Verification and Validation Report: MacONE

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April 3, 2024

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1 Revision History

Date	Version	Notes
2024-03-06	1.0	- First Version
2024-04-02	2.0	- Final Version -

2 Additional Information

2.1 Introduction

This document outlines the Verification and Validation (V&V) report for the MacONE project developed by Team #5, Overwatch League. The V&V report is a critical component of our project management and quality assurance processes, ensuring that MacONE not only meets its specified requirements but also fulfills the needs and expectations of its users and stakeholders. The testers would walk through the testing process as the guidance of VnV Plan to ensure that our system would accomplish all the intended functions correctly and efficiently.

2.2 Project Summary

MacONE is a tailored online platform aimed at streamlining and enhancing the McMaster student experience. It enables students to directly extract and integrate course information into their schedules, creating an individualized to-do list. Additionally, MacONE provides easy access to vital university resources, a forum for student interaction, a Pomodoro timer for effective study sessions, a feedback box for users to share their insights directly with developers, and a function allowing students to calculate their cumulative GPA by uploading their transcripts, all designed to simplify student life at McMaster University.

2.3 Symbols, Abbreviations and Acronyms

symbol	description
UI	User Interface
API	Application Programming Interface
HTTP	Hypertext Transfer Protocol
PDF	Portable Document Format
.csv	Comma-Separated Values
.txt	Text file

3 Functional Requirements Evaluation

3.1 Unit Testing

3.1.1 test_download

- Description: Testing download outline functionality
- Requirement Reference: To be updated
- Inputs: Request file 'testfile.txt'
- Expected Outputs: File content in response.data
- Actual Outputs: File content in response.data
- Result: Pass

3.1.2 test_change_username

- Description: Testing username change
- Requirement Reference: To be updated
- Inputs: New username 'new_user'
- Expected Outputs: Updated username 'new_user' in response.data
- Actual Outputs: Updated username 'new_user' in response.data
- Result: Pass

3.1.3 test_remove_course

- Description: Testing course removal
- Requirement Reference: To be updated
- Inputs: Index of course to remove
- Expected Outputs: Course list without the course
- Actual Outputs: Course list without the course
- Result: Pass

3.1.4 test_course_detail

- Description: Testing course detail retrieval
- Requirement Reference: FR15
- Inputs: Course ID '4C03'
- Expected Outputs: Course details page containing Course ID '4C03'
- Actual Outputs: Course details page containing Course ID '4C03'
- Result: Pass

3.1.5 test_upload_file

- Description: Testing file upload
- Requirement Reference: FR5
- Inputs: File 'test.pdf'
- Expected Outputs: Success message "File uploaded successfully!"
- Actual Outputs: Success message "File uploaded successfully!"
- Result: Pass

3.1.6 test_add_course

- Description: Testing addition of new course
- Requirement Reference: FR5
- Inputs: New course 'new_course'
- Expected Outputs: 'new_course' in response.data
- Actual Outputs: 'new_course' in response.data
- Result: Pass

3.1.7   test_course_page

- Description: Testing course page display
- Requirement Reference: To be updated
- Inputs: None
- Expected Outputs: ["course1", "course2"] in response.data
- Actual Outputs: ["course1", "course2"] in response.data
- Result: Pass

3.1.8   test_profile_page

- Description: Testing profile page display
- Requirement Reference: To be updated
- Inputs: None
- Expected Outputs: "/change_username" in response.data
- Actual Outputs: "/change_username" in response.data
- Result: Pass

3.1.9   test_feedback_page

- Description: Testing feedback page access
- Requirement Reference: To be updated
- Inputs: None
- Expected Outputs: "Submit Feedback" in response.data
- Actual Outputs: "Submit Feedback" in response.data
- Result: Pass

3.1.10 test_submit_feedback

- Description: Testing feedback submission

- Requirement Reference: To be updated

- Inputs: feedback_data = { "name": "John Doe", "email": "john.doe@example.com", "feedback_type": "General", "feedback": "Great app!" }

