

# Product Requirements Document (PRD)

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## Universal Educational Chatbot Platform

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### Document Information

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- **Version:** 3.1.0
  - **Last Updated:** September 14, 2025
  - **Project Status:** Phase 4 Complete - Enhanced Chat Reliability & Intelligence
  - **Next Phase:** Optional Phase 5 - Advanced Integrations & Mobile Apps
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## 1. Executive Summary

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### Vision

Create a universal AI-powered educational chatbot platform that facilitates dynamic assessments and interactive learning across ALL academic subjects, with secure teacher authentication and comprehensive session management, enabling educators to conduct real-time formative assessments with 20-30 students simultaneously.

### Success Metrics

- Support 20-30 concurrent students per session across any subject
  - Generate contextually relevant questions with progressive difficulty for all academic disciplines
  - Provide secure teacher accounts with session ownership and limits
  - Maintain academic integrity through copy/paste prevention
  - Export comprehensive assessment reports (individual .md files + consolidated CSV)
  - Support unlimited subjects and topics through flexible configuration
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## 2. Product Overview

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### Core Value Proposition

- **For Teachers:** Secure account management, streamlined session creation across all subjects, real-time student monitoring, and automated assessment generation with 10-session management system
- **For Students:** Interactive learning experience with personalized difficulty progression, immediate feedback, and academic integrity safeguards
- **For Schools:** Universal assessment tool supporting all academic subjects, scalable deployment with teacher authentication, enhanced classroom engagement and data-driven insights

### Target Users

- **Primary:** High school teachers across ALL academic subjects (grades 9-12)

- **Secondary:** Middle school educators and college instructors
  - **Students:** Learners in any academic subject area
  - **Stakeholders:** School administrators, curriculum coordinators, IT departments
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## 3. Functional Requirements

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### 3.1 Authentication & User Management

- **Teacher Authentication**
- ☒ Secure signup process with email and password validation
- ☒ Login system with encrypted credential storage
- ☒ Protected dashboard access requiring authentication
- ☒ Account profile management and settings
- ☒ Secure session management with automatic token refresh







### 3.2 Teacher Dashboard

- **Session Creation**
- ☒ Subject-agnostic structured forms for any academic discipline
- ☒ Mandatory concept names and learning objectives
- ☒ Configurable session types (Pre-Assessment, Formative Check, Review Session, Unit Assessment, Final Review)
- ☒ Universal assessment focus areas applicable to all subjects
- ☒ Difficulty progression settings (Gradual, Adaptive, Mixed, Fixed Level)
- ☒ Additional context for recent activities or upcoming topics
- **Session Management**
- ☒ 10-session limit per teacher account with deletion prompts
- ☒ User-specific session filtering and ownership validation
- ☒ Real-time participant monitoring
- ☒ Live session statistics and progress tracking
- ☒ Session control (start, pause, end)
- ☒ Assessment scoring and feedback generation








### 3.3 Student Interface

- **Session Participation**
- ☒ Simple join process (name + session code, no authentication required)
- ☒ Real-time chat interface with AI tutor
- ☒ Progressive difficulty scaling (Basic → Scenario → Advanced)
- ☒ Responsive design for various devices
- **Academic Integrity Features**
- ☒ Copy/paste prevention in chat interface and input fields
- ☒ Right-click context menu disabled
- ☒ Keyboard shortcut prevention (Ctrl+C, Ctrl+V)
- ☒ Visual indicators for academic integrity measures

### 3.4 AI Chatbot Intelligence





- **Conversation Management**
-  Context-aware responses based on session configuration across all subjects
-  Concise responses (2-3 sentences for formative/review sessions)
-  Progressive difficulty adjustment based on student performance
-  Subject-appropriate examples and scenarios for any academic discipline
-  Age-appropriate content adaptable to different grade levels
-  Universal educational terminology and concepts

### 3.4 Assessment & Reporting




- **Data Collection**
  -  Complete chat log storage with timestamps
  -  Question difficulty level tracking
  -  Student engagement metrics
  - **Report Generation** (Phase 2)
  -  Individual student .md assessment files
  -  Consolidated CSV reports for class analysis
  -  Understanding score calculations
  -  Feedback summaries
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## 4. Technical Requirements




