Sumerep v.1: Student Medical Reports for Analysis and Monitoring of Student Health

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Abstract

School-age health is essential for educational success. Indonesia's student health examination process is a routine agenda at least twice a year. However, health workers need help storing and analyzing data because the system is still manual. We created a website-based system for screening, diagnosing and monitoring students named Sumerep v.1 (student medical report). Sumerep v.1 users are students, teachers and public health centre workers. The Minimum Viable Product (MVP) shows essential features being developed, including independent mental health screening and checking vital signs and students' physical health. Users can accept the impact of the Sumerep website. The effect of the Sumerep website is acceptable to users; it can be seen from user satisfaction, which is 81.6%.

Keywords

Medical report, Health Screening, User Experience, Agile

Code metadata

Nr	Code metadata description	Please fill in this column
C1	Current code version	*V1*
C2	Permanent link to code/repository used for this code version	*https://github.com/novian66/sumerep*
C3	Permanent link to reproducible capsule	*https://sumerep.com/*
C4	Legal code license	*MIT License*
C5	Code versioning system used	*git*
C6	Software code languages, tools and services used	*CSS, JS, PHP, MySQL*
C7	Compilation requirements, operating environments and dependencies	-
C8	If available, link to developer documentation/manual	*https://github.com/novian66/sumerep/wiki/documentation*
C9	Support email for questions	tenia@ittelkom-pwt.ac.id or novian@ittelkom-pwt.ac.id

Chapter 1. Introduction

Efforts to monitor student health in schools collaborate with the school and the public health service. This monitoring effort requires recording students' health status regularly and continuously to describe a person's health status (Soenarnatalina et al., 2019)*. In Indonesia, the health screening process for school-aged children is a routine activity carried out every semester involving schools and public health centres*(Ripursari & Suhita, 2023)*. With medical reports for students in elementary schools, teachers and doctors from public health centers can be used as the main source in making case notes so that fellow medical officers can observe and know about them* (Ortega-Loubon et al., 2017)*. In addition, health information in schools in a particular area can be used as material for information exchange and communication between different health service* (Almulhem, 2021)*. With a digital medical student report, the students' physical and mental health can be detected by those closest to them, such as parents and teachers* (Agustin et al., 2023; Wahyuningrum et al., 2021)*. Mental health also plays a vital role in student learning success, especially after the COVID-19 pandemic has impacted all aspects of human life* (Wahyuningrum et al., 2022)*.*

Based on the urgency, we need a fast and agile system development method for building a student medical report system. The obstacles we face are limited resources, costs, and a small team. The system requirement is a simple system that can be accessed and operated easily. Therefore, we chose the Agile UX method (Nadikattu, 2016)*, modified in the design sprint process at each iteration. Modified Agile UX helps achieve continuous improvement* (Wahyuningrum et al., 2023)*. Three fundamental principles show how agile methods can enhance and complement UX design:* ***1.)*** *Team member interaction. Play a critical role in software development with concerted and well- communicated efforts;* ***2.)*** *User feedback and analysis. The integration part of the agile development process is where feedback is collected and measured, putting the end users of product development in the early stages;* ***3.)*** *Completion of additional projects. Enables software development to respond to changes incrementally, eliminating unwanted friction. Agile UX modifications accelerate processing time by focusing on building important functions and producing a minimum viable product. Generally, the design sprint process is carried out in five stages over five days (Understand, Diverge, Decide, Prototype, and Validate)* (Dias et al., 2020; Knapp et al., 2016; Sumual et al., 2019; Thomas & Shin, 2016)*, while this modification only uses three stages over three days (Ideate, Create, Iterate).*

Chapter 2. Software Description

a. Functional description

Sumerep (stand for Student Medical Report) is a web-based software used to manage student health and provide reports for students, teachers and public health centres.