- Expected Outputs: Redirect to the feedback page

- Actual Outputs: Redirect to the feedback page

- Result: Pass

3.1.11 test_forum_page

- Description: Testing forum page access

- Requirement Reference: To be updated

- Inputs: None

- Expected Outputs: "MacForum - The McMaster community discussion board" in response.data

- Actual Outputs: "MacForum - The McMaster community discussion board" in response.data

- Result: Pass

3.1.12 test_add_topic

- Description: Testing topic addition in forum

- Requirement Reference: To be updated

- Inputs: topic_data = { "title": "Test Topic", "description": "This is a test topic description.", }

- Expected Outputs: topic_data in response.data

- Actual Outputs: topic_data in response.data

- Result: Pass

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3.1.13 test_topic

- Description: Testing topic page access in the forum

- Requirement Reference: To be updated

- Inputs: Topic ID '1'

- Expected Outputs: "Best Study Spots on Campus" in response.data

- Actual Outputs: "Best Study Spots on Campus" in response.data

- Result: Pass

3.1.14 test_upload_transcript

- Description: Testing transcript upload

- Requirement Reference: To be updated

- Inputs: File "transcript.pdf"

- Expected Outputs: "Profile Page" in response.data

- Actual Outputs: "Profile Page" in response.data

- Result: Pass

3.1.15 test_upload_transcript_processing

- Description: Testing transcript cGPA processing after upload

- Requirement Reference: To be updated

- Inputs: File "transcript.pdf"

- Expected Outputs: "9.4/12" in response.data

- Actual Outputs: "9.4/12" in response.data

- Result: Pass

3.1.16 test_delete_task

- Description: Testing task deletion

- Requirement Reference: To be updated

- Inputs: "id": [task_id, 2,],

- Expected Outputs: task_id not in response.data

- Actual Outputs: task_id not in response.data

- Result: Pass

3.1.17 test_edit_task

- Description: Testing task editing

- Requirement Reference: To be updated

- Inputs: task_data = { "task_name": "Updated Task", "due_date": "2021-01-01", "weight": "5", "est_hours": "2", }

- Expected Outputs: task_data in response.data

- Actual Outputs: task_data in response.data

- Result: Pass

3.2 Manual Testing

3.2.1 TFR1_A1

- Description: Change Testing username change

- Requirement Reference: To be updated

- Inputs: The user navigates to the profile page, enters "newName" in the "change username" input field, clicks the "Submit" button

- Expected Outputs: Redirect to the home page with "Hello, newName! Welcome to Mac One!"

- Actual Outputs: Redirect to the home page with "Hello, newName! Welcome to Mac One!"

- Result: Pass

3.2.2 TFR2-UI1

- Description: Submit feedback

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the feedback page, fills the form, clicks the "Submit Feedback" button

- Expected Outputs: Success message "Thank you for your feedback!"

- Actual Outputs: Success message "Thank you for your feedback!"

- Result: Pass

3.2.3 TFR3-UI1

- Description: Add a topic

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the forum page, clicks "Add Topic" button, fills the form, clicks the "Submit" button

- Expected Outputs: Redirects the forum page with the new topic listed.

- Actual Outputs: Redirects the forum page with the new topic listed.

- Result: Pass

3.2.4   TFR3-UI2

- Description: Add a Comment

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the forum page, clicks a topic, fills the comment input field, clicks the "Submit" button

- Expected Outputs: The new comment is listed under the selected topic.

- Actual Outputs: The new comment is listed under the selected topic.

- Result: Pass

3.2.5   TFR3-UI3

- Description: Add a Comment

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the forum page, inputs keywords in the search box, click the "Search" button

- Expected Outputs: Lists of topics and comments containing the searched keywords are displayed.

- Actual Outputs: Lists of topics and comments containing the searched keywords are displayed.

- Result: Pass

3.2.6   TFR4-UI1

- Description: Get cGPA

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the profile page, chooses a local transcript PDF file, and clicks the "Upload Transcript" button.

