

SpeechWorks

Speech Therapy Treatment Tool

Technical Documentation

INEW 2434 - Advanced Web Programming

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1. Introduction

1.1 Project Overview

SpeechWorks is a comprehensive web-based speech therapy treatment tool designed specifically for speech-language pathologists (SLPs). The application provides an integrated platform for managing clients, conducting therapy sessions, delivering interactive activities, and tracking progress over time.

The system addresses the need for a modern, technology-enhanced solution that can improve efficiency of therapy practices while maintaining detailed documentation capabilities.

1.2 Purpose and Scope

The primary purposes of SpeechWorks include:

- Client management with articulation, fluency, voice, and language profiles
- Treatment goal setting and tracking
- Session scheduling with SOAP notes documentation
- Interactive therapy activities with progress tracking
- Progress visualization with visual analytics
- Resource library for therapy materials

1.3 Technology Stack

SpeechWorks is built using the following technologies:

Layer	Technology
Frontend	AngularJS 1.8.x, HTML5, CSS3, JavaScript
Backend	Python FastAPI with SQLAlchemy ORM
Database	MySQL 8.0
Storage	AWS S3 for file uploads
Authentication	JWT (JSON Web Tokens) with bcrypt

2. System Architecture

2.1 Multi-Tier Architecture

SpeechWorks follows a three-tier architecture pattern that separates concerns and enhances scalability:

Presentation Layer (Frontend)

The frontend consists of a single-page application (SPA) that runs in the user's browser. It handles user interface rendering, input validation, and client-side state management. It communicates with the backend exclusively through RESTful API calls.

Application Layer (Backend)

The backend is a Python FastAPI application that contains all business logic, authorization, data validation, and API endpoints. The main.py file initializes the FastAPI application, configures CORS middleware for cross-origin requests, and registers all routers on startup.

Data Layer (Database)

MySQL database stores all persistent data including user accounts, client records, sessions, progress data, and resource metadata. SQLAlchemy ORM provides database abstraction.

2.2 Backend Structure

The backend is organized into the following modules:

Module	Purpose
app/main.py	Application entry point, CORS config
app/routers/	API route handlers (auth, clients, sessions, etc.)
app/models/	SQLAlchemy database models
app/schemas/	Pydantic validation schemas
app/services/	Business logic (auth_service, s3_service)

2.3 Frontend Structure

The frontend follows AngularJS MVC pattern:

File/Folder	Purpose
index.html	Main HTML template with all views
js/app.js	Angular module, services (ApiService, ToastService)

File/Folder	Purpose
js/controllers/	Controllers for each view (Dashboard, Clients, Sessions, Activities, Resources)
css/styles.css	Custom CSS with CSS variables, responsive design

3. Database Design

3.1 Entity Relationship Diagram

The database follows a relational model with the following key relationships:

- **Users → Clients:** One-to-many (therapist has many clients)
- **Clients → Goals:** One-to-many (client has many treatment goals)
- **Clients → Sessions:** One-to-many (client has many therapy sessions)
- **Sessions → SessionActivities:** One-to-many (session has many assigned activities)
- **Clients → ProgressRecords:** One-to-many (client has many progress records)

3.2 Core Tables

Users Table

Column	Type	Description
id	Integer PK	Auto-increment primary key
email	String(255)	Unique login email
hashed_password	String(255)	Bcrypt hashed password
full_name	String(255)	Therapist's full name
license_number	String(100)	Professional license number

Clients Table

Column	Type	Description
id	Integer PK	Auto-increment primary key
therapist_id	Integer FK	Reference to users table
first_name, last_name	String(100)	Client name
date_of_birth	Date	Client DOB
diagnosis	Text	Speech/language diagnosis
is_active	Boolean	Active/inactive status

Sessions Table

Column	Type	Description
id	Integer PK	Auto-increment primary key
client_id	Integer FK	Reference to clients table
session_date	DateTime	Scheduled date/time
duration_minutes	Integer	Session length (15-90 min)
status	Enum	scheduled, in_progress, completed, cancelled
soap_*	Text	SOAP notes (subjective, objective, assessment, plan)

4. API Documentation

4.1 Authentication Endpoints

Method	Endpoint	Description
POST	/api/auth/register	Create new therapist account
POST	/api/auth/login	Authenticate and get JWT token
GET	/api/auth/me	Get current user info

4.2 Client Endpoints

Method	Endpoint	Description
GET	/api/clients	List all clients
POST	/api/clients	Create new client
GET	/api/clients/{id}	Get client details with goals
PUT	/api/clients/{id}	Update client information

4.3 Session Endpoints

Method	Endpoint	Description
GET	/api/sessions	List sessions with filters
POST	/api/sessions	Create new session
PUT	/api/sessions/{id}	Update session/SOAP notes
GET	/api/sessions/{id}/activities	Get session activities
PUT	/api/sessions/{id}/activities/{aid}	Update activity record

5. Frontend Application

5.1 Controllers Overview

MainController

Handles authentication state, navigation, and global functions. Manages login/logout, view switching, and toast notifications.

