under 'AN HOUR AGO', there's an entry for 'Wildlife Animal Facts: Mammals, Birds, and Reptiles'.

Follows well

Quizlet provides a library to store all content created by a user. Users can pick up where they left off whenever they enter the library.

G13 – Learn from user behavior

The screenshot shows the 'Your test has been generated' page. It allows users to customize a practice test. It includes fields for 'Questions (max 69)' set to 20, 'Timer (minutes)' set to 30, and toggle switches for 'Multiple choice' (on) and 'Written' (off). At the bottom, there are buttons for 'Take this test' and 'View question bank'.

Follows well

Quizlet can gather information on users' activity. For example, a user creates a flashcard for their studying purpose, and when the user wants to generate practice tests on what they have studied, it generates based on the flashcards the user studied earlier.

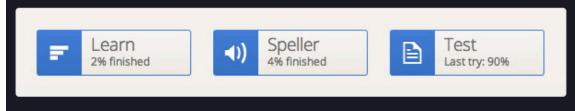
We made improvements to the set page to make two really powerful features, your progress and stars, much more prominent, and therefore more useful for Quizlet users. Along the way we made some design updates to make this page simpler.

New study mode buttons

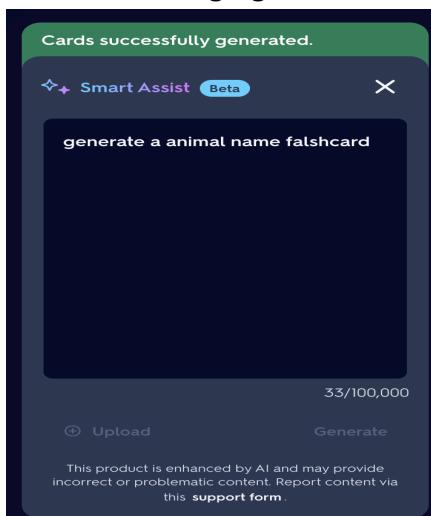
We redesigned the modes buttons from circles to squares and made them bigger targets on the page.



As you get progress on the individual study modes, you'll see it show up underneath the mode name.



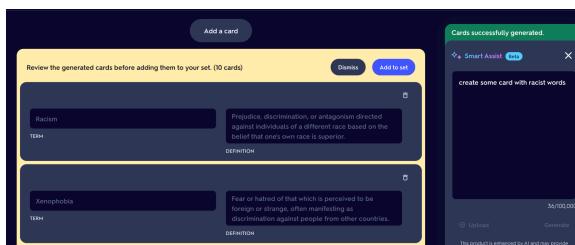
G15 – Encourage granular feedback



Follows partially

Changes in the application occur gradually without disrupting the system. However, major UI changes sometimes happen without clear messaging and may cause inconvenience to the users.

G16 – Convey consequences of user actions



Needs Improvement

As mentioned, in Quizlet, the AI only outputs content without giving any context to the user about why the AI system behaved as it did. In this case, it also doesn't provide if the user's action, such as dismiss or accept, will be used as training data to improve the model.

G17 – Provide global controls

Jurisdictional Rights

The law of the place where you reside may give you certain rights with respect to your personal information as described below. These rights only apply to the extent that both you and Quizlet are subject to such laws.

- If you are located in the EEA, UK, or Switzerland, please review the "EEA, Switzerland, and UK" section below.
- If you are a resident of California, please review the "California" section below.
- For residents of all other jurisdictions, please review the "Privacy Rights in Your State of Residence" section below.

Follows Partially

Quizlet is a multinational company operating in more than 130 countries. In its privacy statement, it gives information on the specific jurisdiction rights relating to different regions where the users are. However, users are not able to control how the AI acts depending on the region.

G18 – Notify users about changes

Quizlet x Superhuman: from writing to studying—instantly



At Quizlet, our mission has always been to help students everywhere learn more effectively. Today, we're thrilled to announce a new partnership with Superhuman (formerly Grammarly), bringing together two trusted tools that support students at every stage of learning. Whether you're writing a paper...

 Quizlet HQ & News
Posted by Kurt October 29th, 2025 · View post

Follows Partially

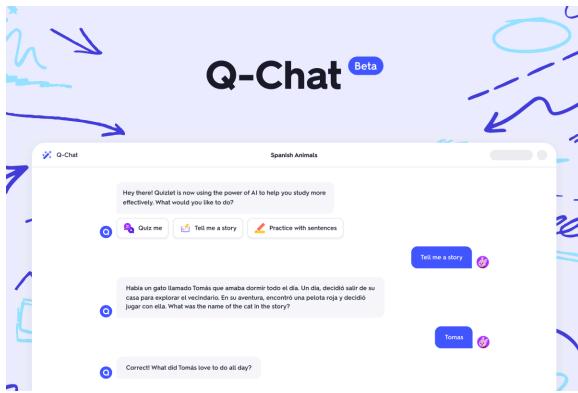
Quizlet has a notification site that posts updates that are going to happen. It can inform users of potential changes and disruptions to the systems. However, no specific dates were given for when those changes are actually going to happen, which needs improvement.

