MyCampus: Customize your iCampus

Team G
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Abstract. ‘iCampus’ is an online class platform of Sungkyunkwan University, which has been used by many students and professors. Through COVID-19, not only online lectures, but also announcements, materials, and assignments of all classes are uploaded through iCampus. As the importance has been emphasized, there has been an approach to improve the function of the iCampus. However, there was a problem that they are concentrated only on the deadline for lectures and assignments. This study proposes a chrome extension-based program for iCampus that user can manage the overall lecture. The program provides following functions: lecture checklist, lecture memo, summary of class materials, and notification of deadline for lectures and assignments. Furthermore, the program improves the existing UI on the iCampus to enhance the user's experience. (Evaluation)

Keywords: iCampus · Chrome Extension · Memo · Bookmark

1 Introduction

1.1 General statement

Almost every student in Sungkyunkwan University is using iCampus, a platform mainly for lecture contents, for a long period of time. Also, iCampus has established oneself as an online lecture platform as it's already been 3 years since Covid-19 pandemic started. Most of professors and assistants provide lecture, assignments and even quiz or test through iCampus which means managing their study through iCampus is a significant issue to students.

1.2 Motivation

Even in the same lecture progression, the study routine varies depending on the individual's understanding or learning speed. In order to study systematically, students need a system to organize their study routine. The previous chrome extensions for iCampus provide functions focused only on attendance of classes, not the learning itself. Thus, students use separate applications that are not linked to iCampus. They must take notes about the current status of their study one by one such as what to study more. It would be great if students could manage their study on iCampus.

1.3 Prior work

For students to check attendance and manage assignments conveniently, three kinds of Chrome extensions, iCampus check, iCampus Check Plus, iCampus support tool, have been made. Those extensions provided functions for students to check their deadline of attendance and assignments. However, they do not provide additional functions for thorough academic management. Our program has been configured to include all the features of the extension and also provide additional features at the same time.

1.4 Objective

The main goal of 'MyCampus' is to provide the most convenient UI of iCampus and help students to study in a more efficient way. Not only providing information of remaining lecture and assignments, we aimed to provide memo function, bookmark function for lectures, and easy access to various class materials and announcements. Namely, we designed 'MyCampus' which is a platform of study management linked with iCampus. This will surely help students focus on learning much more efficiently.

1.5 Technique

Our program is Chrome Extension, which requires several files for Chrome architecture, and files are divided into manifest, service worker, content script, and ui element depending on the functionality provided. For maintenance and productivity, we uses React that can be developed in component units, and SCSS that can make us use CSS more useful by using variables declaration, mixin and functions. For state management, a Recoil library is used which is capable of state management with a global state. In addition, Axios is used for API call, and two storage is used: chrome local storage and chrome sync storage. By using both storage, we provide reduced loading time and personal service such as bookmark and memo.

1.6 Design & Implementation

MyCampus has a total of three types of pages: the entire dashboard, the subject dashboard, and the page for each subject. In the pages of each subject, there are pages of announcements, lectures, assignments, and materials. There is an update button on every page to update information partially. And each page is composed of components such as a sidebar, buttons, tab, tags, tables and etc. Key features of MyCampus is following : First, lectures and assignments are displayed on the entire dashboard in a weekly basis. Second, students can take notes on the dashboard for each subject. Third, there are bookmarking function of lecture content. Finally, students can view lecture materials in the materials page at once.

1.7 Evaluation

After distribution, an extension page test was conducted on a total of 30 users. More than 90 percent of users evaluated that they were satisfied with the overall program and gave positive feedback. Shortcomings in the program's functions, such as memo function and UI, were also provided. These are intended to be supplemented at a later distribution.

1.8 Contribution

Our goal was to help students manage their learning easily. We succeeded implementing all main functions we initially planned. According to the survey conducted after distribution, we checked many people have positively evaluated the functions we have implemented. We believe that by steadily developing this extension, this page contribute to helping learning of Sungkyunkwan University students.

2 Related Works

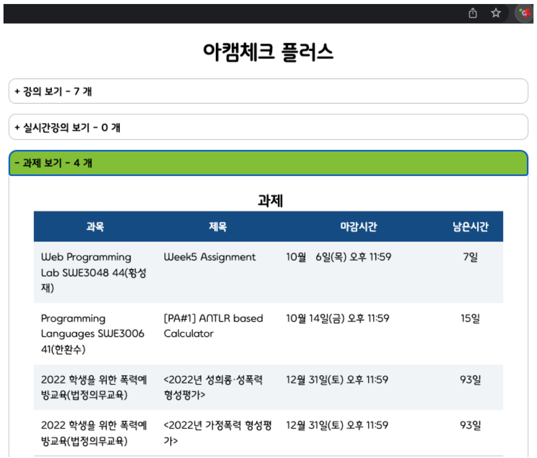
There were previous suggested chrome extensions that helped students check their attendance and assignments which was one of main discomfort of iCampus. Our project not only includes the functions of the existing ones but also reflects other discomforts of iCampus.

2.1 Chrome Extension

Chrome Extension is an additional program that users can install to make the programs more convenient. Chrome users can download the extensions they want from the 'Chrome Web Store', and developers can easily deploy their extensions on store after Google reviews them.
Chrome Extension can provide a suitable function for the program because it can access data stored in the browser (such as login session information, cookies) and access the UI of the program.
Due to the advantage of being able to use data that stored in the browser, a program using the user's information can be developed even if the user's personal information is not directly stored or used. "MyCampus" will be developed as a Chrome Extension program because it needs to utilize personal information such as user's course information and assignment submission status.