- Expected Outputs: The cGPA calculated is displayed.

- Actual Outputs: The cGPA calculated is displayed.

- Result: Pass

3.2.7   TFR6-UI1

- Description: Upload PDF

- Requirement Reference: To be updated

- VnV Plan Reference: TFR6-UI1

- Inputs: The user navigates to a course page, selects a local course outline, clicks the "Upload File" button

- Expected Outputs: Success message "File uploaded successfully!"

- Actual Outputs: Success message "File uploaded successfully!"

- Result: Pass

3.2.8   TFR6-UI2

- Description: Update task progress

- Requirement Reference: FR13

- VnV Plan Reference: TFR6-UI12

- Inputs: The user navigates to the homepage, clicks and drags one of the tasks to another progress zone.

- Expected Outputs: The task stays at the new zone.

- Actual Outputs: The task stays at the new zone.

- Result: Pass

3.2.9 TFR6-UI3

- Description: Delete task

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the homepage, and clicks the delete button of a selected task.

- Expected Outputs: The task disappears.

- Actual Outputs: The task disappears.

- Result: Pass

3.2.10 TFR9-UI1

- Description: Start a Pomodoro timer

- Requirement Reference: FR29

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the Pomodoro page, and clicks the "Start" button.

- Expected Outputs: The Pomodoro countdown starts. A tomato icon is added when the countdown reaches zero.

- Actual Outputs: The Pomodoro countdown starts. A tomato icon is added when the countdown reaches zero.

- Result: Pass

3.2.11 TFR9-UI2

- Description: Reset a Pomodoro timer

- Requirement Reference: FR29

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the Pomodoro page, and clicks the "Start" button, and clicks the "Reset" button before the countdown finishes.

- Expected Outputs: The Pomodoro countdown resets to the default.

- Actual Outputs: The Pomodoro countdown resets to the default.

- Result: Pass

3.2.12   TFR9-UI3

- Description: Play music.

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the Pomodoro page, and clicks the "Play Music" button.

- Expected Outputs: Music is played.

- Actual Outputs: Music is played.

- Result: Pass

3.2.13   TFR9-UI4

- Description: Play music.

- Requirement Reference: To be updated

- VnV Plan Reference: To be updated

- Inputs: The user navigates to the Pomodoro page, selects another genre from the drop-down menu, and clicks the "Play Music" button.

- Expected Outputs: Selected music is played.

- Actual Outputs: Selected music is played.

- Result: Pass

3.2.14 TFR16-17-D1

- Description: Extract data from PDF

- Requirement Reference: FR15

- VnV Plan Reference: TFR16-17-D1

- Inputs: The user presses to extract the course information from the uploaded PDF

- Expected Outputs: The page shows lists of the course information extracted from the PDF as a task list

- Actual Outputs: The page shows lists of the course information extracted from the PDF as a task list

- Result: Pass

3.2.15 TFR21-D5

- Description: Tasks display

- Requirement Reference: FR16

- VnV Plan Reference: TFR21-D5

- Inputs: The start and end times of the working hours for certain tasks recorded by using the Pomodoro Timmers, the estimated progress user input at the end of the Pomodoro Timmers, as well as the user's list of tasks and the percentage of progress of the marked tasks.

- Expected Outputs: Displays to the user a list of tasks with status labels.

- Actual Outputs: Displays to the user a list of tasks with status labels.

- Result: Pass

3.2.16 TFR26-S2

- Description: Tasks information update

- Requirement Reference: FR26

- VnV Plan Reference: TFR26-S2

- Inputs: Current schedule data for the task includes deadline, priority, weight, current progress in completing the task, the user's history of the percentage of progress completed, and the corresponding time spent on the task.

- Expected Outputs: The updated Learning Plan, regenerated task schedule information based on the updated task progress from the user, which may include reordering of task list and TO-DO list, new priority of the task, etc.

- Actual Outputs: The updated Learning Plan, regenerated task schedule information based on the updated task progress from the user, which may include reordering of task list and TO-DO list, new priority of the task, etc.