1.2

Question: Perform the same task with Q1.1 using the PAIR's [design patterns](#). [15]

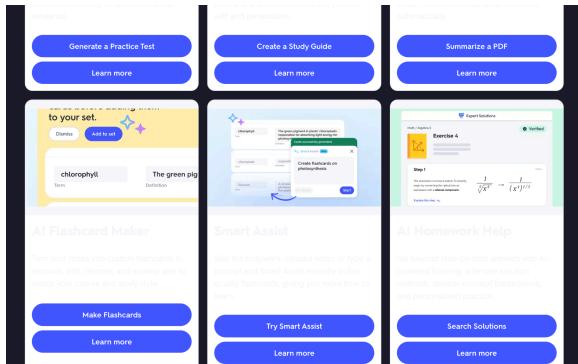
Google Design Patterns

Pattern 1: Determine if AI adds value



Evaluation for Quizlet P1: Partially met. Quizlet's AI (Magic Notes, Q-Chat, etc.) does provide clear value for studying and summarization. However, not all users may need AI for simple flashcard-based tasks, and it's not always obvious when AI is the right tool versus traditional Quizlet features.

Pattern 2: Set the right expectations



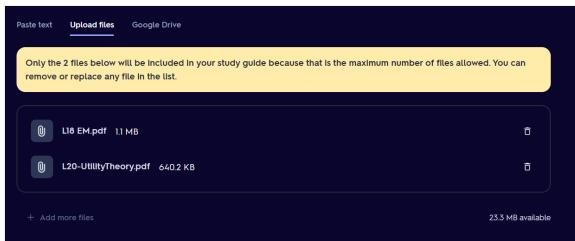
Evaluation for Quizlet P2: Partially met. Quizlet gives some onboarding descriptions of its AI features, but does not clearly communicate the full scope of what is and isn't possible (e.g., potential AI errors, hallucination risk).

Pattern 3: Explain the benefit, not the technology



Evaluation for Quizlet: Well met. Quizlet focuses its communication on how users benefit (study guides, explanations, automatic flashcards), rather than describing its underlying AI architecture or models, which aligns strongly with this pattern. In this picture, we're asked to only input information without worrying about the inner workings of the AI technology.

Pattern 4: Be accountable for errors

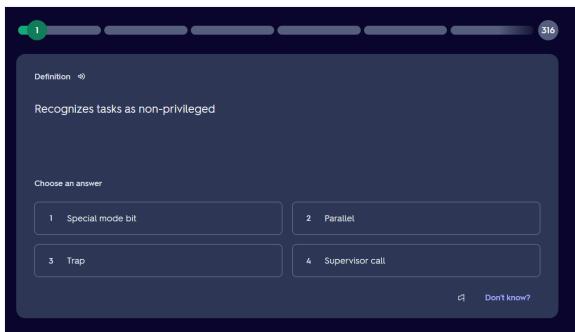


Evaluation for Quizlet: Partially met. While Quizlet shows error messages in some cases (e.g., failed limited generation), it lacks more proactive accountability (e.g., detailed explanations, fallback to a safe human review). In this example, we were not allowed to upload more than 2 files, thus showing the error message.

Pattern 5: Invest early in good data practices

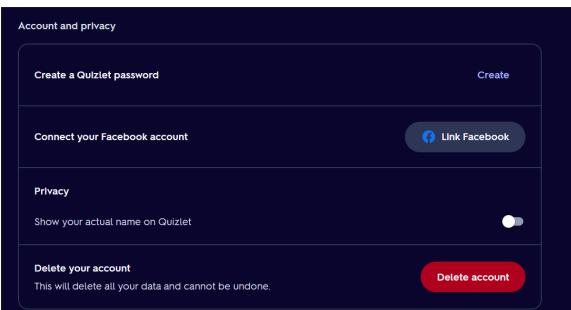
Evaluation for Quizlet: Not clearly applicable at the user level. As a user, you don't see Quizlet's data collection or labelling practices, so evaluating this is difficult. (This pattern is more relevant to internal design teams.)

Pattern 6: Make precision and recall tradeoffs carefully



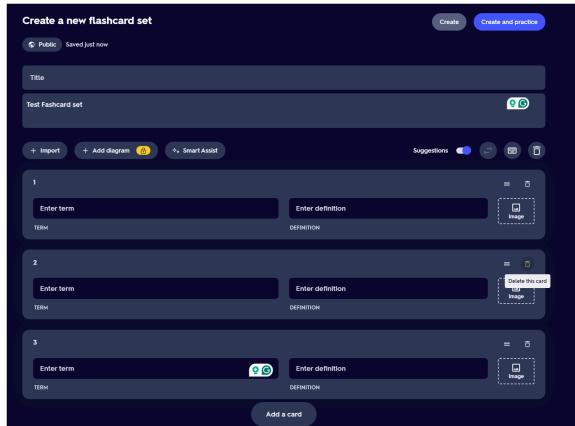
Evaluation for Quizlet: Partially met. Quizlet seems to balance between generating useful, correct content (precision) and providing plenty of content or suggestions (recall), especially in Learn mode. But there's little transparency about how those tradeoffs are chosen.

