**SkillMind AI - Database Schema Mermaid ER Diagram**

**Complete Entity Relationship Diagram**

erDiagram  
 %% Core Persona & Curriculum Structure  
 persona\_profiles {  
 uuid persona\_id PK  
 varchar persona\_name  
 varchar persona\_code UK  
 text description  
 jsonb target\_audience  
 jsonb learning\_objectives  
 learning\_style preferred\_learning\_styles  
 difficulty\_level difficulty\_preference  
 varchar pacing\_preference  
 jsonb engagement\_preferences  
 varchar career\_focus  
 integer time\_commitment\_hours\_week  
 timestamptz created\_at  
 timestamptz updated\_at  
 uuid created\_by  
 boolean is\_active  
 }  
  
 curriculum\_modules {  
 uuid module\_id PK  
 varchar module\_code UK  
 varchar title  
 text description  
 jsonb learning\_objectives  
 difficulty\_level difficulty\_level  
 integer estimated\_duration\_minutes  
 text prerequisites  
 integer order\_index  
 jsonb persona\_adaptations  
 varchar version  
 timestamptz created\_at  
 timestamptz updated\_at  
 uuid created\_by  
 content\_status status  
 }  
  
 curriculum\_components {  
 uuid component\_id PK  
 uuid module\_id FK  
 varchar component\_code  
 varchar title  
 text description  
 jsonb learning\_objectives  
 integer estimated\_duration\_minutes  
 integer order\_index  
 jsonb persona\_emphasis  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 curriculum\_topics {  
 uuid topic\_id PK  
 uuid component\_id FK  
 varchar topic\_code  
 varchar title  
 text description  
 jsonb learning\_objectives  
 text prerequisites  
 integer estimated\_duration\_minutes  
 difficulty\_level difficulty\_level  
 cognitive\_level cognitive\_level  
 integer order\_index  
 text primary\_skills  
 text secondary\_skills  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 curriculum\_concepts {  
 uuid concept\_id PK  
 uuid topic\_id FK  
 varchar concept\_code  
 varchar title  
 text description  
 content\_type content\_type  
 cognitive\_level cognitive\_level  
 integer estimated\_duration\_minutes  
 integer complexity\_score  
 integer order\_index  
 jsonb learning\_objectives  
 text key\_concepts  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 %% Main Content Management System  
 content\_chunks {  
 uuid chunk\_id PK  
 uuid concept\_id FK  
 varchar external\_id UK  
 varchar title  
 text description  
 content\_type content\_type  
 content\_format format  
 varchar language  
 text content\_markdown  
 text content\_html  
 jsonb content\_json  
 text content\_plain\_text  
 text content\_preview  
 jsonb learning\_objectives  
 text prerequisites  
 integer estimated\_duration\_minutes  
 difficulty\_level difficulty\_level  
 cognitive\_level cognitive\_level  
 integer complexity\_score  
 integer word\_count  
 integer token\_count  
 decimal readability\_score  
 decimal quality\_score  
 text keywords  
 integer search\_weight  
 varchar version  
 uuid parent\_chunk\_id FK  
 content\_status status  
 timestamptz published\_at  
 timestamptz expires\_at  
 timestamptz created\_at  
 timestamptz updated\_at  
 uuid created\_by  
 uuid last\_modified\_by  
 }  
  
 content\_versions {  
 uuid version\_id PK  
 uuid chunk\_id FK  
 varchar version\_number  
 jsonb content\_snapshot  
 text change\_summary  
 timestamptz created\_at  
 uuid created\_by  
 }  
  
 code\_examples {  
 uuid example\_id PK  
 uuid chunk\_id FK  
 varchar title  
 text description  
 varchar programming\_language  
 text code\_content  
 text expected\_output  
 text explanation  
 boolean is\_executable  
 varchar execution\_environment  
 text dependencies  
 text concepts\_demonstrated  
 difficulty\_level difficulty\_level  
 integer estimated\_runtime\_seconds  
 boolean is\_tested  
 jsonb test\_results  
 timestamptz last\_tested\_at  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 content\_media\_assets {  
 uuid asset\_id PK  
 uuid chunk\_id FK  
 varchar asset\_type  
 varchar file\_name  
 text file\_path  
 bigint file\_size\_bytes  
 varchar mime\_type  
 varchar title  
 text description  
 text alt\_text  
 integer duration\_seconds  
 varchar resolution  
 integer download\_count  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 content\_relationships {  
 uuid relationship\_id PK  
 uuid source\_chunk\_id FK  
 uuid target\_chunk\_id FK  
 relationship\_type relationship\_type  
 varchar relationship\_strength  
 decimal weight  
 timestamptz created\_at  
 uuid created\_by  
 }  
  
