Project Blueprint: Easely, the Canvas Assistant

I. The Core Concept: Your Personal Academic Easel

Easely is a smart, conversational assistant operating entirely within Facebook Messenger, designed to serve as a supportive easel for a student's academic "canvas." Its primary mission is to transform the static, often overwhelming, nature of the Canvas Learning Management System (LMS) into a dynamic, proactive, and manageable experience. The name itself is a fusion of "Easel," symbolizing support for creative and academic work, and "Easily," reflecting the core value proposition of simplifying a student's life.

The core philosophy of Easely is twofold: to reduce cognitive load and to create a single, unified source of truth. Students are in a constant state of juggling academic deadlines, personal commitments, and social obligations. Easely aims to offload the significant mental burden of tracking these tasks. It achieves this not merely as a one-way notification service, but as a two-way management tool that actively syncs with Canvas. By creating a unified calendar—visible both in the conversational interface of Messenger and on the user's official Canvas website—it allows students to both view their assigned work and create their own academic events directly from their chat, creating a seamless bridge between their academic and digital lives.

II. The User Journey & Core Application Flow

The entire user experience is meticulously designed to be as effortless and supportive as the name "Easely" implies. The flow prioritizes immediate value delivery to build trust and encourage long-term engagement.

A. The Onboarding Experience: The First Five Minutes

The success of Easely hinges on a frictionless onboarding process that seamlessly connects the user's Canvas account and delivers an immediate "magic moment" of value.

- **First Contact & Introduction:** A new user initiates a conversation. Easely responds not just with a greeting, but with a clear identity and purpose. It introduces itself by name and presents a structured consent request, combining the value proposition with the necessary legal framework in one professional message. This includes three clear, tappable buttons: ✅ I Agree, Let's Go!, 📜 Privacy Policy, and ⚖️ Terms of Use. The policy links open in the Messenger WebView to static pages, ensuring the user never has to leave the app.
- **The Guided Token Request:** Upon consent, Easely respects the user's technical readiness with a forked path. It asks, "Do you have your Canvas Access Token ready?" This simple question routes technically proficient users to a direct input step, while providing a clear "Show me how" option for those who need guidance.

- **Tutorial Requirement:** The video tutorial is a critical onboarding asset. It must be exceptionally clear and concise, explicitly instructing the user to enable the necessary permissions (scopes) that allow Easely to both read assignments and write to the calendar. This step's clarity is paramount to the success of the two-way sync.
- **Verification & The "Magic Moment":** The user pastes their token. The backend validates it against the Canvas API.
    - **On Success:** This is the payoff. Easely triggers the Initial Sync. It immediately fetches all current assignments and courses, populates its private database, and then presents the user with a formatted list of their own upcoming deadlines directly in the chat. This act of reflecting the user's personal data back to them is the most powerful way to demonstrate utility and build immediate trust.
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- **The Contextual Upsell:** After delivering this initial value, Easely introduces the premium tier not as a random sales pitch, but as a natural extension of the feature the user has just experienced. It explains the free reminder service and then poses the question of upgrading for a more powerful suite of tools.

B. Daily Interaction: The Returning User

- **Proactive Assistant:** For the user, Easely works silently in the background, sending reminders based on their subscription tier.
- **On-Demand Tool:** When the user engages with the bot, they are presented with a simple menu to list assignments, add new tasks, or manage their subscription. The experience is fast because all requests are served from Easely's own optimized database.

C. The On-Demand Task Management Menu (New Feature)

When a returning user starts a conversation with a generic greeting (e.g., "Hi," "Menu"), Easely will respond with a clear, actionable menu to give them immediate control over their academic workload.

> "Welcome back to Easely! What would you like to see?"

This message will be accompanied by a series of **Quick Reply buttons** that offer powerful, pre-defined filters:

- 🔥 **Due Today**: Shows all tasks and events due within the next 24 hours.
- ⏰ **Due This Week**: Provides a summary of all tasks and events due in the next 7 days.
- ❗ **Show Overdue**: Lists any tasks where the due date has passed.
- 🗓️ **View All Upcoming**: Displays a list of all future tasks, paginated to keep messages concise.
- ➕ **Add New Task**: A persistent shortcut to immediately start the flow for adding a new manual task.

This menu-driven approach is intuitive, requires zero typing, and immediately delivers the exact information a student is most likely looking for.

