

AgileStudy Planner - Business Requirement

Problem Statement

Note: nouns verbs

Context¹

University students face numerous responsibilities - attending classes, participating in activities, job hunting - all while aiming to learn and complete their degrees with good grades.

Assignments play a crucial role in enhancing learning, but they can also become a source of significant stress, especially when students underestimate the time required and are left scrambling at the last minute.

Effective planning is essential for academic success. While many students use electronic calendars to organize their schedules nowadays, they often only mark assignment deadlines without allocating specific study periods. This creates the illusion of having ample "free" time. Even when students do assign study blocks, they frequently overestimate their ability to complete tasks within the planned time, leading to unrealistic or overly optimistic schedules. Additionally, planning and re-adjusting schedules can be time-consuming, particularly when unexpected changes occur, such as altered deadlines or sudden events. The effort required to manually revise plans can make it challenging to stay organized and on track.

Core Concepts²

There is a growing need for an automated, adaptive scheduling tool that integrates with students' calendars to optimize study planning. Such a tool would help students manage their time efficiently, adapt to changes seamlessly, and ultimately achieve better learning outcomes and academic performance.

Develop a study planner tool that integrates students' electronic calendars and automatically schedules study sessions on the calendar based on assignment deadlines, user desired study quality, and general preferences. The system includes a feedback mechanism, from which it learns users' learning patterns, and improves its planning accuracy and becomes more personalized over time.

Key Features³

- When a user marks an assignment's due date on the calendar, the system automatically analyzes the deadline, the user's desired study quality, and creates a personalized study

¹ See "Index: Use of AI" #1

² See "Index: Use of AI" #1 & #2

³ See "Index: Use of AI" #3

plan. It allocates “study time” slots on the calendar without conflicting with existing events.

- Users can set preferences, including blocked study time during specific periods, minimum study session duration.
- The system includes a feedback mechanism to track the actual time users spend on their study sessions.
- Based on feedback, the system learns about users’ personal characteristics, such as learning speed, time management efficiency, preferred study time, and continuously refines future study plans.
 - Learning speed can be inferred from the actual addition or reduction of study time.
 - Time management efficiency can be calculated by the actual use of the planned time slots (utilization rate).
 - Preferred study time can be inferred by the actual study times.
- Automatically scheduled study slots can be freely modified or deleted by users.

Target Audience

- University students who plan daily life and studies with a calendar

Rules⁴

- The allocated study slots generated from AgileStudy should not overlap with the existing calendar events.
- The allocated study slots should not conflict with the user preference settings (blocking time, minimum study session duration).
- The system allows users to modify or delete the allocated slots, which will NOT trigger a rescheduling from AgileStudy.
- When users manually modify the automatically generated plan, the final adjusted plan will be treated as the system's output. This adjusted plan will be used as the metrics for learning user characteristics in the feedback system.
- If the user modifies the desired study quality for an existing assignment event, or modifies preference settings, the system should regenerate the plans if the current plan conflicts with these changes.
- If the user creates a new event that conflicts with allocated but not yet occurring study slots, the system should adjust the remaining study slots accordingly.
- The system uses machine learning algorithms to refine scheduling recommendations. The feedback inputs include:
 - Comparison between total actual study time and total planned time
 - Utilization rate of planned time
 - Actual study times

⁴ See “Index: Use of AI” #4

- If the calendar does not have enough available time for the planned study slots, the system should warn the user and stop creating the assignment event, so that the user can make necessary modifications.

Challenges

- How to integrate with the popular calendars, e.g. Microsoft Calendar, Apple Calendar Google Calendar?
 - For now, assume there are existing APIs that can be used.
- How to design the feedback system? Manual input from the user or integration with other tracking tools?
 - For now, manual input is enough.
- How to develop or attain a machine learning algorithm that adapts to individual study patterns?
 - For now, assume there is an existing machine learning algorithm that can achieve that.