The software functions in detail can be explained as follows,

1. *There are three software users, namely students, teachers and public health centres.*
2. *Student users have the authority to fill in personal health data based on self-assessment. The personal health in question is mental health (psychological well-being, reproductive knowledge, learning motivation);*

3. *Teacher users have a role in filling out the health examination form for each student. Health data that can be input by teachers based on observations and measurements are vital sign checks (blood pressure, pulse, temperature, lung sounds and heart sounds); nutrition check (weight, height, body mass index, stunting, signs of anaemia); Fitness check (travel time and distance based on gender and age when running test); personal hygiene check (cleanliness of hair, nails, skin).*
4. *The public health centre user (an assigned doctor) has a role in inputting student health during health screening, such as ear and mouth health, use of assistive devices, and providing recommendations for each student.*
5. *The output of this software is a student medical report that can be assessed by students, teachers, and public health centres, depending on their roles.*

b. Goals and Milestones

The Sumerep development project is broken down into parts to make it easy to manage. The big goal is for this software to overcome the problem of digitizing student health services. In more detailed goals, we created two sets of milestones. Milestones are checkpoints where stakeholders can determine to what extent project achievements have met targets and which have not. The first milestone is the completion time of sprint 1 to see the features and roles that have been built. Analyze the user experience and discuss designs that are planned to be improved. The second milestone is after the finishing touch on the product is carried out. This milestone ensures that there are no link errors or errors in the design of the Minimum Viable Product (MVP).

c. Timeline

The timeline describes in detail the tasks and deadlines for completing the functions intended for the benefit of the technical team. Basically, the development of the Sumerep website uses two sprints, each sprint lasting 3 days. The design sprint, pre-development and product finalization took about 10 days. Figure 1 shows the timeline of Sumerep Website.

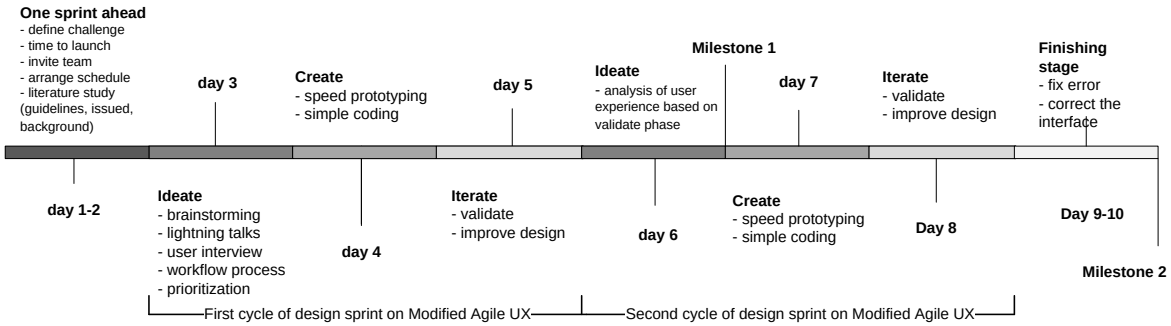


Figure 1. Timeline of development

d. Prioritization

In the idea stage, we identify essential priorities for the product to be developed first. This decision is because we have a limited time, so not all features can be created quickly. We focus on features that are crucial to realizing immediately. We use a priority matrix to describe each feature's importance level. Based on each feature's quadrant, we weigh whether to include it in the MVP. The features in the top right quadrant (high urgency, high impact) are the first prioritization in the MVP. With features in the bottom right (high urgency, low impact) and top left (intense urgency, high impact) quadrants, they are the second priority.

The features in the lower left quadrant (low urgency, low impact) are ignored in the MVP and will be built into future product development.