- Result: Pass

3.2.17 TFR28-S4

- Description: Tasks ranking

- Requirement Reference: TFR28

- VnV Plan Reference: TFR28-S4

- Inputs: The user's task list and data for tasks including taskType, weight and deadline.

- Expected Outputs: A task priority list, based on sorting the tasks in order by task type, weight, and deadline. High-priority tasks will be ranked first.

- Actual Outputs: A task priority list, based on sorting the tasks in order by task type, weight, and deadline. High-priority tasks will be ranked first.

- Result: Pass

4 Nonfunctional Requirements Evaluation

4.1 Usability

4.1.1 Survey

Testing Progress

A usability testing survey was completed by 10 participants, all of whom are students, with 8 attending McMaster University. Participants were invited to provide their feedback through a Google Forms survey, with the questions outlined in the Appendix survey section. The result values are calculated by surveying the overall satisfaction levels, ease of use, and the effectiveness of the specific features.

Result

Table 1: Survey Result for Usability

Survey Result for Usability	Result Value
Percentage of users who found the content of the website clear and easy to understand	78%
Average percentage score of user feedback on overall ease of use of site navigation	62%
Average percentage score of user feedback on ease of use of the prioritization generation feature	28%

Analysis

The result of the survey indicates that the current level of clarity, ease of use, and understanding of our website does not meet the predefined minimum threshold outlined in our Validation and Verification (VnV) plan (90%). This outcome underscores a significant need for enhancement in several key areas to elevate the overall user experience, for example, improving our UI elements, adding new features and simplifying processes to perform certain tasks.

4.1.2 Observation Study

Testing Process

To understand user interactions with our website, we conducted an observation study that involved 10 students from McMaster University, selected for their diverse backgrounds and familiarity with similar digital interfaces. The primary objective was to closely monitor and analyze their overall user experience while engaging with specific, predetermined tasks. These tasks were designed to mimic common user cases such as navigating to designated pages within our website. Two of our developers were assigned to perform the study and conduct the observations. Each participant's approach to the tasks, including the ability to perform specific tasks, interaction with UI elements, and additional comments, was documented.

Result

The result of the test is shown in the table below:

Table 2: Observation Result for Usability

Test Plan	How test has been performed	Actual Result	Expected Result	Result
THUR-1	Users are asked to navigate to a required page, the result of the percentage of users who are able to navigate to the page without confusion are calculated.	60%	90%	Fail
THUR-2	Ask users to upload a course syllabus file and calculate the percentage of users who are able to use this feature without problems.	70%	90%	Fail
THUR-2	Ask users to generate the priority of a course work by using the priority prediction model and calculate the percentage of users who are able to use this feature without problems.	40%	90%	Fail
THUR-2	Ask users to change the user name in the website and calculate the percentage of users who are able to use this feature without problems.	100%	90%	Pass
THUR-3	Ask users to check the grammar of text on a page. Calculate the average number of grammatical errors found by the user.	1.5	0	Fail
THUR-4	Ask users to check if there is any offisive message in the website. Calculate the average number of offiensive messages found by the user.	0	0	Pass
THUR-5	Ask users to observe the color combinations on the page. Count the number of areas of the site's user interface where users find color combinations difficult to distinguish.	3	0	Fail

Analysis

The result reveals that the proportion of users who successfully navigate to certain pages or complete specific tasks falls below our expected value of 90%, as outlined in Section 6.2 of our Verification and Validation (VnV) plan. This discrepancy highlights the necessity for modifications to enhance user navigation and task execution. Accordingly, improvements in the user interface, particularly the navigation bar, and the simplification of task processes are needed. Additionally, we need to address some small grammar mistakes for a better and smoother user experience as on average there are 1.5 grammar mistakes found.