2.2 iCampus Check Plus

'iCampus Check Plus' is a chrome extension that adds the function of providing task list registered in the 'Task' to 'iCampus Check'. In addition, it has the advantage of being able to display real-time lectures(see Fig. 1). However, the disadvantage of taking a certain amount of time to load data every time extension is executed is not compensated.



아캠체크 플러스

+ 강의 보기 - 7 개

+ 실시간강의 보기 - 0 개

- 과제 보기 - 4 개

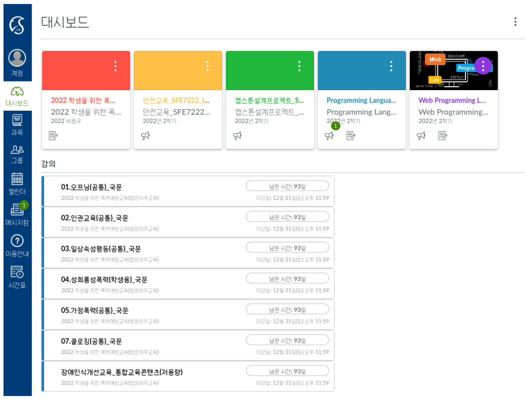
과제

과목	제목	마감시간	남은시간
Web Programming Lab SWE3048 44(황성재)	Week5 Assignment	10월 6일(목) 오후 11:59	7일
Programming Languages SWE3006 41(한환수)	[PA#1] ANTLR based Calculator	10월 14일(금) 오후 11:59	15일
2022 학생을 위한 폭력예방교육(법정의무교육)	<2022년 성희롱·성폭력 형성평가>	12월 31일(토) 오후 11:59	93일
2022 학생을 위한 폭력예방교육(법정의무교육)	<2022년 가정폭력 형성평가>	12월 31일(토) 오후 11:59	93일

Fig. 1. pop-up screen changed using 'iCampus Check Plus'

2.3 iCampus Support Tool

'iCampus Support Tool' is a chrome extension that provides the functions of the above extensions and makes it easier to see by changing the UI of the iCampus (see Fig. 2, Fig. 3). In addition, the function of registering to-do list and checking it on the dashboard is also added. However, like 'iCampus Check', there is a disadvantage in that it is not possible to bring up lists of 'Task' and real-time lectures.



대시보드

2022 학생을 위한 폭...
2022 학생을 위한 폭...
2022 비정규

안전교육_SFE7222_I...
안전교육_SFE7222...
2022년 2학기

캡스톤설계프로젝트_S...
캡스톤설계프로젝트_...
2022년 2학기

Programming Langua...
Programming Lang...
2022년 2학기

Web Programming L...
Web Programming...
2022년 2학기

강의

01.오프닝(공통)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

02.인권교육(공통)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

03.일상속성평등(공통)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

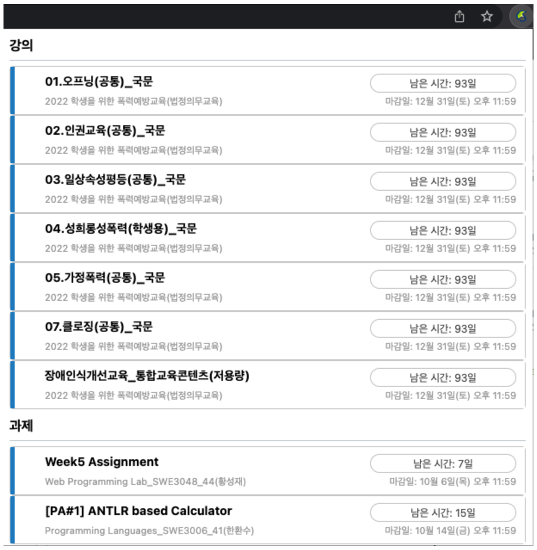
04.성희롱성폭력(학생용)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

05.가정폭력(공통)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

07.클로징(공통)_국문 — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

장애인식개선교육_통합교육콘텐츠(저용량) — 남은 시간: 93일
2022 학생을 위한 폭력예방교육(법정의무교육) — 마감일: 12월 31일(토) 오후 11:59

Fig. 2. Dashboard screen changed using 'iCampus support tool'



강의

01.오프닝(공통)_국문
2022 학생을 위한 폭력예방교육(법정의무교육)
남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

02.인권교육(공통)_국문
2022 학생을 위한 폭력예방교육(법정의무교육)
남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

03.일상속성평등(공통)_국문
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남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

04.성희롱성폭력(학생용)_국문
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남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

05.가정폭력(공통)_국문
2022 학생을 위한 폭력예방교육(법정의무교육)
남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

07.클로징(공통)_국문
2022 학생을 위한 폭력예방교육(법정의무교육)
남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

장애인식개선교육_통합교육콘텐츠(저용량)
2022 학생을 위한 폭력예방교육(법정의무교육)
남은 시간: 93일
마감일: 12월 31일(토) 오후 11:59

과제

Week5 Assignment
Web Programming Lab_SWE3048_44(황성재)
남은 시간: 7일
마감일: 10월 6일(목) 오후 11:59

[PA#1] ANTLR based Calculator
Programming Languages_SWE3006_41(한환수)
남은 시간: 15일
마감일: 10월 14일(금) 오후 11:59

Fig. 3. pop-up screen changed using ‘iCampus support tool’

3 Design

3.1 Overall Architecture

MyCampus efficiently stores and displays the data on iCampus. Data on iCampus is not updated often, so students can quickly browse the pages once they save it. It also improves the current uncomfortable UI so that students can check the data more intuitively.

