

Mobile Application for Learning Cascading Style Sheets Concepts

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Abstract—Learning the topics in Computer Science subject is quite challenging mainly for students at the secondary level. Some topics are hardly to be visualized. Thus, this project has developed a mobile application named as Learning Cascading Style Sheets Concepts (CASSCO), which is an educational application that aims to help the secondary school students in understanding the basics of Cascading Style Sheets (CSS). The targeted audience of CASSCO is the Form 5 students who enroll in the Computer Science course. In brief, CSS is a style sheet language which enables the users or the program authors to decorate their Hypertext Markup Language (HTML) to become attractive with colours and different styled fonts as an example. CASSCO will provide the secondary school students with content that will ease them to understand the CSS concepts and they will also be able to test their understanding by the assessments that is based on the topics taught in CASSCO. The assessment marks and reviews are provided to ensure the students are able to track their learning progress and measure how far they have advanced in understanding CSS concepts through CASSCO. Moreover, Flutter is used to develop CASSCO as this technology is globally used due to the richness of sources and stability. In addition, the methodology that is implemented in the development of this project is the Rational Unified Process (RUP) methodology.

Keywords—*Mobile Application, Educational Application; Flutter; Cascading Style Sheets Concepts*

I. INTRODUCTION

According to Müller [1], the statistic reveals that 73.4% of secondary school students in Malaysia owns a smartphone as of February 2019. The high percentage of students who own a smartphone might have increased greatly in the year 2021 due to the global pandemic which replaces physical classes with online classes, either via Google Meet, WebEx meetings, Zoom meetings and more. It is to enable the students to participate in classes even though they are not present physically at school.

In addition, students learn many subjects at schools. In Malaysia, some schools teach Computer Science as an

alternative subject. Some topics in this subject are quite challenging for the secondary level students. They require appropriate visualisations to ease understanding. Thus, we developed a mobile application named as Learning Cascading Style Sheets Concepts (CASSCO) for the secondary school students who enrolled in the Computer Science subject to have a better comprehension on Cascading Style Sheets (CSS) concepts. In brief, CSS is a part of the Computer Science subject which has been introduced to the secondary school students since the year 2017 [2]. Moreover, CASSCO will be providing the learning materials needed for the students to understand the CSS concepts, assessments to challenge themselves upon revising the learning materials and assessment reviews with the mark obtained to track the learning progress and measure how far they have advanced in understanding CSS concepts by using CASSCO.

According to Stimac [3], “the response from that class of high school students delighted me and grounded me in a way I haven't experienced before. What I view as a simple code was absolute magic to them. And for all of us who code, I think we forget it is magic. Computational magic but still magic. HTML and CSS are magic”, which indicates that high school students find the CSS topic as amazing and something magical since it can be designed according to the likes of the programmer. This situation clearly shows that the exposure of CSS does not reach out to most secondary school students, even if they are enrolled in the Computer Science classes.

CSS is a style sheet language that allows authors and users to attach style, such as fonts and spacing, to Hypertext Markup Language (HTML) documents [4]. Thus, in CSS, it is important for the students to be able to visualize what they are learning about. For instance, based on an interview that was conducted with six secondary school students found that it was difficult when the sample code provided is not attached with a screenshot of the output. This is because they could hardly visualize the output of the code snippet just by using their imagination.

Moreover, most of the topics in the school textbooks are explained using textual representation, which is often lengthy. This would bore the students and make it difficult for them to understand or grasp the concept easily as too many words are being used to represent the material to be taught. It is best to represent the material by using a short length and concise description of the topic provided with graphical representation of the source code output. This method would help the students to easily understand the material to be taught in an interesting and different way compared to textbooks.