4.2 Accuracy

4.2.1 Manual Testing

Testing Process

To ensure the accuracy of our main feature that extracts course information from PDF outlines, we conducted manual testing. For this purpose, two members of our development team chose five different course outlines which were randomly to represent a variety of courses. Each selected course outline was then uploaded to our website to start the course information extraction process. After the extraction was complete for each outline, our developers manually examined the results on the website closely. They checked if the course information such as course codes, and descriptions was accurately extracted. Then they calculated and recorded how much of the information was correctly extracted from each course outline.

Result

- Extract course information using the regular method.

Table 3: Manual Testing Regular Expression Method for Accuracy

Test Plan	How test has been performed	Actual Result	Expected Result	Result
TPAR-1	Manually upload multiple course syllabus documents and record the percentage of course information correctly extracted.	23.6%	90%	Fail

- Extract course information using OpenAI API.

Table 4: Manual Testing OpenAI API Method for Accuracy

Test Plan	How test has been performed	Actual Result	Expected Result	Result
TPAR-1	Manually upload multiple course syllabus documents and record the percentage of course information correctly extracted.	95.6%	90%	Pass

Analysis

As can be seen from the results, the precision of the results obtained using the regular expression method to extract course information from PDF course syllabi is very low and does not meet the minimum precision threshold (90%) specified in Section 6.1 of the VnV Plan. This indicates that we need to improve the accuracy of the algorithm. Since the accuracy (23.6%) is well below the threshold, this means that we may need to propose a new algorithm instead of improving the existing one, which would improve the accuracy to a great extent. We then decided to extract the course information through the OpenAI API by inputting the course syllabus PDF file and collating and extracting the content returned by the API, and the evaluation results showed a significant improvement in the accuracy of extracting the course information using this method, and based on the minimum accuracy threshold of 90% set out in the Verification and Validation (VnV) Plan, Section 6.1, we can tell that the results of the test (95.6%) has been passed.
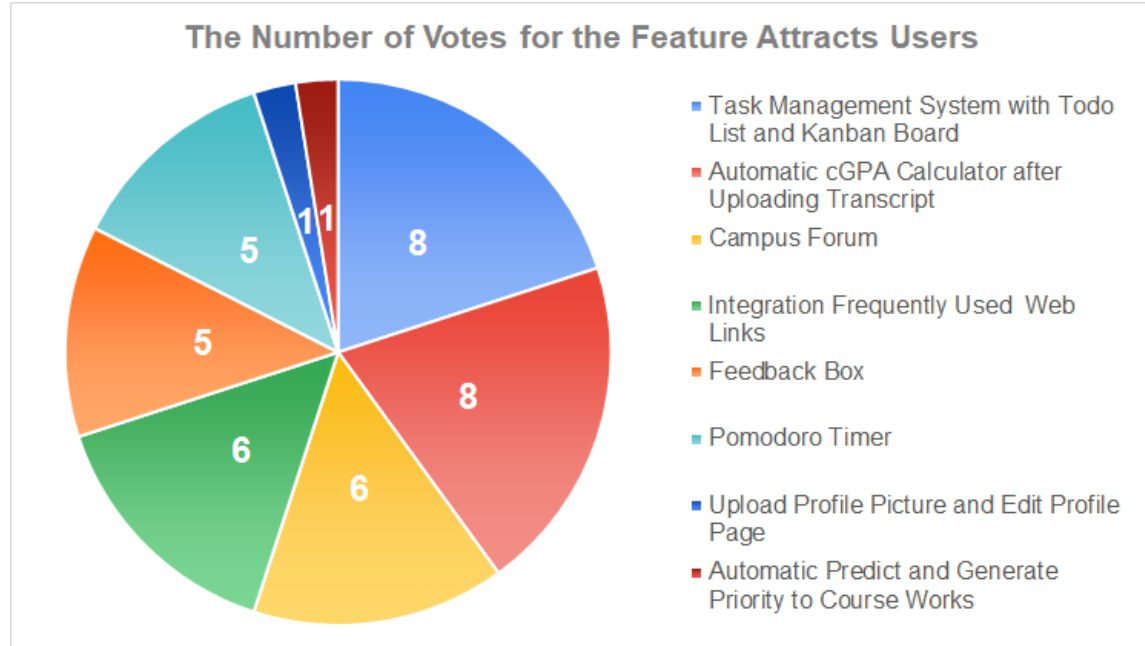
5   Changes Due to Testing