Store Data First, students can load data by pressing the refresh button whenever they want. It takes a few seconds, but it stores all the data students need. Next, students can show the UI of MyCampus instead of the existing one. On this page, based on the data just saved, the materials are listed so that students can see them easily.

Dashboard The point we focused on the most was how to check the remaining schedules at a glance. MyCampus reflects the existing function of prior works, but is configured to further suit the user’s convenience. It informs you of the remaining assignments and lectures on a weekly basis, from near to far deadlines. In addition, colors were designated for each lecture so that the remaining subjects could be identified at a glance.

Subject Dashboard MyCampus provides a dashboard page that shows important information about a specific subject. Students can check information about the subject, lectures and tasks of the week, and upcoming real-time lectures here.

Memo In subject dashboard page, students can take a note about their class. Our service provides a storable note, which students use when they have something to remember about the subject such as class room number, date of midterm exam.

Mark on Lectures Students can make two types of mark on the lecture. One is a completion mark and the other is bookmark. The completion mark is used to indicate that the learning is actually over. Bookmarks are used for lectures that need to be watch later.

Filter and Sort The current iCampus provides assignment filter function long and ordered by time, making it difficult to scroll as the semester passed. Furthermore, it provides weekly lecture without the filter function. In order to find lectures that students have not taken, they should check them one by one. So MyCampus provides filters and sorting functions so that students can quickly find the lecture they want.

Collect by Type MyCampus provides a classification for mixed materials. Professor uploads lectures, files, and assignments together on the 'lecture content' menu. However, MyCampus classifies it and makes it easy to identify the type. In addition, it provides a function to collect by type.

Efficiency of dashboards' movement When students want to check the same tabs in another lecture, the existing iCampus requires three clicks. Students have to enter the dashboard of another lecture and then check the tab. This is very inconvenient and inefficient. However, MyCampus allows students to check the same tabs of other lectures with a single click.

3.2 Technique

Figma An UI prototype was created using Figma. MyCampus was designed in consideration of how it would be most effective when configuring components. In addition, the design was constructed and modified by visually checking what functions are needed within the page and how to move between the page.

Chrome Extension ‘MyCampus’ is chrome extension program. Extensions contain different files, depending on the functionality provided [1]. 1) The manifest file provides the browser information about the extension, such as the most important files and the capabilities the extension might use [2]. 2) The extension service worker is event handler for extension [3]. It contains listeners for browser events that are important. It lies dormant until an event is fired then performs the instructed logic. 3) Content scripts allow extensions to inject logic into a page in order to read and modify its contents [4]. A content script contains JavaScript that executes in the context of a page that has been loaded into the browser. Content scripts can communicate with parent extensions by exchanging messages and storing values using the storage API [5] 4) Last one is UI elements. The existing chrome extension programs for iCampus are pop-up form, so users have to click whenever the page changes. However, MyCampus is available in the form of a page that covers the entire screen.

Data Storage In previous programs for iCampus, users had to wait for a long loading time each time. However, the important purpose of our service is to provide pages with short loading time. It also provides personal services (note, lecture display). Personal services should be checked on multiple computers if the users are the same. Therefore, we choose two storage for our purposes [7]: Chrome local storage, Chrome storage synchronization.
- Chrome Local Storage Chrome local storage has a large capacity by default and can be stored without capacity limitation by adding “UnlimitedStorage” option to the permission. So, it is suitable for storing large amounts of information received through API call. In addition, data can be stored in various forms in Chrome local storage, which makes to store subject numbers or keys more efficiency.
- Chrome Storage Sync Local storage cannot share privately stored information on other computers. However, with Chrome storage sync, data can be maintained even if the user uses other computer if user use the same account. This advantage is useful when using personal memo or bookmark functions.

React Our service chose the React as the development tool [8]. The biggest reasons for choosing React are as follows. The first is the presence of Virtual DOM. Every time an existing DOM changes pages, it changes the entire DOM by loading new HTML. Virtual DOM is created by the value returned by the React component, so it only finds and replaces the changes compared to the actual DOM shown. So, Virtual DOM enables the development of component units in React. The second is creating component Units. Components are individual view units that make up the UI. If UI development is called Lego, the components act as blocks. Assemble these blocks to create a complete product. These components are divided, so they can be reused in different parts. It facilitates productivity and maintenance.

Recoil Our service choose the recoil which is a statement management library for React applications [9]. There are two reasons for adopting. First, recoil provides a global state. Developer set state as atom. So, service can re-render easily the page if there are the atom’s change of the children. Second, Recoil do not require boilerplate code to get started. So, we do not have to edit boilerplate code when we do the refactoring.

Axios Our service fetches and consumes data based on iCampus API. So, we choose the axios which is promise based HTTP client for the browser and node.js [10, 11]. Axios automatically convert HTTP request and response to JSON format. So, we do not have to process which change the format of data. Also, axios can use interceptor which developer can handle error more easily.

Scss CSS is a preprocessing process used to add design elements, such as decorating HTML tags or adding effects. However, CSS becomes a factor that causes difficulty in maintenance, such as poor readability. Therefore, in our project, we used scss to compensate for the shortcomings seen in CSS, such as increasing the reusability of code, increasing readability, and increasing the efficiency of development. SCSS has good advantages to modularize because of using mixin, variable declaration, function and conditional statements and nesting in web publishing.