Summary of Classes, Attributes and Associations (from nouns and verbs)

- **Summary of Nouns & Verbs**

Nouns	Verbs
accuracy, actual study times, actual time, actual use, addition, assignment deadlines, blocked study time, calendars, changes, desired study quality, due date, existing events, feedback, general preferences, learning patterns, learning speed, minimum study session duration, personal characteristics, plan, planner, planning, preferred study time, preferences, reduction, scheduling tool, sessions, slots, time, time management efficiency, utilization rate	adapt, allocates, analyzes, assign, calculated, conflicting, creates, deleted, improves, inferred, integrates, learns, manage, mark, modified, optimize, re-adjusting, refines, schedules, set, track

- **Classes, Attributes, and Associations**

Class	Attributes	Associations
Planner	assignments, existing events, study sessions, preference, algorithm	<ul style="list-style-type: none"> • Planner contains UserEvents, Assignments, StudySessions, Preference, and Algorithm • Planner manages Study Plans and StudySessions

Assignment	time, desired study quality	<ul style="list-style-type: none"> • Assignment inherits UserEvent (modified, deleted, created by the user)
UserEvent	time	<ul style="list-style-type: none"> • UserEvent can be modified, deleted, created by the user • Change of UserEvent can affect StudySession
StudyPlan	assignment, planned time, schedules	<ul style="list-style-type: none"> • Assignment triggers generation of StudyPlan based on Algorithm
StudySession	time, study plan	<ul style="list-style-type: none"> • StudySession inherits UserEvent (modified, deleted the user, created by the system) • StudySessions belongs to a StudyPlan • Scheduler assigns StudySession • StudySession re-adjusts StudyPlan
Preference	blocked study time, minimum study session duration, preferred study time	<ul style="list-style-type: none"> • StudyPlan must comply with Preference
Feedback	total actual time, actual times, addition, reduction, utilization rate, learning speed	<ul style="list-style-type: none"> • Feedback belongs to an Assignment • Feedback refines Algorithm
Scheduler		<ul style="list-style-type: none"> • Scheduler allocates StudySession based on StudyPlan • Scheduler reallocates unhappened StudySession if UserEvent conflict happens • Scheduler warns Users if Calendar does not have available time.
Algorithm		<ul style="list-style-type: none"> • Algorithm learns from Feedback • Algorithm uses Preference • Algorithm readjust StudyPlan with changes in DueEvent and Preference
User		Not managed by this system. The user interact with the Planner through external calendar API and webhook except for providing feedback

Users

Dimensions

Note: the most important two dimensions is marked **yellow**

- Planning skill
- Tendency or probability of changes
- Personality: Spontaneous or Planned
- Busy level in life
- The tendency to carry out plans
- Preference of planner tool

User Personas & User Stories⁵

- Katy - Busy undergraduate
 - Age: 20
 - Background: undergraduate student majoring in economics, minoring in math. President of a dancing club and needs to organize club activities.
 - Dimensions:
 - Planning skill: not very good at planning, often too optimistic
 - Tendency or probability of changes: high probability of changes due to external events
 - Reasons to use the app:
 - Arrange sufficient time for studies during busy daily life
 - Create a realistic study plan
 - Save time in readjusting the schedule
 - User stories:
 - (1) As a busy student, I want to create a study schedule easily with the application, so that I have more time for other important tasks, such as studying.
 - (2) As a club president with unpredictable commitments, I want to quickly adjust my study schedule with the application when new events arise, so that I can quickly deal with everything without wasting time modifying the plan.
 - (3) As someone who struggles with planning, I want to create a realistic study plan that accounts for my club activities and social life, so that I can allocate enough time for my studies without being overly optimistic.
- Elizabeth - Goal Aimer
 - Age: 26

⁵ See "Index: Use of AI" #5

- Background: graduate student studying Computer Science and works part time, hardworking, loves planning and sticks to schedule, pursues high-quality learning
- Dimensions:
 - Planning skill: good at planning
 - Tendency or probability of changes: medium probability
- Reasons to use the app:
 - Save time in planning, helping to focus on study rather than planning
 - Schedules based on personal learning pattern, preferences, and study goal.
 - Automatically adapt the schedule to changes.
- User stories:
 - (4) As a meticulous planner, I want the app to generate a personalized schedule based on my study preferences and study goals, so that I can save time and maintain my productivity.
 - (5) As a part-time worker with a structured routine, I want the app to automatically adapt my schedule when changes occur, so I can stay on track without manual adjustments.
 - (6) As a goal-oriented and hardworking student, I want the app to analyze my learning patterns and suggest optimized study sessions, so I can meet deadlines while truly learning the materials.