Pattern 7: Be transparent about privacy and data settings



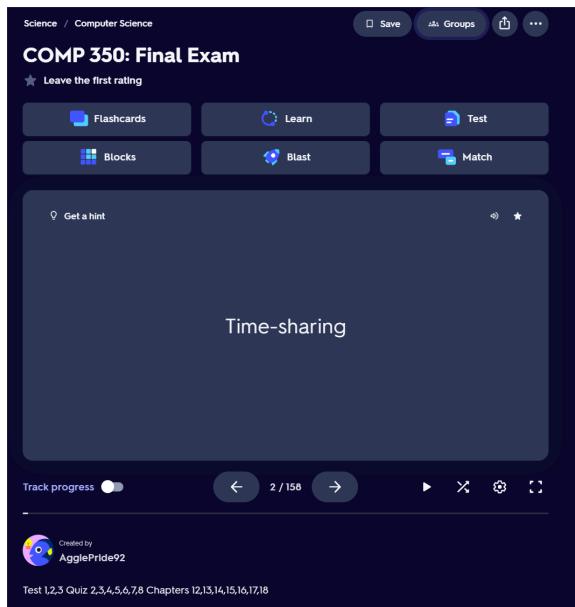
Evaluation for Quizlet: Partially met. Quizlet provides privacy settings, but it could do more to contextualize data used by AI (especially for uploaded notes) and explain how user data feeds into AI models.

Pattern 8: Make it safe to explore



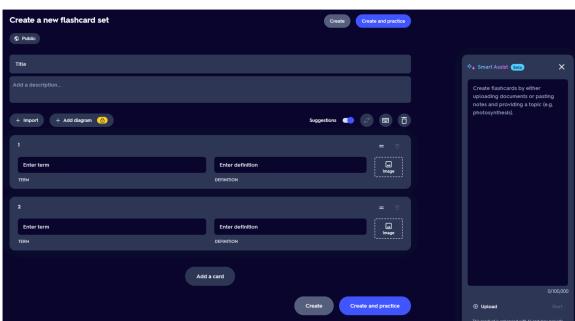
Evaluation for Quizlet: Well met. Users can try out AI features and revert their changes (e.g., delete generated flashcards, undo edits), which encourages experimentation without serious consequences.

Pattern 9: Anchor on familiarity



Evaluation for Quizlet: Well met. The UI uses familiar Quizlet metaphors (flashcards, study sets, match, blast, blocks), making AI features feel like a natural extension rather than a completely new product

Pattern 10: Add context from human sources:



Evaluation for Quizlet: Partially met. Some explanations (in Magic Notes or Q-Chat) are user-generated or user-editable, but Quizlet doesn't always surface human-curated context (e.g., expert explanation) alongside AI-generated content (AI chatbot)

Pattern 11: Determine how to show model confidence, if at all

Evaluation for Quizlet: Not met. There is no visible confidence score, probability, or uncertainty communicated in Quizlet's AI-generated content, which might mislead users about reliability.

Pattern 12: Explain for understanding, not completeness

CS - 2013: 17. Java: Chapter 17 - Binary I/O

A file that can be processed (read, created, or modified) using a text editor such as Notepad on Windows or vi on UNIX is called a file. All the other files are called files. text, binary

Text data are read using the class and written using the class. Scanner, PrintWriter

There are many I/O classes for various purposes. In general, these can be classified as input classes and output classes. An class contains the methods to read data, and an class contains the methods to write data.

An Input object reads a ... of data from a file, and an output object writes a stream of data to a file. An input object is also called an and an output object an input, output, stream, input stream, output stream

Back to search Choose this set

Pattern 13: Go beyond in-the-moment explanations

Evaluation for Quizlet: Partially met. Quizlet's help center or documentation explains features, but there is no deep "why the AI made this choice" for each specific AI-generated output.

Pattern 14: Automate more when risk is low

Alpha-Beta Pruning in Game Search: Soccer
Analogies and Algorithm Insights

bulldozer1321 Created 23/11/25

Outline Quick reference

Key Terms/Concepts

- Minimax: A decision rule for minimizing the possible loss in a worst-case scenario, used in two-player, zero-sum games.
- Alpha-Beta Pruning: An optimization technique for the minimax algorithm that eliminates branches that cannot possibly influence the final decision.
- α (Alpha): The best value found so far for the maximizing player (lower bound).
- β (Beta): The best value found so far for the minimizing player (upper bound).

Key Algorithms

- Alpha-Beta Algorithm: A search algorithm that seeks to decrease the number of nodes evaluated in the minimax algorithm by pruning branches that won't affect the final decision.

