Product Requirements Document (PRD)

Universal Educational Chatbot Platform

Document Information

- **Version**: 3.0.0
- **Last Updated**: September 14, 2025
- **Project Status**: Phase 3 Complete - Authentication & Multi-Subject Platform
- **Next Phase**: Optional Phase 4 - Advanced Integrations & Mobile Apps

1. Executive Summary

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

2. Product Overview

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

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

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

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

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