

# Product Requirements Document (PRD): Guided Learning Platform

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**Development Team:** [Team Assignment Pending]

## Executive Summary

**Product Name:** CodeMentor AI - Guided Learning Platform

**Vision Statement:** Transform software engineering education by providing ethical AI assistance that students earn through demonstrated competency, preparing them for modern AI-assisted development careers while maintaining academic integrity.

**Core Value Proposition:** "Master concepts, earn AI assistance, own your work - where academic integrity meets intelligent learning support"

### Why This Product Is NOT Academic Fraud:

1. Students must demonstrate understanding BEFORE receiving any AI assistance
2. AI provides educational scaffolding, never complete solutions
3. Learning verification is mandatory at every step
4. Students build genuine competency through structured progression
5. The process enhances rather than bypasses educational outcomes

## Product Vision and Objectives

### Primary Objectives

- **Educational Goal:** Teach responsible AI usage while ensuring genuine skill development
- **Student Goal:** Provide practical support for actual assignments without compromising learning
- **Institutional Goal:** Maintain academic integrity while preparing students for professional AI usage
- **Business Goal:** Create sustainable revenue through ethical educational technology

## Success Metrics

- **Learning Effectiveness:** 40% improvement in concept retention vs. traditional methods
- **Student Satisfaction:** 4.5+ star rating on educational value
- **Academic Integrity:** 95%+ honor code compliance rate
- **Business Viability:** 15%+ conversion rate from free to premium users

## Target Users and Use Cases

### Primary User: Software Engineering Students

#### Demographics:

- Computer Science, Software Engineering, and Bootcamp students
- Age 18-30, globally distributed
- Varying skill levels from beginner to advanced
- Time-pressured with multiple competing academic priorities

#### User Needs:

- Help with actual assignments without violating academic integrity
- Learning support that builds real skills
- Ethical AI usage guidance for professional preparation
- Flexible tool that works with various institutional policies

### Secondary Users: Educational Institutions

#### Needs:

- Transparent AI usage monitoring (optional)
- Students arriving better prepared for coursework
- Alignment with academic integrity policies
- Evidence of educational effectiveness

## Core Features and User Stories

### Feature 1: Dual Learning Environment

**User Story:** "As a student, I want both practice challenges and support for my actual assignments so I can build skills and succeed in my courses."

#### Functional Requirements:

##### 1.1 Global Challenge Library

- Curated programming challenges across skill levels (beginner, intermediate, advanced)
- Topics include: Data Structures, Algorithms, Web Development, Database Design, System Design
- Community leaderboards and peer interaction features
- Safe environment for AI assistance experimentation

## 1.2 Guided Learning Mode (Assignment Support)

- Assignment upload functionality supporting text, PDF, and image formats
- AI analysis to identify required concepts and skills
- Automatic learning pathway generation based on assignment requirements
- Integration with competency verification system

### Acceptance Criteria:

- [ ] Users can seamlessly switch between practice and assignment modes
- [ ] Assignment analysis accuracy >90% for common programming tasks
- [ ] Learning pathways generated within 30 seconds of upload
- [ ] Clear visual distinction between practice and real assignment work

## Feature 2: Competency Verification System

**User Story:** "As a student, I want to prove I understand concepts before getting AI help so I can learn effectively and maintain academic integrity."

### Functional Requirements:

#### 2.1 Prerequisite Understanding Checks

- Assignment comprehension verification (student must explain requirements)
- Concept identification challenges (identify key topics and approaches)
- Mini-skill assessments related to assignment topics
- Progressive difficulty with mastery thresholds

#### 2.2 Point-Based Progression

- Points earned only through successful understanding demonstrations
- Different assistance levels require different point thresholds
- Point tracking and achievement visualization
- Reset mechanism for new assignments

### Technical Specifications:

#### Point Earning System:

- Concept Explanation (Correct): 5 points
- Mini-Challenge Completion: 10 points
- Code Review Understanding: 15 points
- Peer Help Provided: 20 points

Point Spending System:

- Conceptual Hints: 5 points
- Pseudocode Guidance: 15 points
- Code Review Session: 25 points
- AI Copilot Time (30 min): 50 points

### Acceptance Criteria:

- ☐ Students cannot skip competency verification
- ☐ Point accumulation requires active learning engagement
- ☐ Understanding assessments adapt to assignment complexity
- ☐ Progress tracking clearly shows learning pathway completion

## Feature 3: Graduated AI Assistance

**User Story:** "As a student, I want AI help that teaches me concepts and guides my thinking rather than giving me answers."