Figure 1: The Number of Votes Got from Survey for Which Feature Attracts Users More

5.1   Removing Task Priority Prediction Feature

From the result of the survey shown in the Figure 1, we can see that only 1 out of 10 users think that the task priority prediction was attractive. Besides, our initial design of task priority prediction's choice of model requires the high demand of dataset as input to ensure the accuracy of this model. However, in the current stage, it is hard to collect the need amount of data for our model training and make this feature complete and effective. Therefore, we abandoned this feature and put our efforts into other features that are more useful, feasible, and less time-consuming.

5.2   Changing Algorithm of Course Information Extraction

From the manual testing data result, we can see that there is an urgent need to improve the accuracy of the algorithm so that the percentage of the course information such as course code, and assignment weights that are correctly extracted can be

improved. Our original design was simply using Regular Expression to parse each information, however, due to the inconsistency of the format of the course outlines, it is difficult to correctly come up with the Regex pattern to extract related information from various course outlines. Therefore, we decided to use a completely new approach which is to use OpenAI API to parse related course information for us and then we can parse the response sent by the OpenAI server. In this way, our accuracy improves dramatically but our performance suffers a bit as it takes longer to complete the extraction due to the way how OpenAI handles those API calls.

5.3 Adding Frequently Used Apps Quick Links Feature

From our survey and additional comments when conducting the observational study, we can see that most users think it would be nice to have a feature where users can navigate quick links to key university websites as well as useful study tools that are being used daily such as Microsoft Teams, GitHub, etc. We wanted to improve our user experience as well as continuously improve our website by gathering feedback from users and developing new useful features, therefore we added this useful feature after the testing.

5.4 Adding Feedback Box Feature

After the testing, we noticed the importance of having continuous improvement and direct user input into our website management and improvement. We therefore added a feature where we implemented a direct communication method through the feedback box page which allows students to provide our developers with their suggestions directly. In this kind of sustainable feedback-improving mechanism, we could o continuously improve our website and meet students' needs as much as possible.

5.5 Adding cGPA Calculator Feature

According to the results of the votes for the feature attract users, we noticed that most of the users have a high preference for the automatic cGPA calculator after uploading the transcript. Also, the cGPA calculation feature is a very useful tool and a brand-new feature which could not be easily accessed from other resources. Therefore, we decided to add this feature for students to evaluate their study performance, view their academic progress, and make a responsive study plan to improve themselves, which meet our users' needs and satisfaction.

5.6 Adding Pomodoro & Weekly achievements Feature

After the testing, we noticed that the pomodoro timer feature is one of the most popular features. Also, even we have transferred our design focus from the study application into a comprehensive McMaster application, we still would like to retain some features that could support students to be able to access efficient study environments and tools. Therefore, This is a feature that aims to help the user have a deeper focus in the virtual study room which could help students manage distraction and control, and decrease back pain and mental fatigue. Also, with the concern of Rev 0 Demo feedback, we should integrate task management with the pomodoro timer. After integration, the user could click the task on the To-Do list board and redirect to the pomodoro timer page with the timer set up according to the task's estimated finish time, which could then massively increase the user's motivation to study, and highly increase the whole project's user experience.

5.7 Adding Forum Discussion Board Feature

Campus forum has been presented as the top four attractive features in the user-survey. The forum allows users to easily search the topics they are interested in and comment on the existing topic to quickly get involved in. Also, this feature supports users to create new topics enabling students to initiate the discussion they would like to arise. Therefore, the students could participate in an inclusive, interactive, and collaborative community and obtain the information they would like to know.