UML Diagram

Link:

https://lucid.app/lucidchart/5c3524c7-0963-4b2d-9a4e-0852fd970371/edit?viewport_loc=-665%2C85%2C3290%2C1566%2CHWEp-vi-RSFO&invitationId=inv_c16e9371-4793-4b2f-896f-311fc6110f71

Mockup

Link:

<https://www.figma.com/design/PDzRWOuGkJXukKSzWz2SR/CS5010-Project1-Mockup?node-id=0-1&t=Ja1AW8kmkSjJUAwN-1>

Video

(TBD: after implementation)

GitHub Repository

<https://github.com/tt5321/AgileStudy>

Index: Use of AI

#1 Use Gen AI for a polished problem statement (context & part of core concept)

Prompt:

"Please polish the following problem statement:

Students are busy with classes, activities, job hunting, while their main priority is to study and finish the degree with a good grade. Assignments can be helpful in boosting learning, but it can also be a pressure when all the stuff is cluttered and the student realizes that the assignment needs more time than expected in the last minutes.

Good planning is a key for successful study.

Nowadays, many people use electronic calendars as a tool for planning by marking and assigning slots for a specific event. However, people usually just mark the due date of an assignment instead of allocating the study time on the calendar, which creates an illusion that there is a lot of "free" time. Even though some assign the study time slots, one may overestimate his/her ability to finish the assignments, causing a bad or "optimistic" planning. Moreover, planning itself can be time costly, especially when things change quickly. Once we make a plan, it is more costly to adjust it if there is a change, like a change of due date, another important event pops up.

There is a desire that students using calendars for planning can have an automotive and adaptive scheduler that helps in planning the studying time, so that we use time efficiently to achieve a good learning and a good grade."

Model: ChatGPT 4o

Response:

"University students juggle numerous responsibilities—attending classes, participating in activities, job hunting—all while aiming to excel academically and complete their degrees with good grades. Assignments play a crucial role in enhancing learning, but they can also become a source of significant stress, especially when students underestimate the time required and are left scrambling at the last minute.

Effective planning is essential for academic success. While many students rely on electronic calendars to organize their schedules, they often only mark assignment deadlines without allocating specific study periods. This creates the illusion of having ample "free" time. Even when students do assign study blocks, they frequently overestimate their ability to complete tasks within the planned time, leading to unrealistic or overly optimistic schedules.

Additionally, planning and re-adjusting schedules can be time-consuming, particularly when unexpected changes occur, such as altered deadlines or sudden events. The effort required to manually revise plans can make it challenging to stay organized and on track.

There is a growing need for an automated, adaptive scheduling tool that integrates with students' calendars to optimize study planning. Such a tool would help students manage their time efficiently, adapt to changes seamlessly, and ultimately achieve better learning outcomes and academic performance.”

Use: Reviewed and accepted the most parts. Further modify some details.

#2 Use Gen AI for a polished problem statement (core concept)

Prompt:

“Develop a study planner tool that automatically schedules study time on students’ calendars based on their desired study quality, assignment deadlines, and personal characteristics. The system includes a feedback mechanism that helps it learn personal learning patterns, and becomes more personalized over time.”

Model: ChatGPT-4o

Response:

“Here’s a structured breakdown of the Study Planner Tool development:

Study Planner Tool: Adaptive and Intelligent Study Scheduler

Objective

To create an automated, personalized study planner that integrates with students' calendars, schedules study sessions based on assignment deadlines and user preferences, and evolves over time using a feedback mechanism to enhance its accuracy and personalization.

Key Features

1. Automated Scheduling

- Integrates with Google Calendar, Outlook, or other calendar apps.
- Analyzes assignment deadlines, personal preferences, and desired study quality (e.g., deep focus vs. quick review) to create an optimized schedule.
- Ensures study sessions are evenly distributed to avoid last-minute cramming.
- Avoids scheduling conflicts by detecting existing events on the user’s calendar.