3.3 Challenges

In the process of development, there were many modifications and challenges both technically and design. The following are three challenges that have been modified through feedback after deploying the beta version 1.0.0.
The first is the UI part. One of the most feedback was that the subject icons in the sidebar were difficult to identify between subjects. In addition, there are many buttons on the page such as update buttons and filters, which can cause confusion. Therefore, to improve these problems, the color of the subject set by the user on iCampus was used, not the color arbitrarily designated by the service. Also, the buttons allow the tooltip to appear according to the purpose, so that the user can use the UI more intuitively. The second is a lack of data. On the beta version 1.0.0, the lecture format and file format were not partially reflected. This is because only our team members can check the API during the development process. Therefore, after distribution as a beta version 1.0.0, information on the missing data type was obtained from users, and then supplemented. The third is loading time. Full loading is essential when installing an extension program for the first time. However, even after the first time, inevitable updates occur to refresh the data which takes a long time, and it put a burden on the user. In order to improve this, small unit update buttons such as each subject, each subject tab, lecture and task separately were prepared so that users could update only what they needed. This method makes the time required for the update to be short, so the user can do it without burden.

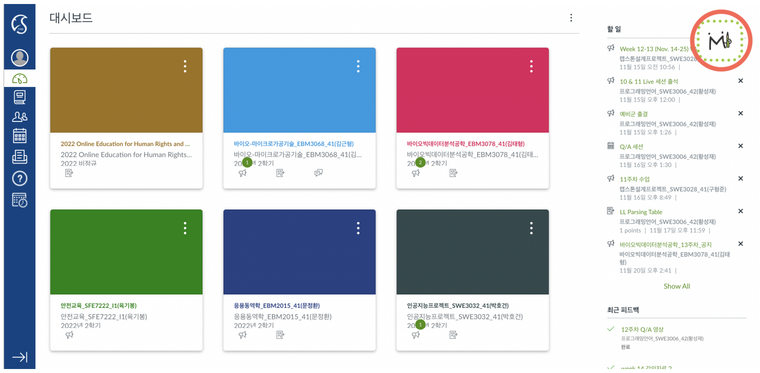
4 Implementation

4.1 UX/UI view point

Logo This is our logo which ensures the identity of our Chrome extension. It is a combination of M as 'My' and pencil as 'an online study platform of Campus'.

Fig. 4. Logo of MyCampus

Quick Button After the user install MyCampus on their Chrome, the logo of MyCampus appears on the upper right of the iCampus dashboard page. By clicking this logo, they can simply enter the page of MyCampus.



2022 Online Education for Human Rights and ...
2022 Online Education for Human Rights...
2022 비정규

바이오-마이크로가공기술_EBM3068_41(김근형)
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2022년 2학기

바이오빅데이터분석공학_EBM3078_41(김태형)
바이오빅데이터분석공학_EBM3078_41(김태...
2022년 2학기

안전교육_SFE7222_I1(육기봉)
안전교육_SFE7222_I1(육기봉)
2022년 2학기

응용동역학_EBM2015_41(문정환)
응용동역학_EBM2015_41(문정환)
2022년 2학기

인공지능프로젝트_SWE3032_41(박호건)
인공지능프로젝트_SWE3032_41(박호건)
2022년 2학기

할 일

Week 12-13 (Nov. 14-25) W
캡스톤설계프로젝트_SWE3028
11월 15일 오전 10:56 |

10 & 11 Live 세션 출석
프로그래밍언어_SWE3006_42(황성재)
11월 15일 오후 12:00 |

예비군 출결
프로그래밍언어_SWE3006_42(황성재)
11월 15일 오후 1:26 |

Q/A 세션
프로그래밍언어_SWE3006_42(황성재)
11월 16일 오후 1:30 |

11주차 수업
캡스톤설계프로젝트_SWE3028_41(구형준)
11월 16일 오후 8:49 |

LL Parsing Table
프로그래밍언어_SWE3006_42(황성재)
1 points | 11월 17일 오후 11:59 |

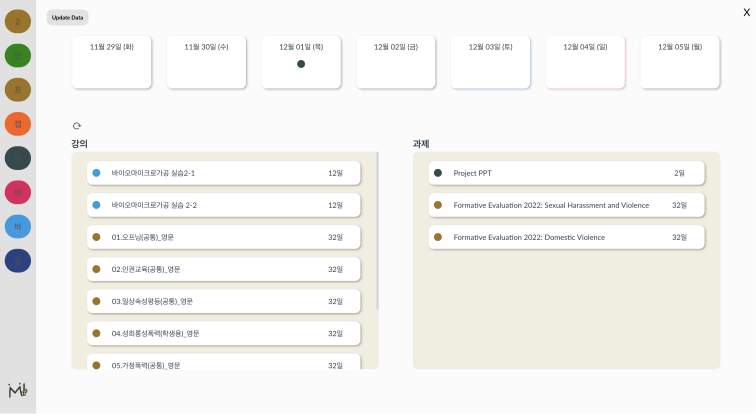
바이오빅데이터분석공학_13주차_공지
바이오빅데이터분석공학_EBM3078_41(김태형)
11월 20일 오후 2:41 |

최근 피드백

12주차 Q/A 영상
프로그래밍언어_SWE3006_42(황성재)
완료

Fig. 5. Quick Button to enter MyCampus

Dashboard The full dashboard is a main page of MyCampus. Students are able to check remaining lectures and assignments. We also provide Day Card on the top of the page to notify students what to do on a weekly basis. Students can check the full name by raising the mouse over the subject icon on the side bar, and click it to move to the dashboard of the subject. On the upper left, there is a update data button which allows users to update whole data such as lecture, assignments, materials from iCampus.