5.8 Improving the main UI elements

From the testing result and analysis, we can see that we need to improve our UI elements such as the layout of the navigation bar and overall user interface to enhance usability. Therefore, we redesigned our navigation bar to make it simpler and bigger and added a color theme for our website to make it cleaner and more clear. Also, more intuitive symbols and buttons have been introduced to this application, which work as the visual representations convey complex meanings and facilitate efficient user interaction.

5.9 Task Management & Calendar

After the testing, we find that the task management system with To-do List and Kanban board is one of the most attractive features to our target users. This feature allows users to organize the tasks into different columns representing different stages

of the process. Students could create the new task, categorize the task content, and dragdrop the cards between these columns to modify their state. This functionality makes the task management process very transparent and the workflow could be efficient as well. Also, the integration with the course outline extraction functionality support automated and consistent task generation features, save the student time and better focus on study itself, leading to better user-experienced application.

6 Changes Due to Feedback

After the Demo 0, we took the advice of professor, to implement the integration between the task manegment tools and the Pomodoro Timer feature. This kind of integration can highly increase the motivation fro users to focus study and put more efforts of the specific tasks with rewards. Such kind of mechanism of "tomato basket" and "weekly achievements" make the users' study time visualized and could manage the tasks using Kan-ban board in an easy way.

Also, we took the advice that make a platform for users to submit feedback and receive responses directly from the developers. Through this kind of transparent and straight-forward mechanism, the application could be continuously improved based on the popular usage. This kind of add-on feature also aligns with the user-friendly purpose mentioned by the supervisor, Prof and TAs. The user-driven enhancements ensure the platform evolves to meet the most demanded features and functions.

According to the feedback given by Prof when Rev0, we also optimized some detailed features. For the course code, we regularized the code name to include the course program in the purpose of improving the usability. Also the problematic issue of anonymous feedback is mentioned in the final demo, we are also working on the real-name system of the feedback form submission for better management and maintainability.

7 Traceability Matrix

This section shows two traceability matrices: between the Vnv Report and the VnV Plan and between the functional Requirements and the Testing.

Table 5: caption

VnV Plan(User Input)	Testing	Revised Changes
TFR6-UI1	**3.1.5**	**5.2 CIEN**
TFR6-UI2	**3.1.5**	**5.2 CIEN**
TFR6-UI3	**3.2.10**	**5.6 PWAC**
TFR6-UI4	**3.1.4**	**5.2 CIEN**
TFR6-UI5	**3.2.9**	**5.6 PWAC**
TFR6-UI6	**3.2.10**	**5.6 PWAC**
TFR6-UI7	N.A.	N.A.
TFR6-UI8	N.A.	N.A.
TFR6-UI9	N.A.	N.A.
TFR6-UI10	N.A.	N.A.
TFR6-UI11	N.A.	N.A.
TFR6-UI12	N.A.	**5.6 CIEN**
TFR6-UI13	N.A.	**5.6 CIEN**

Table 6: Trace Between VnV Plan & Testing & Revised Changes for the User Input

Table 7: caption

VnV Plan(Data)	Testing	Revised Changes
TFR16-17-D1	**3.2.7**	**5.2 CIEN**
TFR16-18-D2	**3.2.7**	**5.2 CIEN**
TFR16-19-D3	**3.2.10**	**5.6 PWAC**
TFR16-20-D4	**3.2.10**	**5.6 PWAC**
TFR16-21-D5	**3.2.10**	**5.6 PWAC**
TFR16-22-D6	N.A.	N.A.
TFR16-23-D7	N.A.	N.A.
TFR16-24-D8	N.A.	N.A.
TFR16-24-D9	**3.2.16**	**5.2 CIEN**
TFR16-24-D10	**3.2.15**	**5.2 CIEN**

Table 8: Trace Between VnV Plan & Testing & Revised Changes for the Data

Table 9: caption

VnV Plan(Scheduling)	Testing	Revised Changes
TFR25-S1	**3.2.15**	**5.9 TMCR**
TFR26-S2	**3.2.16**	**5.9 TMCR**
TFR27-S3	**3.2.16**	**5.9 TMCR**
TFR28-S4	**3.2.10**	**5.9 TMCR**
TFR29-S5	**3.2.10**	**5.9 TMCR**
TFR30-S6	N.A.	N.A.
TFR31-S7	N.A.	N.A.