DashboardController

Displays summary statistics, today's sessions (sorted by proximity to current time), quick actions, and recent activity.

ClientsController

Manages client CRUD operations, treatment goals, progress history, and client detail views with tabs for info, goals, progress, and history.

SessionsController

Handles session scheduling, status management, SOAP notes, activity assignment, and navigation to activities. Includes time-based validation for status changes.

ActivitiesController

Manages interactive therapy activities, trial tracking, progress recording, and return navigation to sessions after completion.

ResourcesController

Handles resource library with file uploads to S3, categorization, and search functionality.

6. Session Activity Workflow

The session activity workflow allows therapists to seamlessly navigate between session management and therapy activities with automatic data synchronization.

6.1 Clickable Activities on Session Cards

Activity tags displayed on session cards are interactive based on session status:

- **In-Progress Sessions:** Activities are clickable if not yet completed (trials_attempted = 0)
- **Completed Activities:** Display green badge with checkmark and accuracy percentage (e.g., "✓ 85%")
- **Other Statuses:** Activities displayed as read-only tags with tooltip "Session must be In Progress to start"
- **Click Hint:** Shows "Click an activity to start" when incomplete activities exist

6.2 Activity Navigation Flow

When a user clicks an activity tag on an in-progress session:

1. System validates session is "in_progress" and activity not completed
2. Client is retrieved from session data
3. Pending activity data stored on \$rootScope.pendingActivity
4. Navigation triggers to Activities tab
5. ActivitiesController detects pending activity and auto-starts session with preselected client

6.3 Return Navigation After Completion

After activity completion:

- Progress record created via POST /api/progress
- Session activity record updated with trials_attempted, trials_correct, and accuracy
- \$rootScope.returnToSessionId set to trigger session reload
- Automatic navigation back to Sessions tab
- Session card updates to show completed activity with accuracy badge

7. Session Status Management

7.1 Status Values

Status	Description
scheduled	Session is scheduled for future date/time
in_progress	Session is currently active, activities can be started
completed	Session finished, all activities completed
cancelled	Session was cancelled (displayed grayed out)

7.2 Time-Based Status Validation

Manual status change to "in_progress" is validated against session time window:

- **Session Window:** session_date to (session_date + duration_minutes)
- **Validation:** Current time must be within session window
- **Error:** "Cannot start session - session time (HH:MM) does not match current time"

7.3 Auto-Complete Sessions

Sessions automatically complete when all assigned activities are done:

- **Trigger:** Immediately after session activities load (checkSessionAutoComplete function)
- **Condition:** All assigned activities have trials_attempted > 0
- **Result:** Status updated to "completed" with toast notification

7.4 Timezone Handling

Session dates use convertLocalDateTimeToISO() function which creates ISO strings with timezone offset instead of UTC conversion, ensuring times display correctly in user's local timezone.

8. UI Components

8.1 Session Card Actions

Each session card displays action buttons with labels (hidden on mobile < 768px):

Button	Label	Function
Notes Button	Notes & Activities	Opens SOAP notes modal
Edit Button	Edit Session	Opens session edit modal
Delete Button	Cancel	Cancels session

8.2 Cancelled Session Styling

Location	Styling
Sessions Tab Cards	60% opacity, gray background, gray left border
Dashboard Today's Sessions	50% opacity, gray background, gray text

8.3 Activity Completion Badge

Completed activities display with visual indicators:

- **Background:** Green (#D1FAE5) with green border
- **Badge:** Dark green background with "✓ XX%" showing accuracy
- **Interaction:** Not clickable, cursor default

9. AWS Cloud Integration

9.1 AWS Services Used

Service	Purpose
Amazon RDS	MySQL database hosting (db.t3.micro)
Amazon S3	File storage for therapy resources and uploads
Amazon EC2	Backend API hosting (optional)

9.2 S3 Configuration

The S3 service (`s3_service.py`) handles:

- Presigned URL generation for secure uploads
- File categorization by resource type
- Unique filename generation to prevent conflicts

9.3 Estimated Costs

Service	Monthly Cost
RDS (db.t3.micro)	\$15-25 (free tier eligible)
S3 Storage	\$1-5 (depends on usage)
EC2 (if used)	\$0 (750 hours/month free tier)

10. Deployment Guide

10.1 Backend Deployment

1. Clone repository and navigate to backend directory
2. Create virtual environment: python -m venv venv
3. Install dependencies: pip install -r requirements.txt
4. Configure .env file with database and S3 credentials
5. Run migrations to create database tables
6. Start server: uvicorn app.main:app --host 0.0.0.0 --port 8000