강의

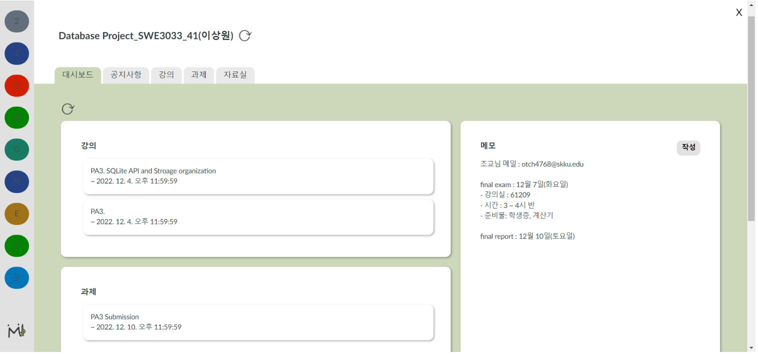
바이오마이크로가공 실습2-1	12일
바이오마이크로가공 실습 2-2	12일
01.오프닝(공통)_영문	32일
02.인권교육(공통)_영문	32일
03.일상속성평등(공통)_영문	32일
04.성희롱성폭력(학생용)_영문	32일
05.가정폭력(공통)_영문	32일

과제

Project PPT	2일
Formative Evaluation 2022: Sexual Harassment and Violence	32일
Formative Evaluation 2022: Domestic Violence	32일

Fig. 6. Full Dashboard of MyCampus

Subject Dashboard Subject dashboard shows remaining lectures and assignments. Also, students are able to take their personal memo. They can write import information about the class such as professor email or date and class room number of final exam etc. Also there are update button on the right side of subject name and inside the dashboard tab. The former updates the whole information on the subject, and the latter updates information on lectures and assignments.



Database Project_SWE3033_41(이상원)

강의

PA3. SQLite API and Stroage organization
~ 2022. 12. 4. 오후 11:59:59

PA3.
~ 2022. 12. 4. 오후 11:59:59

과제

PA3 Submission
~ 2022. 12. 10. 오후 11:59:59

메모

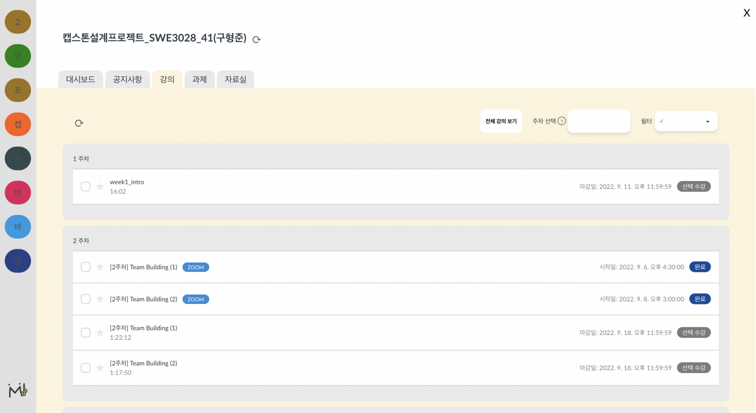
조교님 메일 : otch4768@skku.edu

final exam : 12월 7일(화요일)
- 강의실 : 61209
- 시간 : 3 ~ 4시 반
- 준비물: 학생증, 계산기

final report : 12월 10일(토요일)

Fig. 7. Subject Dashboard of MyCampus

Lectures Lecture page shows the whole lecture of each subject. They can update only lectures from iCampus through update button on the page. The tag on the right of each lectures shows if it is done or not and also if it is mandatory lecture or not. However, the attendance does not mean that the student fully understands the course. So we made a check and star tag on the left side of each lecture. Students can filter lectures using this tags.



캡스톤설계프로젝트_SWE3028_41(구형준)

1 주차

□ ☆ week1_intro 16:02 — 마감일: 2022. 9. 11. 오후 11:59:59 선택 수강

2 주차

□ ☆ [2주차] Team Building (1) ZOOM — 시작일: 2022. 9. 6. 오후 4:30:00 완료

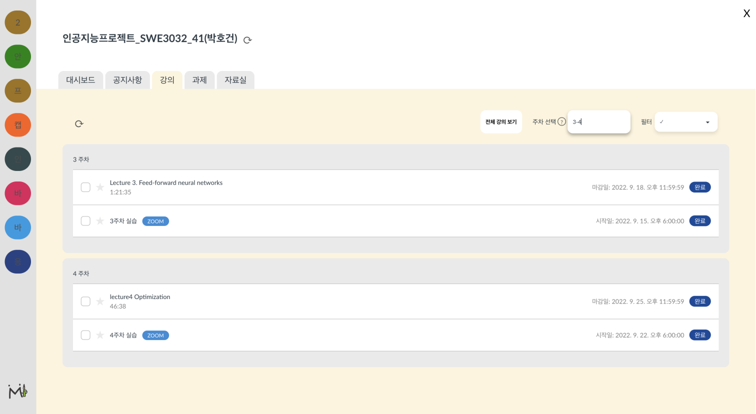
□ ☆ [2주차] Team Building (2) ZOOM — 시작일: 2022. 9. 8. 오후 3:00:00 완료

□ ☆ [2주차] Team Building (1) 1:22:12 — 마감일: 2022. 9. 18. 오후 11:59:59 선택 수강

□ ☆ [2주차] Team Building (2) 1:17:50 — 마감일: 2022. 9. 18. 오후 11:59:59 선택 수강

Fig. 8. Lecture page of MyCampus

Furthermore we made section box which is for typing week number that students want to check out. This will allow more comfortable study for students.



