

# SportsGoalie (SmarterGoalie) - Comprehensive Feature Documentation

**Platform Name:** SportsGoalie / SmarterGoalie **Version:** V3 **Technology Stack:** Next.js 14, TypeScript, Firebase (Firestore, Auth, Storage), Anthropic Claude API, Tailwind CSS, shadcn/ui **Deployment:** Vercel (<https://sportsgoalie.vercel.app>) **Last Updated:** December 8, 2025

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## Platform Overview

SportsGoalie is a **comprehensive digital sports coaching platform** specifically designed for **hockey goalies** (though extensible to other sports). It combines structured learning, performance tracking, interactive assessments, and coach-student communication in a modern, mobile-first web application.

## Core Mission

- Help athletes learn goaltending skills through structured courses
- Track performance through detailed game/practice charting
- Assess knowledge through interactive video-based quizzes
- Enable personalized coaching through video review and messaging
- Provide analytics-driven insights for continuous improvement

## Key Differentiators

1. **AI-Powered Coaching Assistant** - Claude-powered chatbot providing personalized, context-aware guidance site-wide
2. **Dynamic Performance Charting System** - Flexible form templates for tracking goalie performance

3. **Video-Based Interactive Quizzes** - Questions embedded at specific timestamps in training videos
  4. **Video Upload & Coach Review** - Students upload training videos for personalized feedback
  5. **Form Template Builder** - Admin can create custom performance tracking forms
  6. **Comprehensive Analytics** - Detailed performance trends, consistency metrics, and insights
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## User Roles

### 1. Student

- Primary end-users (hockey goalies)
- Can enroll in courses, complete skills, take quizzes
- Upload training videos for coach review
- Chart their own game/practice sessions
- Track personal progress and analytics
- Receive messages and feedback from coaches

### 2. Admin/Coach

- Platform administrators and coaches
  - Full access to all platform management features
  - Create and manage courses, skills, quizzes, and content
  - Review student videos and provide feedback
  - Create custom form templates for performance tracking
  - View student analytics and performance data
  - Send messages and instructions to students
  - Manage user accounts and platform settings
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## Student Features

### Learning & Courses

#### Course Enrollment

- **Browse Course Catalog:** View all available sports courses (Hockey Goalie, Soccer Goalie, etc.)
- **Course Details:** See course descriptions, difficulty levels, estimated completion time
- **Skill Overview:** View all skills within a course before enrolling
- **Enroll in Courses:** One-click enrollment in courses of interest
- **Course Progress Tracking:** Visual progress bars showing completion percentage

## Skill Learning

- **Structured Skill Modules:** Each course contains multiple skills to master
- **Rich Content Display:**
  - Text-based learning content (HTML formatted)
  - Embedded images with captions
  - YouTube video integration with player controls
  - External resource links (PDFs, websites, videos)
- **Learning Objectives:** Clear list of what you'll learn
- **Prerequisites Tracking:** Skills locked until prerequisites are met
- **Difficulty Indicators:** Beginner, Intermediate, Advanced labels
- **Time Estimates:** Estimated time to complete each skill

## Progress Management

- **Bookmark Skills:** Save skills for later review
  - **Personal Notes:** Add notes to any skill for future reference
  - **Completion Tracking:** Mark skills as complete
  - **Video Progress:** Track time watched for video content
  - **Quiz Scores:** See quiz results tied to each skill
  - **Overall Dashboard:** Central view of all course progress
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## Interactive Video Quizzes

### Quiz Taking Experience

- **Video-Embedded Questions:** Questions appear at specific timestamps during video playback
- **Automatic Pause:** Video pauses when a question appears
- **Multiple Question Types:**
  - Multiple choice (single or multiple answers)
  - True/False
  - Descriptive/Open-ended
  - Fill-in-the-blank
- **Question Hints:** Optional hints available for guidance
- **Immediate Feedback:** See if answers are correct right away (configurable)
- **Explanations:** Detailed explanations for each answer
- **Progress Indicator:** Visual progress bar showing questions completed

### Quiz Features

- **Playback Controls:**
  - Variable playback speeds (0.5x to 2x)
  - Rewind capability (if enabled)

- Skip ahead restrictions (configurable)
- **Score Tracking:** Real-time score calculation
- **Time Tracking:** Monitor time spent on quiz
- **Resume Capability:** Return to incomplete quizzes
- **Results Page:** Comprehensive results with:
  - Overall score and percentage
  - Question-by-question breakdown
  - Correct vs. incorrect answers
  - Time spent per question
  - Recommendations for review

## Quiz History

- **Attempt History:** View all past quiz attempts
  - **Score Trends:** See improvement over time
  - **Average Scores:** Compare performance across attempts
  - **Best Scores:** Track personal best performances
- 

## Performance Charting System

### Session Management

- **Create Sessions:**
  - Game sessions (vs opponent)
  - Practice sessions
  - Add date, time, location
  - Tag sessions (home, away, tournament, etc.)
- **Session Types:** Differentiate between games and practices
- **Session Status:** Track session stages (scheduled, in-progress, completed)
- **Opponent Tracking:** Record opponent names for games
- **Result Recording:** Win/Loss/Tie tracking

**Dynamic Charting Forms** The platform uses a **flexible form template system** allowing coaches to create custom tracking forms. Current implementation includes a comprehensive hockey goalie performance tracker:

### Pre-Game Preparation

- **Game Readiness:**
  - Well rested (Yes/No with comments)
  - Fueled for game (Yes/No with comments)
- **Mindset:**
  - Mind cleared (Yes/No with comments)
  - Mental imagery practiced (Yes/No with comments)
- **Pre-Game Routine:**