CASSCO focuses on the CSS topic, which is a part of the Computer Science subject, to improve and ease the understanding of the secondary school students on the topic for extra reference. This is to ensure that CSS Concepts is exposed to the secondary school students not only in the textbooks, but also in mobile application for ease of access and revisions. By using CASSCO, the secondary school students will be provided with learning materials with quality content within the syllabus of Form 5 Computer Science textbook, the students shall be able to browse through the learning materials that will be provided which are short and concise within the Kementerian Pendidikan Malaysia (KPM) syllabus. Moreover, upon revising the topics, the students shall be able to challenge themselves in answering the assessment questions provided, which will cover on the topics taught in CASSCO.

Furthermore, upon attempting the assessments, the students shall be able to track their learning progress by viewing their marks and assessment answer reviews based on their respective assessment attempt. The answer reviews shall be provided with the correct and incorrect answers for the students to revise and reflect on why the answer chosen is correct or incorrect. The assessment attempt shall be limited to encourage and motivate the students to properly revise the topics before proceeding with their assessment attempt.

II. METHODOLOGY

A. Rational Unified Process

According to Altvater [5], a methodology with clearly defined process in producing high quality software which are low cost and able to be delivered in a short time is referred to as Software Development Life Cycle (SDLC). The main software development phases focused in SDLC are requirement analysis, planning, software design, software development, testing and deployment. Moreover, SDLC has a well-structured sequence of phases that assists an organization in producing high quality, well-tested and ready-to-use software quickly.

For CASSCO, the methodology that is best and most appropriate to be used by a single developer is the Rational Unified Process (RUP) which is an iterative and agile software development method. It provides a structured approach in designating tasks and responsibilities in a development organization. RUP aims to produce high quality software that fits the needs of the end users which is within the schedule planned. Moreover, it is known as agile as the phases of the cycle can be repeated until it satisfies the objectives and requirements of the software.

Furthermore, by implementing RUP, the developer is expected to work closely with the clients as it is to ensure the software that is being developed is frequently updated and revised upon the suggestions or comments [6]. The methodology is also a configurable process in which it fits small development teams. RUP is based on a straightforward and simple process design that ensure consistency throughout a group of processes.

Thus, to justify why RUP is the most appropriate methodology to be implemented in the application development is that the methodology is iterative as the phases in the cycle can be repeated until it satisfies the software requirements. Moreover, by having an agile approach, the RUP methodology allows the projects to be adapted in any scale and it is also adaptive to changing requirements, which makes it suitable to be used for the developer to adapt to changes throughout the project iteration. As for CASSCO, it will be developed by a single developer. The methodology can be adapted to the needs of the project development due to its iterative and agile approach.

B. Rational Unified Processing Phases

Based on Fig. 1, the RUP methodology consists of four main phases, which are the inception phase, elaboration phase, construction phase and transition phase.

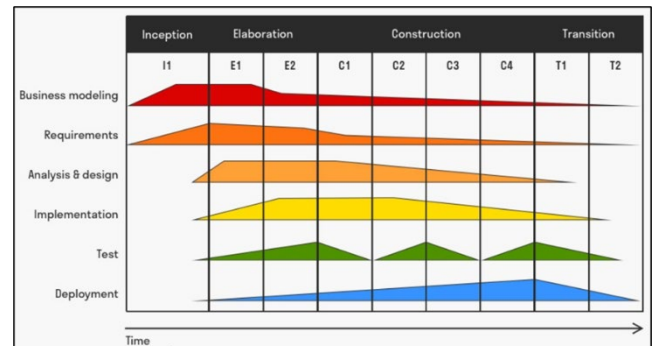


Figure 1: Rational Unified Process phases [7]

The inception phase focuses on the launch of the project, in which the project must be validated for it to be started. This phase is usually short, as it is used to define whether the project is feasible to continue with the defined risks and costs.

According to Anwar [6], the inception phase is considered as the “Lifecycle Objective Milestone”, in which if the project does not pass this milestone, it will either be cancelled or redesigned to satisfy the requirements or criteria missing. On the other hand, the elaboration phase focuses on tackling the most significant technical risks of the project. It exists to make a basic system which will guide through the technical questions. The decision whether the system will be able to be built successfully will be determined at the end of this phase. The deliverables expected to be available by the end of this phase are the use case model, description of software architecture, business case and risks that comes with it, overall project development plan and prototypes [6].