10.2 Frontend Deployment

1. Update API_BASE_URL in js/app.js to production backend URL
2. Deploy static files to web server (Nginx, Netlify, etc.)
3. Configure CORS on backend to allow frontend domain

10.3 Environment Variables

Variable	Description
DATABASE_URL	MySQL connection string
SECRET_KEY	JWT signing secret
AWS_ACCESS_KEY_ID	AWS credentials for S3
AWS_SECRET_ACCESS_KEY	AWS credentials for S3
S3_BUCKET_NAME	S3 bucket for file uploads

11. User Guide

11.1 Getting Started

1. Register a new account with your email and professional license number
2. Log in to access the dashboard
3. Add your first client with their information and diagnosis
4. Create treatment goals for the client
5. Schedule therapy sessions

11.2 Conducting Sessions

1. Navigate to Sessions tab
2. Change session status to "In Progress" when ready to start
3. Click on activity tags to start interactive therapy activities
4. Record correct/incorrect responses during activities
5. Session auto-completes when all activities are finished
6. Complete SOAP notes documentation

11.3 Tracking Progress

- View client progress in the Clients tab under Progress section
- Check activity history showing accuracy trends over time
- Update goal status as client progresses (In Progress, Mastered, etc.)

12. Implementation Plan

12.1 Development Timeline

Phase	Tasks
Week 1-2	Project setup, database design, authentication system
Week 3-4	Client management, goal tracking, session scheduling
Week 5-6	Interactive activities, progress tracking, SOAP notes
Week 7-8	Session-activity workflow, UI refinements, testing
Week 9-10	AWS integration, deployment, documentation

12.2 Future Enhancements

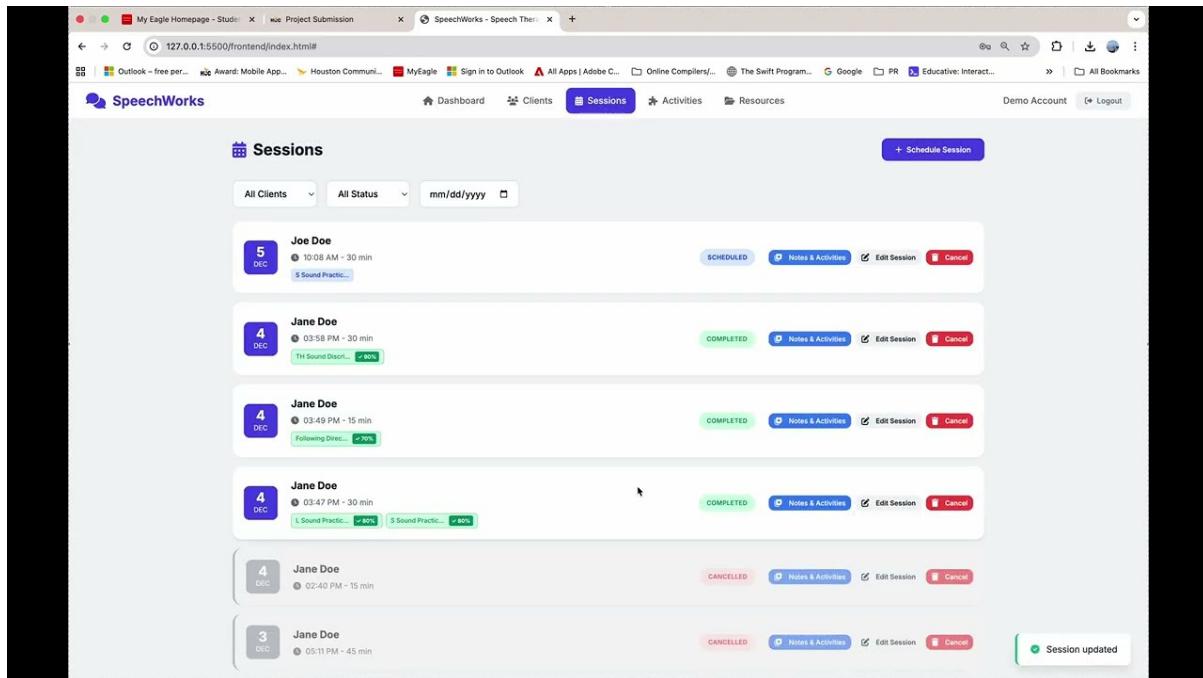
- Mobile-responsive native app version
- Video recording integration for session documentation
- Advanced analytics and reporting dashboards
- Multi-therapist practice management
- Parent/guardian portal for home practice
- Insurance billing integration