2. Personalization

- Tailors study plans based on user input, such as preferred study times, session lengths, and productivity peaks.
- Supports different types of tasks (e.g., reading, problem-solving, writing) with customized time recommendations for each.
- Adjusts session intensity based on user-specified learning goals and workload.

3. Feedback Mechanism

- After each study session, the tool prompts users for feedback (e.g., Was the time sufficient? How productive was the session?).
- Learns from user input to fine-tune future schedules.
- Uses machine learning to identify patterns in study behavior and adjust session recommendations accordingly (e.g., recognizing that a user needs longer sessions for math assignments).

4. Dynamic Rescheduling

- Reacts to changes in deadlines, new tasks, or unexpected calendar events.
- Automatically reorganizes study sessions to maintain balance and ensure deadlines are met.
- Prioritizes tasks based on urgency and estimated time required.

5. Progress Tracking & Insights

- Visualizes study patterns, highlighting trends like peak productivity times and study duration.
- Offers actionable suggestions to improve time management and enhance learning strategies.
- Tracks study hours and completion status of assignments.

Technical Architecture Overview

1. Backend:
 - Machine learning models to predict study needs and adapt based on user behavior.
 - Scheduling algorithm that balances deadlines, task importance, and free time availability.
2. Frontend:
 - Clean and intuitive UI for mobile and web platforms.
 - Integration with calendar services and a feedback interface for seamless updates.
3. Data Storage & Privacy:
 - User data securely stored and processed with privacy compliance (e.g., GDPR).
 - Local storage options for sensitive information if required.

User Workflow

1. Initial Setup:
 - User inputs course schedule, assignment deadlines, and personal preferences (e.g., preferred study times, learning goals).
 - Tool suggests an initial study plan.
2. Ongoing Use:
 - Daily notifications and reminders for upcoming study sessions.
 - Post-session feedback prompt for refinement.
 - Regular updates and adjustments based on performance and evolving priorities.
3. Progress Review:
 - Users can review productivity reports, completed study sessions, and receive suggestions for optimizing study patterns.

Benefits

- Time Efficiency: Eliminates the burden of manual planning and frequent rescheduling.
- Better Study Habits: Encourages consistent, proactive study routines.
- Increased Personalization: Evolves with the user's learning style and adapts to changing needs.
- Stress Reduction: Helps avoid last-minute panic by distributing workload effectively.

Next Steps

1. Define the technical stack (React for frontend, Python for backend, etc.).
2. Develop machine learning models for learning pattern prediction.
3. Build a prototype and test with a sample group of students for feedback.

Would you like to see a UI wireframe, technical stack suggestion, or an MVP development plan for this tool?"

Use: Reviewed and accepted the most parts. Further modified some details.

#3 Use Gen AI for a polished problem statement (key features)

Prompt:

“Please refine the following:

key features: 1. When user marks an assignment due date event on the calendar, the system analyzes the assignment's deadline, user's expectation on study quality, and creates a study plan and automatically assigned “study time” slots on the calendar without affecting other user calendar events. 2. Users should have preference control, for example, no assignment at some specific time. 3. The system should provide a feedback system to collect the user's actual time spent. 4. The system should learn users' personal characteristics from the feedback, such as learning speed and efficiency use of time, to adjust the future planning based on these characteristics. 5. The automatically allocated study time slots can be deleted, modified by the users.”

Model: ChatGPT - 4o

Response:

“Key Features:

1. When a user marks an assignment's due date on the calendar, the system automatically analyzes the deadline, the user's desired study quality, and creates a personalized study plan. It allocates "study time" slots on the calendar without conflicting with existing events.
2. Users can set preferences, such as blocking study time during specific periods.
3. The system includes a feedback mechanism to track the actual time users spend on their study sessions.
4. Based on feedback, the system learns about users' personal characteristics—such as learning speed and time management efficiency—and continuously refines future study plans.
5. Automatically scheduled study slots can be freely modified or deleted by users.”

Use: Accepted the most parts and modified a few small details.