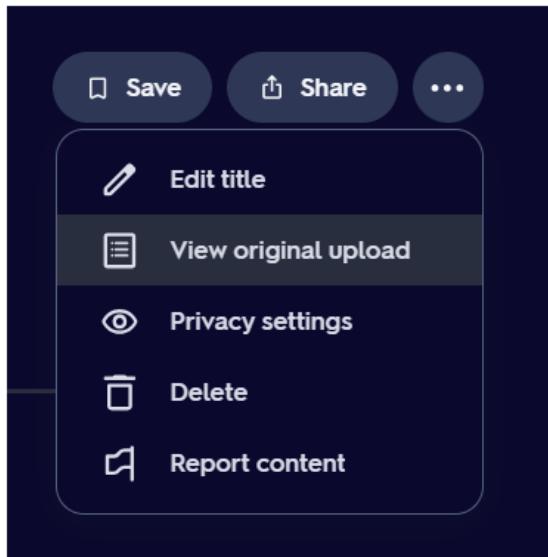
Key Analogy

- Soccer Analogy: The process of evaluating game strategies is likened to a soccer coach planning plays, where certain strategies are abandoned if they cannot outperform a known successful play.

Key Examples

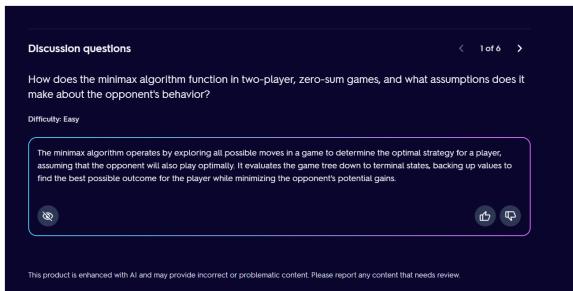
Evaluation for Quizlet: Partially met. Quizlet's automation makes sense for low-risk tasks (flashcard generation), but there is limited user control over how "strong" or "creative" the automation is. In the given picture, we're allowed to use two tabs to navigate to our AI-generated notes (See Outline and Quick Reference under the date), thus lacking in automation creativity.

Pattern 15: Let users give feedback



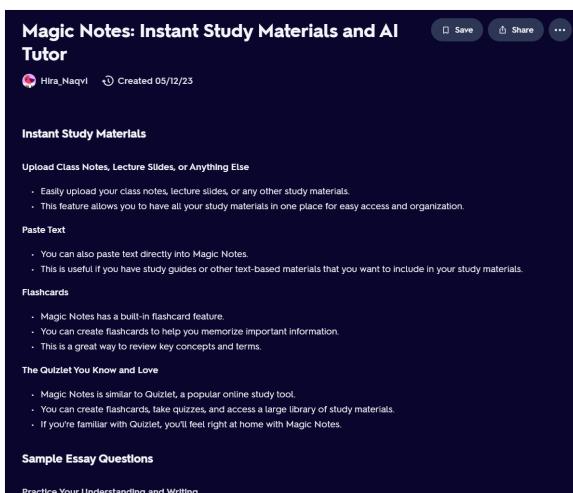
Evaluation for Quizlet: Well met. Quizlet allows users to rate AI responses, report issues, and correct content, supporting a feedback loop. In the given example, we're allowed to report content if any inaccuracy occurs after generating an AI summarizer of our given note.

Pattern 16: Let users supervise automation



Evaluation for Quizlet: Partially met. Users can intervene (edit, delete, regenerate), but they can't finely tune the AI's behaviour (e.g., how much autonomy, style, or reliability).

Pattern 17: Automate in phases



Evaluation for Quizlet: Somewhat met. Some features are gradually introduced (e.g., "try Magic Notes" after uploading), but there isn't a clear, phased automation roadmap presented to users.

Pattern 18: Give control back to the user when automation fails

Evaluation for Quizlet: Not applicable. When generation fails or is poor, users can't regenerate or manually edit (more precisely, in the free version); however, there is no fallback, such as a human explanation or a manual "teach the AI" flow.

Pattern 19: Design for your data labellers

Evaluation for Quizlet: Not applicable. As users, we don't interact with dataset-labelling workflows; this is more relevant for the internal team.

Pattern 20: Actively maintain your dataset

Evaluation for Quizlet: Not applicable from the user perspective (similar to the above).

Pattern 21: Learn from label disagreements

Evaluation for Quizlet: Not applicable in user-facing features.

Pattern 22: Embrace "noisy" data

Evaluation for Quizlet: Not directly observable. Internally, Quizlet probably handles real-world, "messy" note content, but as a user you don't see their data strategy.

Pattern 23: Get input from domain experts as you build your dataset

Evaluation for Quizlet: Not clearly visible. There is no public indication (in the UI) that expert educators or domain experts are used to improve the system.

Brief Discussion

Strengths: Quizlet aligns well with patterns that improve usability and trust in day-to-day interaction (e.g., Explain benefit, not technology; Make it safe to explore; Let users give feedback). These design decisions make the AI feel like a helpful assistant, rather than a black-box.

Weaknesses: It fails to communicate uncertainty, model confidence, or deeper reasoning. Users might over-trust AI outputs because there are no confidence indicators or detailed explanations. Also, while user edits are supported, Quizlet does not appear to learn from them, limiting long-term alignment.