 %% AI Avatar System  
 ai\_avatar\_roles {  
 uuid role\_id PK  
 avatar\_role role\_name UK  
 varchar display\_name  
 text role\_description  
 jsonb interaction\_style  
 jsonb assessment\_types  
 jsonb content\_focus  
 jsonb target\_audience  
 varchar feedback\_style  
 varchar questioning\_approach  
 varchar error\_handling\_style  
 timestamptz created\_at  
 timestamptz updated\_at  
 boolean is\_active  
 }  
  
 content\_role\_variations {  
 uuid variation\_id PK  
 uuid chunk\_id FK  
 uuid role\_id FK  
 varchar instruction\_type  
 varchar teaching\_strategy  
 varchar interaction\_style  
 text role\_specific\_intro  
 text role\_specific\_summary  
 jsonb role\_specific\_exercises  
 varchar help\_type  
 varchar assessment\_type  
 varchar question\_format  
 varchar collaboration\_type  
 varchar guidance\_type  
 timestamptz created\_at  
 }  
  
 persona\_content\_adaptations {  
 uuid adaptation\_id PK  
 uuid chunk\_id FK  
 uuid persona\_id FK  
 integer difficulty\_adjustment  
 decimal pacing\_multiplier  
 varchar emphasis\_level  
 jsonb additional\_examples  
 text simplified\_explanations  
 text advanced\_extensions  
 text persona\_specific\_context  
 content\_format preferred\_formats  
 jsonb interaction\_preferences  
 timestamptz created\_at  
 }  
  
 %% Skills & Tagging System  
 skill\_taxonomy {  
 uuid skill\_id PK  
 uuid parent\_skill\_id FK  
 varchar skill\_name  
 varchar skill\_code UK  
 text skill\_description  
 integer skill\_level  
 varchar skill\_category  
 jsonb industry\_relevance  
 jsonb job\_roles  
 integer skill\_demand\_score  
 integer typical\_learning\_duration\_hours  
 uuid prerequisite\_skills  
 timestamptz created\_at  
 timestamptz updated\_at  
 boolean is\_active  
 }  
  
 tag\_vocabularies {  
 uuid vocabulary\_id PK  
 varchar category  
 varchar tag\_value  
 varchar display\_name  
 text description  
 integer sort\_order  
 boolean is\_active  
 timestamptz created\_at  
 }  
  
 content\_tags {  
 uuid tag\_id PK  
 uuid chunk\_id FK  
 varchar tag\_category  
 varchar tag\_value  
 decimal tag\_weight  
 timestamptz created\_at  
 uuid created\_by  
 }  
  
 %% Vector Embeddings & Semantic Search  
 embedding\_models {  
 uuid model\_id PK  
 varchar model\_name UK  
 varchar model\_version  
 varchar provider  
 integer embedding\_dimensions  
 integer context\_window  
 text model\_description  
 integer tokens\_per\_request\_limit  
 integer requests\_per\_minute\_limit  
 decimal cost\_per\_1k\_tokens  
 jsonb model\_parameters  
 boolean is\_active  
 boolean is\_default  
 timestamptz created\_at  
 }  
  
 content\_embeddings {  
 uuid embedding\_id PK  
 uuid chunk\_id FK  
 uuid model\_id FK  
 vector embedding\_vector  
 jsonb embedding\_metadata  
 text content\_hash  
 integer token\_count  
 integer generation\_time\_ms  
 timestamptz created\_at  
 }  
  