### 4.1 Performance

-  Support 20-30 concurrent users per session
-  Response time < 2 seconds for chat interactions
-  Real-time updates for participant tracking
-  Session data persistence across browser refreshes

### 4.2 Scalability


-  Horizontal scaling capability through stateless design
-  Database optimization for concurrent sessions
-  Cloud-ready architecture for deployment




### 4.3 Data Management

-  PostgreSQL database for structured data
  -  JSON storage for flexible chat logs and session configurations
  -  Data retention policies for student privacy
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## 5. User Experience Requirements

### 5.1 Teacher Experience

-  **UPDATED:** Streamlined session creation (removed definition field, mandatory validation)

-  Intuitive dashboard with clear navigation
-  Real-time visibility into student progress
-  Quick session setup (< 5 minutes)





## 5.2 Student Experience

-  **UPDATED:** More concise chatbot responses (especially for quick assessments)
-  Simple join process (< 30 seconds)
-  Engaging conversational interface
-  Clear feedback on progress and difficulty level

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## 6. Constraints & Assumptions

### Technical Constraints

-  Built on Next.js 14 with TypeScript
-  Uses AbacusAI LLM API for chatbot responses
-  PostgreSQL database with Prisma ORM
-  Responsive web application (no native mobile apps)






### Business Constraints

- Target deployment: Educational institution networks
- Privacy compliance: Student data protection requirements
- Usage patterns: Classroom session durations (15-45 minutes)






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## 7. Success Criteria




### Phase 1 ( COMPLETED)


-  Core web application with teacher and student interfaces
-  Real-time chatbot functionality with difficulty progression
-  Session management and participant tracking
-  Responsive design and error handling
-  **UPDATED:** Improved UX with concise responses and mandatory field validation

### Phase 2 ( COMPLETED)

-  Assessment scoring algorithm implementation
-  Individual student report generation (.md files)
-  Consolidated class reports (CSV export)
-  Advanced analytics dashboard
-  **CRITICAL FIX:** Session management reliability (v2.0.2)

### Phase 3 ( FUTURE)

-  Integration with learning management systems
-  Advanced AI features (sentiment analysis, learning path recommendations)
-  Mobile application development

-  Multi-language support
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## 8. Risk Mitigation

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### Technical Risks

- **AI Response Quality:** Implemented structured prompting with session context
- **Concurrent User Load:** Stateless architecture with database optimization
- **Data Privacy:** No sensitive data collection, anonymous session participation

### Operational Risks

- **Teacher Adoption:** Intuitive interface design and comprehensive documentation
  - **Student Engagement:** Progressive difficulty and real-world business scenarios
  - **Technical Support:** Clear error messages and fallback mechanisms
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## 9. Recent Updates

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### Version 2.0.2 (September 14, 2025) - Critical Production Fix

- **RESOLVED: Session Stopping Failure:** Fixed critical bug preventing teachers from properly ending sessions
- **Enhanced System Reliability:** Improved error handling and database transaction management
- **Production Ready:** System now fully stable for classroom deployment

### Version 2.0.1 (September 14, 2025) - Assessment & Reporting Complete

- **Assessment Scoring Engine:** Full implementation of understanding score calculations
- **Report Generation:** Individual student .md files and consolidated CSV exports
- **Time Tracking:** Complete session duration tracking and "Leave Session" functionality
- **Analytics Dashboard:** Comprehensive performance metrics and reporting

### Version 1.1 (September 14, 2025)

- **Chatbot Response Optimization:** Reduced wordiness, especially for formative assessments and review sessions
  - **Form Simplification:** Removed definition field from concept creation
  - **Mandatory Field Validation:** Enhanced validation for concept names and learning objectives
  - **UI Improvements:** Clear indication of required fields with asterisk (\*) markers
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## Appendix

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### Business Concepts Supported

- Marketing (segmentation, targeting, positioning)
- Finance (budgeting, cash flow, investment analysis)
- Operations (supply chain, quality management)

- Entrepreneurship (business planning, market research)
- Ethics and Social responsibility

### **Assessment Focus Areas**

- Vocabulary Understanding
- Concept Application
- Critical Thinking
- Problem Solving
- Case Study Analysis
- Real-world Connections