Majority of the development process of the project has been completed during the construction phase and all application

components with their functionalities have been incorporated as well as end-to-end testing. By the end of this phase, user manuals and beta version of the system are available for evaluation. The transition phase can be postponed if the product is not ready or stable enough to be tested by end users [6].

In the transition phase, the product shall be introduced to the end users which is like the deployment phase in SDLC. The software requirements and the user needs must already be fulfilled in this phase. Then, the system shall be evaluated and refined based on the user feedback received with the purpose of polishing the system. In addition, training is included in this phase for the end users [6]. The system will be released, and the project will be evaluated at the end of this phase.

III. ANALYSIS AND DESIGN

For the analysis, CASSCO has an actor which is a student and there are nine use cases altogether, which are Register Account, Manage User Account, View Performance, Provide Feedback, View Learning Materials, Attempt Formative Assessment, Review Formative Assessment, Attempt Summative Assessment, and Review Summative Assessment. Then, the use cases are further categorized into three modules, which are Profile, Lesson and Assessment. The use case diagram is as shown in Fig. 2.

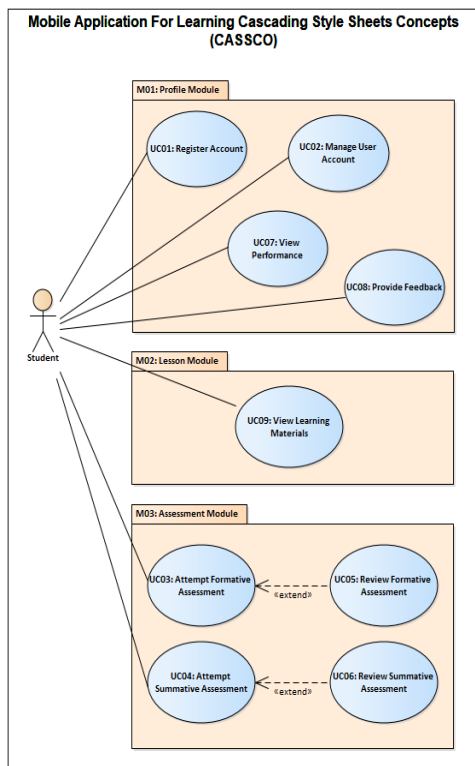


Figure 2: Use case diagram of CASSCO

Based on Fig. 2, there are nine use cases that describes variations of functional requirements of the application.

Use case: UC01 Register Account

Actor: Student

Description: This use case shall describe how the user is able to register an account to login to CASSCO.

Use case: UC02 Manage User Account

Actor: Student

Description: This use case shall describe how the user is able to manage their user account by editing their profile.

Use case: UC03 Attempt Formative Assessment

Actor: Student

Description: This use case shall describe how the user is able to attempt the formative assessment.

Use case: UC04 Attempt Summative Assessment

Actor: Student

Description: This use case shall describe how the user is able to attempt the summative assessment.

Use case: UC05 Review Formative Assessment

Actor: Student

Description: This use case shall describe how the user is able to review their attempted formative assessment answers.

Use case: UC06 Review Summative Assessment

Actor: Student

Description: This use case shall describe how the user is able to review their attempted summative assessment answers.

Use case: UC07 View Performance

Actor: Student

Description: This use case shall describe how the user is able to view their formative and summative assessment performance.

Use case: UC08 Provide Feedback

Actor: Student

Description: The user shall be able to provide feedback for the application improvement.

Use case: UC09 View Learning Materials

Actor: Student

Description: This use case shall describe how the user is able to view the learning materials.