- Ball exercises completed
- Stretching completed
- Other routine items
- **Warm-Up Assessment:**
  - Looked engaged
  - Lacked focus
  - Team warm-up needs adjustment

## Game Overview

- **Goals Tracking by Period:**
  - Good goals allowed (Period 1, 2, 3)
  - Bad goals allowed (Period 1, 2, 3)
- **Degree of Challenge:** Rate game difficulty (1-10 scale per period)

## Period-by-Period Performance (Periods 1, 2, 3)

- **Mindset:**
  - Focus consistency/inconsistency
  - Decision making (strong, improving, needs work)
  - Body language (consistent/inconsistent)
- **Skating:**
  - In sync with puck
  - Improving
  - Weak
  - Not in sync
- **Positional Play:**
  - Above icing line (poor, improving, good, angle issues)
  - Below icing line (poor, improving, good, strong)
  - Four-arch level tracking with specific point selection
- **Rebound Control:**
  - Quality assessment (poor, improving, good)
  - Consistency (consistent/inconsistent)
- **Freezing Puck:**
  - Quality rating
  - Consistency tracking
- **Team Play (Period 3 only):**
  - Setting up defense (poor, improving, good)
  - Setting up forwards (poor, improving, good)

## Overtime & Shootout

- **Overtime Performance:**
  - Mindset focus
  - Decision making
  - Skating performance
  - Positional game

- Rebound control
- Freezing puck
- **Shootout Statistics:**
  - Result (won/lost)
  - Shots saved (0-10)
  - Shots scored against (0-10)
  - Dekes saved (0-10)
  - Dekes scored against (0-10)
  - Comments

### **Post-Game**

- **Review Completion:** Track whether post-game review was completed
- **Additional Comments:** Free-form notes about the session

### **Charting Features**

- **Session Calendar View:** Visual calendar showing all sessions
  - **Calendar Heatmap:** Color-coded calendar showing charting activity
  - **Session Details:** View complete charting data for any session
  - **Edit Capability:** Update charting data after submission
  - **Partial Save:** Save incomplete forms and return later
  - **Completion Percentage:** Track how much of each form is complete
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## **Personal Analytics Dashboard**

### **Overview Statistics**

- **Total Sessions:** Count of all games and practices
- **Completed Sessions:** Sessions with charting data
- **Current Streak:** Consecutive days with activity
- **This Month Stats:** Session count for current month
- **Completion Rate:** Percentage of sessions charted

**Performance Analytics** The platform provides **comprehensive analytics** based on charting data:

### **Goals Analysis**

- **Average Good Goals per Game:** Track quality saves
- **Average Bad Goals per Game:** Identify areas for improvement
- **Good/Bad Ratio:** Performance indicator
- **Goals by Period:** See which periods are strongest/weakest
- **Trend Analysis:** Compare recent vs. older performance

## Challenge & Difficulty

- **Average Challenge Rating:** How difficult games have been (1-10)
- **Challenge Consistency:** Standard deviation of difficulty
- **Performance vs. Challenge:** Compare performance at different difficulty levels

## Mindset Performance

- **Focus Consistency:** Percentage of periods with consistent focus
- **Decision Making Strength:** Percentage of strong decision making
- **Body Language:** Consistency tracking
- **Trend Indicators:** Improving, stable, or declining

## Technical Skills

- **Skating Performance:** In-sync percentage and trends
- **Positional Play:** Strong positioning percentage
- **Rebound Control:** Quality and consistency percentages
- **Freezing Puck:** Quality and consistency metrics

## Team Play

- **Setting Up Defense:** Quality assessment
- **Setting Up Forwards:** Quality assessment
- **Period 3 Performance:** Specific team play metrics

## Pre-Game Adherence

- **Equipment Check:** Completion percentage
- **Mental Preparation:** Adherence tracking
- **Warm-Up Quality:** Assessment scores
- **Physical Preparation:** Completion rate
- **Overall Prep Score:** Combined metric (0-100)

## Shootout Statistics

- **Total Shootouts:** Count participated in
- **Win Rate:** Success percentage
- **Shot Save Percentage:** Saves/total shots
- **Deke Save Percentage:** Dekes saved/total dekes

## Activity Tracking

- **Calendar Heatmap:** Visual representation of session frequency
- **Streak Tracking:** Current and longest streak
- **Session Frequency:** Average sessions per week/month
- **Time Periods:** Filter analytics by week, month, 3 months, or all time

## Recent Sessions Timeline

- **Session List:** Chronological view of recent sessions
  - **Quick Stats:** Good/bad goals at a glance
  - **Status Indicators:** Completion badges
  - **Jump to Details:** Click to view full session charting
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## Video Upload & Coach Feedback

### Video Upload

- **Upload Interface:** Drag-and-drop or click to upload
- **File Validation:** Supports MP4, MOV, AVI, WebM formats
- **Size Limits:** Maximum file size enforcement
- **Sport Selection:** Tag videos with relevant sport
- **Description Field:** Add context about the video
- **Upload Progress:** Real-time progress indicator
- **Firebase Storage:** Secure cloud storage integration

### Feedback Reception

- **Message Notifications:** Notified when coach provides feedback
  - **Video Review Messages:** Detailed feedback with video reference
  - **Course Recommendations:** Coaches can recommend specific courses
  - **Feedback History:** Archive of all received feedback
  - **Video Player:** Embedded player to review videos with feedback
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## Messaging System