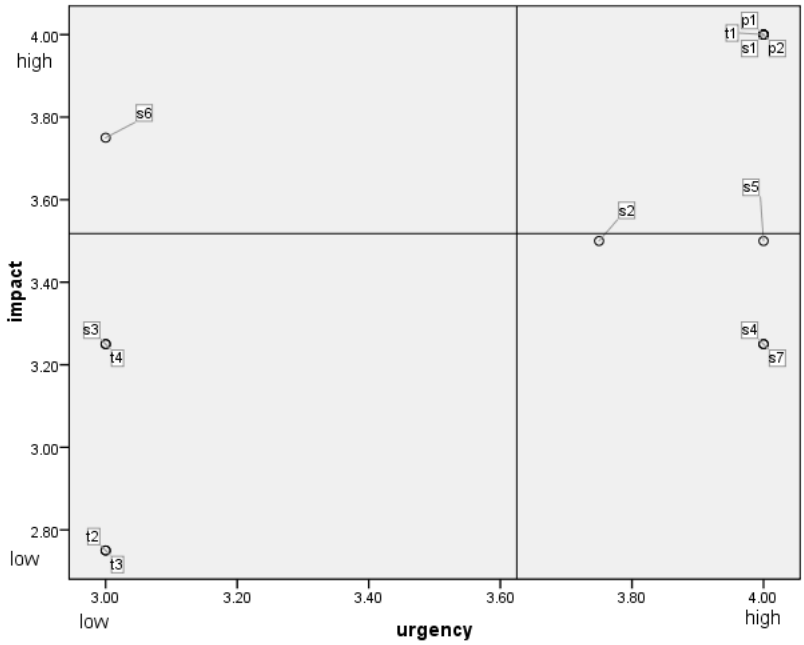


Figure 2. Prioritization matrix

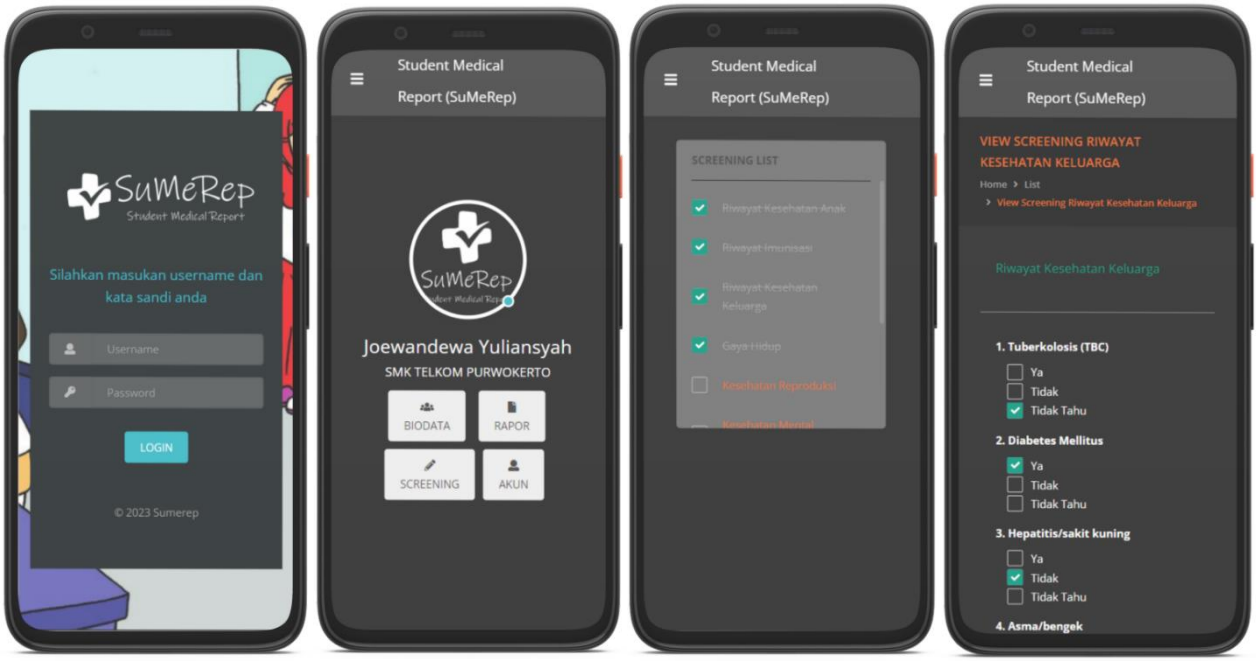
Based on Figure 2, it can be seen that the main priorities with high urgency and impact are S1 (psychological wellbeing), T1 (vital sign check), P1 (hearing health check), P2 (dental and oral health check), and P3 (use of assistive devices). While other features in the upper left quadrant and lower right quadrant will be the second priority. There are S4 (motivation to learn), S6 (familiy health history), S7 (congenital disease). To see in more detail the features that will be created, based on their level of importance, can be seen in Table 1.