인공지능프로젝트_SWE3032_41(박호건)

주차 선택: 3-4

3 주차

□ ☆ Lecture 3. Feed-forward neural networks 1:21:35 — 마감일: 2022. 9. 18. 오후 11:59:59 완료

□ ☆ 3주차 실습 ZOOM — 시작일: 2022. 9. 15. 오후 6:00:00 완료

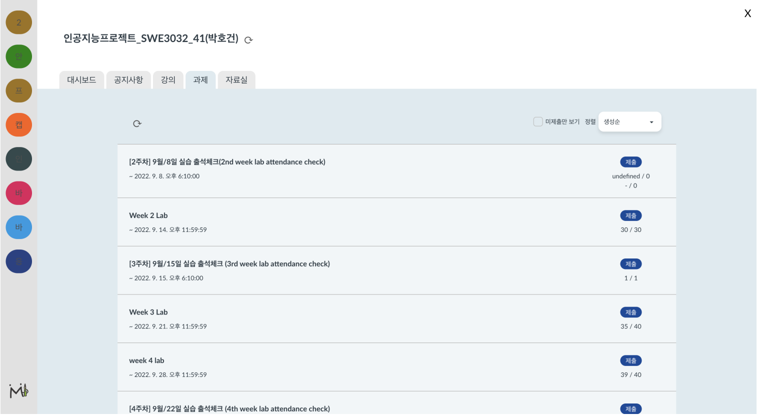
4 주차

□ ☆ lecture4 Optimization 46:38 — 마감일: 2022. 9. 25. 오후 11:59:59 완료

□ ☆ 4주차 실습 ZOOM — 시작일: 2022. 9. 22. 오후 6:00:00 완료

Fig. 9. Select section of the lectures

Assignments Assignments page operates similarly with Lecture page. The main difference is sorting option. Assignments can be sorted in a time order, inverse time order or deadline order. Also, students are able to check only not submitted assignments separately. In addition, they can immediately check the grades they received for each assignment.



인공지능프로젝트_SWE3032_41(박호건)

[2주차] 9월/8일 실습 출석체크(2nd week lab attendance check)
~ 2022. 9. 8. 오후 6:10:00
제출
undefined / 0
- / 0

Week 2 Lab
~ 2022. 9. 14. 오후 11:59:59
제출
30 / 30

[3주차] 9월/15일 실습 출석체크 (3rd week lab attendance check)
~ 2022. 9. 15. 오후 6:10:00
제출
1 / 1

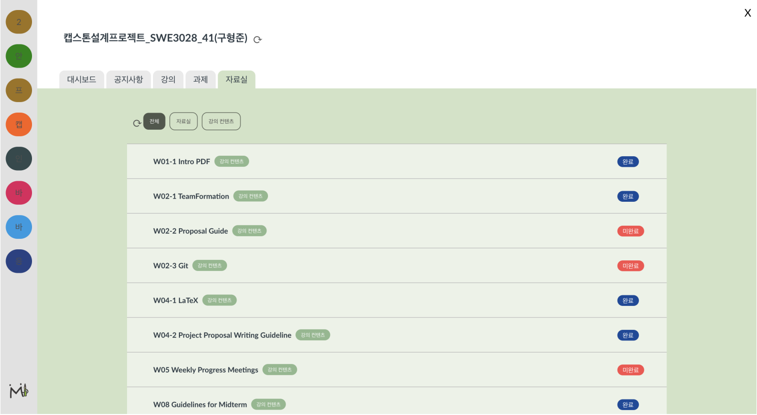
Week 3 Lab
~ 2022. 9. 21. 오후 11:59:59
제출
35 / 40

week 4 lab
~ 2022. 9. 28. 오후 11:59:59
제출
39 / 40

[4주차] 9월/22일 실습 출석체크 (4th week lab attendance check)
제출

Fig. 10. Assignment page of MyCampus

Materials There are countless materials in each subject. However, each professor has a different location to upload data such as materials and lecture contents. It is very confusing and cumbersome to check every time. On our materials page, users can check the entire data at once, and they can also check the data uploaded to the materials and lecture contents separately through the radio button.



캡스톤설계프로젝트_SWE3028_41(구형준)

W01-1 Intro PDF 강의 컨텐츠 완료

W02-1 TeamFormation 강의 컨텐츠 완료

W02-2 Proposal Guide 강의 컨텐츠 미완료

W02-3 Git 강의 컨텐츠 미완료

W04-1 LaTeX 강의 컨텐츠 완료

W04-2 Project Proposal Writing Guideline 강의 컨텐츠 완료

W05 Weekly Progress Meetings 강의 컨텐츠 미완료

W08 Guidelines for Midterm 강의 컨텐츠 완료

Fig. 11. Materials page of MyCampus

4.2 Frontend

There are elements commonly used for each page and elements particularly used for a specific page. Each was developed separately, and then combined to create a single page. Also, we used local and sync storage of Chrome to store and get data we obtained from various api.

Common Component For common components, there are sidebar, tab, table, tag, update button, button, card, checkbox, radio button and dropdown.

- Sidebar Sidebar is used in every page. It shows the subjects that student takes. Users are able to move to the other subject through this sidebar. The color of subjects are same as the color used in iCampus.

- Tab Tab is the main component of every page. There are dashboard tab, announcement tab, lectures tab, assignments tab and materials tab. Users are able to navigate pages by clicking tabs.