Missing / Under-used Patterns: Some data-centric patterns (like "Actively maintain your dataset" or "Design for your data labels") are not visible from a user perspective, which is expected, but means the evaluation focuses more on interaction patterns than on data practices.

1.3

Question: Compare the reports from the two works. Discuss how well they support the HAI design evaluation, including both their usefulness and limitations. Explain how the design patterns help realize those design guidelines. Discuss if there is any aspect you find missing from either the guideline or design pattern to reveal the quality of the HAI design of the product.

Comparison of Evaluation Focus

The Microsoft guidelines and Google PAIR patterns evaluate the system from two different perspectives. The Microsoft guidelines are primarily concerned with *how users experience the AI during interaction*. They focus on clarity, feedback, timing, user control, and the communication of system limitations. This made it straightforward to assess Quizlet's strengths, such as its supportive feedback in Learn mode (G3), clear task previews (G1), and easy invocation and dismissal of AI features (G7, G8). At the same time, the Microsoft Lens surfaced several gaps that come up directly in the user interface, including the lack of uncertainty explanations (G10), missing reasoning for generated outputs (G11), and limited ability to correct AI-generated content directly (G9).

In contrast, the Google PAIR patterns take a broader view of AI systems, covering topics such as data practices, model confidence, automation design, and user supervision. These patterns were helpful in highlighting systemic issues that are less visible in day-to-day interaction. For example, the absence of model confidence displays (Pattern 11), unclear communication of how user data is used (Pattern 7), and limited support when automation fails (Pattern 18) all point to deeper structural limitations in Quizlet's design that go beyond the UI.

Overall, the Microsoft guidelines were more applicable to evaluating Quizlet's current interface, while the PAIR patterns brought attention to underlying issues that influence long-term trust, transparency, and responsible AI behaviour.

How PAIR Patterns Support the Microsoft Guidelines

Even though the two frameworks have different sources, many of their ideas coincide. The PAIR patterns often provide a way to operationalize or extend the expectations stated by Microsoft. For example:

- This is closely related to the focus of Pattern 2: Communicate Scope and Limitations, since it is about setting correct expectations.
- Microsoft's call for showing why the system behaved a certain way (G11) is reinforced by PAIR's patterns that encourage richer explanations beyond the immediate moment (Pattern 13) and the communication of uncertainty (Pattern 11).
- Guidelines related to efficient correction and control (G7–G9) are supported by PAIR's emphasis on reversible actions and supervised automation (Patterns 8, 15–17).
- Privacy-related guidelines G17 are in accordance with PAIR's pattern on transparent data and privacy settings, Pattern 7.

In this sense, the PAIR patterns are often a technical or design-oriented extension of Microsoft's more interaction-focused guidelines. Taken together, they paint a more complete picture of what effective and trustworthy Human-AI interaction should look like.

Usefulness and Limitations of Each Framework

Both frameworks were helpful for different reasons. The Microsoft guidelines proved especially useful when analyzing how the AI features appear directly to learners. They provided concrete criteria to assess interaction quality, such as timing of feedback and clarity of action consequences. Some guidelines proved difficult to evaluate because they involve internal processes, such as how cautiously updates are deployed, G14, or how the system learns from users behind the scenes, G13. Where the Google PAIR patterns really added value was in highlighting areas that Microsoft's guidelines did not focus on as much: things like a lack of confidence indicators, missing expert-curated context, or murky accountability when AI-generated content has gone wrong. That being said, a number of the PAIR patterns—particularly those to do with how datasets are managed, or labelling workflows, weren't relevant from the user perspective, since they describe internal development practices rather than user-facing behaviour. Together, the two sets of criteria produced a more well-rounded evaluation than either would have on its own.

Missing Aspects Not Fully Captured by Either Framework

While the two frameworks touch on many key dimensions of HAI design, the assessment of Quizlet also uncovered several gaps not adequately met by either framework:

- Generative AI challenges. Problems of hallucinations, misinterpretation of prompts, or low quality in study material generated are addressed only indirectly via general guidance on transparency and uncertainty.
- Personalization transparency. Quizlet adapts study difficulty and content based on user actions, yet neither framework requires examining how personalization decisions are made, whether they are fair, or if they can be controlled by the user.
- Educational validity and content quality: Since Quizlet is used in learning contexts, there are additional concerns about the pedagogical soundness of AI-generated content or whether it aligns with curriculum standards.
- Fairness of content generation: Apart from the brief mention by Microsoft about the mitigation of bias, G6, neither framework tackles the issue of AI reinforcing cultural and academic biases in generated material.

These gaps suggest that while both frameworks make useful contributions, current generative AI systems, especially in education, may call for further evaluation criteria on content quality, personalization, and fairness.

Task 2

2.1

Question: Revisit the user stories you wrote in Assignment 1. Discuss what kind of decisions (big or small) its users need to make during interaction when trying to achieve their goals. Explain what the decision is, what knowledge is required to make the decision, and how much effort is needed to make such decisions.