### Functional Requirements:

#### 3.1 Tiered Assistance System

- **Level 1 (5 points):** Conceptual hints and guiding questions
- **Level 2 (15 points):** Pseudocode structures and logical approaches
- **Level 3 (25 points):** Code review with educational feedback
- **Level 4 (50 points):** Limited-time AI copilot pair programming

#### 3.2 Educational Guardrails

- AI never provides complete, copy-paste solutions
- All assistance includes educational explanations
- Socratic method questioning to promote understanding
- Error identification with learning opportunities

#### 3.3 AI Conversation Engine

AI Response Framework:

- Always ask "What do you think about..." before providing guidance
- Provide examples from similar problems, not direct solutions
- Include "Why is this important?" explanations
- Suggest next learning steps after assistance

### Acceptance Criteria:

- ☐ AI responses promote understanding rather than solution-seeking
- ☐ Students can explain AI-guided portions of their work

- ☐ Assistance is contextually relevant to assignment and student level
- ☐ Educational value measurable through follow-up comprehension checks

## Feature 4: Academic Integrity Framework

**User Story:** "As a student, I want clear guidance on ethical AI usage so I can succeed without compromising my academic integrity."

### Functional Requirements:

#### 4.1 Honor Code Integration

- Digital signature required before assignment upload
- Academic integrity reminders before AI assistance access
- Institution-specific policy integration where applicable
- Clear guidelines on appropriate use and disclosure

#### 4.2 Transparency and Documentation

- Complete learning pathway documentation
- AI assistance usage summary generation
- Optional sharing with instructors (student-controlled)
- Learning process verification for student records

#### 4.3 Institutional Flexibility Tools

Three Integration Levels:

1. Partnership Mode: Full institutional integration with instructor oversight
2. Transparency Mode: Usage reports available to institutions upon request
3. Student Mode: Individual use with honor code and self-regulation

### Acceptance Criteria:

- ☐ Honor code compliance measurable and enforced
- ☐ Students can generate usage summaries for transparency
- ☐ Clear documentation of learning vs. assistance portions
- ☐ Institution-specific customization available

## Feature 5: Ethical Project Download

**User Story:** "As a student, I want to download the work I created through learning so I can use it for my course submissions and portfolio."

### Functional Requirements:

#### 5.1 Download Qualification System

- Verification of completed learning pathway

- Confirmation of competency demonstration for all assisted portions
- Academic integrity acknowledgment before download
- Usage documentation attachment

## 5.2 Multiple Format Options

- **Clean Project:** Complete implementation for submission-ready use
- **Portfolio Version:** Includes learning documentation and process notes
- **Learning Template:** Structure and approach requiring additional work

## 5.3 Academic Integrity Safeguards

### Pre-Download Checklist:

- ☐ All competency requirements met
- ☐ Understanding verified through explanations
- ☐ AI assistance earned through point system
- ☐ Academic integrity policies reviewed
- ☐ Appropriate use commitment signed

### Technical Implementation:

- Download only enabled after learning pathway completion
- Automatic generation of learning summary document
- Watermarking of AI-assisted vs. student-created portions
- Version control for iterative development tracking

### Acceptance Criteria:

- [ ] Downloads represent genuine student work and learning
- [ ] Clear documentation of learning process included
- [ ] Academic integrity safeguards prevent misuse
- [ ] Multiple format options support different institutional needs

## Technical Requirements

### Architecture Overview

- **Frontend:** React.js with TypeScript for interactive learning environments
- **Backend:** Node.js with Express for scalable API and real-time features
- **Database:** PostgreSQL for user data, Redis for session management and caching
- **AI Integration:** OpenAI API with custom educational guardrails
- **Cloud Infrastructure:** AWS with auto-scaling and global distribution