Conclusion

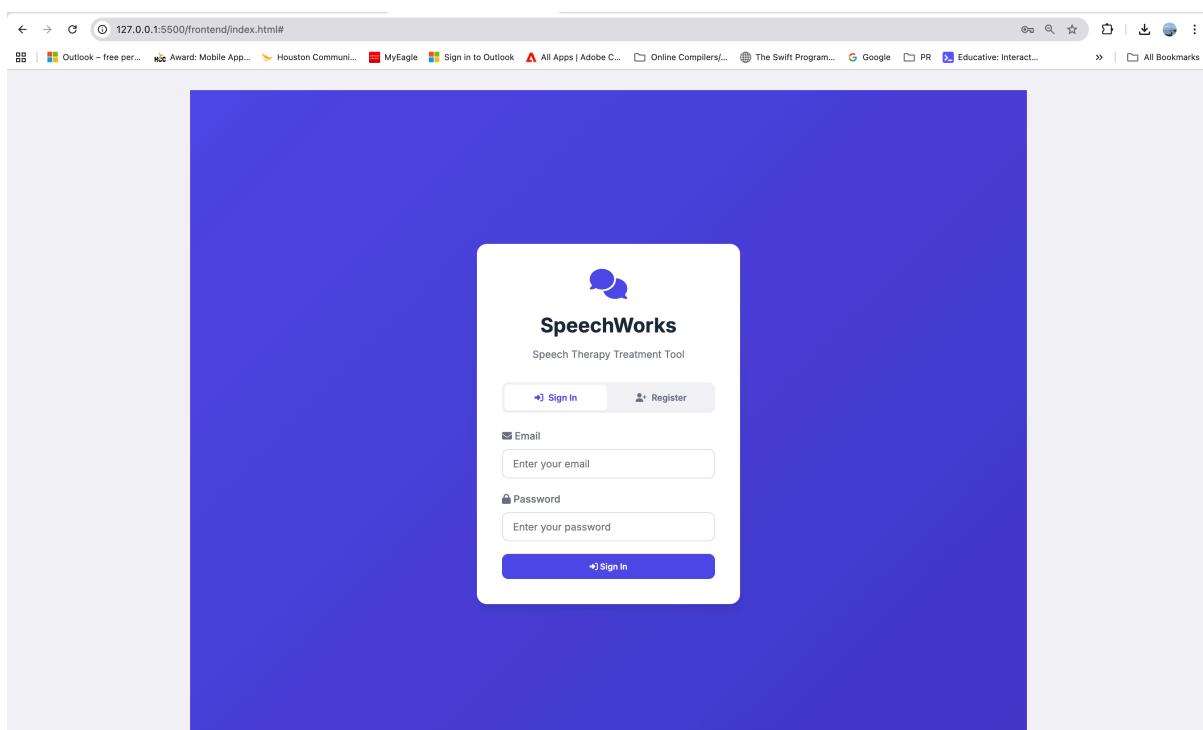
SpeechWorks provides a comprehensive solution for speech-language pathologists to manage their practice efficiently. The application combines client management, session scheduling, interactive therapy activities, and progress tracking in a single integrated platform. The session-activity workflow enables seamless navigation between scheduling and therapy delivery, while automatic status management reduces administrative burden.

Built with modern web technologies (AngularJS frontend, Python FastAPI backend, MySQL database), the application is designed for scalability and maintainability. AWS cloud integration provides reliable hosting and file storage capabilities.