### Inbox Features

- **Message Types:**
  - General messages
  - Instructions from coaches
  - Feedback on performance
  - Video review feedback
- **Unread Indicators:** Visual badges for new messages
- **Message Filters:**
  - Filter by type (general, instruction, feedback, video\_review)
  - Filter by read/unread status
  - Search by sender or content
- **Message Details:**
  - Subject and body
  - Attachments (images, videos, documents)
  - Timestamp

- Sender information

## Message Organization

- **Inbox View:** All messages in one place
  - **Message Count:** Total and unread counts
  - **Sorting:** By date, unread first
  - **Attachment Preview:** Icons showing attachment types
  - **Message Status:** Read/unread tracking
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## AI Coaching Chat (Claude-Powered)

**Overview** The platform features an **AI-powered coaching assistant** available site-wide to all users (students and admins). The chatbot uses Anthropic's Claude AI (claude-3-haiku model) to provide intelligent, context-aware assistance.

### Features

- **Site-Wide Availability:** Floating chat widget accessible from any page
- **Context-Aware Responses:** AI receives user progress data for personalized guidance
- **Real-Time Assistance:** Instant responses to questions
- **Multiple Use Cases:**
  - Technique questions and explanations
  - Platform navigation help
  - Learning recommendations
  - Motivational support and encouragement
  - Progress insights

**Context Injection** The AI chatbot has access to:  
- User enrollments and course progress  
- Quiz scores and performance history  
- Recent video uploads  
- Charting activity and statistics  
- This enables highly personalized and relevant responses

### Chat Features

- **Conversation History:** Maintains chat history during session
- **User-Friendly Interface:** Clean, intuitive chat interface
- **Message Formatting:** Markdown support for formatted responses
- **Loading States:** Clear indicators when AI is thinking
- **Error Handling:** Graceful error messages and retry options

### Privacy & Cost Control

- **Cost-Optimized:** Uses claude-3-haiku model for efficient operation

- **Context Privacy:** User data only used for current conversation
  - **No Data Storage:** Chat history not permanently stored
  - **Secure API:** Anthropic API key securely stored in environment variables
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## User Profile & Settings

### Profile Management

- **Personal Information:**
  - First and last name
  - Email address (verified)
  - Profile picture upload
  - Date of birth
  - Location (country, city)
- **Sports Interests:** Select interested sports
- **Experience Level:** Beginner, Intermediate, Advanced
- **Goals:** Personal learning objectives

### Preferences

- **Notification Settings:**
  - Progress notifications
  - Quiz result alerts
  - New content announcements
  - Reminder emails
- **Theme:** Light/Dark mode (if implemented)
- **Language:** Platform language preference
- **Timezone:** For accurate scheduling

### Account Management

- **Email Verification:** Verify email address
  - **Password Change:** Update password securely
  - **Account Deletion:** Request account deletion
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## Achievements & Gamification

### Achievement System

- **Achievement Types:**
  - Progress achievements (complete X skills)
  - Quiz achievements (score above X%)
  - Streak achievements (X day streak)
  - Time achievements (spend X hours learning)
  - Special achievements (unlock secrets)

- **Achievement Levels:** Common, Uncommon, Rare, Epic, Legendary
- **Progress Tracking:** See progress toward locked achievements
- **Unlock Notifications:** Celebrate when achievements are unlocked

### Leaderboards (Potential)

- **Score Rankings:** Compare quiz scores with peers
  - **Completion Rankings:** See who's completed the most skills
  - **Streak Rankings:** Longest learning streaks
- 

## Admin Features

### Dashboard Overview

#### Platform Statistics

- **User Metrics:**
  - Total users (students + admins)
  - New users this month
  - Active users (last 7 days)
  - User role distribution
- **Content Metrics:**
  - Total sports/courses available
  - Total skills available
  - Quiz attempts
  - Average quiz score
- **Engagement Metrics:**
  - Platform activity rate
  - System uptime percentage
  - Performance scores

#### Quick Actions

- **Content Management:** Jump to sports, skills, quizzes
  - **User Management:** Manage user accounts
  - **Video Reviews:** Pending video reviews count
  - **Analytics:** Platform-wide analytics
  - **Settings:** System configuration
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## Course & Content Management

### Sports (Course) Management

- **Create Sports:**
  - Name and description

- Category selection
- Difficulty level (beginner, intermediate, advanced)
- Estimated completion time
- Icon/color selection
- Cover image upload
- Tags and keywords
- Prerequisites (other sports)
- Featured flag
- **Edit Sports:** Update any sport details
- **Sport Ordering:** Control display order
- **Activate/Deactivate:** Control visibility
- **Delete Sports:** Remove sports (with safeguards)
- **Sport Metadata:** View enrollment and completion stats

## Skills Management

- **Create Skills:**
    - Skill name and description
    - Associate with sport
    - Difficulty level
    - Estimated time to complete (minutes)
    - Learning objectives list
    - Tags for searchability
    - Prerequisites (other skills)
    - Display order
  - **Content Authoring:**
    - Rich text editor for content
    - Image uploads with captions
    - YouTube video embedding
    - External resource links (PDF, website, video)
  - **Media Management:**
    - Upload images to Firebase Storage
    - YouTube video integration
    - Video thumbnails
    - Media ordering
  - **Skill Settings:**
    - Active/Inactive toggle
    - Featured flag
    - Order within sport
  - **Skill Analytics:** View completion rates and ratings
- 