- Table Table is also one of frequently used component. Announcements, lectures, assignment and materials are all shown in table type.

- Tag Tag is used to notify attendance status, assignment submission status and materials check status. It also informs if it is a compulsory lecture or not. This is frequently used in various pages for each subjects.

- Update Button We created one or two update buttons on every page. This makes partial update by subject, lecture, and assignments to be possible. Using all components, lectures and assignments API, this button get data from local Storage and then update data on the page.

- Close Button Every page has close button on the upper right. This allows users easily go back to iCampus page. **- Button** The button is frequently used in almost every page. It is mainly used when updating whole data, storing notes, checking whole lectures in lectures page and checking the comments for announcements.

- Card The card is used in each subject dashboard to show remaining lectures, assignments and personal memos.

- Checkbox Checkbox is mainly used for classifying absent lectures and not submitted assignments.

- Radio Button Radio button is for materials page. This button allows students to see the data posted elsewhere at once, or check each of them.

- Dropdown We made dropdown component to sort items in an order that the user wants. It is used in lecture page and assignment pages. Students are able to sort the items based on their mark on lectures. Also, they can sort their assignments in a time order, reverse time order and the urgent order of submission. The mark on lectures are stored in sync storage and assignments are stored in local storage. We get information from each storage to sort items.

Dashboard Component Not only common components, there is a component only used for the function of full dash board.

- Day Card On the full dashboard, we made day card to inform remaining lectures and assignments to students. We made total seven cards to tell students the remaining amount on a weekly basis.

Subject Component Similar to the full dashboard, there is also a component only used for the function of subject dash board.

- Text Area The main function of MyCampus is that it's possible to take notes for each subjects in a single page. We made a text area that students can write and edit their memo. This information is stored and updated using sync storage.

Lecture Component There is a component only used for the function of lecture dash board.

- Section We created a section where students can type the week or the week range of the lecture they want to check.

4.3 Backend

Postman My Campus brings information about the subjects students are currently taking through the iCampus API. It is necessary to first find out what kind of data each Request url receives. In this process, we utilized postman, an API platform [12].

	request url
Base url	https://canvas.skku.edu/
All Component	api/v1/users/self/favorites/courses
Announcement	api/v1/courses/${courseId}/discussion$_{t}opics?only_{a}nnouncements = true\&per_{p}age = 200\&page = 1\&filter_{b}y = all\&no_{a}vatar_{f}allback = 1\&include[] = sections_{u}ser_{c}ount\&include[] = sections$
Assignment	api/v1/courses/${courseId}/assignments?per page=200
Courses	api/v1/users/self/favorites/courses
Resources	learningx/api/v1/courses/${courseId}/resources db?user login=${user.studentId}
Sections	learningx/api/v1/courses/${courseId}/sections db?user id=${user.userId}&role=1&type=
User	courses/${courseId}/external tools/5

Table 1. API-Request url.

Fetch In the previous process, we checked which url and permissions were needed and what information each API brings. However, considering various aspects such as limitation of storage capacity, reduction of loading time, and convenience of development, it is essential to extract the appropriate data necessary for our service. Through the following process, we extract necessary information of data and return it to one object.

- Fetch All Component It provides information on all subjects overall. Information on subjects is assignment id, attachment status, created at, completed, component id, commons content, description, due at, grade, late at, lock at, points possible, score, submitted, title, type, unlock at, url. This project categorizes all assignments into four types: lecture, assignment, announcement, resources. A subject is classified according to the content type of the commons content. It also stores IDs for all subjects to be used as indexes for easy classification and finding.

- Fetch Announcement It provides information on announcements of each subject which are posted on iCampus notice tab. Information on announcement is id, created at, message, title, url, username.

- Fetch Assignment It provides information on assignments for each subject. The 'assignment' mentioned here are all integrated with lectures, materials, and assignments which a piece of work that professors give students to do. Information on assignment is assignment id, created at, description, due at, unlock at, lock at, points possible, grading type, title, submitted, url.

- Fetch Color It provides the color set by the user for each subject on the iCampus. After receiving html from the base url, use DOM parser to interpret and store the color set on the iCampus for each subject ID. If user changes the colors of subjects on the iCampus and update the My Campus, user can see that the changes are reflected.

- Fetch Courses It provides the information on favorite subjects of user. If the user does not set it up separately on iCampus, it refers to subjects that the user takes in the semester. Information on favorite subject is id, name and course code. So, it is used as the parameter of fetching other data.

- Fetch Resources It provides the information on Resources data stored in material tab of iCampus. Information on Resource is resource id, title, description, commons content, completed.

- Fetch Sections It provides position information on what lectures there are weekly for each subject. Therefore, it returns an object that stores week(position) as key and lecture ids of that week as value.

- Fetch Users It provides the user information. The method of fetching data is performed by interpreting html using dom parser like fetching color data. Information on user is student Id, user Id which is the number provided by iCampus per user. Also, it is used as the parameter of fetching other data.

Get At the current iCampus, students can see that lecture contents tab has various data such as assignments and files as well as lecture videos. As described above, it may be seen that several types of data are not divided appropriately but are mixed on one type of tab. Therefore, My Campus provides pages for each tab and classifies data accordingly, making it convenient for students to use. For that, the process is necessary that organize the data format to load data easier in page development, such as follows.

- Get Announcement Our service classified all components in the announcement tab of iCampus and text form data in the lecture content as announcements.

- Get Assignments Our service classified components in the assignment tab of iCampus and text form of data in the lecture content as announcements.