Table 1. Level of importance of the feature

code	feature	impact	urgency
S1	Psychological wellbeing	4	4
S2	Reproduction health	3.5	3.75
S3	Lifestyle	3.25	3
S4	Motivation to learn	3.25	4
S5	Vaccine history	3.5	4
S6	Family health history	3.75	3
S7	Congenital disease	3.25	4
T1	Vital sign check	4	4
T2	Nutritional status check	2.5	3
T3	Personal hygiene check	2.75	3
T4	Physical fitness check	3.25	3
P1	Hearing health check	4	4
P2	Dental and oral health check	4	4
P3	Use of assistive devices	4	4

e. User Interface

At the speed prototyping stage we created a simple UI based on the needs in MVP development. We divide UI into 3 user roles, namely students, teachers and community health center officers. Figure 3 shows the student UI, that consists of login page, menu page report page, and screening page. UI Sumerep communicates with users using Indonesian. On the login page, students need to enter their username and password according to what they have previously registered (Figure 3. (a)). The menu page has four main features: health report, self-screening form, biodata form, and user account (Figure 3. (b)). Users can select one of the features and can return to the main menu by clicking back or the burger menu. In Figure 3. (c), the students can see their health reports during school. Students also get feedback from health workers through recommendations; if the illness they suffer is severe enough, students can see a doctor's referral to the nearest hospital for follow-up. Figure 3. (d) shows one of the independent screening forms that students can fill out: the psychological well-being form. From the results of student input, health workers and teachers can provide recommendations regarding their physical and mental health.