## Quiz Management

### Video Quiz Creation

- **Quiz Setup:**
  - Title and description
  - Associate with sport and skill (mandatory)
  - Category and tags
  - Difficulty level
  - Estimated duration
  - Cover image/thumb nail
  - Instructions for students
- **Video Configuration:**
  - Upload video to Firebase Storage or use external URL
  - Video duration (auto-detected)
  - Thumbnail/poster image
  - Playback settings
- **Question Builder:**
  - Add questions at specific timestamps
  - Question types:
    - \* Multiple choice (single or multiple correct)
    - \* True/False
    - \* Descriptive/essay
    - \* Fill-in-the-blank
  - Question text and options
  - Correct answer marking
  - Points assignment per question
  - Explanations for answers
  - Hints (optional)
  - Media attachments for questions (images, video clips)
- **Quiz Settings:**
  - Allow playback speed change
  - Available playback speeds (0.5x - 2x)
  - Allow rewind
  - Allow skip ahead
  - Require sequential answers
  - Show progress bar
  - Auto-play next
  - Show correct answers (immediate/after submission)
  - Show explanations (immediate/after submission)
- **Publishing:**
  - Active/Inactive toggle
  - Published/Unpublished status
  - Visibility controls

## **Quiz Management Features**

- **Edit Quizzes:** Update any quiz details or questions
- **Preview Mode:** Test quiz before publishing
- **Duplicate Quiz:** Clone existing quizzes

- **Question Reordering:** Drag-and-drop question ordering
  - **Bulk Operations:** Activate/deactivate multiple quizzes
  - **Quiz Analytics:**
    - Total attempts
    - Completion rate
    - Average score
    - Average time spent
    - Drop-off points (where students abandon)
    - Question-level statistics
- 

## User Management

### User Administration

- **User List:**
    - View all registered users
    - Filter by role (student/admin)
    - Search by name or email
    - Sort by registration date, last login
  - **User Details:**
    - View full user profile
    - See enrollment history
    - Check progress across courses
    - Review quiz history
    - Message history
  - **User Actions:**
    - View user as admin
    - Promote student to admin
    - Demote admin to student
    - Suspend user account
    - Delete user account (with data removal)
    - Reset user password (trigger email)
  - **User Analytics:**
    - Total learning time
    - Skills completed
    - Quiz performance
    - Engagement metrics
- 

## Video Review Management

### Video Review Dashboard

- **Pending Videos:** Count of videos awaiting review
- **Review Queue:** Organized list of uploaded videos

- **Filtering Options:**
  - By status (pending, reviewed, feedback sent)
  - By student name
  - By upload date
  - By sport
- **Search:** Find specific videos quickly

## Video Review Process

- **Video Playback:**
    - Embedded video player
    - Full playback controls
    - Download option for offline review
    - Timestamp markers
  - **Student Information:**
    - Student name and email
    - Video description/context
    - Upload date
    - File size and format
  - **Feedback Composition:**
    - **Quick Feedback Form:**
      - \* Text feedback field
      - \* Recommend courses (multi-select)
      - \* One-click send
    - **Detailed Feedback Message:**
      - \* Rich text editor
      - \* Attach images, videos, documents
      - \* Reference specific timestamps
      - \* Send as formal message
  - **Course Recommendations:**
    - Select from all available courses
    - Add multiple recommendations
    - Recommendations appear in student messages
  - **Status Tracking:**
    - Pending review
    - Under review (marked but not sent)
    - Feedback sent
  - **Review History:** See all past feedback for a video
- 

## Form Template Management

**Dynamic Form Builder** The platform features a powerful form template system for creating custom performance tracking forms:

### Template Creation

- **Template Information:**
  - Name and description
  - Associate with sport
  - Version number (auto-incremented)
  - Active/Inactive toggle
  - Archive capability
- **Section Builder:**
  - Add multiple sections to template
  - Section title and description
  - Section icon selection (Lucide icons)
  - Section ordering
  - Repeatable sections (e.g., “Period” section repeated 3 times)
  - Conditional sections (show if certain conditions met)

**Field Types & Configuration** The form builder supports comprehensive field types:

1. **Yes/No Fields:**
  - Boolean value
  - Optional comment field
  - Comment required/optional toggle
  - Custom comment label
2. **Radio Buttons (Single Selection):**
  - Custom options list
  - Pre-defined option sets (poor/improving/good/strong)
  - Comments field
  - Default selection
3. **Checkboxes (Multiple Selection):**
  - Multiple choice options
  - Allow all/limit selections
  - Comments field
4. **Numeric Input:**
  - Min/max validation
  - Default value
  - Units (optional)
  - Number formatting
5. **Scale (Rating):**
  - Min and max values (e.g., 1-10)
  - Step size
  - Label customization
  - Visual representation
6. **Text Input:**
  - Short text (single line)
  - Long text (textarea)
  - Min/max length validation
  - Placeholder text

- Regex pattern validation
- 7. Date & Time:**
- Date picker
  - Time picker
  - Date range
  - Past/future restrictions

## Field Configuration

- **Validation Rules:**
  - Required field toggle
  - Min/max values (numeric)
  - Min/max length (text)
  - Pattern matching (regex)
  - Custom error messages
- **Analytics Configuration:**
  - Enable/disable analytics for field
  - Analytics type (percentage, average, sum, trend, consistency, distribution, count)
  - Category grouping for related fields
  - Display name override
  - Weight for weighted averages
  - Higher is better toggle
  - Target value for goal tracking
- **Conditional Display:**
  - Show field if another field meets condition
  - Conditions: equals, not equals, contains, greater than, less than
  - Dependent field selection
- **UI Configuration:**
  - Field order
  - Column span (half-width or full-width)
  - Help text/description
  - Placeholder text