A. User Interface

The user interface is the representation of the presentation layer which is a method for the user to interact with the application. The user interface for the login page of CASSCO is as shown in Fig. 3. In brief, the user is required to enter their login credentials, such as email and password, to login to CASSCO. If the user does not have an account with CASSCO, the user shall click on the “Sign Up” text button to register an account. Furthermore, if the user has forgotten their password,

the user shall click on the “Forgot Password?” text button to reset their password.

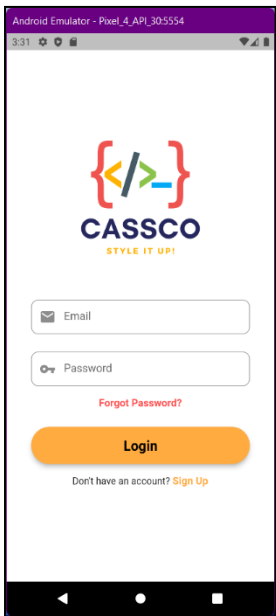


Figure 3: Login page of CASSCO

Fig. 4 is the sign up page of CASSCO. To register an account, the user needs to fill-in the registration form with the user details, which are their first name, second name, email, and password confirmation. To submit the registration form, tap on the SIGN UP” button.

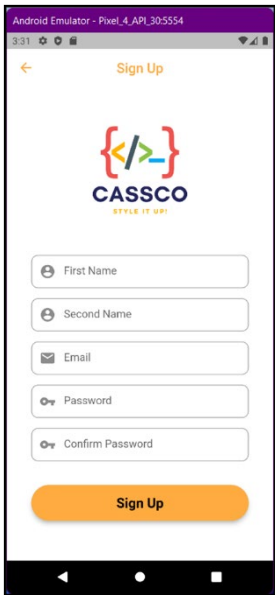


Figure 4: Sign up page of CASSCO

Fig. 5 illustrates the main page of CASSCO. It shows the CSS Keywords feature, provide feedback and frequently asked questions section. The user shall be able to navigate to the topic by tapping the “Go To” topic button respective to the keyword.

If the user wants to provide feedback for the application, the user shall tap on the “Submit Feedback” button. If the user wants to see the frequently asked questions, the user shall tap on the “List of FAQ” button. Fig. 5 also shows the lesson page of CASSCO. The topic of the lesson is displayed on top of the page, followed by the lesson topic and learning material contents.



Figure 5: Main page of CASSCO

Fig. 6 shows the feedback page for the users to submit their feedback upon using the application. The user may input their feedback in the text box with the “Enter your feedback here” placeholder.

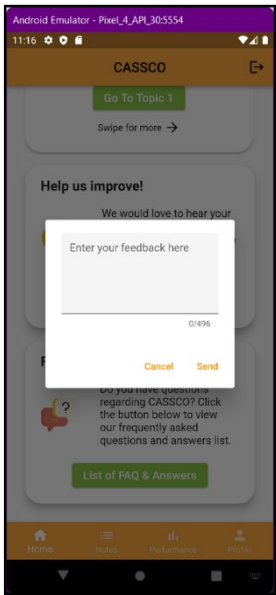


Figure 3: Feedback page of CASSCO

Fig. 7 is the formative assessment page of CASSCO. The topic of the assessment will be displayed on top, followed by the type of assessment, question and answer options of the formative assessment.

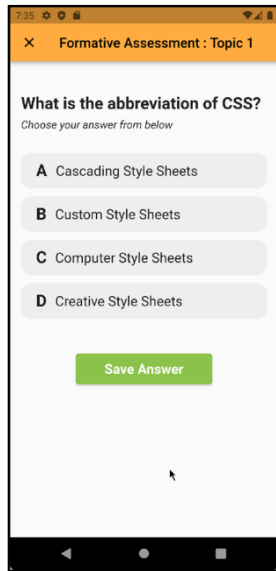


Figure 7: Formative Assessment page of CASSCO

Fig. 8 shows the summative assessment page of CASSCO. The type of assessment will be displayed on top, followed by question and answer options of the formative assessment.