User Decision-Making During Interaction

This analysis examines the decisions users must make while interacting with the adaptive learning system to achieve their goals. For clarity, users are grouped into Learners (students and working professionals) and Instructors (professors and private tutors). We analyze the required knowledge across four categories: self knowledge (users' awareness of their own proficiency, goals, and fatigue), system knowledge (how recommendations, difficulty adjustments, and confidence signals are generated), context knowledge (time availability, workload, and external consequences such as exams or teaching responsibilities), and domain knowledge (subject-specific expertise needed to assess correctness and relevance).

Learners (Students & Working Professionals)

Decision 1: Whether to follow system-recommended content or choose manually

- Decision: Accept personalized recommendations or search for alternative materials.
- Required knowledge:
 - Self: Awareness of personal weak areas, confidence, and learning goals.
 - System: Understanding that recommendations are based on quiz performance and activity history.
 - Domain: Basic familiarity with the subject to judge relevance.
- Effort level: Low–Medium
 - Requires brief evaluation of recommendations and explanations; consequences are reversible.

Decision 2: Whether to trust and rely on AI explanations

- Decision: Use AI-generated explanations as authoritative learning material or verify externally.
- Required knowledge:
 - Domain: Subject-matter understanding (e.g., anatomy concepts, CFA formulas).
 - System: Interpretation of citations, confidence indicators, or “verify” warnings.
 - Context: Stakes of correctness (exam vs casual review).
- Effort level: Medium–High
 - Higher cognitive effort for professionals due to exam risk and technical depth.

Decision 3: How to respond to adaptive difficulty changes

- Decision: Continue with automatically adjusted difficulty or intervene (seek easier/harder content).
- Required knowledge:
 - Self: Awareness of frustration, fatigue, or overconfidence.
 - System: Understanding that quiz scores trigger difficulty adjustments.
- Effort level: Low
Mostly passive; adaptation is system-driven unless the learner opts out.

Decision 4: Choosing session length and study mode

- Decision: Start a short “Quick Study” session, follow the full study plan, or postpone studying.
- Required knowledge:
 - Context: Available time, mental energy, and workload.
 - System: Understanding the trade-off between micro-sessions and deeper study.
- Effort level: Low
A fast, contextual decision with minimal cognitive load.

Instructors (Professors & Private Tutors)

Decision 1: Whether to use AI-generated content in teaching

- Decision: Adopt, edit, or discard AI-generated explanations, quizzes, or materials.
- Required knowledge:
 - Domain: Expert subject knowledge.
 - System: Ability to assess citations, confidence flags, and source mappings.
 - Context: Curriculum alignment and academic standards.
- Effort level: High
High responsibility and risk; incorrect content directly impacts learners.

Decision 2: Trusting analytics to identify student weaknesses

- Decision: Act on system-flagged struggle areas or rely on personal teaching judgment.
- Required knowledge:
 - System: Understanding thresholds (e.g., $\geq 40\%$ underperformance) and aggregation logic.
 - Context: Knowledge of how to remediate identified misconceptions.
- Effort level: Medium
Analytics reduce effort but still require interpretation and instructional planning.

Decision 3: Selecting and publishing difficulty-tiered materials

- Decision: Choose which difficulty levels (beginner/intermediate/advanced) to share with learners.
- Required knowledge:

- System: Awareness of how tiers differ and are generated.
 - Context: Understanding of student preparedness and progress.
- Effort level: Medium
Requires previewing outputs and anticipating learner needs.

Decision 4: Managing privacy and data usage

- Decision: Decide how to use learning analytics while maintaining student privacy.
- Required knowledge:
 - System: Understanding anonymization guarantees and data visibility.
 - Context: Institutional policies and ethical responsibilities.
- Effort level: Low–Medium
Low interaction effort, but high accountability if mishandled.

Learners primarily make low-effort, frequent decisions focused on pacing, trust, and time management, with limited long-term risk. Instructors make fewer but higher-stakes decisions, where accuracy, privacy, and pedagogical responsibility significantly increase cognitive effort. The system therefore, offloads logistical decisions while preserving human judgment where consequences are greatest.

2.2

Question: Examine each decision-making point closely and consider if the users are vulnerable to any of the four biases from the work [Judgment under uncertainty: Heuristics and biases](#), i.e., Representativeness, Availability, Adjustment, and Anchoring. Explain how the design of the product exacerbates or alleviates each of the users' biases. For the designs that alleviate users' biases, what kind of information should be presented and how so that it might improve the users' decision-making?

Heuristics and Biases in User Decision-Making

Learners (Students & Working Professionals)

Decision 1: Whether to follow system-recommended content or search manually

Bias

- **Representativeness**
Users may accept recommended topics because they “look” relevant — e.g., bolded, featured, labeled “Top pick for you.” This perceived similarity to useful material leads to over-trust.
- **Availability**
Recently failed topics may be over-emphasized due to Quizlet’s adaptive algorithms surfacing them more often.
- **Anchoring & Adjustment**
Users anchor on the first recommended topic and rarely explore beyond the top 1–2 suggestions.

Design impact

- The prominent ranking of recommended items can reinforce anchoring and reduce exploration.
- Visual “Why am I seeing this?” explanations partially mitigate representativeness by encouraging reasoning beyond surface relevance.