## Security and Privacy Requirements

- End-to-end encryption for all student work and communications
- FERPA compliance for educational data handling
- GDPR compliance for international users
- SOC 2 Type II certification for enterprise partnerships
- Student data ownership and control mechanisms

## Performance Requirements

- Assignment analysis response time <30 seconds
- AI assistance response time <5 seconds
- Platform availability >99.9% uptime
- Support for 100,000+ concurrent users
- Mobile-responsive design for all features

## Integration Requirements

- LMS integration APIs (Canvas, Blackboard, Moodle)
- GitHub integration for portfolio building
- Single sign-on (SSO) support for institutional partnerships
- RESTful API for third-party integrations

## User Experience Requirements

### Core UX Principles

1. **Learning-First Design:** Every interaction promotes educational engagement
2. **Transparent Progress:** Clear visualization of learning pathway and achievements
3. **Ethical Guidance:** Constant reinforcement of appropriate AI usage
4. **Student Agency:** Students control their learning pace and assistance level

### Key User Flows

#### Flow 1: Assignment Support Journey

1. Student uploads assignment requirements
2. System analyzes and creates personalized learning pathway
3. Student completes competency verification challenges
4. Student earns points through demonstrated understanding
5. Student accesses graduated AI assistance using earned points

6. Student builds solution incrementally with guided support
7. Student downloads completed work with learning documentation

## **Flow 2: Global Challenge Engagement**

1. Student browses curated challenge library
2. Student selects challenge matching current skill level
3. Student attempts problem independently
4. Student uses earned AI assistance for learning support
5. Student completes challenge and earns points
6. Student advances to next difficulty level

## **UI/UX Design Requirements**

### **Dashboard Design:**

- Clear separation between practice and assignment modes
- Progress visualization for current learning pathways
- Point balance and earning opportunities prominently displayed
- Recent activity and achievement highlights

### **Assignment Interface:**

- Side-by-side assignment requirements and work environment
- Progress tracker showing learning pathway completion
- AI assistance chat interface with educational tone
- Code editor with real-time collaboration features

### **Mobile Experience:**

- Full feature parity with desktop version
- Touch-optimized coding interface
- Offline capability for learning content review
- Push notifications for learning reminders and achievements

## **Business and Legal Considerations**

### **Revenue Model**

- **Freemium Structure:** Basic features free, premium assistance levels paid
- **Pricing Tiers:** \$12.99/month premium, \$19.99/month professional
- **Institutional Licensing:** Custom pricing for university partnerships
- **International Pricing:** Regional adjustment for market accessibility



## Legal Framework

- **Terms of Service:** Clear appropriate use guidelines and student responsibilities
- **Privacy Policy:** FERPA and GDPR compliant data handling
- **Academic Integrity Policy:** Partnership with institutions on appropriate use
- **Intellectual Property:** Student ownership of their created work

## Risk Mitigation

- **Advisory Board:** Academic integrity experts and educational technology leaders
- **Usage Monitoring:** Pattern analysis for inappropriate behavior identification
- **Institutional Partnerships:** Proactive collaboration rather than competitive positioning
- **Legal Review:** Ongoing compliance assessment and policy refinement

## Success Metrics and KPIs

### Educational Effectiveness

- **Learning Retention:** 40% improvement vs. traditional methods (measured through follow-up assessments)
- **Concept Transfer:** Students can explain AI-assisted work portions independently
- **Skill Development:** Progressive advancement through competency levels
- **Academic Performance:** Grade improvements in supported courses

### Platform Engagement

- **Daily Active Users:** 60%+ of registered students using platform weekly
- **Learning Pathway Completion:** 80%+ completion rate for started assignments
- **Point Earning Rate:** Average 50 points earned per assignment
- **Community Participation:** 40%+ of users engaging in peer features

### Business Viability

- **User Acquisition:** 50% month-over-month growth in first year
- **Premium Conversion:** 15%+ conversion from free to paid tiers
- **Student Retention:** 85%+ semester-over-semester retention
- **Institutional Partnerships:** 25+ university partnerships within 18 months

## **Academic Integrity**

- **Honor Code Compliance:** 95%+ adherence to appropriate use policies
- **Institutional Satisfaction:** 4.0+/5 rating from partnered universities
- **Misconduct Reports:** <0.1% of users reported for academic integrity violations
- **Transparency Usage:** 60%+ of students willing to share usage reports with instructors