Table 10: Trace Between VnV Plan & Testing & Revised Changes for Scheduling

Table 11: caption

VnV Plan(Non-func Req)	Testing	Revised Changes
TAR-1	**4.1.1**	**5.8 IMUI**
TAR-2	**4.1.1**	**5.8 IMUI**
TAR-3	**4.1.1**	**5.8 IMUI**
TAR-4	**4.1.1**	**5.8 IMUI**
TSTR-1	**4.1.1**	**5.8 IMUI**
TSTR-2	**4.1.1**	**5.8 IMUI**
TSTR-3	**4.1.1**	**5.8 IMUI**
TSTR-4	**4.1.1**	**5.8 IMUI**
TSTR-5	**4.1.1**	**5.8 IMUI**
TUHR-1	**THUR-1**	**5.8 IMUI**
TUHR-2	**THUR-2**	**5.8 IMUI**
TUHR-3	**THUR-3**	**5.8 IMUI**
TUHR-4	**THUR-4**	**5.8 IMUI**
TUHR-5	**THUR-5**	**5.8 IMUI**
TSLR-1	N.A.	N.A.
TSCR-1	N.A.	N.A.
TPCR-1	N.A.	N.A.
TRFTR-1	N.A.	N.A.
TCR-1	N.A.	N.A.
TCR-2	N.A.	N.A.
TOER-1	N.A.	N.A.
TOER-2	N.A.	N.A.
TSPR-1	N.A.	N.A.
TSPR-2	N.A.	N.A.
TSR-1	N.A.	N.A.
TSR-2	N.A.	N.A.
TSR-3	N.A.	N.A.
TSR-4	N.A.	N.A.
TSR-5	N.A.	N.A.
TCPR-1	N.A.	N.A.

Table 12: Trace Between VnV Plan & Testing & Revised Changes for Non-Functional Requirements

Appendix

7.1   Reflection

The VnV Report outlined specific tests conducted, including unit and manual testing, non-functional requirements evaluation, and changes due to testing which were more detailed compared to the initial plan. This indicates a deeper exploration into the practical aspects of verification and validation as the project progressed.

Changes were necessitated by the results obtained from testing, such as the removal of the task priority prediction feature, changing the algorithm for course information extraction, and adding new features based on user feedback and testing outcomes. These changes indicate adaptability and responsiveness to testing outcomes and user feedback, underscoring the dynamic nature of the development process. Changes occurred due to a variety of reasons including low user interest in certain features, the need for improved accuracy in algorithms, and the desire to enhance user experience based on feedback. These adjustments were critical for aligning the project closer to user needs and technical feasibility.

While some changes could potentially be anticipated in future projects through more thorough initial testing and user feedback collection, the unpredictable nature of development work means that some adjustments will always be a part of the process. Lessons learned from this project, such as the importance of early and continuous user feedback, can help in better anticipating future changes.

7.2   Survey Questions

1. Are you a student? If so, are you from McMaster?

2. Which following current feature in the website attracts you the most?

3. Please select from the options below that you think may be used less often?

4. We are considering adding some new features to the website to improve your experience. Please select from the options below the features that you think will make you use our site more frequently.

5. Is the content on our website clear and understandable?

6. On a scale of 1 to 5, how easy was it to navigate our website overall?

7. On a scale of 1 to 5, how would you rate the ease of the priority generation feature?

8. On a scale of 1 to 5, how visually appealing do you find our website?

9. Were you able to find all the current features we have? if not, please describe the problem you met.

10. On a scale of 1 to 5, how would you rate the accuracy of the information provided on our website overall?

11. On a scale of 1 to 5, how would you rate the task priority feature?

12. have you encountered any other inaccuracies while using our website? if yes, please provide examples.