13. Video Demonstrating SpeechWorks App Working



14. Screenshots of SpeechWorks App



SpeechWorks Sign in/Registration page

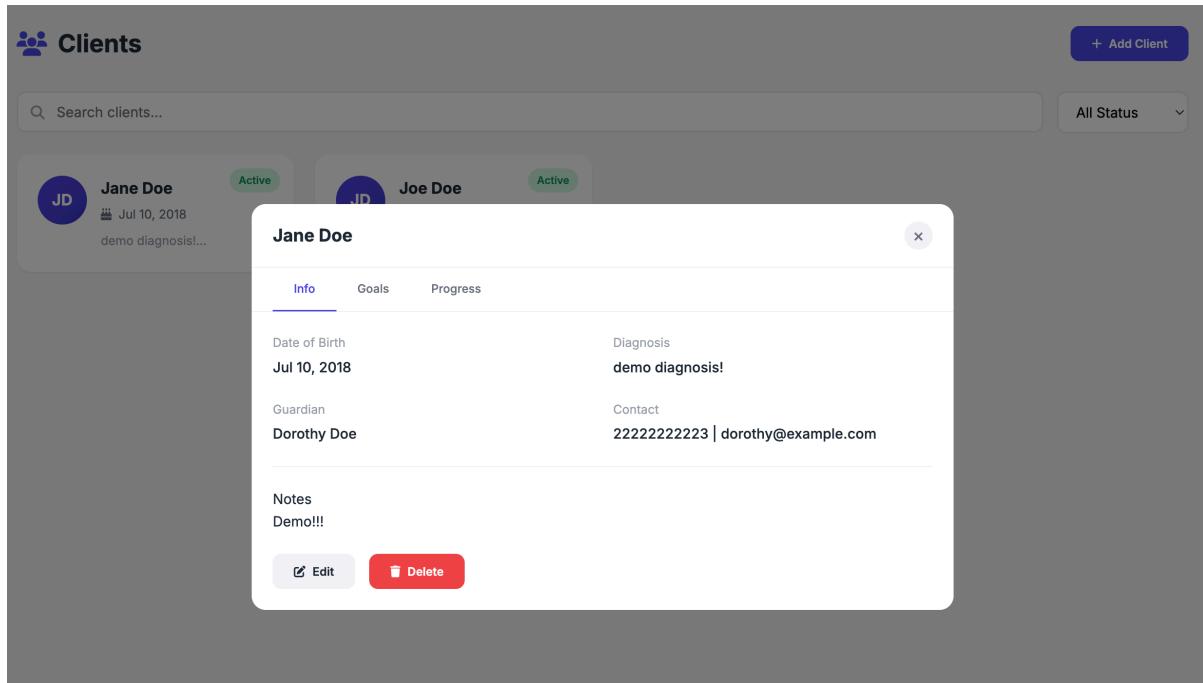
SpeechWorks Technical Documentation

The screenshot shows the SpeechWorks application interface after a user has logged in. The top navigation bar includes links for Outlook, Award, Houston Community, MyEagle, Sign in to Outlook, All Apps | Adobe C..., Online Compilers/..., The Swift Program..., Google, PR, and Educative: Interact... along with a search bar and bookmark icons. Below the navigation is a header bar with the SpeechWorks logo, a 'Dashboard' button (which is highlighted in blue), and other tabs for Clients, Sessions, Activities, and Resources. On the far right of the header are 'Demo Account' and 'Logout' buttons. The main content area is titled 'Dashboard' and features several summary cards: 'Total Clients' (2), 'Sessions Today' (1), 'Sessions This Week' (6), and 'Avg. Accuracy' (80%). Below these cards is a section titled 'Today's Sessions' showing a single session for 'Joe Doe' at '10:08 AM' for '30 min' which is marked as 'COMPLETED'. At the bottom of the dashboard is a 'Quick Actions' section with three buttons: 'Add Client', 'Schedule Session', and 'Start Activity'. A welcome message 'Welcome back, Demo Account!' is displayed in the top right corner.

Landing Page After Login is Dashboard Tab

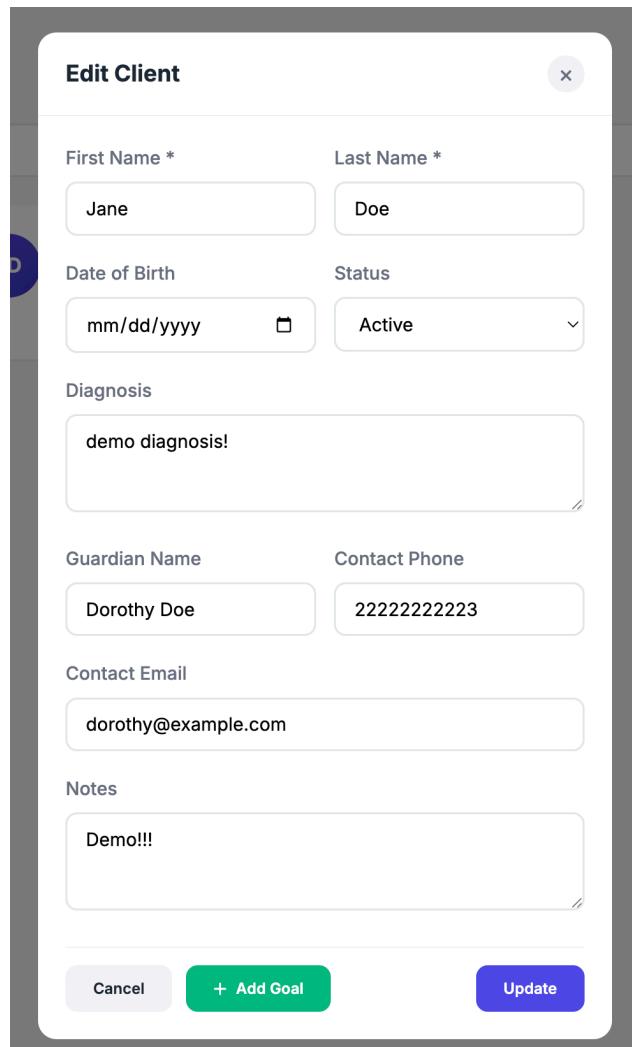
The screenshot shows the 'Clients' tab of the SpeechWorks application. The top navigation bar and header are identical to the dashboard, including the SpeechWorks logo, 'Clients' tab, and 'Demo Account / Logout' buttons. The main content area is titled 'Clients' and contains a search bar with placeholder text 'Search clients...' and a dropdown menu for 'All Status'. Below the search bar is a note: 'Click on a client card to view their details and progress.' Two client cards are displayed: 'Jane Doe' (Active, last seen Jul 10, 2018, with status 'demo diagnosis...') and 'Joe Doe' (Active, last seen Jun 17, 2023, with status 'Demo diagnosis...'). A blue '+ Add Client' button is located in the top right corner of the clients section.