Bias-aware information support

- Present confidence levels and data coverage indicators (e.g., number of quizzes used) alongside recommendations.
- Offer visible alternative topics to reduce overcommitment to anchored options e.g. “Other relevant topics based on your history”.
- Use randomized order or rotation in recommendation UI

Decision 2: Whether to trust AI-generated explanations

Bias

- **Bias: Representativeness:** Learners may assume explanations are correct if they resemble what a teacher or textbook would say, regardless of accuracy.
- **Bias: Availability:** Recent negative experiences with AI errors can disproportionately reduce trust. Also one very clear or useful explanation becomes the mental standard, biasing trust in future answers.

Design impact

- Polished explanations may increase the illusion of validity.
- Citations, accuracy checks, and “verify with curriculum” warnings counter surface-level trust.

Bias-aware information support

- Display confidence ranges, citation sources, and uncertainty flags prominently.
- Allow optional deeper inspection for users with higher domain expertise.

Decision 3: How to respond to adaptive difficulty changes

Bias

- **Anchoring and insufficient adjustment:** Learners may cling to initial self-assessments of ability (e.g., “intermediate”) and stick with it even if their performance improves.
- **Availability:** Recent failures or successes may dominate perceptions of long-term performance.

Design impact

- Unexplained difficulty shifts risk reinforcing incorrect self-anchors.
- Gradual adjustments and consistent feedback reduce overreaction to salient events.

Bias-aware information support

- Show historical performance trends rather than single outcomes.
- Use explanations to clarify why difficulty changed and whether the change is provisional.

Decision 4: Choosing between session lengths and study plans

Bias

- **Availability:** A stressful previous session or recent time crunch makes users default to Quick Study, regardless of their actual availability.
- **Anchoring:** Repeated use of micro-sessions can anchor long-term study behavior.

Design impact

- Emphasizing “Quick Study” may encourage overreliance on short-term convenience.
- Automatic recalibration of plans helps counter insufficient adjustment.

Bias-aware information support

- Present comparisons between short- and long-term outcomes for different study modes.
- Weekly feedback panel: “You’ve done 8 Quick Studies this week. Consider a full session to reinforce.
- Allow users to preview content volume before choosing session type
- Frame micro-sessions explicitly as complementary, not primary, learning strategies.

Instructors (Professors & Private Tutors)

Decision 1: Whether to use AI-generated content in teaching

Bias

- **Representativeness:** If the content *looks* polished (e.g., clean format, formal tone), instructors may accept it without sufficient verification.
- **Anchoring:** Initial AI-generated materials can anchor subsequent revisions.

Design impact

- Ready-to-use materials risk insufficient adjustment.
- Mandatory previews, citations, and confidence warnings reduce anchoring effects.

Bias-aware information support

- Provide side-by-side comparisons between original and modified content.
- Include a “Model confidence: low/medium/high” tag on each explanation
- Provide evidence sources both inline and prominently before publication.

Decision 2: Acting on system-identified student struggle areas

Bias

- Availability: Salient anecdotes may outweigh aggregate trends.
- Representativeness: A flagged topic may be seen as universally problematic.

Design impact

- Highlighting only top struggle areas risks oversimplification.
- Thresholds and aggregated summaries ground decisions in data.

Bias-aware information support

- Display distributional statistics and time-based trends.
- Clearly differentiate persistent issues from short-term fluctuations.

Decision 3: Selecting difficulty tiers of study material

Bias

- Anchoring and insufficient adjustment: The AI's default tiering (Beginner/Intermediate/Advanced) often dictates what gets shared — instructors may not override it even if it mismatches class needs.
- Representativeness: Perceived "average student" may not reflect real variability.

Design impact

- Default-selected tiers may discourage exploration.
- Previewing all tiers encourages deliberate comparison.

Bias-aware information support

- Present learner-level distributions (e.g., percentage of students at each tier).
- Emphasize that tiers are parallel options, not hierarchical recommendations.

Decision 4: Using learning analytics while preserving privacy

Bias

- Availability: If a privacy setting is labeled "Private Mode" and uses secure-looking icons, instructors assume full compliance without understanding the fine print. Outliers or extreme cases may distort interpretation.
- Anchoring: Early analytics snapshots may shape long-term beliefs.

Design impact

- Snapshot-based dashboards risk misinterpretation.
- Aggregation and anonymization reduce salience of extremes.

Bias-aware information support

- Use trend-based visualizations and confidence intervals.
- Clearly label analytics as provisional signals, not definitive judgments.

Across both user groups, cognitive heuristics and biases emerge selectively depending on uncertainty, time pressure, and responsibility. Learners are particularly vulnerable to anchoring and availability in low-effort, high-frequency decisions, while instructors face higher risks from representativeness and anchoring due to the high stakes of content sharing and assessment. By presenting uncertainty-aware, contextual, and comparative information, the system can mitigate heuristic-driven errors without sacrificing usability. Bias-aware design thus serves not to eliminate heuristics, but to scaffold better judgments under uncertainty, improving decision quality for both learners and instructors.