## Template Management

- **Template Library:** View all created templates
  - **Template Details:** See complete template structure
  - **Template Versioning:** Track template changes over time
  - **Activate/Deactivate:** Control which template is currently active
  - **Template Migration:** Convert old data to new template format
  - **Usage Statistics:** See how many entries use each template
  - **Default Templates:** Initialize pre-built hockey goalie template
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## Analytics & Reports

### Platform Analytics

- **User Growth:**
  - Registration trends over time
  - Active user metrics
  - User retention rates
  - Churn analysis
- **Content Engagement:**
  - Most popular courses
  - Most accessed skills
  - Quiz participation rates
  - Video view counts
- **Performance Metrics:**
  - Average quiz scores by course
  - Skill completion rates
  - Time to complete courses
  - Drop-off points in courses
- **System Health:**
  - Page load times
  - Error rates
  - API response times
  - Database performance

### Student Analytics Dashboard

- **Individual Student Reports:**
    - Progress across all courses
    - Quiz performance history
    - Charting completion rates
    - Time spent learning
  - **Cohort Analysis:**
    - Compare students in same course
    - Identify struggling students
    - Recognize top performers
    - Engagement trends
  - **Dynamic Charting Analytics:**
    - Field-level statistics (percentage, average, distribution)
    - Category-level analytics (grouped fields)
    - Trend analysis (improving, stable, declining)
    - Consistency scores
    - Target progress tracking
    - Strengths and weaknesses identification
-

## Messaging Administration

### Message Management

- **Send Messages:**
    - Compose messages to individual students or groups
    - Select message type (general, instruction, feedback, video\_review)
    - Subject and body
    - Attach files (images, videos, documents)
    - Priority level (low, medium, high)
    - Expiration date (optional)
  - **Broadcast Messages:**
    - Send to all students
    - Send to students in specific course
    - Send to filtered user groups
  - **Message Templates:**
    - Save frequently used messages
    - Reuse templates for common communications
  - **Message Tracking:**
    - See which students have read messages
    - Delivery confirmation
    - Read receipts
- 

## Platform Settings

### General Settings

- **Platform Information:**
  - Platform name
  - Logo upload
  - Favicon
  - Description
  - Contact information
- **Maintenance Mode:**
  - Enable/disable platform access
  - Maintenance message customization
  - Scheduled maintenance windows
- **Feature Flags:**
  - Enable/disable registration
  - Enable/disable quizzes
  - Enable/disable achievements
  - Enable/disable notifications
  - Enable/disable content creation
  - Enable/disable video learning
  - Enable/disable social features
  - Enable/disable analytics tracking

## Security Settings

- **Authentication:**
  - Password requirements (length, complexity)
  - Email verification requirement
  - Session timeout duration
  - Remember me duration
- **Rate Limiting:**
  - API calls per minute
  - Quiz attempts per hour
  - Content upload per day
- **IP Restrictions** (if implemented)
- **Two-Factor Authentication** (if implemented)

## Content Settings

- **Language Support:**
    - Available languages
    - Default language
    - Translation management
  - **Cache Settings:**
    - User data TTL
    - Content TTL
    - Quiz TTL
    - Static assets TTL
- 

## Core Modules

### 1. Authentication Module

#### Features

- Firebase Authentication integration
- Email/password authentication
- Email verification required
- Password reset functionality
- Remember me functionality
- Session management
- Role-based access control (student/admin)
- Protected routes (client-side and server-side)
- Guest routes (redirect if already logged in)

#### Security

- Secure password hashing (Firebase)
- CSRF protection

- XSS prevention
  - SQL injection prevention (NoSQL database)
  - Rate limiting on auth endpoints
  - Session timeout
- 

## 2. Database Module

### Firestore Collections Structure

```
- users
  {userId}
    email, displayName, role, profile, preferences
    createdAt, updatedAt, lastLoginAt

- sports
  {sportId}
    name, description, icon, color, category
    difficulty, estimatedTimeToComplete, skillsCount
    imageUrl, tags, prerequisites
    metadata (enrollments, completions, ratings)

- skills
  {skillId}
    sportId, name, description, difficulty
    content, media (images, videos)
    externalResources, learningObjectives
    prerequisites, tags
    metadata (completions, ratings)

- video_quizzes
  {quizId}
    sportId, skillId (mandatory)
    title, description, videoUrl, videoDuration
    thumbnail, coverImage, instructions
    questions[] (with timestamps)
    settings (playback, rewind, etc.)
    metadata (attempts, scores, drop-offs)

- quiz_progress
  {progressId}
    userId, videoQuizId, sportId, skillId
    currentTime, questionsAnswered[]
    score, percentage, isCompleted
    watchTime, totalTimeSpent
```

```

- sport_progress
  {progressId}
    userId, sportId
    status, completedSkills[], progressPercentage
    timeSpent, streak
    rating, review

- skill_progress
  {progressId}
    userId, skillId, sportId
    status, progressPercentage, timeSpent
    bookmarked, notes, rating, quizScore
    videoProgress

- user_progress
  {userId}
    overallStats (timeSpent, skillsCompleted, quizzesCompleted)
    achievements[], lastUpdated

- charting_sessions
  {sessionId}
    studentId, type (game/practice)
    status, date, opponent, location, result
    tags[]

- charting_entries (Legacy)
  {entryId}
    sessionId, studentId, submittedBy
    preGame, gameOverview
    period1, period2, period3
    overtime, shootout, postGame
    additionalComments

- dynamic_charting_entries (New System)
  {entryId}
    sessionId, studentId
    formTemplateId, formTemplateVersion
    responses (dynamic form data)
    isComplete, completionPercentage
    signature

- form_templates
  {templateId}
    name, description, sport, version
    isActive, isArchived
    sections[] (with fields[])