Clients Tab



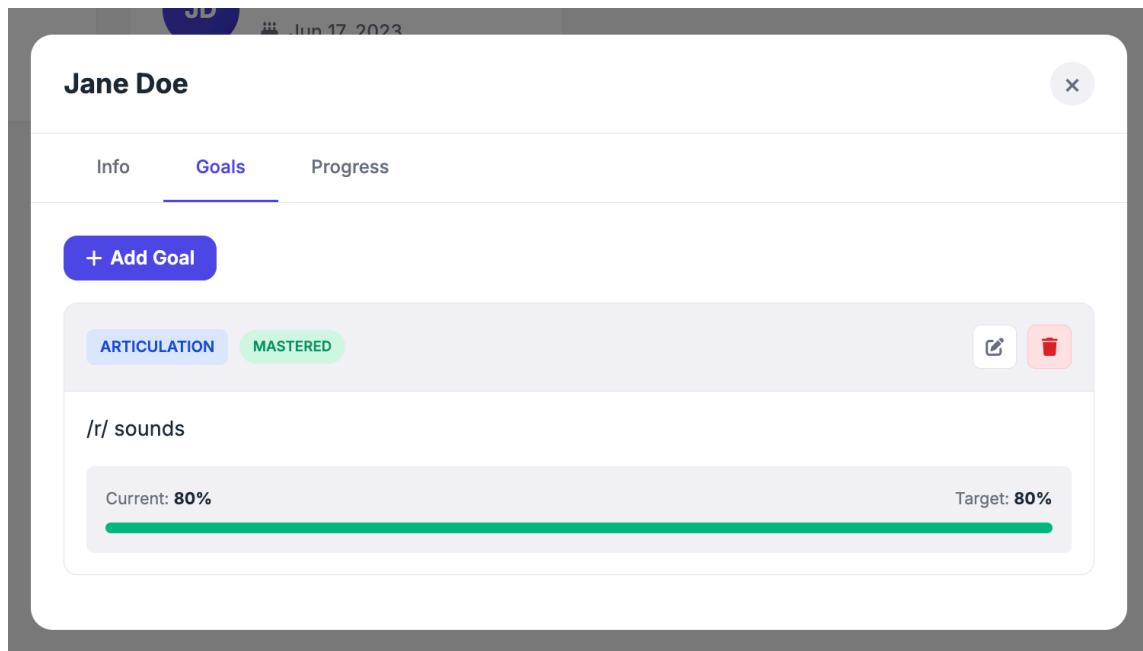
The screenshot shows a client card for "Jane Doe" in a modal window. The card displays personal information: Date of Birth (Jul 10, 2018), Diagnosis (demo diagnosis!), Guardian (Dorothy Doe), and Contact (2222222223 | dorothy@example.com). It also contains a Notes section with the text "Demo!!!". At the bottom, there are "Edit" and "Delete" buttons.

Client Card - Personal Info



The screenshot shows an "Edit Client" form. It includes fields for First Name (Jane), Last Name (Doe), Date of Birth (mm/dd/yyyy), Status (Active), Diagnosis (demo diagnosis!), Guardian Name (Dorothy Doe), Contact Phone (2222222223), Contact Email (dorothy@example.com), and Notes (Demo!!!). At the bottom, there are "Cancel", "+ Add Goal", and "Update" buttons.