2.3

Question: Revisit the persona you created in Assignment 1. Discuss the consequences for the users (including how they would feel and act) if they adopt the product and make decisions. Then, stretch your imagination and discuss how it might impact the relationship between the persona and other stakeholders as the system becomes more integrated into their daily routine.

Impact of Product Adoption

1. **Olivia Wilson (Private Chemistry Tutor):** Olivia values credible, accurate content and student engagement.

Positive:

- She feels relieved because AI reduces workload for creating flashcards, worksheets, and quizzes.
- Gains confidence in being able to personalize materials faster.
- Feels motivated seeing students enjoy interactive study tools.

Negative:

- Anxiety increases when AI-generated content feels oversimplified or inaccurate.
- She may become overly dependent on AI to generate worksheets instead of creating original pedagogical material.

Impact on Stakeholder Relationships

- With students: Students may begin relying on AI explanations instead of her detailed tutoring guidance, reducing her perceived value.
- With parents: Improved analytics give Olivia clearer progress reports, strengthening trust with parents.
- With other tutors: Competitive pressure rises, since tutors using AI can produce materials faster.
- With institutions: Privacy concerns (listed as a frustration on page 1) may strain compliance expectations.

2. **Frenkie Beukema (Physiotherapy Student):** Frenkie values clear visual explanations and hands-on learning that connects theory to real world practice.

Positive:

- Feels more confident when AI provides simplified visuals and step-by-step anatomy breakdowns.
- Increased motivation because adaptive quizzes reinforce difficult terms.
- Can study efficiently even outside class, reducing stress.

Negative:

- Might over rely on AI flashcards instead of practicing hands-on therapy skills.
- May feel frustrated if explanations oversimplify complex biomechanics, reducing grades.

Impact on Stakeholder Relationships

- With classmates: He may participate less in collaborative practice sessions, weakening peer bonds and teamwork.
- With instructors: Instructors may notice a mismatch between his theoretical quiz performance (helped by AI) and his practical lab performance, weakening of trust.
- With clinical supervisors: If he depends too much on AI-generated descriptions, he may struggle during real patient interactions.

3. Brenda Smith (Investment Banking Analyst & CFA Candidate): Brenda values precise, reliable study materials that help her stay efficient despite her demanding work schedule.

Positive:

- Brenda feels relieved because AI helps her maximize fragmented study time.
- Gains confidence through targeted review of weak areas.
- Reduced cognitive load during late-night sessions.

Negative:

- If she trusts incorrect AI-generated finance formulas, she may develop false confidence.
- She may reduce deep conceptual study because system recommendations seem “accurate enough.”

Impact on Stakeholder Relationships

- With coworkers: Improved knowledge may make her appear more prepared, improving workplace credibility. But she may favor AI explanations over asking senior analysts, weakening mentorship relationships.
- With study groups: Might withdraw from group sessions because AI pacing feels more efficient.
- With supervisors: If she relies heavily on AI for model explanations, supervisors might question her independent reasoning skills.

4. Dr. Daniel Chen (University Professor): Dr. Chen values accuracy, verifiability, and tools to keep privacy that support teaching without compromising academic integrity.

Positive:

- Dr. Chen feels empowered by analytics that pinpoint student misconceptions.
- Saves time generating examples of introductory explanations.
May feel relieved by better insight into student progress across topics.

Negative:

- Anxiety increases if AI-generated content simplifies technical concepts too much.
- Feels loss of control over the course structure if students rely more on AI materials than lectures.
- May feel pressured to modify teaching pace to match what the AI recommends to students.

Impact on Stakeholder Relationships

- With students: Students may challenge him (“The AI says X...”) creating tension or skepticism.
- With teaching assistants: AI analytics may reduce TA involvement in diagnosing student weaknesses.
- With institution: His concerns about accuracy and privacy may cause friction with administrators pushing AI adoption.
- With colleagues: If others adopt AI quickly, he may feel isolated or behind, impacting collegial collaboration.

Contribution Statement:

Given our busy and conflicting schedules, team members initially worked independently on different parts of the assignment. We began with a group meeting to align on the assignment requirements and brainstorm ideas together. Since there was limited overlap between tasks, responsibilities were divided among team members accordingly. We then met three to four additional times to share research findings, discuss and review each other's work, and ensure the quality and correctness of decisions across tasks. Finally, we worked collaboratively to integrate all contributions into a single, coherent report.

| Group Member | Tasks Assigned | Comments |
|---------------------|--|--|
| Eric | Tasks 1.1 & 1.3 | Focused on Microsoft guidelines |
| Sam | Tasks 1.2 & 1.3 | Focused on Google patterns |
| Jess | Tasks 2.1 & 2.2 | Focused on users' decision-making and biases |
| Harry | Tasks 2.2 & 2.3 | Focused impact of production adoption on users and stakeholders |
| All Members | Report writing and task reviewing, and evaluating each team member | Reviewed and assessed each other's tasks and decisions. Also collaborated on overall structure and quality assurance |

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