- Get Lectures Our service provides the filter functions with lecture. Users can enter notes in the direct input column to check only the lecture of the desired week. So,

- Get Resources Our service classified components in the meterial tab of iCampus and file form of data in the lecture content as resources.

- Get Todos Todos includes lectures that are included in attendance but have not yet taken and assignments to be submitted.

Store data To store the data, we use two methods: local storage, sync storage. The storage used basically consists of key and value, and stores data. The process of storing data in storage consists of 'get' that loads data and 'set' that stores data. Both storage loads and stores data using 'mycampus' as key value.

- Update The following update are related with local storage. These parts are not saved separately by the user, but pages that are organized by obtaining information from the API. Therefore, there is no need for computer memory storage linking between Chrome accounts.
If users load whole data, it will take a long time and users will be burdened. Therefore, a small unit of update should be prepared so that it can be lightly

updated when necessary. The following is an explanation of the relevant parts. In the process of updating, the information contained through command 'get' from local storage is called, and then the changed part is saved through command 'set'. The data stored depends on the classified unit. Small units that are set to be updated include the all component, announcement, assignment, lecture, lecture and announcement, one subject, and resource.

Book Mark & Memo Since bookmarks and memos are set by the user, they cannot be used on other computers if there is no linking function between accounts. Therefore, chrome sync storage is used in this process.
Our service provides one note for each subject. Therefore, memos are not stored and deleted in a list unit, but instead insert and delete them by modifications.

	Bookmark	**Completed check**	**Memo**
key	course Id	course Id	course Id
value	assignment Id	assignment Id	content
store process	setBookmark deletBookmark	setCompleted deleteCompleted	updateMemo

Table 2. Bookmark and Memo.

5 Evaluation

5.1 Beta Version test

After distributing the beta version, 30 students at Sungkyunkwan University were tested and received feedback through a questionnaire. The survey items consisted of a total of nine items, including the satisfaction of design, memo function, lecture bookmark function, materials and overall page. The answer was determined by setting a range of five steps from "very dissatisfied" to "very satisfied."

5.2 Overall Evaluation

As a result of the survey, the majority of people were satisfied with the page. Most of people chose their answer as satisfied or very satisfied to each items.

5.3 Detailed Evaluation

Positive Feedback There were several positive feedback about our page. We received answers about why ours is better than existing expansion programs and iCampus.

- Learning management Students liked our extension because they could check the tasks to be done or the lectures to be taken at a glance. They also told us that it was good to show the remaining tasks in a card format on a weekly basis.

- Unique function of MyCampus As for the function of MyCampus, it was evaluated that the speed of movement between pages, no need to move pages several times in respect of announcement and materials page, and that the page remains the same even if the subject changes is really satisfying and is much easier to use than iCampus.

- UI Students evaluated that it looks like we put a lot of attention to UI, such as overall design, logo and update button, considering the user's convenience.

Negative Feedback We also collected negative feedback from users. Users informed us various things to supplement our page that we didn't think of.

- Memo First of all, some students told us that when writing a memo, it would be better to have a small memo pad every time the users upload it rather than a single large memo pad. Also, it would be nice if there was a function to delete existing memo. Some students wanted a memo function for each lecture and a time tag function for each lecture.

- UI Few people wanted to see the bigger logo on the top of the dashboard. Also they hope that the name of the subject on the sidebar can be displayed in two letters and customized by the user. Some people wanted to check the notice of each subject on the dashboard.

- Others There were two more other feedback. First, students wanted the iCampus screen to change to an extension screen immediately, without clicking the button. Second, some said that the data loading time at the first step was quite long than they expected.

5.4 Achievement

Lastly, he gave a positive evaluation that it is an expansion program that reflects the alternatives to the things that felt uncomfortable while using iCampus. Looking at these reviews, it can be said that the ultimate purpose of 'My Campus' was achieved to make learning management easier.

6 Discussion

6.1 Limitation

There were some restrictions in the process of loading data on the page. First, the current page cannot run the lecture directly from the lecture content page, and a new lecture content window must be opened through a click. The lecture contents were received in url form, but it was impossible to display the lecture on the page in the form of a video. In addition, we tried to add a function to download one or more data from the archives, but downloading with just one click was difficult to implement. Therefore, we decided to open several data at once. In the case of lecture information, lecture information is not imported from iCampus, but from GLS, the official portal of Sungkyunkwan University. The authentication method used to access the page is not an easily accessible method such as cookies, tokens, and query strings. Since authentication is performed after creating a token by inserting a JavaScript file on its own, it was difficult to obtain the information necessary for authentication, so it could not be implemented. Finally, the information of iCampus is not automatically updated. If you update automatically, it takes a long time to load each time you load the information. This is thought to be a fatal disadvantage in the convenient use of the program, enabling the entire and update manually, minimizing loading time.

6.2 Future Work

After distributing MyCampus to several people, we are planning to receive feedback steadily. First, the program should be developed by overcoming above mentioned limitations. Then, if the feedback suggests a problem for the page, the development will be carried out with the aim of modifying the problems as much as possible.

7 Conclusion

The final goal of MyCampus was to help students manage their learning easily. It succeeded in implementing all of the initially planned functions, such as the memo function, the lecture bookmark function, and the function of checking announcements or materials at once. In addition, through a survey after distribution, we checked many people have positively evaluated the functions we have implemented, and they are willing to use our program in the future. This indicates that we have achieved our goal. In the future, we would like to contribute to helping learning of Sungkyunkwan University students by steadily supplementing and developing this extension.

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