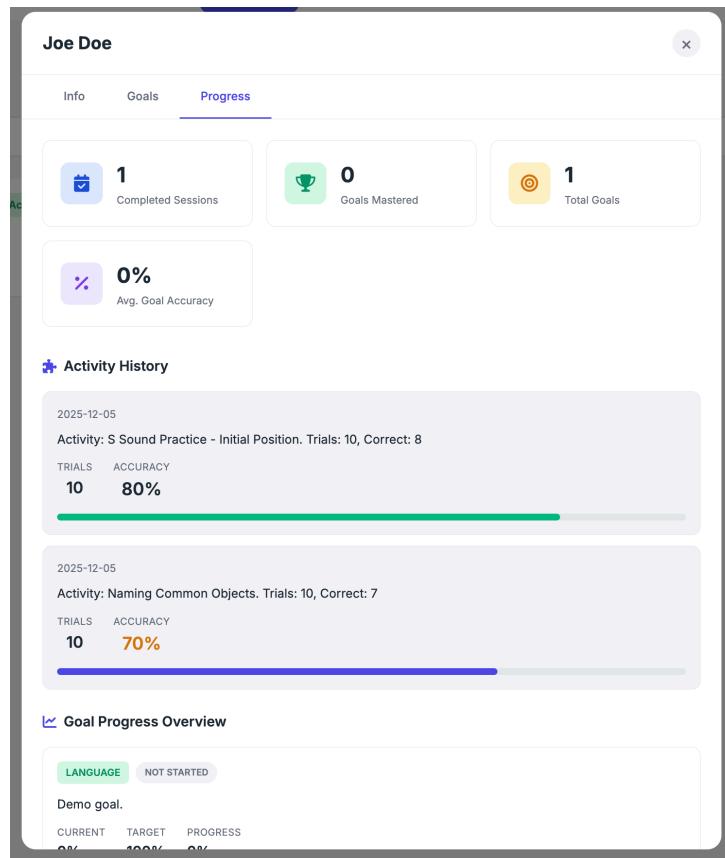
Edit Client Form



Client's Goals Tab

A screenshot of the 'Edit Goal' form. The title is 'Edit Goal'. The 'Category' field is set to 'Articulation'. The 'Goal Description *' field contains '/r/ sounds'. Under 'Target Accuracy (%)', the value is 80. Under 'Current Accuracy (%)', the value is also 80. A checked checkbox says 'Auto-set to target accuracy'. The 'Target Date' field shows 'mm/dd/yyyy' and includes a calendar icon. A dropdown menu next to the date field lists status options: 'Not Started', 'In Progress', '✓ Mastered', and 'Discontinued'. At the bottom, there are 'Cancel' and 'Update Goal' buttons.

Edit Goal Form



Client's Progress Tab

The screenshot shows the 'Add New Client' form. It includes fields for First Name and Last Name, Date of Birth (with a date picker), Status (Active), Diagnosis (text area for 'Speech/language diagnosis...'), Guardian Name (Parent/Guardian name and Phone number), Contact Email (Email address), and Notes (Additional notes...). At the bottom are 'Cancel' and 'Save' buttons.

Add Client Form

The screenshot shows the 'Sessions' tab in the SpeechWorks application. At the top, there are filters for 'All Clients', 'All Status', and a date range 'mm/dd/yyyy'. Below the filters, a list of sessions is displayed for two clients:

- Joe Doe:**
 - Session 5 (DEC): Completed at 10:08 AM - 30 min. Notes & Activities: S Sound Practic... ✓ 80%.
 - Session 4 (DEC): Completed at 03:58 PM - 30 min. Notes & Activities: TH Sound Discr. ✓ 90%.
 - Session 4 (DEC): Completed at 03:49 PM - 15 min. Notes & Activities: Following Direc... ✓ 70%.
 - Session 4 (DEC): Cancelled at 03:47 PM - 30 min. Notes & Activities: L Sound Practic... ✓ 80%, S Sound Practic... ✓ 80%.
 - Session 4 (DEC): Cancelled at 02:40 PM - 15 min. Notes & Activities: ✓ 80%.
 - Session 3 (DEC): Cancelled at 05:11 PM - 45 min. Notes & Activities: ✓ 80%.
- Jane Doe:**
 - Session 4 (DEC): Completed at 03:58 PM - 30 min. Notes & Activities: ✓ 90%.
 - Session 4 (DEC): Completed at 03:49 PM - 15 min. Notes & Activities: Following Direc... ✓ 70%.
 - Session 4 (DEC): Cancelled at 03:47 PM - 30 min. Notes & Activities: L Sound Practic... ✓ 80%, S Sound Practic... ✓ 80%.
 - Session 4 (DEC): Cancelled at 02:40 PM - 15 min. Notes & Activities: ✓ 80%.
 - Session 3 (DEC): Cancelled at 05:11 PM - 45 min. Notes & Activities: ✓ 80%.

A 'Schedule Session' button is located in the top right corner of the main content area.

Sessions Tab

The screenshot shows the 'Edit Session' form. It includes the following fields:

- Client ***: A dropdown menu showing 'Joe Doe'.
- Date & Time ***: A date and time input field showing 'mm/dd/yyyy, --:-- --'.
- Duration (minutes)**: A dropdown menu showing '30 min'.
- Status**: A dropdown menu showing 'Completed'.

At the bottom of the form are 'Cancel' and 'Update' buttons. A progress bar at the bottom left indicates '80%' completion.