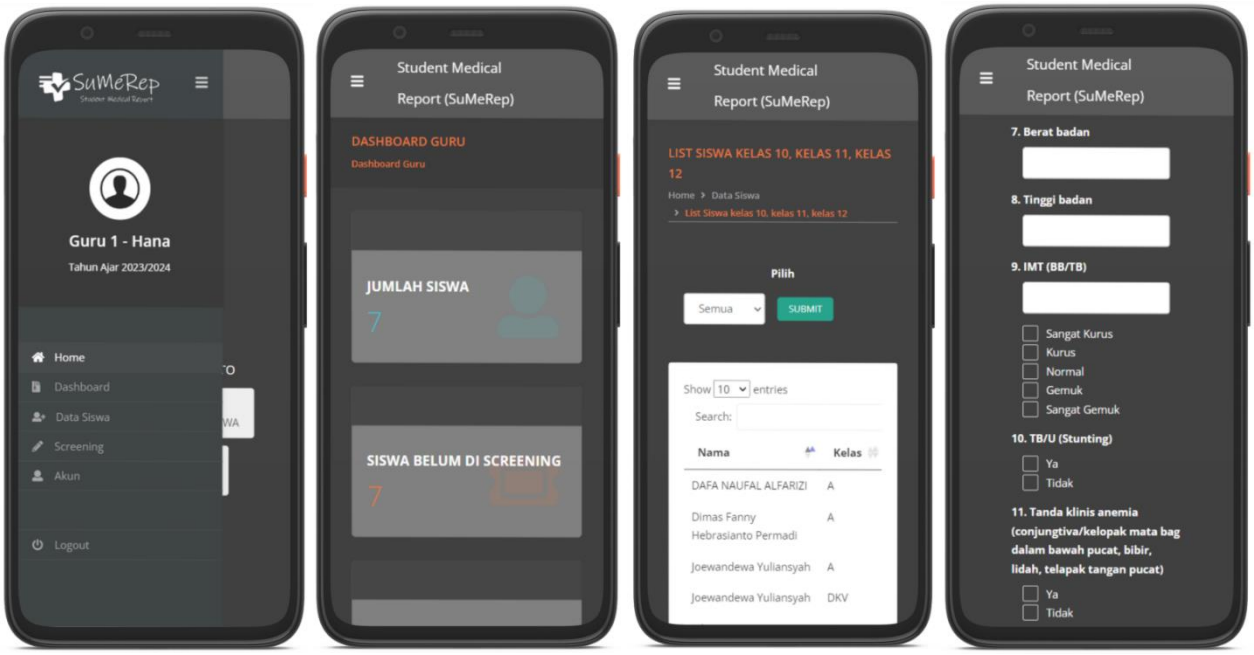


(a). login page (b). menu page (c). report page (d). screening page

Figure 3. Student UI

The UI for teacher users is essentially able to input student health based on observations and measurements by the teacher; the teacher dashboard can see students who have carried out self-screening and those who have not and can see a list of all students along with their health reports. Figure 4. (a). shows the home page of the teacher's user; it consists of 4 menus: student biodata, dashboard, screening and user account. Teachers can see the student's health dashboard as a whole and students who have undergone health screening on the teacher's dashboard page (Figure 4 (b)). Figures 4. (c) and (d) shows the student list

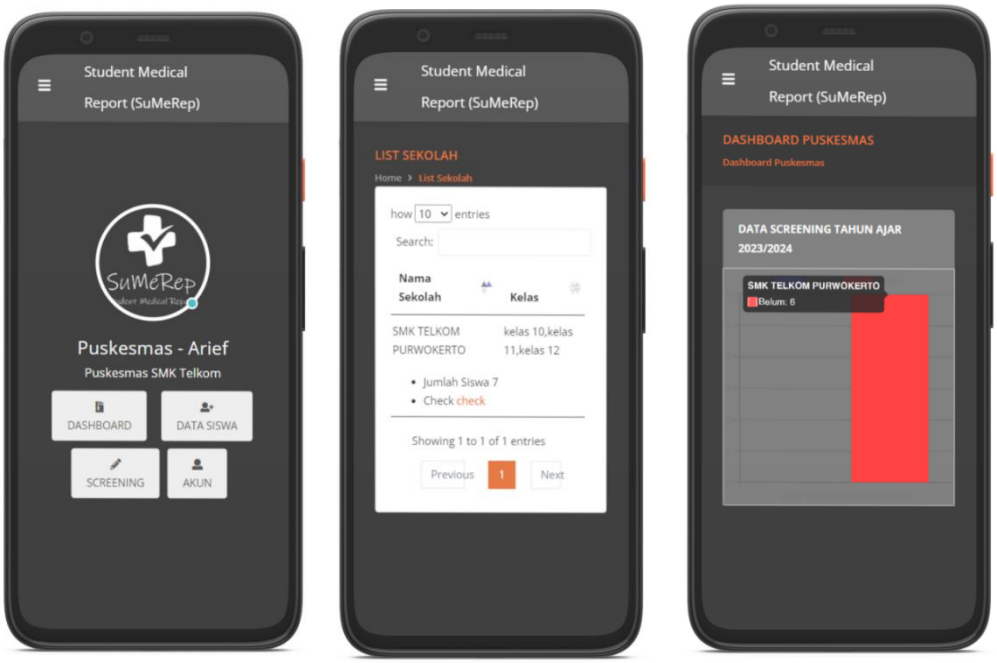
and teacher screening checklist. On this page, teachers can see the student's overall health ledger and input health checks by the teacher. These include checking vital signs such as blood pressure and temperature.



(a). home page (b). teacher's dashboard (c). list of students (d). teacher's screening list

Figure 4. Teacher UI

The user interface for health workers (doctors in public health centres) generally has three main functions: menu page, screening page, and dashboard page. Figure 5 (a) shows the public health centre worker's menu page. There are 4 menus: dashboard, student data, screening data and user account. Figure 5 (b) expresses the screening list the public health centre carried out at schools in its area. Figure 5 (c) represents the screening list the public health centre carried out at schools nearby. In this menu, the public health centre can monitor and analyze schools with low health achievements, such as the discovery of stunting cases, mental health cases and other cases affecting students in the area.