#4 Use Gen AI to understand the meaning of rules and challenges

Prompt: “What does the Rules and Challenges means in the following:
To propose it on #project and get it #approved one week before the deadline

Business Requirements

- Nouns-verbs
- Target audience
- Rules

- Challenge Questions
- Summary of Classes, Attributes and Associations (from nouns and verbs)

Model: ChatGPT 4o

Response:

“Explanation of "Rules" and "Challenge Questions":

1. Rules (Business Rules)

These are the specific, detailed statements that define or constrain some aspects of the business. Rules help ensure that the system behaves as expected and remains consistent with business policies and goals.

Examples for the AgileStudy Planner System:

- Study sessions should not overlap with existing calendar events.
- Users cannot schedule more than 8 hours of study time in a single day.
- The system should allocate at least 48 hours before an assignment deadline for final review if possible.
- Study slots must be at least 30 minutes long.
- The system must avoid scheduling during blocked periods specified by the user.

2. Why it's important:

These rules help guide the development process by defining the boundaries and expected behaviors of the system.

2. Challenge Questions

These are thought-provoking questions designed to challenge assumptions, identify potential issues, and ensure that all aspects of the requirement are considered. They help refine and validate the business requirements by exploring edge cases, alternative scenarios, and system limitations.

Examples for the AgileStudy Planner System:

- How will the system prioritize overlapping study sessions for multiple assignments?
- What happens if a user frequently overrides the automatically scheduled study slots?
- How will the system handle changes to assignment deadlines after the initial plan is created?
- How can the feedback mechanism avoid misinterpretation of incomplete study sessions?

- What if a user has an unpredictable schedule with frequent last-minute events?
3. Why it's important:
Challenge questions can reveal gaps in requirements, identify risks, and lead to more robust and resilient system designs.
-

Summary:

- Rules = Specific constraints or behaviors that the system must adhere to.
- Challenge Questions = Open-ended questions that help explore and validate the requirement, ensuring a more thorough and well-rounded solution.

If you'd like, I can also generate a list of rules and challenge questions for your AgileStudy Planner proposal!"

Use: Learned what rules and challenges mean, and took a few examples as reference

#5 Use Gen AI to generate user stories

Prompt:

"Please provide user stories for the following personas:

Katy - Age: 20 Background: undergraduate student majoring in economics, minoring in math. President of a dancing club and needs to organize club activities. Dimensions: Planning skill: not very good at planning, often too optimistic Tendency or probability of changes: high probability of changes due to external events Reasons to use the app: Arrange sufficient time for studies during busy daily life Create a realistic study plan Save time in readjusting the schedule

Elizabeth - Age: 26 Background: graduate student studying Computer Science and works part time, hardworking, loves planning and sticks to schedule. Dimensions: Planning skill: good at planning Tendency or probability of changes: medium probability Reasons to use the app: Save time in planning, helping to focus on study rather than planning Adjust schedules based on personal learning pattern, preferences, and study goal. Automatically adapt the schedule to changes.

3 user stories for each persona"

Model: ChatGPT 4o

Response:

"User Stories for Katy (Undergraduate Student, Age 20)

1. As a student with a busy schedule, I want to create a realistic study plan that accounts for my club activities and social life, so that I can allocate enough time for my

studies without being overly optimistic.

2. As a club president with unpredictable commitments, I want the app to easily adjust my study schedule when last-minute events arise, so I can quickly reorganize my priorities without wasting time.

3. As someone who struggles with planning, I want the app to recommend a balanced study schedule, so I can focus on studying rather than constantly rescheduling when plans change.

User Stories for Elizabeth (Graduate Student, Age 26)

1. As a meticulous planner, I want the app to quickly generate a detailed schedule based on my study preferences and goals, so I can save time and maintain my productivity.

2. As a part-time worker with a structured routine, I want the app to automatically adapt my schedule when changes occur, so I can stay on track without manual adjustments.

3. As a goal-oriented student, I want the app to analyze my learning patterns and suggest optimized study sessions, so I can achieve my study goals efficiently while balancing my work commitments.”

Use: Used most of the response and modified details after review.