III. Feature Breakdown: Easely vs. Easely Premium

The two-tier model is designed to make the free version genuinely useful and habit-forming, while making the premium version feel like an indispensable upgrade for serious students.

A. Easely (Free Tier) - The "Hook"

- **Full Canvas Synchronization:** All existing assignments and deadlines are continuously synced and kept up-to-date in Easely's database.
- **The 24-Hour Heads-Up:** A single, high-value reminder is sent 24 hours before each assignment is due.
- **Limited Two-Way Manual Tasks:** Users can add up to 5 new tasks or events per month. Each task created via Easely is pushed to the user's official Canvas Calendar, creating a powerful incentive and demonstrating the two-way sync capability.
- **On-Demand Assignment List & Quick Filters:** The user has full access to the On-Demand Task Management Menu, allowing them to filter their tasks by Due Today, Due This Week, Show Overdue, and View All Upcoming at any time. This provides immense interactive value.

B. Easely Premium - The "Proactive Partner"

- **Flagship - Full Proximity Reminders:** The complete cascade of reminders at 1 week, 3 days, 1 day, 8 hours, 2 hours, and 1 hour, ensuring nothing is ever missed.
- **Unlimited Two-Way Manual Tasks:** Users can add unlimited personal or course-related tasks, all seamlessly synced back to their Canvas Calendar, establishing Easely as their central scheduling tool.
- **AI-Powered Outline Generation:** An on-demand creative partner that helps users break down complex assignments and overcome the initial hurdle of starting work.
- **Personalized Weekly Digest:** A proactive Monday morning briefing that summarizes the week's workload, identifies potential crunch points, and offers encouragement.
- **Calendar Generation:** The ability to export the entire unified schedule into an Excel file for use in other productivity tools.

IV. Monetization & Payment System

This system is pragmatic, designed for an individual developer to operate legally and efficiently while providing a seamless user experience.

- **The Model:** A manually-renewed, 30-day "Easely Premium Access Pass." This functions as a subscription for the user but avoids the significant technical and legal overhead of implementing true auto-debit recurring payments.
- **The Platform:** Ko-fi Memberships, a strategic choice that allows an individual to accept GCash (via Stripe) without being a registered business.

- **The Flow:** The user initiates the upgrade from the chat, pays via a guest checkout in the Messenger WebView (no Ko-fi account needed), and returns to the chat. They type "ACTIVATE" to get instant access. The developer receives an email from Ko-fi and can perform a simple, periodic audit to cross-reference activations with payments, ensuring system integrity.

V. Technical Architecture & Database Integration

The database is the core of Easely's intelligence, enabling its speed, proactive features, and reliability.

- **The Database Choice:** PostgreSQL, chosen for its robust support for relational data, powerful data types (ENUM, DATETIME), and its seamless integration as a managed service on Render.
- **The Database Schema:**
    - **Users Table:** Stores messenger_id, encrypted canvas_token, canvas_user_id, and subscription status (subscription_tier, subscription_expiry_date).
    - **Tasks Table:** The central operational table, storing user_id, canvas_assignment_id or canvas_event_id, title, due_date (in UTC), and source.
    - **Courses Table:** An optimization to store user-specific course data (canvas_course_id, course_name) to speed up the manual task creation flow.
- **The Data Flow:** Easely operates on a "mirror" principle. It performs an Initial Sync during onboarding to populate its database. All subsequent user requests are served from this fast, local database. Manual tasks are created via API call to Canvas, with the resulting canvas_event_id stored in Easely's database. Background jobs periodically refresh the data from Canvas to ensure the mirror remains accurate.

C. The Data Flow in Action

- **Flow 1: Initial Sync (Onboarding):** After getting a valid token, Easely makes a series of API calls to Canvas to fetch all assignments and courses. It then populates the Users, Tasks, and Courses tables in its own database. This one-time heavy lifting allows all future interactions to be lightning-fast.
- **Flow 2: Manual Task Creation (The Two-Way Sync):**
    1. User initiates the flow and provides details (title, time, and course/personal).
    2. Easely makes a POST request to the Canvas API's /api/v1/calendar_events endpoint.
    3. Canvas confirms creation and returns a unique canvas_event_id.
    4. Easely INSERTs a new record into its Tasks table, storing all the details, including the canvas_event_id it just received. The source is set to 'manual_entry'.
- **Flow 3: The Reminder Job (The Payoff):** A background job (Cron Job on Render) runs hourly. It performs a fast SELECT query on its own Tasks table to find all tasks due soon. It joins this with the Users table to check each user's subscription_tier and applies the appropriate reminder logic. This process is highly efficient as it requires zero API calls to Canvas.