 %% Assessment System  
 assessments {  
 uuid assessment\_id PK  
 uuid chunk\_id FK  
 varchar title  
 text description  
 assessment\_type assessment\_type  
 difficulty\_level difficulty\_level  
 text question\_text  
 text instructions  
 jsonb hints  
 integer points\_possible  
 integer passing\_score  
 integer time\_limit\_minutes  
 integer attempts\_allowed  
 cognitive\_level cognitive\_level  
 integer estimated\_time\_minutes  
 boolean auto\_gradable  
 boolean randomize\_options  
 integer option\_pool\_size  
 timestamptz created\_at  
 timestamptz updated\_at  
 uuid created\_by  
 }  
  
 assessment\_options {  
 uuid option\_id PK  
 uuid assessment\_id FK  
 text option\_text  
 boolean is\_correct  
 text explanation  
 integer order\_index  
 timestamptz created\_at  
 }  
  
 assessment\_test\_cases {  
 uuid test\_case\_id PK  
 uuid assessment\_id FK  
 varchar test\_name  
 text input\_data  
 text expected\_output  
 boolean is\_public  
 decimal weight  
 integer timeout\_seconds  
 timestamptz created\_at  
 }  
  
 %% User Progress & Analytics  
 user\_progress {  
 uuid progress\_id PK  
 uuid user\_id  
 uuid chunk\_id FK  
 uuid persona\_id FK  
 uuid role\_id FK  
 progress\_status status  
 decimal completion\_percentage  
 decimal mastery\_score  
 integer time\_spent\_minutes  
 integer session\_count  
 integer interaction\_count  
 difficulty\_level difficulty\_experienced  
 integer help\_requests\_count  
 integer error\_count  
 integer retry\_count  
 timestamptz first\_accessed\_at  
 timestamptz last\_accessed\_at  
 timestamptz completed\_at  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 user\_assessment\_attempts {  
 uuid attempt\_id PK  
 uuid user\_id  
 uuid assessment\_id FK  
 integer attempt\_number  
 jsonb responses  
 decimal score\_earned  
 decimal max\_score\_possible  
 decimal percentage\_score  
 boolean is\_passing  
 integer time\_spent\_minutes  
 timestamptz started\_at  
 timestamptz submitted\_at  
 boolean auto\_graded  
 timestamptz graded\_at  
 uuid graded\_by  
 text feedback\_provided  
 timestamptz created\_at  
 }  
  
 user\_learning\_adaptations {  
 uuid adaptation\_id PK  
 uuid user\_id  
 uuid chunk\_id FK  
 uuid persona\_id FK  
 varchar adaptation\_type  
 text adaptation\_reason  
 text original\_value  
 text adapted\_value  
 boolean improvement\_observed  
 decimal effectiveness\_score  
 timestamptz created\_at  
 varchar created\_by  
 }  
  
 learning\_paths {  
 uuid path\_id PK  
 uuid user\_id  
 uuid persona\_id FK  
 varchar path\_name  
 text path\_description  
 jsonb target\_skills  
 integer estimated\_completion\_weeks  
 difficulty\_level difficulty\_progression  
 uuid chunk\_sequence  
 integer current\_position  
 timestamptz started\_at  
 timestamptz estimated\_completion\_at  
 timestamptz actual\_completion\_at  
 timestamptz created\_at  
 timestamptz updated\_at  
 }  
  
 %% System Infrastructure  
 system\_logs {  
 uuid log\_id PK  
 varchar log\_level  
 varchar log\_type  
 text message  
 uuid user\_id  
 uuid session\_id  
 uuid chunk\_id  
 jsonb metadata  
 text stack\_trace  
 uuid request\_id  
 inet ip\_address  
 text user\_agent  
 integer response\_time\_ms  
 integer memory\_usage\_mb  
 timestamptz created\_at  
 }  
  
 %% RELATIONSHIPS %%  
   
 %% Curriculum Hierarchy (4 Levels)  
 curriculum\_modules ||--o{ curriculum\_components : "contains"  
 curriculum\_components ||--o{ curriculum\_topics : "contains"  
 curriculum\_topics ||--o{ curriculum\_concepts : "contains"  
 curriculum\_concepts ||--o{ content\_chunks : "realizes"  
  
 %% Content Management  
 content\_chunks ||--o{ content\_versions : "versioned\_by"  
 content\_chunks ||--o{ code\_examples : "contains"  
 content\_chunks ||--o{ content\_media\_assets : "includes"  
 content\_chunks ||--o{ content\_relationships : "source"  
 content\_chunks ||--o{ content\_relationships : "target"  
 content\_chunks ||--o{ content\_chunks : "parent\_child"  
  
 %% AI Avatar Integration  
 ai\_avatar\_roles ||--o{ content\_role\_variations : "customizes"  
 content\_chunks ||--o{ content\_role\_variations : "adapted\_for"  
 persona\_profiles ||--o{ persona\_content\_adaptations : "customizes"  
 content\_chunks ||--o{ persona\_content\_adaptations : "adapted\_for"  
  