```

```

    allowPartialSubmission
    usageCount

- student_videos
  {videoId}
    userId, studentName, studentEmail
    fileName, fileSize, storagePath, videoUrl
    sport, description
    status (pending/reviewed/feedback_sent)
    coachFeedback, recommendedCourses[]
    uploadedAt, reviewedAt, reviewedBy

- messages
  {messageId}
    fromId, fromName, toId (studentId)
    type (general/instruction/feedback/video_review)
    subject, message
    attachments[] (images, videos, documents)
    isRead, priority
    videoReviewId (if type is video_review)
    createdAt, expiresAt

- achievements
  {achievementId}
    name, description, icon, type
    criteria, points, rarity
    isActive, isSecret

- user_achievements
  {userAchievementId}
    userId, achievementId
    progress, isCompleted, unlockedAt
    isNotified

- notifications
  {notificationId}
    userId, type, title, message, data
    isRead, priority
    createdAt, expiresAt

```

---

### 3. Storage Module

#### Firebase Storage Structure

/storage

```
/users/{userId}
    profile-pictures/
/sports/{sportId}
    images/
/skills/{skillId}
    images/
    videos/ (if local)
/quizzes/{quizId}
    videos/
    thumbnails/
    question-media/
/student-videos/{userId}
    {videoId}/
/messages/{messageId}
    attachments/
```

### Storage Features

- Automatic file compression (images)
  - CORS configuration for public access
  - Security rules for authenticated upload
  - File size limits enforcement
  - Accepted file formats validation
  - Signed URLs for secure access
  - CDN distribution for performance
- 

## 4. Messaging Module

### Message Types

1. **General:** Standard communication
2. **Instruction:** Training instructions from coach
3. **Feedback:** Performance feedback
4. **Video Review:** Feedback on uploaded videos

### Message Features

- Rich text formatting
- File attachments (images, videos, documents)
- Read/unread status
- Message priority levels
- Expiration dates
- Message filtering and search
- Notification integration
- Video reference (for video review messages)
- Course recommendations (for video reviews)

---

## 5. Analytics Module

### Analytics Types

1. **User Analytics:** Individual student performance
2. **Platform Analytics:** Overall platform metrics
3. **Content Analytics:** Course and skill engagement
4. **Quiz Analytics:** Quiz performance and drop-offs
5. **Charting Analytics:** Performance tracking metrics

### Analytics Features

- Real-time calculation
  - Caching for performance
  - Trend analysis (improving, declining, stable)
  - Consistency scores
  - Comparative analytics
  - Goal tracking
  - Strength/weakness identification
- 

## Technical Architecture

### Frontend Architecture

#### Framework & Structure

- **Next.js 14** with App Router
- **TypeScript** (strict mode)
- **React Server Components** where applicable
- **Client Components** for interactivity
- **Tailwind CSS** for styling
- **shadcn/ui** component library
- **Lucide React** for icons

#### State Management

- **React Context** for global state (Auth, User)
- **Custom Hooks** for data fetching
- **Local State** with useState, useReducer
- **Real-time Updates** with Firestore listeners

#### Key Directories

```
/app
  /admin          # Admin pages
```

```

/auth          # Auth pages (login, register)
/charting      # Performance charting
/dashboard     # Student dashboard
/messages      # Messaging
/quiz/video    # Video quizzes
/sports        # Courses
/profile       # User profile

/src
/components
  /admin        # Admin components
  /auth         # Auth components
  /charting     # Charting components
  /quiz          # Quiz components
  /ui            # shadcn/ui components
/lib
  /auth         # Auth utilities
  /database     # Database services
    /services    # Service layer
  /utils         # Utility functions
/hooks          # Custom React hooks
/types          # TypeScript definitions

```

---

## Backend Architecture

### Database (Firestore)

- **NoSQL Document Database**
- **Real-time Listeners** for live updates
- **Optimistic UI Updates** for responsiveness
- **Batch Operations** for efficiency
- **Transactions** for data consistency
- **Offline Support** (PWA capability)

### Authentication (Firebase Auth)

- **Email/Password** authentication
- **Email Verification** required
- **Custom Claims** for role-based access
- **Token Refresh** automatic
- **Session Management** configurable timeout

### Storage (Firebase Storage)

- **CDN Distribution** for global access
- **Automatic Backup** by Firebase

- **Security Rules** for access control
- **CORS Configuration** for web access

### Security Rules

- **Firestore Rules:** Collection-level and document-level rules
  - **Storage Rules:** Path-based access control
  - **Role-Based Access:** Student vs Admin permissions
  - **Ownership Validation:** Users can only access their own data
- 

### Service Layer

**Service Architecture** All database operations go through a service layer for:  
- **Abstraction:** Hide Firestore implementation - **Validation:** Ensure data integrity - **Error Handling:** Consistent error responses - **Caching:** Improve performance - **Type Safety:** TypeScript interfaces - **Testing:** Easier to mock and test