- **Flow 4: The Data Refresh (Maintaining the Mirror):** Another background job runs periodically (e.g., every few hours). For each user, it makes a lightweight API call to Canvas to check for any changes (new assignments, updated due dates). It then updates its Tasks table accordingly, ensuring Easely's data never becomes stale. This keeps the mirror accurate.
- **Flow 5: On-Demand Task Filtering:**
    1. A returning user taps a Quick Reply button, such as 🔥 Due Today.
    2. The bot's event_handler receives the payload (e.g., GET_TASKS_TODAY).
    3. The handler calls a specific, new function in the database/queries.py module (e.g., get_tasks_due_in_next_24_hours(user_id)).
    4. This function executes a highly efficient, time-based query against the local PostgreSQL database.
    5. The results are returned to the event_handler, which then formats them into a user-friendly message and sends it via the messenger_api module. The entire process is near-instantaneous and requires no calls to the Canvas API.

VI. Hosting & Deployment on Render

The entire Easely application will be hosted on Render's platform, utilizing a combination of three distinct, free-tier services for a professional-grade architecture.

- **The Render Ecosystem:**
    1. **A PostgreSQL Database:** The foundational, managed data store.
    2. **A Web Service:** The core Python application that listens for Messenger webhooks and handles real-time user interaction.
    3. **Cron Jobs (Background Workers):** The engine of Easely's proactive features. Separate, scheduled jobs for sending reminders, checking subscription expiries, and refreshing data from Canvas.
- **The Deployment Workflow:** A PostgreSQL instance is created first, and its internal connection URL is secured. The main application is then deployed as a Web Service, configured with this URL and other secrets as Environment Variables. Finally, the various background tasks are deployed as separate Cron Jobs, each with its own schedule and command, but sharing the same set of Environment Variables to ensure they can connect to the database and use the necessary APIs.

VII. Potential Challenges & Strategic Solutions

A robust plan anticipates obstacles. The following are not flaws in the design, but key areas that will require focused attention during development.

- **Challenge: User Onboarding Friction.** The single biggest point of failure for new users will be the Canvas Token generation. A confusing tutorial or a user's failure to select the correct API permissions will halt the onboarding process.
    - **Solution:** Invest heavily in the quality of the tutorial video. Make it short, clear, mobile-friendly, and use visual callouts to highlight exactly which checkboxes

must be ticked. In the bot's error message for an invalid token, include a direct link back to this video to minimize frustration.

- **Challenge: API Rate Limiting.** The Canvas API will enforce limits on how many calls can be made in a given time period. As the user base grows, the "Data Refresh Job" could exceed these limits if it tries to sync all users simultaneously.
    - **Solution:** Design the refresh job to be intelligent. Instead of a single monolithic run, it should be a "staggered" or "rolling" update. The job can fetch a small batch of users, refresh their data, pause briefly, and then fetch the next batch. This distributes the API load over time, ensuring Easely remains a good API citizen and avoids being throttled.
- **Challenge: Handling Revoked Tokens and Errors.** A user can revoke Easely's token from their Canvas settings at any time. If this happens, all subsequent API calls for that user will fail.
    - **Solution:** Implement robust error handling around all Canvas API calls. If a call fails with an "invalid token" error (HTTP 401), the system must automatically flag that user in the database (e.g., set their status to token_invalid). The next time the user interacts with the bot, Easely should inform them that the connection has been lost and politely guide them through the process of providing a new token.
- **Challenge: Structured Date & Time Input.** Removing natural language parsing improves reliability but requires a user-friendly alternative. Simply asking a user for a date and time in a specific format is prone to error and frustration.
    - **Solution:** Implement a structured, multi-step conversational flow using Messenger's built-in UI elements.
        1. Easely asks: "What day is this for?" and provides Quick Reply buttons: Today, Tomorrow, Next Week, Choose Date....
        2. If the user chooses a specific date, you can then ask for the time in a separate, clear step.
        3. For time, you can present common options as Quick Replies (9:00 AM, 12:00 PM, 5:00 PM) alongside an instruction to type a specific time (e.g., "2:30 PM"). This guided, step-by-step process is far more reliable and less error-prone than a single open-ended question. It provides a better user experience by removing ambiguity.