(a). menu page (b) sceening list based on school (c) public health center dashboard

Figure 5. Public Health Center UI

f. Prototyping

The Sumerep website was created using the PHP programming language, the database used is MySQL. To regulate the appearance of elements written in markup language, Cascading Style Sheets (CSS) are used so that content and visual appearance are separated on the site. The following is a coding script for collecting student mental health data through a form with questions the psychologist has determined.

```
if(isset($_POST['submit'])){

    foreach($rows3s as $row){
        $id_question = $row['id'];
        $stmtsss = $pdo->prepare("SELECT * FROM `master_question` WHERE categories_id =
'$id_question'");
        $stmtsss->execute();
                    // Fetch the records so we can display them in our template.
        $rowsss = $stmtsss->fetchAll(PDO::FETCH_ASSOC);
        foreach($rowsss as $row2){
        $i = $row2['id'];
        $check1 = $row2['question_check_option'];
        $check2 = $row2['question_need_answer2'];
        if(is_null($check1) and is_null($check2)){
            $input[$i] = $_POST['input'.$i];
            $number[$i] = 44;
        }elseif(!is_null($check1) and is_null($check2)){
            $input[$i] = '';
            $number[$i] = $_POST['checkbox'.$i];
        }elseif(!is_null($check1) and !is_null($check2)){
            $input[$i] = $_POST['ya_input'.$i];
            $number[$i] = $_POST['checkbox'.$i];
        }
        $stmt3 = $pdo->prepare("INSERT INTO `answer_question` (`question_id`, `answer`,
`answer2`,`id_kelas` ,`tahun_ajar`, `created`, `created_by`) VALUES ( '$i', '$number[$i]',
'$input[$i]','$id_kelas' ,'$tahunajar', current_timestamp(), '$id_siswa')");
        $stmt3->execute();
        }
        $idcategories[] = $id_question;
    }
    $idcats = implode(',', $idcategories);
    $stmt4 = $pdo->prepare("INSERT INTO `check_done` (`categories_id`, `user_id`, `done`, `created` ,
`type` , `tahun_ajar` , `id_kelas`) VALUES ('$idcats', '$id_siswa', 'yes', current_timestamp() ,
'puskesmas' , '$tahunajar' , '$id_kelas');");
        if($stmt4->execute()){
            $msg = 'Success!!';
            echo "<script type='text/javascript'>alert('$msg'); window.location.href='detail-kelas-
puskesmas.php?sekolah=$id_sekolah&kelas=$id_kelas'</script>";
            }else{
                $msg = 'Error!!';
            echo "<script type='text/javascript'>alert('$msg'); window.location.href='detail-kelas-
puskesmas.php?sekolah=$id_sekolah&kelas=$id_kelas'</script>";
            }

}
```

Chapter 3. Impact

We tested 25 students with task-level questions to see the impact on users. Task level satisfaction is a measure of user satisfaction, seen from how difficult a given task is. After the user performs a series of requested tasks, whether they were successful or not will be asked a question. The questionnaire commonly used is the Single Ease Question (SEQ), which only consists of 1 question: "In general, how do users assess the system?". The answer to this question is in the form of a 1-5 Likert scale (the bigger the number, the more satisfied)(Sauro & Dumas, 2009). *The user's satisfaction can be calculated using the equation (1).*

$$test\ level\ satisfaction\ score = \frac{\sum_{i=1}^{x} w_i \times n_i}{N \times 100 \times 5} \times 100\%$$

where w_i is the weight of each scale, n_i is the number of participants who answered on that scale, x is the number of scales, N is number of respondents, and 5 is the maximum of weight.

$$test\ level\ satisfaction\ score = \frac{(2 \times 1) + (3 \times 5) + (4 \times 10) + (5 \times 9)}{25 \times 100 \times 5} \times 100\%$$

$$test\ level\ satisfaction\ score = 81.6\%$$

Based on the results, the percentage of user satisfaction was found to be 81.6%, meaning that users felt that the task given was easy.

Chapter 4. Limitations and Future Work

This research is still being developed, in line with user requests to complete website features. Among them, features in in-depth data analysis show trends in certain health conditions in schools in the area. This analysis can help public health centres determine the direction of health policy development in their region. The government can also assess support for the community, especially school-aged children, in improving their health.

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