### Key Services

1. **authService:** Authentication operations
  2. **userService:** User CRUD operations
  3. **sportsService:** Sports/course management
  4. **skillsService:** Skill management
  5. **videoQuizService:** Quiz operations
  6. **progressService:** Progress tracking
  7. **chartingService:** Charting operations
  8. **dynamicChartingService:** Dynamic form charting
  9. **formTemplateService:** Template management
  10. **dynamicAnalyticsService:** Analytics calculations
  11. **messageService:** Messaging operations
  12. **videoReviewService:** Video upload and review
  13. **analyticsService:** Platform analytics
  14. **enrollmentService:** Course enrollments
- 

## Data Models

### Core Entities

#### User

```
interface User {  
  id: string;  
  email: string;  
  displayName: string;
```

```

    role: 'student' | 'admin';
    profileImage?: string;
    emailVerified: boolean;
    preferences: UserPreferences;
    profile?: UserProfile;
    createdAt: Timestamp;
    updatedAt: Timestamp;
    lastLoginAt?: Timestamp;
}

```

### Sport (Course)

```

interface Sport {
    id: string;
    name: string;
    description: string;
    icon: string;
    color: string;
    category: string;
    difficulty: 'beginner' | 'intermediate' | 'advanced';
    estimatedTimeToComplete: number; // hours
    skillsCount: number;
    imageUrl?: string;
    tags: string[];
    prerequisites?: string[]; // sport IDs
    isActive: boolean;
    isFeatured: boolean;
    order: number;
    metadata: SportMetadata;
    createdAt: Timestamp;
    updatedAt: Timestamp;
    createdBy: string;
}

```

### Skill

```

interface Skill {
    id: string;
    sportId: string;
    name: string;
    description: string;
    difficulty: DifficultyLevel;
    estimatedTimeToComplete: number; // minutes
    content?: string; // Rich HTML content
    externalResources: ExternalResource[];
    media?: SkillMedia;
}

```

```

    prerequisites: string[]; // skill IDs
    learningObjectives: string[];
    tags: string[];
    hasVideo: boolean;
    isActive: boolean;
    order: number;
    metadata: SkillMetadata;
    createdAt: Timestamp;
    updatedAt: Timestamp;
    createdBy: string;
}

```

### VideoQuiz

```

interface VideoQuiz {
    id: string;
    title: string;
    description?: string;
    sportId: string; // MANDATORY
    skillId: string; // MANDATORY
    videoUrl: string;
    videoDuration: number; // seconds
    thumbnail?: string;
    coverImage?: string;
    instructions?: string;
    questions: VideoQuizQuestion[];
    settings: VideoQuizSettings;
    difficulty: DifficultyLevel;
    estimatedDuration: number; // minutes
    tags: string[];
    isActive: boolean;
    isPublished: boolean;
    category: string;
    createdAt: Timestamp;
    updatedAt: Timestamp;
    createdBy: string;
    metadata: VideoQuizMetadata;
}

```

### FormTemplate

```

interface FormTemplate {
    id: string;
    name: string;
    description?: string;
    sport?: string;

```

```

version: number;
isActive: boolean; // Only one active at a time
isArchived: boolean;
sections: FormSection[];
allowPartialSubmission: boolean;
requireSignature?: boolean;
createdAt: Timestamp;
updatedAt: Timestamp;
createdBy: string;
lastModifiedBy?: string;
usageCount?: number;
}

```

### Message

```

interface Message {
  id: string;
  fromId: string;
  fromName: string;
  toId: string; // studentId
  type: 'general' | 'instruction' | 'feedback' | 'video_review';
  subject: string;
  message: string;
  attachments?: MessageAttachment[];
  isRead: boolean;
  priority: 'low' | 'medium' | 'high';
  videoReviewId?: string; // if type is video_review
  createdAt: Timestamp;
  expiresAt?: Timestamp;
}

```

---

## Security & Authentication

### Authentication Flow

1. User registers with email/password
2. Email verification sent
3. User verifies email
4. User can now log in
5. Session token generated (Firebase)
6. Token stored in cookie/localStorage
7. Token validated on each request
8. Token auto-refreshes before expiry

## Authorization

- **Role-Based:** Student vs Admin
- **Resource-Based:** Users can only access their own data
- **Route Protection:** Client-side and server-side guards
- **Firestore Rules:** Database-level security
- **Storage Rules:** File access control

## Security Best Practices

- **HTTPS Only:** All traffic encrypted
  - **Password Hashing:** Firebase handles securely
  - **CSRF Protection:** Built into Firebase
  - **XSS Prevention:** React auto-escapes
  - **Input Validation:** Client and server-side
  - **Rate Limiting:** Prevent abuse
  - **Session Timeout:** Configurable
  - **Email Verification:** Required for activation
- 

## Analytics & Reporting

### Student Analytics

- **Progress Metrics:** Skills completed, time spent, courses enrolled
- **Quiz Performance:** Average scores, attempts, improvement trends
- **Charting Insights:** Performance categories, consistency, strengths/weaknesses
- **Streak Tracking:** Learning consistency, longest streaks
- **Goal Progress:** Achievement unlocking, target progress

### Admin Analytics

- **Platform Overview:** User count, content count, engagement rates
- **User Analytics:** Individual student performance, cohort analysis
- **Content Analytics:** Most popular courses/skills, completion rates
- **Quiz Analytics:** Average scores, drop-off points, question difficulty
- **Charting Analytics:** Field-level statistics, trend analysis
- **System Health:** Performance metrics, error rates, uptime

### Reporting Features

- **Real-Time Dashboards:** Live data updates
  - **Historical Trends:** Compare periods
  - **Export Options:** CSV, Excel, PDF, JSON
  - **Customizable Reports:** Select metrics and date ranges
  - **Scheduled Reports:** Automated report generation (future)
-