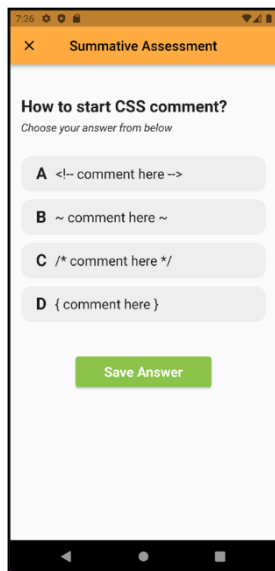


Figure 8: Summative Assessment page of CASSCO

Fig. 9 illustrates the answer review of the assessment selected from the performance page. The correct answers will be shown, as well as the incorrect answers attempted by the user.

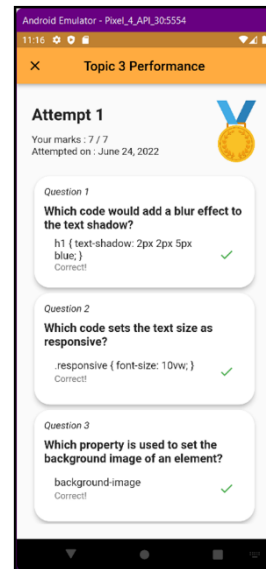


Figure 9: View performance page of CASSCO

Fig. 10 is the edit profile page of the respective user. The user shall be able to edit their first name and second name only. The email field shall be disabled.

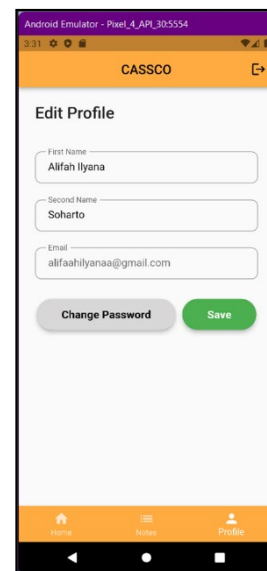


Figure 10: Edit profile page of CASSCO

IV. THE IMPLEMENTATION

The implementation of CASSCO using Flutter provides a platform for the students to learn the CSS concepts simply by installing a mobile application on their mobile devices. This will ease the students in gaining knowledge even outside of their classrooms. The application stores all attempted assessments results to be revised and reviewed by the students

upon assessment attempt. Two types of assessments are available in CASSCO, which are formative and summative assessment. The formative assessment is an assessment that tests the students' knowledge by topic which consists of seven questions from the respective topic chosen, whereas the summative assessment is an assessment which consists of 15 questions from all topics. Upon each assessment attempt, the students shall receive their marks and answer summary of correct and incorrect answers as well as the badge gold, silver, or bronze according to their achievement. To review the attempts, they shall be able to do so by viewing it in the view performance section.

The User Acceptance Testing (UAT) test results derived positive feedback and impression from the users. This reflects that the implementation of CASSCO managed to fulfil the identified requirements, objectives and specifications during the analysis and design phases of this project following the RUP methodology.

V. CONCLUSION

In conclusion, CASSCO is a mobile application developed using Flutter that uses the Dart programming language, which is connected using the Firebase Firestore database. The purpose of this application is to ensure that CSS Concepts is exposed to the secondary school students not only in the textbooks, but also in mobile application for ease of access and revisions.

Thus, the students shall be able to revise the notes through the application and challenge themselves by attempting the formative and summative assessments provided in CASSCO. The student's assessment attempt shall be rewarded with badges as an achievement to encourage the students to properly revise the topics as it is only limited to two attempts per assessment type and topic.

For future improvements, such educational applications may include gamification and extra video references for better content understanding for visual learners. It is anticipated that students' interest in CASSCO could be improved and they are also able to experience enhanced learning experience with improved user experience through gamification.

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