Edit Session Form

Session: Joe Doe

Dec 5, 2025, 10:08 AM 30 min COMPLETED

SOAP Notes (Subjective, Objective, Assessment, Plan)

S - Subjective
Client's report of symptoms, feelings, concerns, and goals for this session
demo

O - Objective
Measurable observations, test results, and accuracy data from this session
demo

A - Assessment
Clinical interpretation and progress toward treatment goals
demo

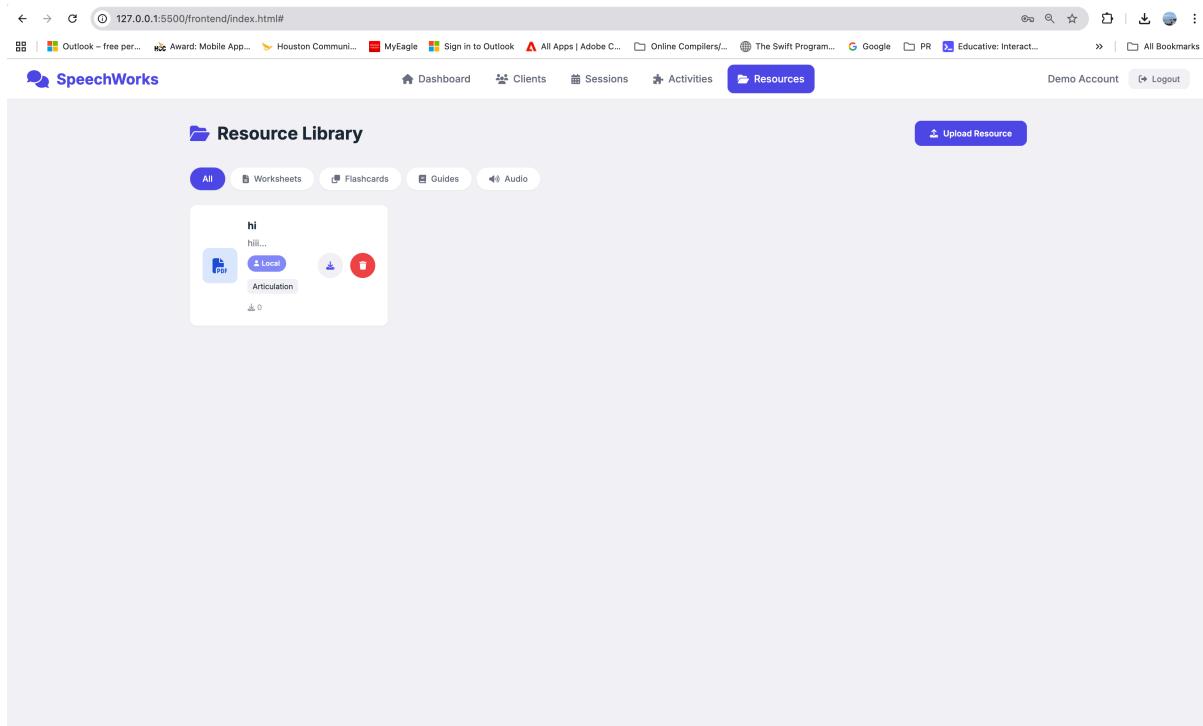
Session Notes Form

Therapy Activities

All Articulation Language Fluency Voice Phonology

S Sound Practice - Initial Position Articulation	R Sound Practice - Vocalic R Articulation	L Sound Practice - All Positions Articulation	TH Sound Discrimination Articulation
Practice producing the /S/ sound at the beginning of words. Focus on correct tongue placement and al... ★★★★★	Target vocalic R sounds including -AR, -ER, -IR, -OR, -UR patterns... ★★★★★	Comprehensive /L/ sound practice in initial, medial, and final positions... ★★★★★	Practice voiced and voiceless TH sounds with minimal pairs... ★★★★★
Naming Common Objects Language	Following Directions Language	Sentence Building Language	Easy Onset & Slow Speech Fluency
Expressive naming activity using everyday objects for word retrieval... ★★★★★	Receptive language activity with 1-step to 3-step directions... ★★★★★	Create grammatically correct sentences using word cards.... ★★★★★	Fluency shaping with easy voice onset and reduced speech rate... ★★★★★
Voice Projection Exercises Voice	Minimal Pairs - Final Consonants Phonology	Conversation Skills Pragmatics	
Practice producing voice at appropriate loudness levels.... ★★★★★	Phonological awareness targeting final consonant contrasts.... ★★★★★	Practice initiating and maintaining conversations.... ★★★★★	

Activities Tab



Resources Tab

A screenshot of a modal window titled 'Upload Resource'. The form fields include:

- Title ***: A text input field labeled 'Resource title'.
- Description**: A text area labeled 'Describe this resource...'.
- Resource Type ***: A dropdown menu set to 'Worksheet'.
- Category**: A dropdown menu labeled 'Select category'.
- File (Optional)**: A file input field with a placeholder 'Choose File' and 'No file chosen'.
- A note below the file input: 'Supported formats: PDF, DOC, MP3, PNG, JPG'.
- Checklist**: A checkbox labeled 'Make this resource public (visible to all therapists)' which is checked.
- Buttons**: 'Cancel' and 'Upload Resource' buttons at the bottom.

Upload Resource Form