## Integrations

### Current Integrations

1. **Firebase:**
  - Authentication
  - Firestore Database
  - Storage
  - Hosting (via Vercel)
2. **Vercel:**
  - Hosting & CDN
  - Serverless Functions
  - Automatic Deployments
  - Custom Domain
3. **Anthropic Claude API:**
  - AI-powered chatbot (claude-3-haiku-20240307 model)
  - Context-aware coaching assistance
  - Site-wide availability
  - Cost-optimized model selection
4. **YouTube:**
  - Video embedding
  - Player API integration

### Potential Future Integrations

- **Email Service:** SendGrid, Mailgun for transactional emails
  - **Analytics:** Google Analytics, Mixpanel
  - **Payment:** Stripe for subscriptions
  - **Video Hosting:** Vimeo, Wistia for better video analytics
  - **Chat:** Real-time chat for coach-student communication
  - **Calendar:** Google Calendar for session scheduling
  - **Social Login:** Google, Facebook OAuth
  - **Mobile Apps:** React Native apps (iOS, Android)
- 

## Deployment & DevOps

### Development Environment

- **Local Development:** npm run dev
- **Environment Variables:** .env.local (git-ignored)
- **Firebase Emulators:** Test locally without production data

### Staging Environment

- **Vercel Preview Deployments:** Automatic for PRs
- **Branch Deployments:** Test specific branches

- **Separate Firebase Project:** Staging database

## Production Environment

- **Vercel Production:** Automatic on main branch merge
- **Custom Domain:** Production domain configured
- **Firebase Production:** Production database and storage
- **Monitoring:** Error tracking, performance monitoring
- **Analytics:** User behavior tracking

## CI/CD Pipeline

1. **Code Push:** Developer pushes to Git
  2. **Vercel Build:** Automatic build triggered
  3. **Type Check:** TypeScript validation
  4. **Linting:** ESLint checks
  5. **Build:** Next.js production build
  6. **Deploy:** Automatic deployment
  7. **Post-Deploy:** Run smoke tests
- 

## Performance Optimization

### Frontend Optimization

- **Code Splitting:** Route-based lazy loading
- **Image Optimization:** Next.js Image component
- **Bundle Analysis:** Monitor bundle size
- **Caching Strategy:** Aggressive caching for static assets
- **Lazy Loading:** Non-critical components loaded on demand
- **Memoization:** React.memo for expensive renders
- **Virtual Scrolling:** For long lists

### Backend Optimization

- **Firestore Indexes:** Optimized for common queries
- **Caching Layer:** Cache frequently accessed data
- **Batch Operations:** Reduce database calls
- **Pagination:** Limit data fetched per request
- **Real-Time Listeners:** Only for critical data
- **CDN:** Firebase Storage with CDN for media

### Database Optimization

- **Denormalization:** Store computed values
- **Composite Indexes:** For complex queries
- **Query Limits:** Prevent excessive data fetching

- **Offline Persistence:** Firestore local cache
- 

## Mobile Responsiveness

### Design Approach

- **Mobile-First:** Designed for mobile, enhanced for desktop
- **Responsive Breakpoints:** sm, md, lg, xl, 2xl (Tailwind)
- **Touch-Friendly:** Large tap targets, swipe gestures
- **Adaptive Layouts:** Grid/flexbox for all screen sizes

### Mobile Features

- **PWA Capability:** Installable as app
  - **Offline Support:** Basic offline functionality
  - **Touch Gestures:** Swipe navigation
  - **Mobile Navigation:** Hamburger menu, bottom nav
  - **Optimized Forms:** Mobile-friendly inputs
  - **Video Playback:** Native mobile video controls
- 

## Future Enhancements

### Planned Features

1. **Real-Time Chat:** Live messaging between coaches and students
  2. **Live Sessions:** Virtual coaching sessions via video call
  3. **Social Features:** Student community, forums, discussions
  4. **Advanced Analytics:** AI-powered insights and recommendations
  5. **Gamification:** Points, badges, leaderboards
  6. **Mobile Apps:** Native iOS and Android apps
  7. **Payment Integration:** Subscription plans, course purchases
  8. **Content Marketplace:** User-generated content
  9. **Multi-Language:** Full internationalization
  10. **Accessibility:** WCAG 2.1 AA compliance
  11. **API:** Public API for third-party integrations
  12. **Webhooks:** Real-time event notifications
  13. **Advanced Search:** Elasticsearch integration
  14. **Video Hosting:** Self-hosted video platform
  15. **Calendar Integration:** Schedule coaching sessions
-

## Conclusion

SportsGoalie (SmarterGoalie) is a **comprehensive, feature-rich sports coaching platform** built with modern web technologies. It provides:

- **AI-Powered Coaching Assistant** (Claude API) for intelligent, context-aware guidance
- **Complete Learning Management System** for sports courses
- **Interactive Video Quizzes** with timestamp-based questions
- **Dynamic Performance Charting** with customizable form templates
- **Video Upload & Coach Review** for personalized feedback
- **Messaging System** for coach-student communication
- **Comprehensive Analytics** for performance tracking
- **Admin Tools** for complete platform management
- **Mobile-Responsive Design** for access anywhere
- **Secure & Scalable Architecture** using Firebase, Vercel & Anthropic Claude

The platform is **production-ready**, actively deployed, and serving real students and coaches in the hockey goalie training space, with the flexibility to expand to other sports and use cases.

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