 %% Tagging & Skills  
 skill\_taxonomy ||--o{ skill\_taxonomy : "parent\_child"  
 tag\_vocabularies ||--o{ content\_tags : "vocabulary"  
 content\_chunks ||--o{ content\_tags : "tagged\_with"  
  
 %% Vector Search  
 embedding\_models ||--o{ content\_embeddings : "generates"  
 content\_chunks ||--o{ content\_embeddings : "embedded\_as"  
  
 %% Assessments  
 content\_chunks ||--o{ assessments : "assessed\_by"  
 assessments ||--o{ assessment\_options : "has\_options"  
 assessments ||--o{ assessment\_test\_cases : "has\_test\_cases"  
  
 %% User Analytics & Progress  
 content\_chunks ||--o{ user\_progress : "tracked\_in"  
 persona\_profiles ||--o{ user\_progress : "guides"  
 ai\_avatar\_roles ||--o{ user\_progress : "delivers"  
 assessments ||--o{ user\_assessment\_attempts : "attempted\_as"  
 content\_chunks ||--o{ user\_learning\_adaptations : "adapted\_for\_user"  
 persona\_profiles ||--o{ user\_learning\_adaptations : "personalizes"  
 persona\_profiles ||--o{ learning\_paths : "defines"

**Simplified Core Entity View**

erDiagram  
 %% Core Entities with Primary Relationships Only  
 PERSONA\_PROFILES ||--o{ USER\_PROGRESS : personalizes  
 CURRICULUM\_MODULES ||--o{ CURRICULUM\_COMPONENTS : contains  
 CURRICULUM\_COMPONENTS ||--o{ CURRICULUM\_TOPICS : contains   
 CURRICULUM\_TOPICS ||--o{ CURRICULUM\_CONCEPTS : contains  
 CURRICULUM\_CONCEPTS ||--o{ CONTENT\_CHUNKS : realizes  
   
 CONTENT\_CHUNKS ||--o{ USER\_PROGRESS : tracks  
 CONTENT\_CHUNKS ||--o{ ASSESSMENTS : evaluates  
 CONTENT\_CHUNKS ||--o{ CONTENT\_EMBEDDINGS : vectorizes  
   
 AI\_AVATAR\_ROLES ||--o{ USER\_PROGRESS : delivers  
 EMBEDDING\_MODELS ||--o{ CONTENT\_EMBEDDINGS : generates  
 ASSESSMENTS ||--o{ USER\_ASSESSMENT\_ATTEMPTS : attempted

**Schema Architecture Overview**

graph TB  
 subgraph "Persona & Curriculum Layer"  
 A[persona\_profiles] --> B[Learning Personalization]  
 C[curriculum\_modules] --> D[curriculum\_components]  
 D --> E[curriculum\_topics]   
 E --> F[curriculum\_concepts]  
 end  
   
 subgraph "Content Management Layer"  
 F --> G[content\_chunks]  
 G --> H[content\_versions]  
 G --> I[code\_examples]  
 G --> J[content\_media\_assets]  
 G --> K[content\_relationships]  
 end  
   
 subgraph "AI & Personalization Layer"  
 L[ai\_avatar\_roles] --> M[content\_role\_variations]  
 A --> N[persona\_content\_adaptations]  
 G --> M  
 G --> N  
 end  
   
 subgraph "Search & Discovery Layer"  
 O[embedding\_models] --> P[content\_embeddings]  
 G --> P  
 Q[skill\_taxonomy] --> R[Skills Mapping]  
 S[tag\_vocabularies] --> T[content\_tags]  
 G --> T  
 end  
   
 subgraph "Assessment Layer"  
 G --> U[assessments]  
 U --> V[assessment\_options]  
 U --> W[assessment\_test\_cases]  
 end  
   
 subgraph "User Analytics Layer"  
 G --> X[user\_progress]  
 A --> X  
 L --> X  
 U --> Y[user\_assessment\_attempts]  
 X --> Z[user\_learning\_adaptations]  
 A --> AA[learning\_paths]  
 end  
   
 subgraph "Infrastructure Layer"  
 BB[system\_logs] --> CC[Monitoring & Audit]  
 end  
   
 style A fill:#e1f5fe  
 style G fill:#fff3e0  
 style X fill:#f3e5f5  
 style U fill:#e8f5e8