## **Implementation Timeline**

### **Phase 1: Core Platform Development (Months 1-6)**

#### **Month 1-2: Foundation**

- User authentication and basic platform architecture
- Assignment upload and analysis system
- Basic competency verification framework

#### **Month 3-4: AI Integration**

- Graduated assistance system implementation
- Educational guardrails and response filtering
- Point-based access control system

#### **Month 5-6: User Experience**

- Dashboard and interface development
- Mobile responsive design
- Beta testing with 100 student volunteers

### **Phase 2: Advanced Features (Months 7-12)**

#### **Month 7-8: Enhanced AI Capabilities**

- Advanced copilot functionality
- Personalized learning path optimization
- Peer interaction and community features

#### **Month 9-10: Institutional Tools**

- Transparency and reporting systems
- LMS integration capabilities
- University partnership pilot program

#### **Month 11-12: Scale Preparation**

- Performance optimization

- Security auditing and compliance verification
- Customer support system implementation

## **Phase 3: Launch and Growth (Months 13-18)**

### **Month 13-14: Public Launch**

- Marketing campaign execution
- Student acquisition programs
- University partnership expansion

### **Month 15-16: Feature Enhancement**

- Advanced analytics and personalization
- Portfolio and career development features
- International market expansion

### **Month 17-18: Optimization**

- Performance monitoring and optimization
- Feature refinement based on usage data
- Long-term growth strategy implementation

## **Competitive Differentiation Arguments**

### **Why This Platform Advances Education Rather Than Undermining It**

#### **1. Competency-First Design**

Unlike tools that provide immediate answers, our platform requires demonstrated understanding before any assistance. Students cannot bypass learning - they must engage with concepts authentically to progress.

#### **2. Professional Preparation**

Modern software engineers work in AI-assisted environments. Our platform teaches appropriate AI usage patterns that transfer directly to professional settings, preparing students for career success.

#### **3. Educational Research Foundation**

Our approach is based on peer-reviewed research showing that scaffolded learning with earned assistance produces superior educational outcomes compared to both unrestricted AI access and complete AI prohibition.

#### **4. Transparency and Accountability**

Complete documentation of learning pathways and AI assistance usage enables appropriate oversight while respecting student privacy and autonomy.

#### **5. Institutional Partnership Approach**

Rather than operating in opposition to educational institutions, we provide tools for collaboration and

transparency, supporting institutional goals of student learning and academic integrity.

## Addressing Academic Fraud Concerns

### The Critical Distinction:

- **Academic Fraud Tools:** Provide solutions without learning requirements
- **Our Platform:** Requires learning demonstration before providing any assistance

### Evidence of Educational Value:

- Students must explain their approach and understanding at every stage
- AI assistance is contextual and educational, never solution-providing
- Learning verification occurs before download capability is enabled
- Usage documentation supports rather than hides the educational process

### Professional Ethics Modeling:

- Teaches when AI assistance is appropriate vs. inappropriate
- Develops judgment about tool usage in professional contexts
- Creates habits of transparency and appropriate disclosure
- Builds skills that enhance rather than replace human capability

## Conclusion and Recommendation

This Product Requirements Document outlines a revolutionary approach to AI integration in software engineering education that addresses the fundamental challenges facing students and institutions today. The Guided Learning Platform provides practical value to students while maintaining educational integrity through innovative competency verification and graduated assistance systems.

### Key Success Factors:

1. **Mandatory learning verification** ensures educational value
2. **Transparent documentation** supports institutional trust
3. **Flexible integration options** accommodate diverse institutional needs
4. **Professional preparation focus** justifies AI assistance as career development
5. **Strong ethical framework** prevents misuse while enabling appropriate usage

**Recommendation:** Proceed with full platform development. This product addresses genuine market needs while advancing educational outcomes, creating sustainable competitive advantages through ethical innovation in educational technology.

The comprehensive safeguards, learning-first design, and institutional collaboration options position this platform to become the definitive solution for ethical AI integration in software engineering education, providing lasting value to all stakeholders while building a scalable, profitable business.

